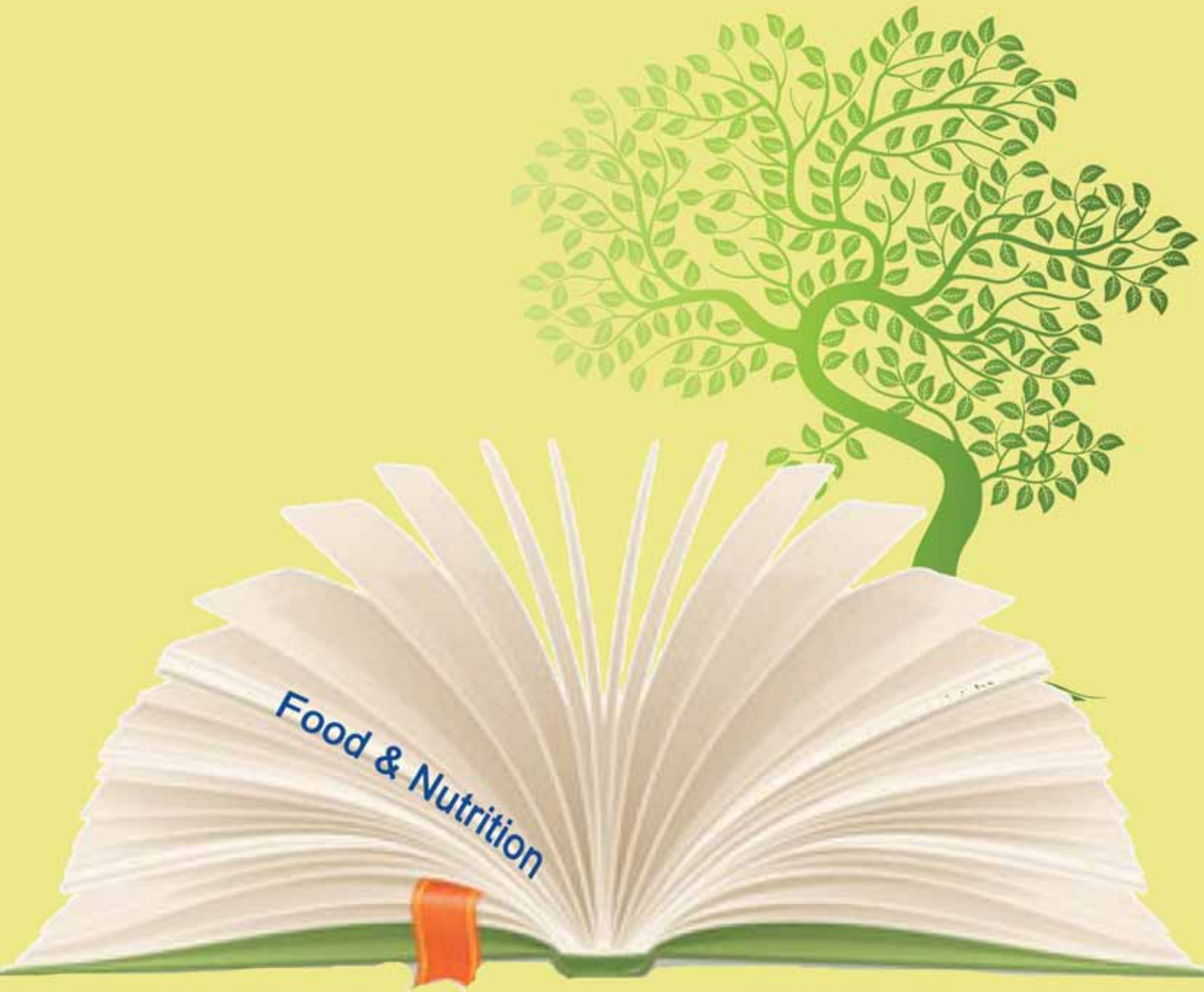

OPEN EDUCATIONAL RESOURCES

4

OPEN SCHOOLS

Taking Education to the People

Open Educational Resources (OER) for Open Schooling

The Commonwealth of Learning (COL) Open Schools Initiative launched an Open Educational Resources (OER) Project to provide materials under the Creative Commons license agreement to support independent study in 17 specially selected secondary school subjects. Funded by the William and Flora Hewlett Foundation its aim is to broaden access to secondary education through the development of high quality Open Distance Learning (ODL) or self-study materials.

These specially selected OER subjects include:

1. Commerce 11
2. Coordinated Science 10 (Biology, Chemistry and Physics)
3. English 12
4. English Second Language 10
5. Entrepreneurship 10
6. Food & Nutrition
7. Geography 10
8. Geography 12
9. Human Social Biology 12
10. Life Science 10
11. Life Skills
12. Mathematics 11
13. Mathematics 12
14. Physical Science 10
15. Physical Science 12
16. Principles of Business
17. Spanish

Open Educational Resources are free to use and increase accessibility to education. These materials are accessible for use in six countries: Botswana, India, Lesotho, Namibia, Seychelles and Trinidad & Tobago. Other interested parties are invited to use the materials, but some contextual adaptation might be needed to maximise their benefits in different countries.

The *OER for Open Schooling Teachers' Guide* has been developed to guide teachers/instructors on how to use the Open Educational Resources (OER) in five of these courses.

1. English
2. Entrepreneurship
3. Geography
4. Life Science
5. Physical Science

The aim of this teachers' guide is to help all teachers/instructors make best use of the OER materials. This guide is generic, but focuses on Namibian examples.

Print-based versions are available on CD-ROM and can be downloaded from www.col.org/CourseMaterials. The CD-ROM contains the module and folders with additional resources, multimedia resources and/or teacher resources. Note that not all subjects have multimedia resources.

Acknowledgements:

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Ministry of Education, Seychelles: www.education.gov.sc
Ministry of Education and Training, Lesotho: www.gov.ls/education
Ministry of Education Trinidad& Tobago: www.moe.gov.tt
National Open School of Trinidad & Tobago (NOSTT): www.moe.gov.tt/NOSTT
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The Commonwealth of Learning (COL) is an intergovernmental organisation created by Commonwealth Heads of Government to encourage the development and sharing of open learning and distance education knowledge, resources and technologies.

COURSE BLUEPRINT

Food and Nutrition

For the Caribbean Secondary Education Certificate

COL Open School Initiative Trinidad and Tobago

Copyright

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About this course blueprint

Food and Nutrition For the Caribbean Secondary Education Certificate has been produced by COL Open School Initiative Trinidad and Tobago.All course blueprints produced by COL Open School Initiative Trinidad and Tobago are structured in the same way, as outlined below.

How this course blueprint is structured

The course overview

The course overview gives you a general introduction to the course. Information contained in the course overview will help you determine:

- If the course is suitable for you.
- What you will already need to know.
- What you can expect from the course.
- How much time you will need to invest to complete the course.

The overview also provides guidance on:

- Study skills.
- Where to get help.
- Course assignments and assessments.
- Activity icons.
- Units.

We strongly recommend that you read the overview *carefully* before starting your study.

The Course Content

The course is broken down into 30 units. Each unit comprises:

- An introduction to the unit content.
- Unit Objectives

- Unit outcomes.
- New terminology.
- Core content of the unit with a variety of learning activities.
- A unit summary.
- Assignments and/or assessments, as applicable.
- Answers to Assignment and/or assessment, as applicable

Resources

For those interested in learning more on this subject, we provide you with a list of additional resources at the end of this course blueprint; these may be books, articles or web sites.

Your Comments

After completing Food and Nutrition we would appreciate it if you would take a few moments to give us your feedback on any aspect of this course. Your feedback might include comments on:

- Course content and structure.
- Course reading materials and resources.
- Course assignments.
- Course assessments.
- Course duration.
- Course support (assigned tutors, technical help, etc.)

Your constructive feedback will help us to improve and enhance this course. Feedback may be submitted on a form supplied at the end of each unit or completed online via the feedback section on the National Open School of Trinidad and Tobago website (www.deutt.moe.org).

Course Overview

Welcome to Food and Nutrition For the Caribbean Secondary Education Certificate

Food and Nutrition is a science based subject. Did anyone ever tell you that? Yes it is. It has its foundation in chemistry and biology. 'Food and Nutrition' is what is referred to as an applied science. As an applied science Food and Nutrition uses scientific principles of food science and nutrition to help you appreciate the value of food and its function within the body. In addition, there is use of practical skills in the preparation and service of food. In essence, Food and Nutrition is geared towards helping you as an individual recognize that your health is dependent on the quantity and quality of food eaten and functions to guide you in the selection of appropriate cooking methods to be used in food's preparation. Choosing to pursue this course of study will allow you to make invaluable contributions to your improving the quality of life for your home and society. Already, in the Caribbean issues of food security, safety and health are concerns of the various territories in their quest to efficiently function in today's world. The study of Food and Nutrition can function as one of an arsenal of initiatives to assist in achieving this.

Food and Nutrition, is offered at the Caribbean Secondary Education Certificate (CSEC) level and the governing body charged with the responsibility of overseeing certification is the Caribbean Council Examination (CXC). It is offered to secondary school students in Forms Four (4) and Five (5) at the General Proficiency Level. Candidates sit the terminal examination in their fifth year of secondary school. This two year course of study provides you with opportunities for the development of skills in the planning, preparation and presentation of foods, which are the basic requirements for general health and well-being. In order to achieve this, Food and Nutrition (CSEC) has two operative domains, namely theoretical and practical. The latter culminates in a School Based Assessment which carries a weight of twenty percent (20%) of your final examination mark. On completion of this course of study you will have a body of knowledge and skills which can be applied in your daily lives. It may also form the foundation in your pursuit of tertiary level education or at other programmes such as Youth Training and Employment Partnership Programme (YTEPP) which offer technical vocational training as well as the Trinidad and Tobago Hospitality Tourism Institute (TTHTI).

Access to technical vocational training in Trinidad and Tobago is being expanded through the Ministry of Education's Distance Education Unit. Food and Nutrition being a technical/vocational subject can now be

pursued using open and distance education modality. As a consequence students desirous of pursuing the CXC course of study in Food and Nutrition can do so in the formal setting of the classroom or via the distance education mode in the virtual classroom. Introduction of this new mode of curriculum delivery caters for students already in the secondary school system, at the Forms Four (4) and Five (5) level pursuing the two year course of study or those repeating the final year to gain certification. In addition individuals, who may have left the formal education system but have pursued technical vocational training at programmes such as YTEPP in the said field may do the course. On successful completion they will be certified by an examination body that has both regional and international currency.

To ensure currency both regionally and internationally, the CSEC syllabus was used. The application of the syllabus to the development of this Food and Nutrition course is to convert the substance of the CSEC program into thirty one units, which revolve around seven main concepts or themes to be covered within 240 hour period. The units are designed to supplement or replace classroom teaching. The lessons are written in the form of self-learning materials designed to meet the individual needs of the learner. They are activity based, written in simple language with clearly defined objectives. You can access and monitor your progress throughout the course via the internet as well as in printed format.

So without further ado let us begin our journey into the exciting world of distance education in the field of Food and Nutrition. We need you to stay the course to make this journey memorable.

A visit to the website of this course will provide you with a wealth of pleasurable learning experiences. These experiences will include interactive modules, webcasts, games, manipulative materials, downloads, recipes, desktop videos, printed material and webcam conversations

Food and Nutrition For the Caribbean Secondary Education Certificate

Learner Profile

This course is designed to allow you access to your education in Food and Nutrition, whether you are at home or at school or anywhere, both online and in face to face instructional environment. This will enable those of you currently pursuing Food and Nutrition at the CSEC level to complete this syllabus in a manageable timeframe as you progress through this self- instructional material. It also allows those of you who wish to begin to develop your knowledge and skills in Food and Nutrition to do so outside of the formal classroom environment.

The course is designed for use by people who may currently be secondary school students, school dropouts or, secondary school (O'level) repeaters. Adults, who may not have attended secondary school with limited practical skills wishing to acquire a theoretical knowledge of Food and Nutrition and improve their practical ability, may also be amongst the target learners for this program. With this in mind you should be independent learners, who are committed to lifelong learning and possess a keen interest in developing a high level of skill proficiency.

Prerequisites

You should be willing to try new foods and cooking techniques. You should be able to engage in active reading in order to extract, analyze and interpret information and instructions which will be used to answer questions about the nutritional information presented in the course

Prerequisite Skills

You should have a desire to learn and be an independent learner. As an independent learner you should be seen to be adept at problem solving, decision making, critical thinking and troubleshooting issues related to Food and Nutrition.

You should possess basic numeracy and literacy skills as well as developed competencies in lower secondary level Mathematics, English and Integrated Science. In addition you should have a working knowledge of units of measurement i.e. Metric and Imperial measures.

It is important that students pursuing this course demonstrate an ability to communicate information in a clear, logical and concise manner as well as the ability to represent and interpret information in diagrammatic form.

Course objectives

This course in Food and Nutrition is designed to provide opportunities to develop general and specific skills in the planning, preparation and presentation of foods. This is a basic requirement for the maintenance of good health and general well-being. Additionally this course provides an understanding of the nature of food and the principles of nutrition

With the aforementioned in mind, upon completion of this course you should be able to:

The objectives of this course are:

- Demonstrate an increased awareness of the importance of practising behaviour, specific to the choice, preparation and presentation of food that will enhance the quality of life at home, school or in the work place.

Objectives

- Creatively use indigenous foods and materials of the region in the preparation and presentation of various dishes and as a consequence improve the social and economic well-being of the region.
- Develop skills and competencies that will enable you to pursue post secondary studies and future careers in fields related to Food and Nutrition.

Course outcomes

Upon completion of Food and Nutrition For the Caribbean Secondary Education Certificate you will be able to:

Outcomes

- *Understand* the scientific principles underlying the preparation of food and various nutritional concepts.
- *Understand* the principles underlying the planning, preparation and service of a variety dishes and meals.
- *Demonstrate* skills in the preparation of food with due regard to the appropriate selection of ingredients and the preservation of their nutritive values.
- *Apply* management skills in the planning, preparation and service of meals.
- *Appreciate* the aesthetic and creative aspects of food preparation and service.
- *Understand* the relationship between diet and good health particularly as it relates to the nutritional problems of the Caribbean.
- *Apply* the knowledge of the nutritional content of various foods in meal planning and meeting the nutritional needs of individuals and families at different stages of the life cycle.

Timeframe

How long?

You should begin this course at least fifteen (15) months prior to the start of the scheduled terminal examinations. To assist you to complete the 240 hours allotted for the coursework here's how you should devote your time for a timely completion of all units and requisite assignments.

4 hours of formal study is required, in the form of two 2 hour tutorial

sessions one of which is a practical session (food preparation) at designated learning centers.

You will need at least fifteen (15) hours of study to complete each unit. This is divided into ten (10) hours of formal study and five (5) hours of self-study time to complete each unit. This does not include assignments and/or assessments.

Study skills

As an adult learner your approach to learning will be different to that from your school days: you will choose what you want to study, you will have professional and/or personal motivation for doing so and you will most likely be fitting your study activities around other professional or domestic **responsibilities.**

Essentially you will be taking control of your learning environment. As a consequence, you will need to consider performance issues related to time management, goal setting, stress management, etc. Perhaps you will also need to reacquaint yourself in areas such as essay planning, coping with exams and using the web as a learning resource.

Your most significant considerations will be *time* and *space* i.e. the time you dedicate to your learning and the environment in which you engage in that learning.

We recommend that you take time now—before starting your self-study—to familiarize yourself with these issues. There are a number of excellent resources on the web. A few suggested links are:

- http://www.how-to-study.com/

  The "How to study" web site is dedicated to study skills resources. You will find links to study preparation (a list of nine essentials for a good study place), taking notes, strategies for reading text books, using reference sources, test anxiety.

- http://www.ucc.vt.edu/stdysk/stdyhlp.html

  This is the web site of the Virginia Tech, Division of Student Affairs. You will find links to time scheduling (including a "where does time go?" link), a study skill checklist, basic concentration techniques, control of the study environment, note taking, how to read essays for analysis, memory skills ("remembering").

- http://www.howtostudy.org/resources.php

  Another "How to study" web site with useful links to time

management, efficient reading, questioning/listening/observing skills, getting the most out of doing ("hands-on" learning), memory building, tips for staying motivated, developing a learning plan.

The above links are our suggestions to start you on your way. At the time of writing these web links were active. If you want to look for more go to www.google.com and type "self-study basics", "self-study tips", "self-study skills" or similar.

Need help?

Help

You will receive support from online course facilitators as well as physical tutors in the classroom and at designated support centers, during the hours of 8.00 am-4.00pm twice a week.

You can call, fax or email (www.deutt.moe.org) any enquiries you have to the tutorial support centers or communicate with course facilitators via the use of webcam.

For the developing practical skills and techniques you will be able to view online the demonstration videos, you can also access these videos in CD format at learner support centers during the stipulated contact hours.

While theoretical content is provided throughout all the lessons, you can use supplemental texts, such as; *Food and Nutrition* by Anita Tull or *C-SEC Home Economics and Beyond: Food and Nutrition* by Rita Dyer and Norma Maynard which you may purchase or access via a rental program at the learner support centers, to provide additional information or further clarification of theoretical points.

In addition to the tutorial support that will be provided, tutorial sessions will be provided at the designated learning centers.

In the event you should experience any technical issues regarding computer problems you should contact the technical support staff at our learner support centers via the telephone numbers provided or e-mail for advice.

Assignments

Assignments

In this course throughout each unit activities are provided to allow you tto do self-assessment. These activities check for understanding of the information provided and your ability to apply the knowledge gained. The answers key for these self-assessments will be provided at the end of each lesson. At the end of each lesson there will be an assignment. Assignments may be written assignments in the form of projects, journals, structured questions, true/false statements, matching items, interpretation of pictorial information, completion of tables, MCQs and fill in the blanks statements.

End of lesson assignments, on completion, should be submitted to your learner support centers via snail mail, e-mail (www.deutt.moe.org), or in person to the designated course facilitator for correction and feedback. Feedback will be timely, and may be given in person or via e-mail correspondence to learner. Assignments are to be completed as they as given at the end of each unit, within two weeks of completing the unit.

Assessments

Assessments

Assessments for this course will take two formats: Formative and Summative. Formative assessments in the form of 'reflective assignments' will be done throughout the lesson as well as at the end of each lesson as previously described. Summative assessments will be done at the end of each unit, and as a part of the requirement for certification at the end of a two year period.

Self-assessments that check for your understanding of the concepts presented in the lesson will marked by you as you monitor your progress thorough the unit.

Practical assessments will take place at designated secondary school food labs at a date and time that will be specified by the course facilitator and communicated to the learner via telephone and e-mail instructions. The learner is expected to complete at the end of each cluster of units a major written and practical assessment. Written assessments comprising structured questions essay type questions, MCQs will be conducted at the learner support centers on completion of each major theme. They will be approximately two hours long and will be held at a time and date specified by the course facilitator. These assessments will be marked by your tutor.

Instructional Design of this course blueprint

This course comprises seven major themes which are organized into fifteen (15) units or modules. Each unit is written as a self-instructional handbook comprising three (3) - five (5) lessons derived from the major objectives set out at the beginning of each unit.

Each lesson presents several key learning activities as well as a listing of new terminology that may be encountered in that lesson. Self-assessment activities for each lesson also include the answers key, as well as the mark scheme for summative assessments additionally necessary measures and their conversion equivalents are also provided for you.

Hyperlinks and web links to, and CDs of instructional videos are also provided throughout the lessons for an interactive and interesting learning experience.

Major Themes

The course is divided into six major themes given as follows; and each theme is divided into units.

- Healthy Eating
- Nutrition for Life
- Responsible Consumerism
- Kitchen Layout Equipment and Tools
- Science in Food Preparation
- Food Preparation skills

Contents

Unit 1

Nutritive Value of Foods

Introduction

Why do we eat what we eat? Have you ever wondered about this? After you have completed this unit you should be able to explain this concept. One of the best ways to healthy living is to make wise food choices. You may be asking yourself "how do I do that?," the Caribbean's six food groups will help you do this.

Food groups are not unique to the Caribbean. Different countries have their particular way in which they group their foods, for example, our North American neighbours, use four food groups. You may have heard of 'glow, grow and go foods,' which is another way of grouping foods according to what they do in our bodies. Grouping foods help us ensure that our diets are varied, balanced and in moderation. We ensure or diets are varied by consuming different foods from many different groups. Also, our diets are balanced so that we eat the right amounts from all groups daily and in moderation so that we don't consume foods from only one group.

"Why groups" you ask, "What does this mean for me?" Through this first unit of your course you will be introduced to these concepts and learn what the term food group means, what foods comprise the different groups, the major nutrient in each group and how you can use the food groups to combine foods and plan healthy meals. The skills and knowledge gained in this unit will help you understand later topics such as meal planning. Meal time will never be boring again!!!

Outcomes

Upon completion of this unit you will be able to:

- *Define* the term food group
- *Group* the foods into appropriate groups
- *Identify* the main nutrient in each food group
- *Explain* the multi-mix principle as it relates to meal planning
- *Use* the multi-mix principle to write combination meals
- *Discuss* how various categories of foods nourish our bodies

Terminology

Food: Any substance solid or liquid, when eaten provides the body with nourishment.

Food Group: A food group consists of foods that are similar based on their type e.g. vegetables or fruit, and all have similar nutrients.

Nutrients: These are the chemical substances found in food that provide the body with the material for energy, growth maintenance and repair.

How long?

You will need to devote fifteen (15) hours to work on this unit. Ten (10) hours for formal study and five (5) hours for self-study and completing assessments/assignments.

This Unit is Comprised of Four Sessions:

Session 1.1 Food Classification
Session 1.2 Multi-Mix Principle
Session 1.3. Using the Multi-Mix Principle
Session 1.4. Food and its Functions

Session 1.1 Food Classification

Introduction

Foods can be classified or grouped based on their various characteristics such as their source, where they are found, whether they are a plant or an animal and what they do. For example, 'go foods' are foods that give us energy, 'grow foods' are foods that make us grow and 'glow foods' are foods that protect our bodies. However, in the following lesson we learn to classify foods based on their common characteristics and the nutrients they provide for our bodies. You will be able to describe a food group, classify foods into their various groups and identify the main nutrient found in each food group.

It is important that you know how the foods we eat are classified because it will help you to plan meals wisely and make wise food choices to meet the body's dietary requirements. Throughout this lesson on food classification you will complete a few activities all geared towards enhancing your understanding of food.

Outcomes

Upon completion of this session you will be able to:

Define the term 'food group'

Classify foods into the appropriate food group

Identify the main nutrient in the foods within each food group

Terminology

Food: This is anything we eat or drink that provides our bodies with nourishment.

Balanced Diet: A diet that contains adequate amounts and proportions of all the necessary nutrients required for healthy growth and activity.

Food Group: A food group consists of foods that are similar based on their type, e.g. vegetables or fruit, and all have similar nutrients.

How Long?

You need to devote two and a half (2.5) hours of formal study time and one and one half (1.5) hours of self study to complete this session and the assessment/assignments.

1.1-1Food Groups

Before we even begin to consider grouping our food, our first question should be "what is food?" Some people when asked may say it is something we eat, but what about things we drink, such as milk? For an item to qualify as food it must supply our bodies with nourishment and help our bodies function properly.

Note It!

Food is anything we eat or drink that provides our bodies with nourishment and helps our bodies function properly.

Activity 1.1

Based on the explanation given above, in the table below write a list of about ten (10) foods that can be considered as food. Write your answers in Table 1.1 under the headings.

Table 1.1

Solid	Liquid

Fig. 1

Feedback

Solid	Liquid
Cereals	Fruit juices
Pasta	Milk drinks
Bread	Yogurt
Vegetables	
Fruits	

1.1-2 Food Groups

Now let's discuss Food and Food Groups.

Think of the foods you've eaten in the last 2-3 days. Write them down on a sheet of paper. Examine the foods you wrote down a little more closely. Now, put similar foods together. How did you determine this? Maybe you said these foods all come from plants, or animals, or they are all fruits.

No matter how you came to your conclusion, it is important you know that these foods can be found in your home garden, the market, supermarkets and food marts and they all vary in colour, shape, texture, flavour, nutrient content and source. All of these foods are placed in groups to assist you in making wise choices in planning a balanced diet.

So then, what does this mean? Well, foods such as: meats, fish, eggs, milk, cheese, animal based foods, peas, beans, nuts, vegetable based foods, rice, oats, corn, potato, yam, starchy foods, spinach, cauliflower, carrot, cucumber, green and leafy vegetables, orange, banana, pawpaw, pineapple, fruits, butter, coconut, avocado, margarine and fatty foods are some examples of the foods we regularly eat everyday in the Caribbean.

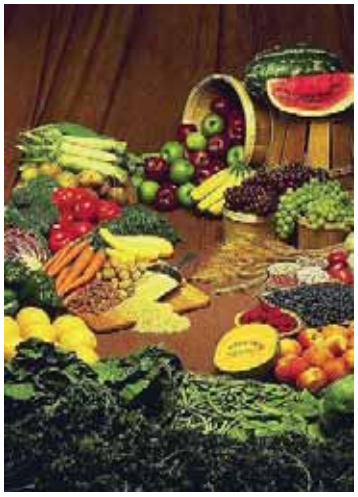


Figure 1: Plant Sources of Food
Photo by Keith Weller.

Figure 2

The foods are grouped according to their similarities and nutrient content. Some foods are similar according to their type, such as dried peas, beans or nuts. Other foods may be starchy, vegetables, fruits or fatty.

From our discussion above, we can derive that:

A food group consists of foods that are similar based on their type e.g. vegetables or fruit and have similar nutrients.

For example, all of the foods in the Food from Animals food group provide protein. Another example shows that those foods in the Fruit group provide vitamins and minerals.

Let's look at the Caribbean's six food groups. It is true that all of these foods are similar, but one may question as to why these foods were chosen as the foods from the Caribbean?

1.1-3 Classification of Foods into the Food Groups

In the Caribbean, foods are grouped into six food groups. The food groups are based on foods we regularly enjoy and are easily available in the Caribbean. Take a look at the link provided below. This link takes you to the Pan American Health Organization's website. The document shows you several colourful posters of the name of each food group and the foods that comprise each group. The last page of this document shows a pie chart or a circular graphic representation of the names of our food groups and the foods that comprise each food group. Complete the exercise that follows, (activity 1.1-2) using information you gleaned from the website link provided below.

Reading

Copy and paste the following link into the address bar on your browser. Read the information contained, and then answer the questions that follow.

http://www.paho.org/English/CFNI/Foodgroup_poster.pdf

Activity 1.1-2

Now answer the following about the six food groups as it relates to the document in the link. Write your answers in the space provided.

1. List the names of the six food groups. For EACH food group give at least three examples of foods that belong to that group.
   One has been done for you already.

Table 1.1.2

Food Group	Example 1	Example 2	Example 3
1. Staples	Rice	Bread	Potatoes
2.			
3.			
4.			
5.			
6.			

In the circular representation of the food groups, you should have noticed that not all of the divisions in the chart are equal.

1. Starting with the largest section of the circular pie like representation and moving to the smallest division/section in the pie chart, list each food group in descending order based on their size.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

2. Why do you think that there is a difference in the sizes of the different food groups? Go to the next page for the answers.

Feedback

So now that you have had a chance to read and answer, here's what your answers should be.

1. The six food groups with relevant examples are:

Food Group	Example 1	Example 2	Example 3
1. Staples	Rice	Bread	Potatoes
2. Legumes	Dried beans e.g. red/kidney beans, black beans	Peas e.g. black eye peas, lentils, split peas	Nuts e.g. peanuts, cashews etc
3. Vegetables	Dark green e.g. sweet peppers, christophene etc	Leafy e.g. lettuce, patch choi/bokchoi. etc	Yellow and other vegetable e.g. carrots, tomato, pumpkin etc
4.Fruit	Mangoes etc	Guava etc	Citrus e.g. oranges etc
5. Food from animals	Poultry e.g. chicken	Meat e.g.beef	Dairy e.g. eggs

6. Fats and Oils	Butter	Margarine	Pastries etc.

2. a) Staples

   b) Legumes

   c) Vegetables.

   d) Fruit

   e) Food from Animals.

   f) Fats and Oils

The size of the food groups corresponds to the foods that form the base of our diet. Staples, the largest group which includes food such as rice, is common in our Caribbean diet. We eat them regularly and have quite a number of servings from this group. The group that is the smallest corresponds to concerns about our health and well-being, therefore we should eat the smallest amount of food from this group.

In other words, the size of each group corresponds to the number of servings daily we should consume from each group.

Here is a list of guidelines that should help you as you plan your diet.

1.1- 4 The Dietary Guide For the Caribbean

- Eat a variety of foods from all of the food groups
- Maintain your ideal body weight
- Avoid the use of or decrease your intake of fatty foods
- Avoid the use of sugar
- Select carbohydrate foods that provide lots of starch and fibre
- Decrease your salt intake
- Eat iron rich foods
- Decrease or avoid the consumption of alcohol

1.1-5 Main Nutrient in Each Food Group

All foods contain chemical substances that are necessary for the proper functioning of the body. These chemical substances are called nutrients. Each food contains a main or macro nutrient of which is the basis upon how the food is grouped or classified.

- Foods from animals and legumes mainly supply the nutrient **protein**.
- Staples largely provide the nutrient **carbohydrate**.
- Fruits and vegetables generally supply **vitamins and minerals.**
- Fats and oils provide the body with the nutrient **fat.**

Session Summary

Summary

In this unit you learnt the following:

- Food is any substance you eat or drink that provides your body with nourishment.
- A food group consists of foods that are not only similar according to their type, e.g. vegetables, but also all contain similar nutrients.
- The names of the Caribbean's six food groups are: Staples, Legumes, Vegetables, Fruit, Food from Animals and Fats and Oils.
- These groups differ in size based on the part they play in our diets, the largest group forming the base of our diet.
- The main nutrient present in each food group is protein - from both animals and legumes.
- Carbohydrates- from the Staples group.
- Vitamins and Minerals- from dark green leafy vegetables and fruits.
- Fats- supplied by the Fats and Oils group.

Assessment

Assessment

So then let's try the following exercise, for each of the meals listed in table 1.1-3 indicate by ticking or placing an 'X' in the appropriate box in which the food group from which the major foods/items/dishes is found. The first one is done for you.

Table 1.1-3

Food Group	Beef Burger, French Fries / Peanut Punch	Steamed Fish, Saffron Rice, Callaloo	Sweet and Sour Chicken, Lo Mein, Sauteed Chunky Vegetables	Stewed Chicken, Provision Pie, Cucumber and Tomato Salad
Staples	X			
Legumes	X			
Vegetables				
Fruit				
Food from Animals	X			
Fats and Oils	X			

Session 1.2 Multi-Mix Principle

Introduction

Foods are classified into groups based on their similarity of nutrient content as you leant in the previous session. The system of combining food groups rather than individual foods is known as the *Multi-Mix Principle*. The *Multi-Mix Principle* is a Caribbean guideline, used for combining foods from 'Foundation Food' groups to assure nutritional balance. They include four of the six food groups previously studied, including, Staples, Food from Animals, Legumes and Vegetables which form the basis of this principle.

Outcomes

Upon completion of this unit you will be able to:

- *List* the basic *Multi-Mixes*
- *List* four guidelines to follow when planning meals using the *Multi-Mix Principle*
- *Create* a meal using the *Multi- Mix Principle*

Terminology

Multi-Mix Principle:	A system of combining foods from food groups to ensure that the right balance and combination of foods are selected for our meals.
Meal:	The portion of food served and eaten at a particular time of day.
Vegetarian:	A person who does not eat meat or any of its by products e.g. eggs for religious, moral or health reasons.
Biological Value of Protein:	A measure of how much of the protein in a protein based food is available to the body for growth, repair and maintenance.
Amino Acid:	The building blocks of proteins. Long chains of amino acids join together to form proteins.
Supplementary Value:	The ability of one protein to supplement for the deficiency of another protein, since both proteins are deficient in a different amino acid. Foods such as rice contain essential amino acids not present in other protein foods e.g. peas. A mixture of two foods, e.g (rice and peas) will ensure that the full

complement of essential amino acids is provided.

Diet: The food that we consume every day. Some people may follow varied types of diets e.g. low fat or high fibre.

How Long?

You need to devote two and a half (2.5) hours of formal study and one and one half (1.5) hours of self-study to complete this session and the required assessments/assignments.

1.2-1 The Multi-Mix Principle

What do I eat today? Sometimes planning or choosing what to eat can be such a chore! It can however be simplified if we know our food groups and a little bit about nutrition. The important thing to understand in planning our meals is that we must select the foods that give us the right balance and combination of nutrients for our bodies' needs. Using the *Multi-Mix Principle* to choose our foods and plan our meals assists us in doing this correctly.

The *Multi-Mix Principle* is a guideline for combining foods from complementary food groups to assure that the nutritional balance and the correct combination of foods are selected for our meals.

Remember in lesson one, we learnt about the six food groups (Staples, Foods from Animals, Legumes, Vegetables, Fruits and Fats and Oils) and the major nutrients those groups supply? In this lesson we are going to use that information to choose foods for our meals. The *Multi-Mix Principle* will assist you to do this efficiently, as it gives you options in the combinations of foods you can use. The first four groups-Staples, Foods from Animals, Legumes and Vegetables form the basis of the *Multi-Mix Principle's* method of meal planning and are called the 'Foundation Food Groups.'

Note it!

The food group that forms that basis of meals in the *Multi-Mix Principle* is the Staples food group.

Remember the Staples food group contains foods such as cereals e.g. rice, pasta and bread as well as potatoes and ground provisions such as dasheen and cassava.

Figure 4: Sweet Potato
Image: DEU TT

Figure 5
Image: Suat Eman / FreeDigitalPhotos.net

Combining the Staples food group with foods from three of the other 'Foundational Food Groups' gives you three types of mixes:

- The Two-Mix or Double-Mix
- The Three-Mix
- The Four-Mix

Let's begin, there are three basic *Multi-Mix* meal options and each of them must have a Staple food. Do a quick review of lesson one to jog your memory.

1.2-1.1 The Two- Mix or Double-Mix

The simplest combination is called a *Two-Mix* because it uses foods from two of the four foundational food groups to make a meal. Using the staple foods as a base, we then choose either a food from an animal or legume source.

If you choose a food item from the Food from Animals group, then the choice of Staple food could be either a provision such as a yam, a potato,

or cereal grain such as rice, wheat or corn. Seems confusing right? Perhaps the illustrations below will help you.

If the two foods used in the *Two-Mix* belong to the same food group, e.g. a fried potato and bread sandwich, then this can't be considered an appropriate *Two-Mix* meal.

- Here are the possible combinations for the *Two-Mix or Double – Mix:*

Note it!

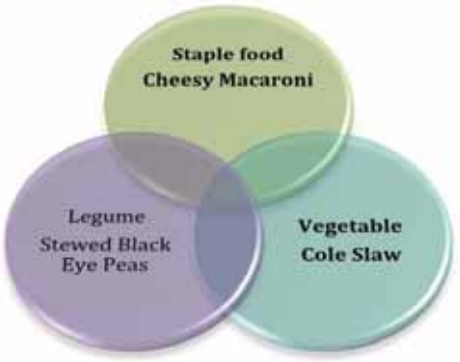
When you are using legumes as your source of protein, the Staple food you choose should be a cereal e.g. rice.

- What if you don't eat foods from animals like meat or poultry? Then you will be a vegetarian. A vegetarian means you don't eat meat, poultry, fish or any of the byproducts of those animals such as eggs, milk or cheese. What food items would you consume instead?
- If you are vegetarian then you would consume foods from the legumes group e.g. red beans and foods from the Staple group such as cereal such as rice or pasta.
- Do you think you get it? You will do a little practice later on. Let's move on to another possible mix that you can use to plan your meals; the *Three-Mix*. If using the *Two Mix* you would use foods from two groups to plan your meals, however in the *Three-Mix* approach you use foods from three food groups to plan meals. That's simple, right? Let's move on.

1.2-1.2 The Three- Mix

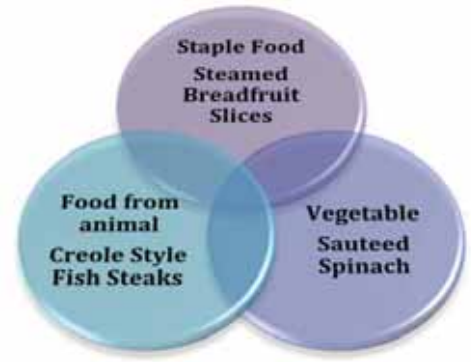
The *Three-Mix* uses foods from three of the four 'Foundational Food Groups.' How does this work?

Several combinations can exist when using the *Three- Mix Principle*. Remember you are using three of the four 'Foundational Food Groups' (Staple food, Legumes, Food from Animals and Vegetables) to help you choose and plan. The possible combinations are:



1)

2)



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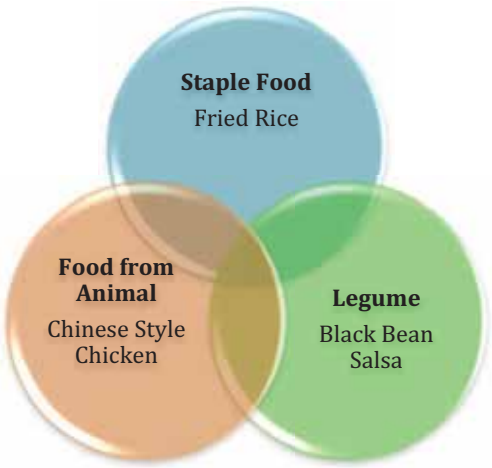
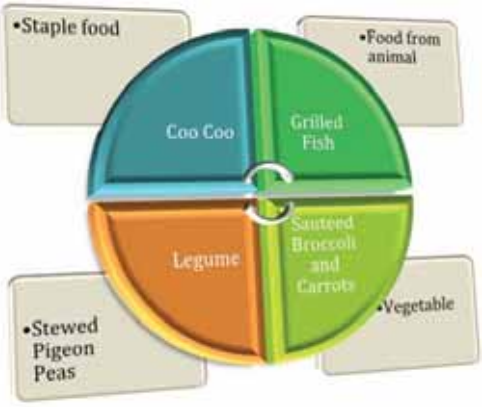


1.2-1.3 Four- Mix

Now that we've looked at the *Three-Mix* meal combinations, let's briefly look at the *Four- Mix*. For the *Four-Mix* we use all of the four 'Foundational Food Groups' to make up our meal. Your meal should comprise the following combination:

A)



Your choice of Staple food for the *Four-Mix* can either be a cereal e.g. pasta or a root vegetable e.g. potatoes.

Now that we've come to the end of our discussion on the *Multi-Mix Principle,* do you wonder what about the foods that fall into the remaining two food groups, which are Fats and Oils and Fruit. The foods contained in these two groups play an integral part in our diets. Fats supply our bodies with fats that help us to feel full after a meal and also adds flavor to our meal. Fruits are great for snacks and provide us with very important nutrients such as vitamins and minerals.

The *Multi-Mix Principle* is an especially important tool in choosing the right combination of foods with the right balance of nutrients for babies who have just been weaned off of milk and onto more solid foods. It is a simple way to help mothers and the general public choose better foods and plan better meals.

1.2-2 Guidelines to Follow When Preparing These Meals

The *Multi-Mix Principle* is put into effect after the baby has been weaned off of the breast and is being introduced to solid foods. If you develop healthy eating habits early on in your life, many health issues can be avoided as we age. Therefore, when planning and preparing meals the following brief points below will help you to do this efficiently. Take a look!

When using the *Multi-Mix Principle* to plan meals for a young child being introduced to solid food, use the following guidelines:

- It is important that a variety of nourishing foods in small amounts are introduced to the young child.

- The texture of the food should be soft and frequently fed to the child.
- Gradually increase food portion sizes and the range of foods provided.
- Suggested foods include fruit, dark green leafy and yellow vegetables, foods from animals and iron-fortified foods.

We've now come to the end of our discussion on the *Multi-Mix Principle*. Try the exercise below to see how much you understood.

Activity

Let us reflect for a moment on our own experiences at home.

Think about some of the meals we have for lunch. Write down three (3) examples in the spaces provided. Can you identify which type of mix they are? Write your answers in the space provided.

1. _____

_____

2. _____

_____

3 _____

_____

Feedback

Remember your meals should fall into the following categories:

Two-Mix, Three-Mix or Four-Mix.

What did your meals look like?

Session Summary

Summary

In this session you learnt that the *Multi-Mix Principle* uses foods from the four foundational food groups to assist you in choosing and planning a well-balanced meal using a combination of foods.

1. The four 'Foundational Food Groups' are: Staple foods, Foods from Animals, Legumes and Vegetables.

2. The remaining two food groups, Fats and Oils and Fruit, are important in the diet because fats provide flavor to the meal and make us feel full after a meal. Further, fruits supply us with vital vitamins and minerals.

3. The possible combinations of food groups for the *Multi-Mix Principle* are:

    a. The simplest– the *Two-Mix* or *Double -Mix*

    b. The *Three-Mix*

    c. The *Four-Mix*

4. The *Two-Mix* uses two food groups a cereal staple along with either a food from the Legume or Food from Animals grouping.

    a. Staple food (cereal or starchy roots and vegetables) + Food from Animals

    b. Staple Food (cereal) + Legumes

5. The *Three-Mix* as the name implies uses three food groups. The combination may use a cereal/provision staple with:

    (i) A legume and a food from an animal

    (ii) A legume and a vegetable

    (iii) A food from an animal, and a vegetable

6. The *Four-Mix* uses four food groups, a cereal/provision staple along with a food from each of the Animal, Legume and Vegetable groupings.

Let's not forget the guidelines that must be observed when using the *Multi- Mix Principle* to prepare meals for babies as their introduction to solid foods.

- These mixes should be offered after breastfeeding.

- The *Multi-Mix* meal should offer a variety of nourishing foods in small amounts.
- The texture of the food should be soft and frequently fed to the child.
- Food portion sizes as well as the range of foods provided should be increased gradually.
- Suggested foods include fruit, dark green leafy and yellow vegetables, foods from animals and iron-fortified foods.

What have you learnt? Complete the following assessment in the spaces provided, using the information provided in the lesson to give you the answers.

Assessment

Assessment

1. List the three main *Multi-Mixes* and give an example of each one in the spaces provided below. One example has already been done for you.

Two-Mix	B	C
Vegetable rice and stewed pigeon peas		

Figure 3

2. Write four guidelines to be considered when planning a meal using the *Multi-Mix Principle.*

1. _____

2. _____

3.

4.

Session 1.3 Using the Multi-Mix Principle

Introduction

Hooray! You have been able to correctly define the term *Multi-Mix* and you have also been able to name the *Multi-Mix* combinations. This means that you are half way there on your way to completing this topic. In this lesson we will take the next step which will help you to identify foods that are suitable for planning nutritionally balanced *Multi-Mix* meals. We will also encourage you to write meals that could be used at home using the *Multi-Mix Principle.*

Outcomes

Upon completion of this unit you will be able to:

- ***Use*** *Multi-Mix Principle* to plan various meals.
- ***Write*** meals that accurately reflect the various *Multi-Mix* options.

Terminology

Macronutrient: The group of chemical compounds that is consumed in the largest quantities which provide us with energy.

How Long?

You need to devote two and a half (2.5) hours of formal study time to this session. You will also need to devote one and one half (1.5) hours to self -study which includes completion of assessments/assignments.

1.3-1 Planning Multi-Mix Meals

A *Multi-Mix* meal ensures that foods eaten together will complement and reinforce one another. Therefore if one food is lacking or deficient in one of the macro nutrients, the other food will supplement or make up for that short fall. Staples, Foods from Animals, Legumes and Vegetables are the basis of the *Multi-Mix Principle* method of meal planning. They are referred to as the 'Foundation Food Groups.' Remember a *Multi-Mix* meal MUST have a Staple food, which will give your body the nutrient carbohydrate in the form of starch. Examples of Staple foods (rice, pasta etc) have been noted in the previous lesson. In addition to Staples, the meal must contain foods from the remaining food groups which are:

Food Group	Nutrient Supplied to the Body
Foods from Animals	Supplies the body with proteins
Legumes	Supplies the body with proteins, minerals and vitamins
Vegetables	Supply the body with vitamins and minerals

Figure 4

Using the 'Foundation Food Groups' identified above will provide individuals, especially those in low income families in these pressing global economic times, with many options to create nutritionally balanced meals.

Activity

You have asked to plan a *Multi-Mix* meal for your family which will be served for lunch. This means that you will have to shop for the ingredients you need to use in planning the *Multi-Mix* meal.

Using the shopping list below arrange the foods in the 'Foundation Food Groups.' Write your answers in the spaces below.

Dasheen Bush, Salt fish, Rice, Plantain, Channa/Chick peas, Potatoes, Patchoi, Melongene, Roti Skins, Split peas, Pigeon Peas, Black Eye Peas, Dasheen, Cheese, Bodi, Bakes, Pumpkin, Carrot, Cabbage, Macaroni, Beef, Pigtail, Ochroes, Chicken, Baked Beans, Eggs, Red beans.

Staples:

Legumes:

Food from Animals:

Vegetables:

Once you've completed the exercise, check the sample answer at the end of this unit to see if you have correctly placed the foods into their 'Foundation Food Groups.'

Feedback

a Staples: rice, plantain, potatoes, macaroni, bakes, roti skins, dasheen.
b Legumes: channa/chick peas, split peas, pigeon peas, black eye peas, bodi, baked beans, red beans.
c Food from Animals: saltfish, cheese, beef, pigtail, chicken eggs.
d Vegetables: dasheen bush, patchoi, melongene, pumpkin, carrots, cabbage, ochores.

Now let's use the grocery list form above and plan our meals using the *Multi-Mix Principle*.

The *Multi-Mix Principle* is system of combining foods from the 'Foundational Food Groups' to ensure that the right balance and combination of foods are selected for our meals.

1.3-2 Balance- "What Does That Have To Do With Multi-M ix Meal Planning?"

What do we mean when the word 'balance' is used? Maybe the guidelines for planning *Multi-Mix* meals will help you. Take a look at them below:

- It is important that a variety of nourishing foods in small amounts are used regularly.
- The texture of the foods vary, e.g. some are crunchy, some are soft.
- Suggested foods include: fruit, dark green leafy and yellow vegetables, foods from animals and iron-fortified foods.

Session Summary

Summary

In this session you learned:

- A *Multi-Mix* meal ensures that foods eaten together will complement and reinforce one another.
- Staples, Foods from Animals, Legumes and Vegetables are the 'Foundational Food Groups' or the basis of the *Multi-Mix Principle*.
- A *Multi-Mix* meal MUST have a Staple food which will give your body the nutrient carbohydrate in the form of starch.
- The *Multi-Mix* meal should offer a variety of nourishing foods in small amounts.

Assessment

Assessment

Now, use the three *Multi-Mix* meal combinations you learnt in the lesson along with the templates provided below to plan your *Multi -Mix* meals. You must identify the main ingredient used in each item or dish. An example is done for you.

Here‘s an example that has been completed for you.

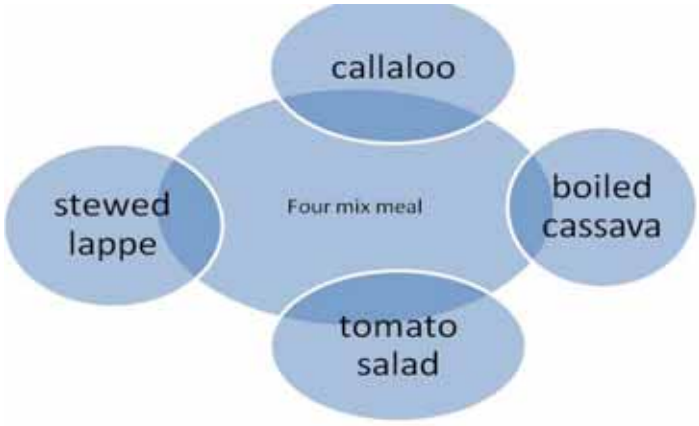


Figure 5: *Four-Mix* meal

Using the templates provided on the following page, write your planned meals for the various *Multi-Mix* combinations. Write you answers inside the templates provided.

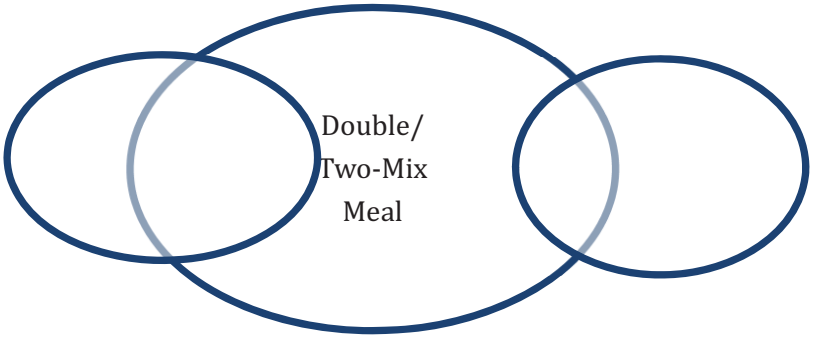


Figure 6

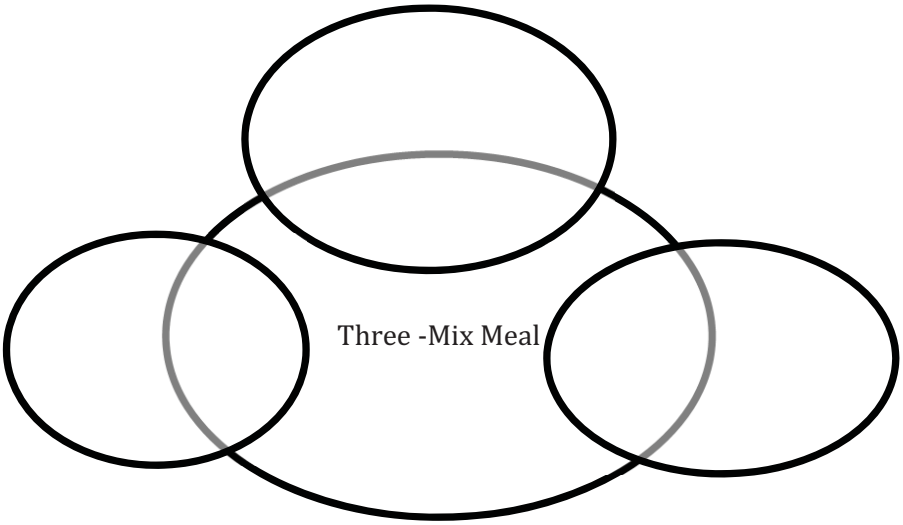


Figure 7

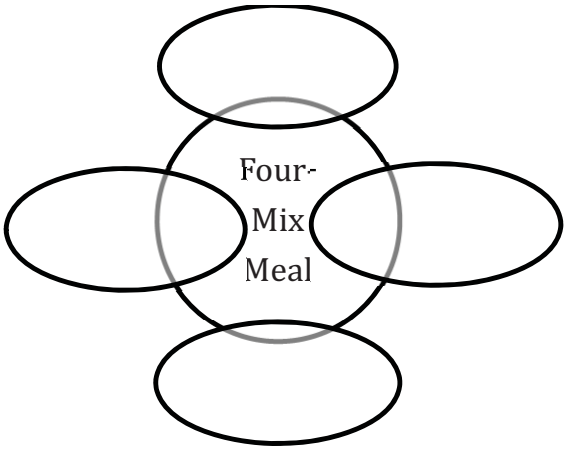


Figure 8

Session 1.4 Foods and Their Functions

Introduction

Have you ever wondered why we eat food? We eat food to stay alive, to keep us healthy, to give us energy, to grow and the list goes on. Can you add any more reasons why we eat food? I am sure you can, just think about it and the answers will flow. In this lesson we will take an in depth look at the importance of food in our body.

Upon completion of this unit you will be able to:

Outcomes

- *Identify* the main functions of food in the body.
- *Outline* the nutrients responsible for growth, energy and protection of the body.
- *Identify* the main food sources of the nutrients that are responsible for growth, repair and maintenance of the body.

Terminology

Minerals: Inorganic elements such as calcium, iron, potassium, sodium or zinc that are essential to the nutrition of humans.

Vitamins: A group of various organic substances essential in minute amounts for normal growth and activity of the body and obtained naturally from plant and animal foods.

Kilocalories: This is a unit of energy; it is 1 food calorie, or 1,000 energy calories. It is the energy necessary to raise the temperature of 1 kilogram of water by 1° Celsius.

Food: This is any solid or liquid substance that provides the body with nourishment.

1.4 -1 Main Functions of Foods

Food performs three main functions in our body. It supplies us with energy and warmth, enables our body to grow and performs repairs and protects us from the onset of diseases. Let's explore this further.

Energy Giving and Warmth

How do you feel when you lack energy to carry out your daily activities? It is not a good feeling; therefore it is important that we consume energy giving foods. These foods provide us with the energy our body needs. Activities that we take for granted such as the proper functioning of the heart, breathing, thinking and talking all require energy. Let us pause for a moment- we want you to hold your breath for one minute, were you able to? How did it feel, were you able to do any activity? Some of you may agree and others may disagree. However when our body is deprived of energy, it is unable to function properly.

Figure 10: Energy To Play
Image courtesy: CDC/ Dawn Arlotta

Growth and Repair

Looking back at your photographs as a toddler have you remained the same height? Has your height changed significantly? I am sure that all of you have said "yes". This shows that growth has taken place. Growth can also be seen when we go to the hairdresser or barber and cut our hair; automatically new growth appears. Even when we trim our nails the same thing happens without us noticing. The last time that you suffered a

bruise or broken limb, has the injury healed? The answer would be in the affirmative, which his clearly shows that your body has been repaired.

Protection

Have you ever had the common cold? Do you know that there are several foods that protect us from such diseases? They act as an armor or shield to help us fight off the disease and bring us back to good health. This is pertinent to both minor and major illnesses. Under this heading, the body is kept in good working condition and as a result alleviates the occurrence of deficiency and other diseases.

Figure 11: Food's Protective Role
Image:CDC/ Mary Anne Fenley

Activity

List the main functions of foods.

Outline additional examples to highlight the main functions of foods.

Tabulate your information.

1.4.2 Nutrients and Their Functions

What are nutrients? Do you remember? These are the chemical substances that are found in the foods we eat. These nutrients when they are broken down in our bodies during the process of digestion are then made available to our bodies. There are six major nutrients: proteins, carbohydrates, fats, vitamins, minerals and water. Each one of these nutrients performs different functions in our body. Which of them provide us with energy? Read below and you'll find out.

Nutrients That Supply Energy

The three main nutrients responsible for energy are carbohydrates, fats and proteins. These nutrients supply us with energy to run, walk or jump. They provide energy for your brain to work properly and even supply energy to keep us breathing when we're asleep.

Note it!

Carbohydrates are the major source of energy in our diet. One gram of carbohydrates yields 4 kilocalories. Fats supply a concentrated source of energy. Each gram of fats provides 9 kilocalories. Proteins provide a secondary source of energy. One gram of proteins supplies 4 kilocalories.

Nutrients for Growth and Repair

The nutrients protein, minerals and vitamins are required for growth and repair. Protein is made up of a special element called nitrogen which promotes growth. A few minerals are responsible for growth and repair. These include calcium, phosphorous, and zinc. Vitamins, such as vitamin A, vitamin D, vitamin B6, folic acid and vitamin C, contribute to the growth and repair of tissues.

Nutrients That Protect Us

Minerals, vitamins and water protect our bodies against diseases. Minerals and vitamins are required by the body in small amounts. They protect the body against deficiency diseases. Every cell is composed of water, therefore water is essential for the proper functioning and regulation of the body. It is recommended that we consume a minimum of eight glasses of water daily.

Activity

Which nutrients supply the body with the necessary components for?

1. Energy

2. Growth and Repair

3. Protection

1.4-3 Sources of Nutrients

So where do these nutrients come from? The foods we eat of course! What foods supply them? All foods supply us with nutrients and each food contains more than one nutrient. It is helpful though when we are discussing food sources that we discuss foods in terms of a major supplier of a particular nutrient. It is important that you bear this in mind as you continue studying the subject of Food and Nutrition.

Energy giving nutrients as discussed before are carbohydrates and fat. Protein is a secondary energy source, meaning that its major function is to

supply us with the material for growth and repair. Let's look at some foods that supply us with energy.

Energy Giving Nutrients	Food Sources
Carbohydrates	Cereals e.g. rice, pasta, fruits, starchy roots and tubers e.g. potatoes, sugars
Fats	Vegetable and fish oils, butter
Protein	Foods from animals e.g. poultry, meat and seafood. Dairy products e.g. eggs, milk and cheese. Legumes e.g. dried peas and beans and nuts

Nutrients that enable us to grow and repair or heal are proteins, minerals and vitamins. Nutrients that protect us include vitamins, minerals and water.

Growth and Repair Nutrients/Protective nutrients	Food Sources
Proteins	Foods from animals e.g. poultry, meat and seafood. Dairy products e.g. eggs, milk and cheese. Legumes e.g. dried peas and beans and nuts
Vitamins	Fruits e.g. mango, papaya, citrus fruit, vegetables e.g. carrots, spinach, cauliflower, tomatoes meat, fish and poultry, dairy products, eggs, milk and cheese, wholegrain cereals, etc
Minerals	Milk, cheese, edible bones of canned fish, seaweed/kelp, dried fruit, green leafy vegetables, etc
Water	Fruits, vegetables, hot and cold

Growth and Repair Nutrients/Protective nutrients	Food Sources
	beverages, drinking water

Session Summary

Summary

In this session you learnt:

- Food benefits the body as it performs three major functions: supplying energy, providing the material for growth and repair and protecting the body from the onset of disease.
- Nutrients are chemical substances found in foods that nourish our bodies and help it to work properly. There are six major nutrients including: protein, carbohydrates, fats, vitamins, minerals and water.
- No one food contains all the nutrients, nor does it contain only one nutrient.
- Carbohydrates, fats and to some extent protein supply energy for the body to do the work of walking, breathing, digesting etc.
- Protein, vitamins and minerals are responsible for providing the material for growth and repair of the body.
- Vitamins, minerals and water protect our body from disease.
- Food sources of the various nutrients include: (see the table below.)

Nutrients	Food Sources
Carbohydrates	Cereals, starchy roots and tubers, sugars
Fats	Vegetable and fish oils, butter
Protein	Meat, poultry and seafood, dairy products, eggs, milk and cheese, legumes, dried peas, beans and nuts
Vitamins	Green leafy vegetables, wholegrain cereals, dairy products, meat poultry
Minerals	Milk, cheese, edible bones of canned fish, seaweed/kelp,

	dried fruit, green leafy vegetables, etc
Water	Fruits, vegetables, hot and cold beverages, drinking water

Figure 9

Assessment

Assessment

Match each nutrient with its source. There may be more than one nutrient for each food.

Nutrients	Foods
Carbohydrates	Fruits
Proteins	Wholegrain cereals
Fats	Pasta
Vitamins	Meat
Minerals	Fish
Water	Milk
Carbohydrates	Eggs
Proteins	Dark green leafy vegetables
Fats	Butter
Vitamins	Vegetable oils
Minerals	Cheese
Water	Rice

Carbohydrates	Poultry
Proteins	Dried peas and beans
Fats	

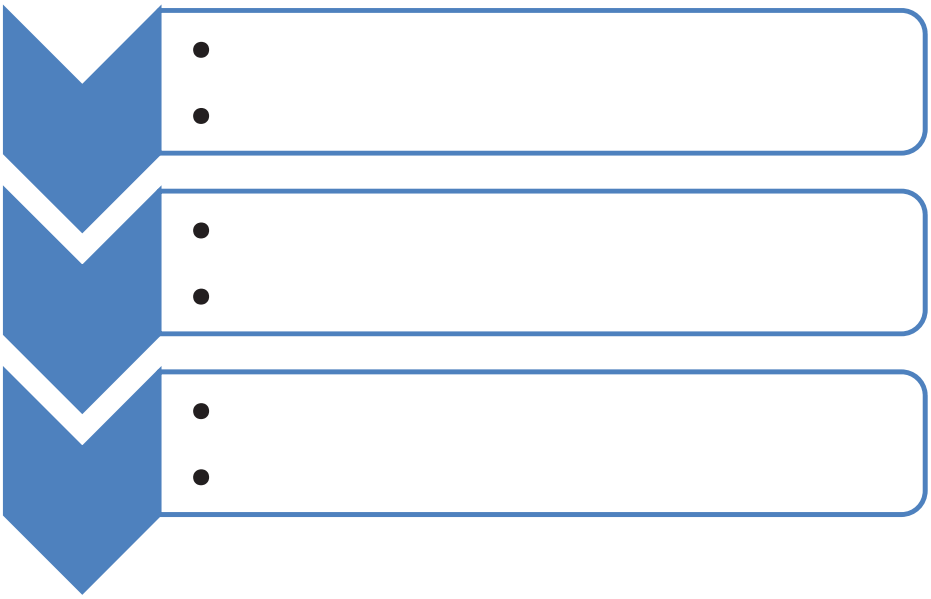
Figure 10

Assignment

Nutrient Builder

In the spaces provided

- In each of the blue arrows state the main function of food in the body.
- Fill in the main nutrients that provide the body with the indicated functions.
- For each of the nutrients given list four main food sources.



Unit Summary

Summary

In this unit you learnt about food, how they are grouped the major nutrients found in the foods in each group and how to combine these foods using the Multi-Mix Principle to plan nutritious meals.

- In session 1 you learnt that food is any substance that you eat or drink that provides your body with nourishment.
- Foods are grouped according to their similarity such as their type e.g. vegetables and similarity in nutrient content.
- There are six food groups in the Caribbean: Staples, Legumes, Vegetables Fruit, Food from Animals and Fats and Oils. These groups differ in their sizes based on the part they play in our diets meaning that the largest group (Staples) forms the base or bulk of our diet.
- Each food group contains foods with a main nutrient e.g. protein foods are found in the Food from Animals and Legumes food group, carbohydrates in the Staples group, vitamins and minerals in the dark green and leafy Vegetables and Fruits food group and fat are supplied by the Fats and Oils group.

In Session 1.2

You learnt that the *Multi-Mix Principle* uses foods from the four foundational food groups to assist you in choosing and planning a well balanced meal using a combination of foods.

- The four 'Foundational Food Groups' are: Staple foods, Foods from Animals, Legumes and Vegetables.

- The remaining two food groups, Fats and Oils and Fruit, are important in the diet because, fats add flavor to a meal and make us fell full or satisfied after a meal, and fruits supply us with vital vitamins and minerals.

- The possible combinations of food groups for the *Multi-Mix Principle* are:

    a. The simplest –the *Two-Mix* or *Double -Mix*

    b. The *Three-Mix*

    c. The *Four-Mix*

- A *Multi-Mix* meal ensures that foods eaten together will complement and reinforce each other.

- Staples, Foods from Animals, Legumes and Vegetables are the 'Foundational Food Groups' or the basis of the *Multi-Mx Principle.*

- A *Multi-Mix* meal MUST have a Staple food which will give your body the nutrient carbohydrate in the form of starch. The *Multi-Mix* meal should offer a variety of nourishing foods in small amounts.

- Staple foods benefit the body as they perform three major functions: supplying energy, providing the material for growth and repair and protecting the body from the onset of disease.

- Nutrients which are chemical substances found in food nourish our bodies and help our bodies work properly. There are six major nutrients: protein, carbohydrates, fats, vitamins, minerals and water.

- Carbohydrates, fats and to some extent protein supply energy for the body to do the work of walking, breathing, digesting etc. Protein as well as vitamins and minerals are responsible for providing the material for growth and repair of the body. Vitamins, minerals and water protect our body from disease.

- Food sources of the various nutrients include: (see the table below.)

Nutrients	Food Sources
Carbohydrates	Cereals, starchy roots and tubers, sugars
Fats	Vegetable and fish oils, butter
Protein	Meat, poultry and seafood, dairy products, eggs, milk and cheese, legumes, dried peas, beans and nuts
Vitamins	Green leafy vegetables, wholegrain cereals, dairy products, meat, poultry
Minerals	Milk, cheese, edible bones of canned fish, seaweed/kelp, dried fruit, green leafy vegetables, etc
Water	Fruits, vegetables, hot and cold beverages, drinking water

Assignment

Using the information you have acquired from these lessons, plan a day's menu for a toddler which includes:

- A *Two -Mix* breakfast
- A *Three- Mix* lunch
- A *Four-Mix* dinner

This first unit in your course sets the stage for employing healthy eating habits which in turn results in healthy living.

Contents

Unit 2

The Energy Yielding Capacity of Food

Introduction

You would have learned in a previous lesson that the nutritive value of any food depends on its composition and the quantity of the essential nutrients it possess. You would have also recognized from your previous study that all foods provide the body with a certain measure of energy.

In this unit we will explore the nutritive value of food with respect to its energy yielding capacity, as well as how it relates to the effective functioning of the body. It must also be noted that the initial supply of energy to the body is provided by food and is made available for use in the body as a result of its release during digestion, absorption and other metabolic processes.

Outcomes

Upon completion of this unit you will be able to:

- *Identify* the foods that supply energy
- *Describe* how energy is utilized in the body
- *Calculate* the energy value of key nutrients
- *Explain* how food in the body is processed to yield energy
- *Discuss* how energy requirements may differ from person to person

How Long?

You need to devote fifteen (15) hours of study to this unit. Ten (10) hours of formal study time and five (5) hours of self-study.

Terminology

Calorie: A calorie is a unit of energy. It is used as a measure of the amount of energy a particular food provides to the body. The calorie is a very small measure of energy, therefore the food calorie measure of kilocalories (Kcal), which contains 1000 calories, is more often used and is what is used on food labels when showing the caloric

value of a food item.

Calorimeter: The instrument used to measure the heat energy released when foods are burned. This heat energy produced provides an estimate of the potential energy of the food.

Metabolism: A set of chemical reactions that occur in living organisms that maintain life. These reactions allow organisms to grow and reproduce, maintain their structures, and respond to their environments. Metabolism is divided into two categories, *catabolism* which breaks down organic matter, such as to produce energy in cellular respiration, and *anabolism*, which uses energy to create components of cells such as proteins and nucleic acids.

Metabolic Rate: The speed at which our bodies burn calories.

Basal Metabolic Rate (BMR): This is the body's energy expenditure while at rest. It is the rate or speed at which the body uses energy while at rest to maintain vital processes such as breathing or keeping warm.

This Unit is Comprised of Four Sessions

Session 2.1 How my body uses the energy provided by food.

Session 2.2 Digestion of nutrients.

Session 2.3 Metabolism-utilization of energy in the body.

Session 2.4 Energy requirements from person to person.

Session 2.1 How My Body Uses the Energy Provided By Food

Introduction

The energy content of food depends on just how much carbohydrate, fat and protein it contains. These nutrients are used to fuel the body's metabolic and physical activities. These activities include the beating of the heart, the running motion of the legs, the clapping of ones hands and even the playing of the steel pan. When the body breaks down the nutrients from food, some energy is released as heat while some is used as electricity to send electrical impulses to the brain and nerves to facilitate muscle movement where needed. Therefore, the energy from food enables

us to carry out all of our activities from simply thinking of hugging a friend to kicking a ball on a football field.

Outcomes

Upon completion of this unit you will be able to:

- *State* the different types of energy found in the body
- *Explain* how the different types of energy are utilized in the body
- *List* four food sources of energy
- *Calculate* the energy value of any food item or an entire meal

Terminology

Energy :	A measure of the body's ability or capacity to do work or produce change.
Energy Dense:	These are foods that contain a high level of energy or calories per ounce or serving of the food and few nutrients.
Voluntary Movement:	Voluntary movement occurs as a result of free will e.g. running, or walking.
Involuntary Movement:	This is an automatic movement that occurs by reflex e.g. breathing, blinking, or even shivering when it's cold.
Kilocalorie:	The unit of measure of the energy in food. Energy is measured in kilocalories (Kcal) written with a 'C' and each kilocalorie contains 1000 calories.

How Long?

You will need to devote two (2) hours of formal study and one and a half (1.5) hours of self-study to complete this session.

2.1-1 Where Does the Energy in Our Body Come From?

We know from our previous unit that the body's supply of energy is provided by the three main nutrients: protein, fats and carbohydrates. Of these three nutrients fats provide the most concentrated source of energy per gram. This supply of energy is made available to the body as a result of digestion and is used by the body in various ways to ensure the proper functioning of all its parts. You may ask, "are there different forms of energy in the body?" That's a very good question and my

answer is “yes,” there are different types of energy in the body and each one has a different job. There are four basic forms of energy (see figure 1 below).

Energy Type	Description of Type of Energy
Mechanical Energy	Mechanical energy is used for the voluntary and involuntary movement of muscles in the body.
Chemical Energy	Chemical energy is used in all chemical and metabolic responses/reactions e.g. the making of new cells.
Heat Energy	Heat energy is used to maintain the body temperature at 37 C
Electrical Energy	Electrical energy is used in the body for the transfer of nervous impulses.

Figure 1: Forms of Energy Used by the Body

You might be wondering, “do these forms of energy remain the same?” “Is there ever going to be a buildup of one kind of energy and a decrease of another kind at any one time?” The answer to your question is “no.” Energy can’t be created or destroyed, rather it is converted from one form of the energy to another.

Don’t forget ALL the energy is initially supplied to the body through our food intake. These foods contain one or more of the three main energy-producing nutrients: carbohydrates, fats and proteins.

Fats yield the most energy gram per gram and are said to be an energy-dense nutrient.

Activity 2.1-1a

Can you list four foods you may have at home that may be referred to as energy dense? Write your list in the following spaces provided below.

Energy dense foods are foods that have more calories per ounce and provide few other nutrients. A few examples of energy dense foods include: frosted cakes, donuts and candies. Healthier versions of energy dense foods include: potatoes, ground provisions e.g. cassava (yucca), dasheen (taro) and other starchy vegetables as well as peanut butter.

*Hint: When you eat them do you suddenly feel to run, jump and skip?

1. _____

2. _____

3. _____

4. _____

How Much Energy Do We Get From the Foods We Eat?

You may ask, "how much energy can we get from what we eat." Firstly, the energy content of our meals will depend on the amount of carbohydrates, fats and proteins we consume at each meal. When the body digests a meal that is comprised by foods with these nutrients, we've eaten energy that is produced after the food is broken down. This food energy is measured in kilocalories (Kcal) written with a 'C' and each kilocalorie contains 1000 calories. In order to calculate the amount of energy in food we have eaten we must first know a few things.

We must know:

- The weight in grams of each nutrient we have consumed i.e. how many carbohydrates, fats and proteins are present
- 1 gram of carbohydrate = 4kcal
- 1 gram of protein = 4Kcal
- 1 gram of fat = 9Kcal

Feedback

Good! You may now have a look at the list at the end of the lesson to see how many of your answers may be correct.

Did you get three or four correct? Great! If you got two or less, please read about energy dense foods again before you move on.

Category of Energy Dense Foods	Examples of Foods in this Group
Milk and Milk Products	Sweetened yogurts, whole milk, sour cream, margarine, butter, cheese sauce, cream cheese, processed cheese
Meats, Fish and Poultry	Beef ribs, chicken skin, luncheon meat, hot dogs (frankfurters), sausages
Grains	Granola, sweetened cereals (frosted corn flakes), pasta, croissants, pastries and cakes
Vegetables	Deep fried french fries, baked potatoes with cheese sauce, fried vegetables
Preserved Fruit	Apple/cherry/berry pies, sweetened fruit based sauces, canned fruit in syrup
Added Sugars	Soft drinks (sodas), sweetened tea/fruit drinks, cordials, syrup on pancakes, candies, cookies, cakes and pastries

This list is by no means exhaustive. It just gives some examples of the many energy-dense foods we have available to us in our homes.

Note it!

1 gram of fat yields 2.5 times more kilocalories than the same measure of carbohydrates or protein.

Calculating the Energy Value of Food

To apply a method of calculation in order to calculate the energy of a food you must:

- First, multiply the number of grams of carbohydrate, protein or fat by the number of calories each provides (4, 4, and 9) per gram.
- Second, add each of the results together, which then gives you the total amount of calories provided for the meal.

Here is an example:

Seraiah had 5 grams of grilled chicken (no dressing), 6 grams of rice and a 1 gram pat of garlic butter. How much energy did she consume?

(Assume that food has the amount of protein, carbohydrate and fat quoted.)

Solution

5 grams of chicken = 5 grams of protein = 5 x 4kcal = 20kcal.

6 grams of rice = 6 grams of carbohydrate = 6 x 4kcal = 24kcal.

1 gram of garlic butter = 1gram of fat = 1 x 9kcal = 9kcal.

Total = 53kcal.

Therefore we can say Seraiah's meal gave her 53kcal of available energy for use after digestion.

Did you understand these calculations? If you didn't, here is another example:

Jean-Marc bought lunch at the school's cafeteria today. It included 4 grams of pigeon peas, 2- 5gram scoops of mashed potatoes, and 2 grams of pork fat gravy. How much energy did he get from his meal? (Assume the food items have the amount of protein, fat and carbohydrate quoted.)

Remember to first multiply the number of grams of protein, carbohydrates and fat by their respective kilocalorie amount (4, 4, 9).

Then, add the result for each nutrient together to provide the total energy value of the meal.

Solution:

4 grams of pigeon peas = 4 grams of vegetable protein = 4 x 4kcal = 16kcal.

2 x 5 grams scoops of mash potatoes = 10 grams carbohydrate = 10 x 4kcal = 40kcal.

2 grams of pork fat gravy = 2 grams fat = 2 x 9kcal= 18kcal.

Total = 74kcal

Therefore Jean-Marc had 74kcal of available energy for use after his meal was digested.

Activity 2.1-1b

Let's see how well you understand how to calculate the energy value of a meal.

Here is a practice question:

Pat was given a packed meal to evaluate the energy content of it. The box contained 2, 2 gram slices of steamed fish, 8 grams of boiled provision and 1 gram of olive oil dressing. Help Pat calculate the energy value of this meal.

Please complete the solution in the space provided below.

You may check to see if your calculations are correct.

Feedback

Here are the answers to this activity.

Solution

- 2 x 2 grams slices of fish= 4 grams of protein = 2 x 2 x 4kcal = 16kcal.
- 8 grams of ground provisions = 8 grams carbohydrate = 8 x 4kcal =32kcal.
- 1 grams of olive oil dressing = 1 gram fat = 1 x 9kcal = 9kcal.

Total = 57kcal.

Therefore, Pat calculated 57kcal of available energy for use from the packed meal.

Session Summary

Summary

- In this unit you learned that voluntary movement is done as a result of your free will.
- Involuntary movement is automatic movement.

Energy Type	Description of Type of Energy
Mechanical Energy	Mechanical energy is used for the voluntary and involuntary movement of muscles in the body.
Chemical Energy	Chemical energy is used in all chemical and metabolic responses/reactions e.g. making of new cells.
Heat Energy	Heat energy is used to maintain the body temperature at 37C.

Energy Type	Description of Type of Energy
Electrical Energy	Electrical energy is used in the body for the transfer of nervous impulses.

Different forms of energy used in the body.

Now let's check to see if you understood what you did in this unit.

Assessment

1. For each type of energy listed in the table below, write a brief description in the space provided.

Energy Type	Description of Type of Energy
Chemical Energy	
Electrical Energy	
Heat Energy	
Mechanical Energy	

2. Manely is shopping for foods at the supermarket that provide him with energy. Suggest at least four foods that he can buy that provide him with energy.

3. It is important to know how much energy the food we eat provides:

-What are three important pieces of information we must have before we calculate the energy value of the food?

-How do you find out how much energy the meal contains:

A) 5 grams chicken and 10 grams boiled rice,

Feedback

How well did you do? Check the answers below.

1.

Energy Type	Description of Type of Energy
Mechanical Energy	Mechanical energyis used for the voluntary and involuntary movement of muscles in the body.
Chemical Energy	Chemical energy is used in all chemical and metabolic responses/reactions e.g. making of new cells.
Heat Energy	Heat energy is used to maintain the body temperature at 37C.
Electrical Energy	Electrical energy used in the body for the transfer of nervous impulses.

2. Starchy foods, foods from animals, fats and oils (foods that belong to these groups.)

3. The weight in grams of each nutrient we have consumed i.e. how much carbohydrate, fat and protein.

- 1 gram of carbohydrate = 4kcal
- 1 gram of protein = 4Kcal
- 1 gram of fat = 9Kcal

4.

5 grams chicken and 10 grams boiled rice.

5 grams of protein x 4 kcal= 20 kcal

10 grams carbohydrate 4 kcal= 40 kcal total kcal 60 kcal

Session 2.2 Digestion of Nutrients

Introduction

When we have a meal, the food we consume needs to be processed or broken down in order for our bodies to be able to utilize it. This process whereby the body breaks down food into absorbable units called nutrients is called digestion. During digestion, nutrients are absorbed into the bloodstream and the nutrients are made available for use as blood is transported throughout the body.

The processes of digestion and absorption occur both physically and chemically. They are accompanied by the secretion of a number of digestive juices containing enzymes, which speed up the chemical reactions in the body, therefore making the nutrients readily available for use. This lesson will provide the necessary information that is required to understand the processes involved in digestion.

Outcomes

Define the terms related to digestion

Describe the activities that take place along the digestive tract

List the enzymes associated with digestion

How Long?

You will need to devote three (3) hours of formal study and two (2) hours of self-study to complete this session.

Digestion: The process by which food is broken down both physically and chemically into smaller units which can be easily absorbed by the body.

Terminology

Bolus: A term used to describe the moistened ball of crushed food particles and salivary *amylase* which passes from the mouth to the stomach.

Peristalsis: Refers to the movement of the moistened ball of crushed food particles and digestive enzymes as it passes from the mouth through the esophagus into the stomach by a wavy motion of muscles along the digestive tract.

Chyme: A semi-liquid mass of partially digested food mixed with gastric juices and mucus that passes from the stomach into the duodenum and along the digestive tract.

Gastrointestinal Tract: Referred to as the digestive tract, it comprises the main spots, (mouth, esophagus, stomach, small intestine, large intestine, rectum and anus) the body uses to digest and absorb the nutrients made available by digestion.

Mucus: A thick fluid that is secreted by various glands throughout the body. In digestion, mucus acts as a lubricant and protects the cells of the digestive tract from destruction from various gastric juices e.g. hydrochloric acid.

Bile: A yellow-green fluid that is made by the liver, stored in the gallbladder and moves into the duodenum where it helps digest fat. Bile works as an emulsifier helping two or more unblendable liquids.

2.2-1 What is Digestion?

Let's begin our lesson. You may be asking "at what point are we able to access the nutrients from the food we eat," and "are the nutrients accessible to us as soon as we consume it or is there some form of processing it must go through before the body can use it?"

Good questions! The food we eat must go through a process before the body can use it. Some people may think that it is unnecessary to address what happen to food after we consume it, however basic knowledge of the digestive process is paramount if we are to fully understand the other metabolic processes that follow.

So what is digestion?

Digestion is the process by which food molecules are broken down both physically and chemically into smaller units which can be easily absorbed by the body's cells. Digestion begins in the mouth and ends in the anus.

The digestive system or alimentary canal comprises the following parts; **the mouth, esophagus, stomach, intestines (small and large,) the rectum and the anus.**

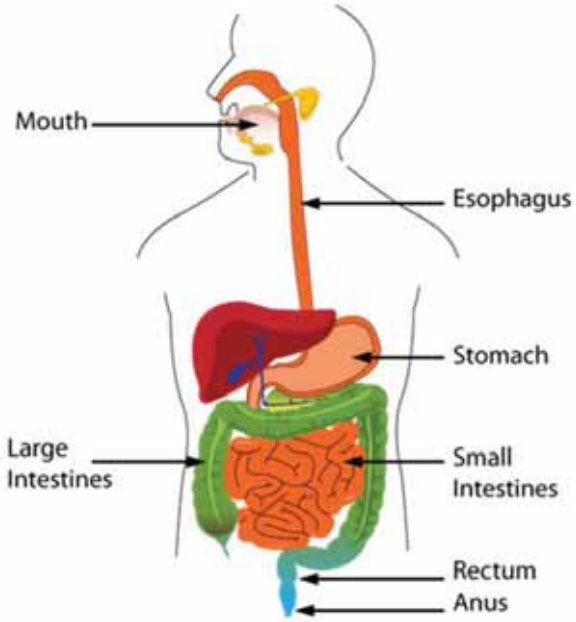


Figure 2: The Entire Digestive System.

Let's explore the process of digestion!

In the Mouth

The process of digestion begins in the mouth. The organs involved in this process include the teeth and the tongue as well as the lubricant saliva.

Chewing

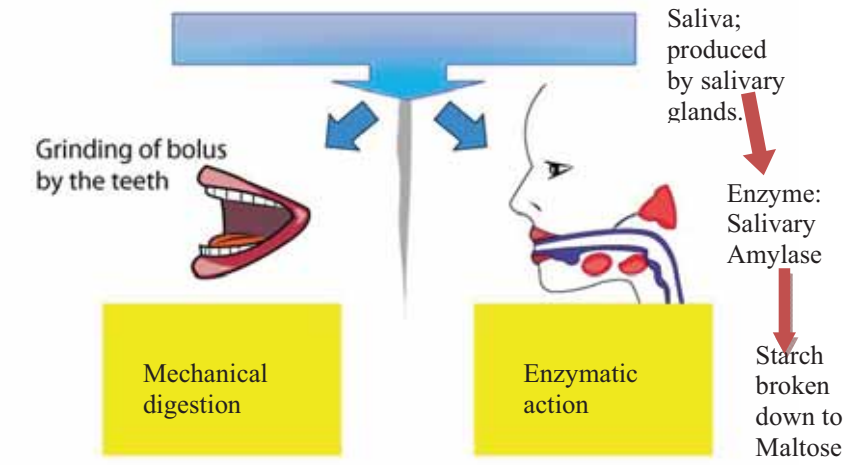


Figure 3: What Happens in the Mouth

In the mouth, the food is physically broken down into much smaller fragments, exposing more surface area of the food, thus assisting the enzymes to do their job more efficiently through the chewing action of the jaws and teeth (mastication).

Saliva and Amylase

The food is mixed with saliva which moistens the food and facilitates the activity of the enzyme called *amylase* which breaks down carbohydrates e.g. in bread into starch and even simpler sugars. This moistened ball of crushed food particles and amylase now known as the *bolus* is swallowed as it passes from the mouth through the esophagus into the stomach by a wavy motion of muscles in the digestive tract called *peristalsis*.

Note it!

Enzyme at work in the mouth: *AMYLASE*

In the Stomach

The mouth and the stomach are connected by the esophagus.

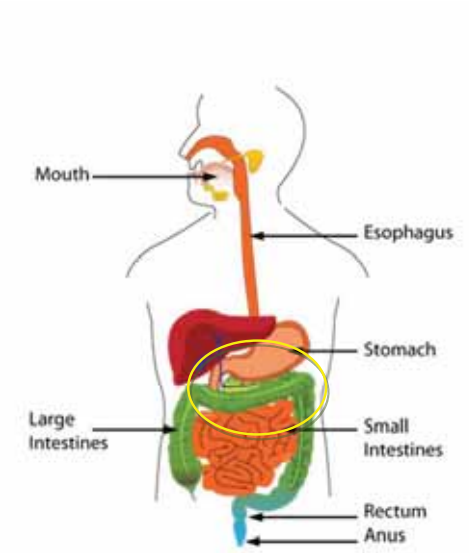


Figure 1: Mouth and Stomach Connected by the Esophagus.

Physical Activity

The food arrives in the stomach and both physical, (muscular contractions of peristalsis) and chemical breakdown of food takes place. What prevents the food (as it is chewed and swallowed) from continuously flowing into the stomach down the esophagus? Entry of food matter into the esophagus is controlled by the action of sphincter muscles. There are several of these types of muscles throughout the digestive tract. Their purpose is to control entry and exit of the food *bolus* into the different sites of digestive activity. These sphincter muscles usually open in response to muscle contractions (*peristalsis* in the esophagus). Ok, so let's continue discuss the chemical activity that takes place in the stomach.

Chemical Activity

The food is churned and grounded by the physical activity of the muscles in a wavelike motion. Gastric juices (hydrochloric acid and mucus) are added to the ball of food (or *bolus*) which is now a semi liquid mass referred to as *chyme*.

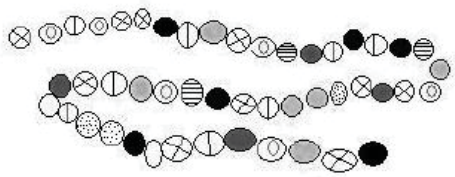
The breakdown in the stomach continues, as it now becomes chemically active. Stomach acids inactivate the salivary enzyme *amylase* stopping starch digestion. The addition, the enzyme known as *pepsin* then continues the break down proteins into smaller units of amino acid chains called *peptides*.

Here is an example of the digestion of protein in the stomach:

Protein from animal foods e.g. chicken, beef

+ *pepsin* (enzyme in the stomach) =

amino acid chains called *peptides*



A chain of amino acids

Figure 2
http://upload.wikimedia.org/wikipedia/commons/8/8e/Chain_of_amino_acids.jpg

Another enzyme present in the stomach is *rennin,* which is responsible for clotting milk so that the *pepsin* can work much better on the molecules of milk and milk products such as yogurt.

Note it!

It must be noted that more *rennin* is found in the digestive system of young mammals compared to that of adults because young mammals' initial diet consists of only breast milk or milk formula.

Also taking place in the stomach is the retardation of salivary *amylase* by the stomach's secretion of hydrochloric acid. This activity improves the activity of *pepsin* during the further digestion of proteins.

Let's do a little recap before we move on..

Enzymes at work in the stomach: *PEPSIN* and *RENNIN*

Activity 2.2-1

1. What do you understand by the term digestion? Choose the best answer by circling the corresponding letter.

a) The physical break down of food molecules into smaller molecules.
b) The physical breakdown of food into smaller pieces.
c) The physical and chemical break down of larger food molecules into smaller ones.
d) The chemical breakdown of larger food molecules from smaller ones.

Here are few statements that are associated with the digestive process taking place in the mouth and stomach. State whether these statements are true or false by circling (T) for true or (F) for false.

a) Saliva moistens the food and facilitates the activity of the enzyme *amylase*. (T) / (F)

b) Amylase breaks down carbohydrates into water and simpler sugars. (T) / (F)

c) The moistened chewed food passes the mouth into the stomach by way of the esophagus. (T) / (F)

d) The moistened ball of crushed food particles and *amylase* is called the *bolus* (T) / (F)

e) Stomach acids inactivate the salivary enzyme *amylase* stopping protein digestion. (T) / (F)

f) *Peristalsis* is the wavy motion of muscles in the digestive tract. (T) / (F)

g) Stomach acids inactivate the salivary enzyme *amylase* to stop starch digestion. (T) / (F)

h) *Pepsin* breaks down proteins into smaller units of sugars called *peptides* (T) / (F)

Feedback

1. Digestion is the physical and chemical break down of larger food molecules into smaller ones.

2. True or False

a)True b)False c)True d)True, e)False f)True g)True h) False.

If you had all correct well done!!

If you got two or more incorrect answers you need to reread the information and see where you went wrong.

You may be asking, “is this all there is to this business of digestion?” Of course not! Let’s continue with the lesson. Now we’ll look at digestion in the duodenum.

In the Duodenum

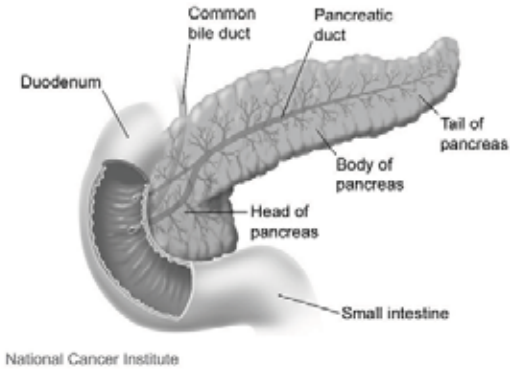


Figure 6: The Duodenum: The First Part of the Small Intestine.
By: Don Blis (artist) (National Cancer Institute (NCI)) [Public domain], via Wikimedia Commons

The duodenum is the first part of the small intestine. There is no physical breakdown of food in the duodenum such as was present in the mouth. The *chyme* is mixed with the bile which is secreted by the gall bladder. Bile contains bicarbonate of soda which has a neutralizing effect (inactivates the acids) on the acids introduced in the stomach. It stops the activity of the enzyme *pepsin*. The enzyme t*rypsin* then takes over the digestive process and continues to break down the proteins into *polypeptides.*

In the duodenum there is also the emulsification of fat (breaking up of fat into smaller droplets) where pancreatic *lipase* breaks down the fat molecules into glycerol and fatty acids. Also occurring in the duodenum is the further digestion of the carbohydrate starch into the simple sugar maltose by the activity of the enzyme known as *pancreatic amylase*.

Enzymes at work in the duodenum: *TRYPSIN, PANCREATIC LIPASE* and *PANCREATIC AMYLASE*

In the Small Intestine (Ileum)

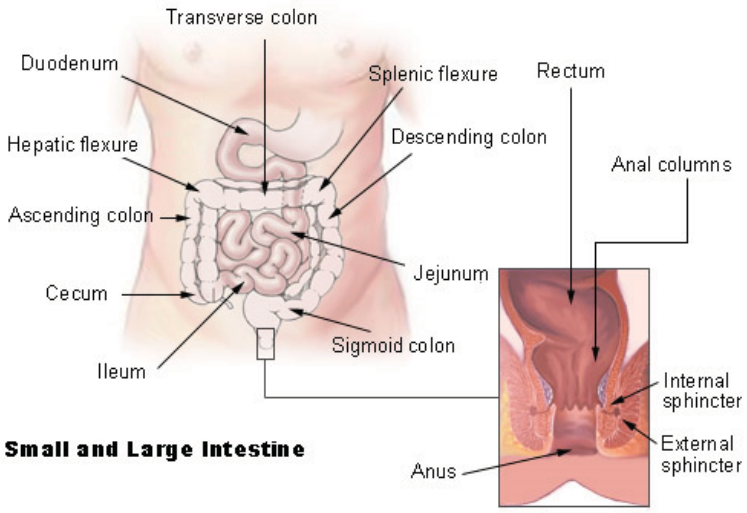


Figure 7: The Small and Large Intestine as it Appears in the Human Body

The *polypeptides* (chains of amino acids) are further broken down by pancreatic enzyme *erepsin* into amino acids, which thus completes protein digestion.

Molecules of fat are further broken down by *lipase* into glycerol and fatty acids and passed through the lymphatic system to the liver.

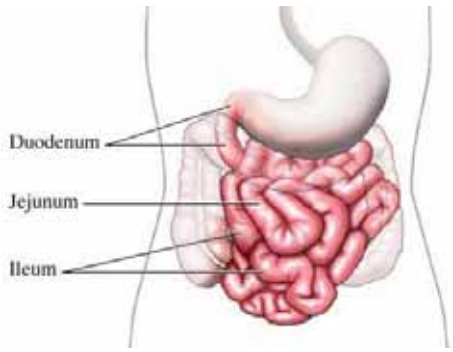


Figure 3: The Small Intestine.
http://share1.wikispaces.com/file/view/smallIntestine2.jpg/136174581/smallIntestine2.jpg

With respect to the digestion of carbohydrates in the ileum we will find the simple sugars such as:

- Maltose being broken down by *maltase* to form glucose
- *Sucrase* breaking down sucrose to glucose and fructose
- Lactose being broken down by *lactase* to form glucose and galactose

Enzymes at work in the ileum: *PANCREATIC EREPSIN, LIPASE, MALTASE, SUCRASE, LACTASE.*

Absorption of Digested Nutrients

After food molecules have been broken down, in order for the body to use the products of digestion— such as amino acids, fatty acids, glycerol and glucose— they must be absorbed. The stars of this part of the digestive process are called the 'villi.' These finger-like projections along the entire length of the small intestine facilitate making the end products of digestion (amino acids, simple sugars and fatty acids) available.

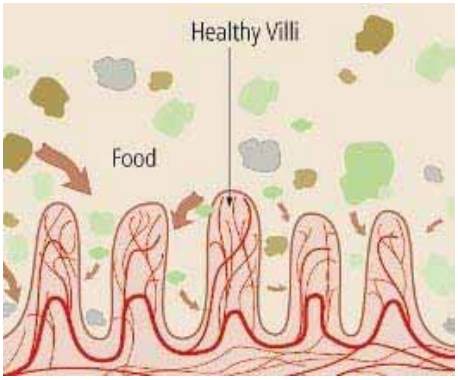


Figure 4: The Villi at Work

The Large Intestine (Colon)

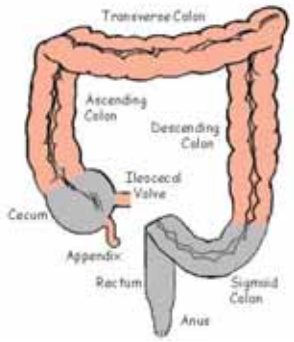


Figure 10: The Large Intestine, (with rectum and anus.)
http://share1.wikispaces.com/file/view/Colon-Diagram-New.jpg/136182465/Colon-Diagram-New.jpg

The large intestine is a shorter and fatter version of the small intestine. Take a look at both illustrations and you'll see. Indigestible food material can be found in the large intestine. It can stay there for as long as a day. Except for the physical action of the tearing of fiber in the mouth, there is no chemical breakdown of fiber along

the digestive system until it reaches the large intestine. At this point some of the fiber consumed is acted upon by bacterial enzymes and broken down into fatty acids, water and gas. The fiber also holds water, regulates bowel movements and aids in the excretion of substances such as bile, some minerals and cholesterol from the body.

Rectum

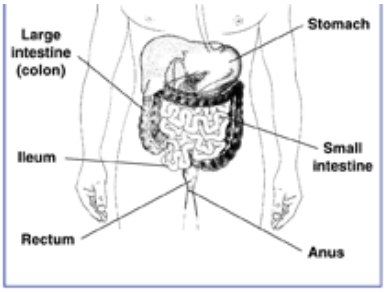


Figure 5: Rectum and Anus, (part of the large intestine.)

As the *chyme* passes through the colon to the rectum, the water is withdrawn from it leaving a semi-solid waste material. The strong muscles of the rectum hold back the waste until it is time to excrete it or defecate through the anus; the last part of the digestive system. Thus completing the digestive processes of the food consumed during a meal.

Session Summary

Summary

In this session you learned that the food we eat must go through a process before the body can use it. Digestion is the process by which food is broken down both physically and chemically into smaller units that can be easily absorbed and utilized by the body.

- Digestion begins in the mouth where the food mixes with saliva that moistens it and facilitates the activity of the enzyme called *amylase*. This enzyme breaks down carbohydrates into starch and simpler sugars. The moistened ball of crushed food particles and digestive enzyme (*amylase*) is swallowed as it passes from the mouth through the esophagus into the stomach by a wavy motion of muscles in the digestive tract called *peristalsis*.

- In the stomach, acids inactivate salivary enzyme *amylase* stopping starch digestion. The addition of the enzyme known as *pepsin* then continues the break down proteins into smaller units of amino acid chains called *peptides*. Another enzyme present in

the stomach is *rennin,* which is responsible for clotting milk so that the *pepsin* can work much better on the molecules of milk and milk products. Also taking place in the stomach is the retardation of salivary *amylase* by the stomach's secretion of hydrochloric acid. This secretion of hydrochloric improves the activity of *pepsin* during the further digestion of proteins.

- The food then moves to the duodenum where the activity of the enzyme *pepsin* is stopped. The enzyme *trypsin* then takes over the digestive process and the breakdown of the proteins into polypeptides continues. Also occurring in the duodenum is the emulsification of fat where *pancreatic lipase* breaks down the fat molecules into glycerol and fatty acids.
- In the small intestine, maltose is broken down by *maltase* to form glucose, *sucrase* acts on sucrose to produce glucose and fructose and *lactase* breaks down lactose to form glucose and galactose.
- In the large intestine, some of the fibre consumed is acted upon by bacterial enzymes and broken down to form fatty acids, water and gas.
- In the rectum, the water is withdrawn from the *chyme* leaving a semi-solid waste material. The strong muscles of the rectum hold back the waste until it is time to excrete or defecate.

Assessment

Use the table provided to list the active enzymes found at each point along the digestive tract as well as their functions.

Assessment

PART OF THE DIGESTIVE TRACT	ACTIVE ENZYME(S)	FUNCTION(S) OF THE ENZYME
Mouth		

PART OF THE DIGESTIVE TRACT	ACTIVE ENZYME(S)	FUNCTION(S) OF THE ENZYME
Stomach		
Duodenum		
Small Intestine		
Large Intestine		
Rectum		

Figure 12

Here's another question for you. In the diagram provided:

(i) Label the parts of the digestive system:

Esophagus, salivary glands, rectum, large intestine, stomach, anus, gall bladder, liver, mouth, small intestine

(ii) State what nutrient is being broken down at that site.

Diagram of the Digestive System / Alimentary Canal

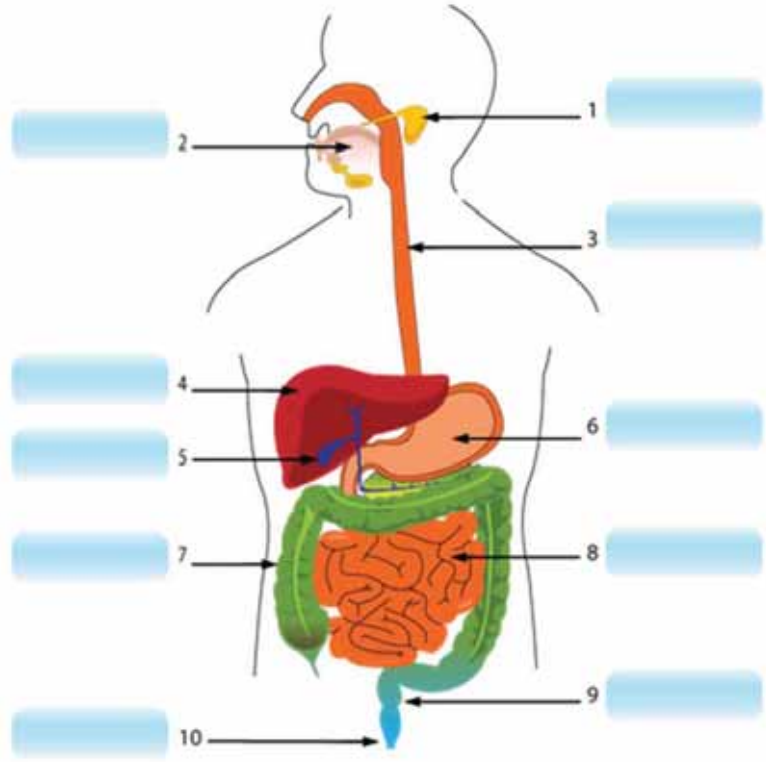


Figure 12: Digestive System

Session 2.3 Metabolism-Utilization of Energy in the Body

Introduction

At the end of the body's metabolic activities the energy released is utilized in different ways. Some of this energy facilitates the communication between the brain and other parts of the central nervous system by sending electrical impulses to and from the brain. The energy released during metabolism also synthesizes body compounds and moves muscles during their locomotive activities. It is therefore imperative that

in a well balanced diet, the amount of energy supplied by food is equivalent to that of the body's requirements. Also, if the quality of the energy in and the energy out of the body is not balanced there will be consequences to the individual. This lesson attempts to address the energy balance within the body specifically as it relates to that of excess energy.

Outcomes

State how the body utilizes the energy it receives from food

Explain what happens to excess energy in the body

Describe the ill effects of prolonged excess energy intake

How Long?

You need two and a half (2.5) hours of formal study and one (1) hour of self-study to complete the session.

Terminology

Metabolism: A series of chemical reactions in our bodies that convert the fuel from food into energy needed to do everything in our bodies such as grow, breathe, or move.

Anabolism: A constructive process in which small molecules are built up into larger molecules. Through anabolic processes new cells grow e.g. chains of amino acids built up into body cells and body tissues, body tissues are maintained and energy is stored for future use.

Catabolism: A destructive process where larger molecules are broken down via processes like digestion into simpler molecules e.g. proteins into amino acids.

Adenosine Triphosphste: (ATP) is a common high energy compound made up of a purine (adenine), a sugar and three phosphate groups which help speed up and regulate the metabolic process.

Obesity: A medical condition where there is an abnormal accumulation of excess body fat far above a

person's ideal weight.

Diabetes: Diabetes is a group of metabolic diseases in which a person has high blood sugar. This occurs when the pancreas does not produce enough of the hormone insulin, or when the body cannot effectively use the insulin it produces.

Hypertension: Referred to as high blood pressure. Hypertension describes the condition where the force of the blood pushing against the artery walls as it flows through the arteries is continually elevated.

Cardiovascular Disease: A disease or a group of diseases that affect the heart and it blood vessels.

2.3-1 Metabolism Basics

Our body gets the energy we need from food through the process of metabolism.

Metabolism is the chemical reactions in the body's cells that convert the fuel from food into energy, which is needed by the body to do everything from moving to thinking to growing.

Figure 13: Energy!
http://upload.wikimedia.org/wikipedia/commons/thumb/0/07/Usain_Bolt_Olympics_cropped.jpg/450px-Usain_Bolt_Olympics_cropped.jpg

How are These Chemical Reactions Controlled?

Specific proteins (enzymes) in the body control the chemical reactions of metabolism and these reactions are coordinated with the other body functions requiring energy.

Do Metabolic Reactions Occur in Isolation or Along with Other Activities?

Thousands of metabolic reactions occur at the same time in order to keep our body's cells healthy and functioning.

When we consume food, we take in the nutrients: carbohydrates, proteins and fats along with a few other micro-nutrients. These energy yielding nutrients are broken down as followed;

- Proteins into amino acids
- Fats into fatty acids and glycerol
- Carbohydrates into simple sugars such as sucrose, glucose and maltose

These end products of digestion are then transported by the blood stream to our body's cells where they are joined by other enzymes such as *Adenosine Triphosphate (ATP)* which helps to speed up and regulate the metabolic process. During metabolism, energy from the amino acids, fatty acids and simple sugars are released and distributed for use as fuel by the body during various activities such as running, playing, breathing etc.

Activity3.3-1

Fill in the blanks in the statements below. Write your answers in the space provided.

1. The process that controls the chemical reactions that occur in the body is called_____.
2. Amino acids are the end products of the digestion of _____.
3. The end products of digestion that are used in metabolism are transported via the_____ to our body's cells.
4. The nutrients that are a major source of energy for our bodies are: _____.
5. Metabolism is controlled by_____.

You may be wondering what happens to the excess energy in the body that is not utilized right away?

To understand this, let's look at the money your parents give you to spend, do you spend it all each day? I'm guessing the answer to that question is "no". I'm sure that on some days you will save some maybe in your piggy bank for use at a later time. It is the same principle that the body uses to deal with the excess energy in the body, it is stored in body tissues of the liver, muscles and as body fat under the skin for use at a later time. This storage of excess energy for future use is called 'anabolism' and when it is reconverted for use at a later time it is called 'catabolism.'

Anabolism (Constructive Metabolism) Building and Storing Energy

The process of anabolism involves the following actions:

- Supports the growth of new cells
- Maintains body tissue
- Storage of energy for future use
- Small molecules of carbohydrates, protein and fat are changed into more complex molecules

Catabolism (Destructive Metabolism)

Converts the fuel in the food we've eaten into energy needed to power everything. This process produces the energy required for all activity in the cells. In this process:

- Breakdown of mostly carbohydrates and fats to release energy
- The energy released provides fuel for anabolism
- Heats the body
- Facilitates movement through muscular activity, i.e. contracting and relaxing muscles
- Waste products are removed from the body through the skin, kidney, lungs and intestines

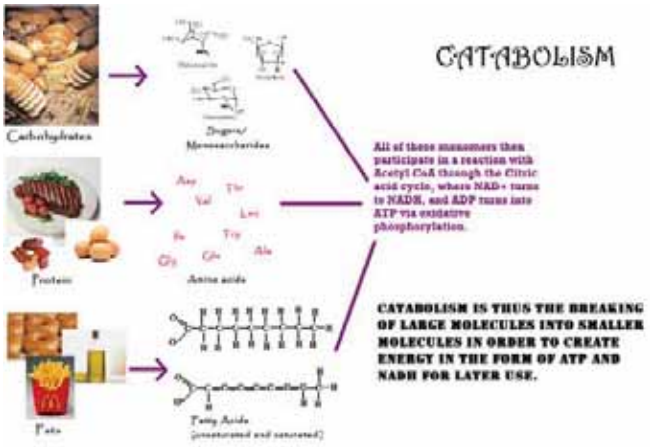


Figure 14: Catabolism and the Macro Nutrients
http://images-mediawiki-sites.thefullwiki.org/09/8/2/7/7358532651658404.jpg

What Happens if We Do Not Use All the Energy We Stored for Later Use?

If we do not use all the energy that we stored for later use, and we do not engage ourselves in some form of physical activity to utilize the stored energy we become overweight. If the trend continues and we still continue to eat and not utilize the energy consumed, we will potentially become obese.

Obesity is an abnormal accumulation of fat (usually 20% or more over a person's ideal body weight.) Obesity occurs when a person ingests more calories than he/she can burn off.

Factors that Contribute to Becoming Overweight and Obese

There are many factors that can be blamed, these factors may include:

- Socioeconomic
- Biochemical
- Genetics
- Social or Psychological

If this is allowed to continue over a period of time, the body will store the extra calories as fat. Constantly storing the excess energy may result in excessive weight gain. Consequently, this condition posse many health risks if we do not monitor our excessive energy intake. These health risks include diabetes, hypertension, abdominal hernias, cardiovascular disease, varicose veins, sleep apnea (abnormal ceasing of breathing) and

during sleep), some cancers, gout, gallbladder disease and other respiratory disorders.

You might be asking yourself if we going to have an opportunity to learn more about obesity and its related diseases.

The answer to this question is "yes!" The issues of obesity and the other nutritionally related diseases will be dealt with in a subsequent unit. You might want to check out units 6 and 7 for those issues.

Session Summary

Summary

In this session you learned that our body gets the energy we need from food through metabolism. Metabolism is the chemical reactions in the body's cells that convert the fuel from food into energy.

Thousands of metabolic reactions occur at the same time in order to keep our body's cells healthy and functioning.

The Energy Yielding Nutrients Derived from the Food We Eat are Broken Down as Follows:

- Proteins into amino acids
- Fats into fatty acids
- Carbohydrates into simple sugars, such as sucrose, glucose and maltose

These products of digestion are then transported by the blood stream to our body's cells where they are combined with enzymes such as *Adenosine Triphosphate (ATP)* which helps to speed up and regulate the metabolic process. During metabolism, energy from the amino acids, fatty acids and simple sugars are released and distributed for use as fuel by the body. The unutilized energy that we consume from food will be stored by the body for later use. Therefore, if this trend continues and we do not engage ourselves in some form of physical activity to utilize the stored energy, we become overweight and if we still continue not to utilize the excess energy we will be obese.

Anabolism (Constructive Metabolism)- Building and storing energy.

Catabolism (Destructive Metabolism) - Converts the fuel in the food we've eaten into energy needed to power everything. This process

produces the energy required for all activity in the cells.

We Can Say that Metabolism Balances Two Kinds of Activities:

1. The buildup of body tissue and energy stores
2. The breakdown of body tissue and energy stores to provide fuel for the effective functioning of the body

Obesity is an abnormal accumulation of fat (usually 20% or more over a person's ideal body weight). Obesity is associated with increased risks of illness, disability and death. It occurs when a person ingests more calories than he /she can burn off. Constantly, storing the excess energy may result in excessive weight gain which may result in many serious and potentially life threatening problems including hypertension, type II diabetes, mellitus (non-insulin dependent diabetes), an increased risk for coronary disease, hyper-lipidemia, infertility and a high prevalence of colon or prostate cancer.

Assessment

Assessment

Write a short paragraph stating why it is not advisable to exceed daily energy requirements.

Session 2.4 Energy Requirements from Person to Person

Introduction

When we speak about energy requirements we are referring to the amount of dietary energy needed to maintain good health, growth, physical activity and the maintenance of the body's basal metabolic rate. It is the capacity of the body to do work. This capacity to do work is fueled by the nutrients from the food we eat and the energy required is determined by our energy expenditure.

Outcomes

Upon completion of this unit you will be able to:

- *List* the nutrients that supply the body with energy
- *State* the different ways in which energy can be utilized by the body
- *State* why individuals have different energy requirements
- *Discuss* the factors that influence the individual's daily energy requirements

Terminology

Energy:	The capacity to do work
Energy Expenditure:	Refers to the amount of energy the body utilizes when it is at rest
Sedentary:	Inactive or desk bound
Lactation:	The production of milk by the mammary glands
Adenosine Triphosphate (ATP):	(ATP) is a common high energy compound made up of a purine (adenine), a sugar and three phosphate groups which help speed up and regulate the metabolic process
Glycolsis:	A metabolic process that breaks down carbohydrates and sugars through a series of steps producing energy in the form of ATP and pyruvic or lactic acid
Citric Acid Cycle:	The citric acid cycle, also known as the tricarboxylic acid (TCA) cycle or the Krebs cycle, represents one part of the three-part aerobic

cellular respiration pathway. In cellular respiration, a molecule of glucose enters the pathway and adenosine triphosphate (ATP) and ultimately gets produced for use as a source of energy to run cellular processes

How Long?

You will need to devote two and half (2.5) hours of formal study and one (1) hour of self-study to complete this session.

Have you ever wondered how a weight lifter raises his dumbbells, how big brother rides his bike, or how a mom may be working all day, yet still have the strength to take you for a walk at the end of a long day?

Think about it. Now, list three reasons why you think they are able to do what they do.

1. _____

2. _____

3. _____

Did any of your reasons resemble this one?

We are able to perform these tasks because of the energy acquired from the food we eat. When we eat, the nutrients carbohydrate, fats and protein provide our body with the energy we need to function effectively and efficiently throughout the day.

Note it!

It must be noted that the nutrient protein is only called upon to supply energy to the body in extreme cases of starvation and protein energy malnutrition (PEM); however this is not the norm.

Carbohydrates are the basic source of fuel, but all three of the macronutrients in our food – carbohydrates, fat, and protein – can be metabolized (broken down) to yield body energy.

In the human energy system, this major carbohydrate fuel comes from two forms of carbohydrate foods we eat – starches and sugars. The human body digests its basic food fuel, carbohydrates, changing them to the refined fuel glucose, then absorbs this refined fuel and transports it through the blood circulation to the cells that constantly need it. Further, glucose is then broken down by the cell's highly specific equipment, releasing energy through its biochemical pathways, glycolysis and the citric acid cycle, of cell metabolism. Here, glucose is broken down to basic carbon and hydrogen atoms and combined with oxygen, yielding *adenosine triphosphate (ATP)*, with its high-energy phosphate bonds, and releasing carbon dioxide and water as end products.

The energy obtained from the food we eat can be summarized by this equation:

Glucose, glycerol, fatty acid or amino acid + oxygen → energy in the form of ATP + carbon dioxide + water

You May Ask "How Does the Body Use this Energy?"

The energy in the form of *ATP* is used by the body's cells as follows:

- To transport substances across the cellular membranes
- For the contraction of muscles during movement and other activities
- During the buildup of the body's nutrient stores and other materials
- To conduct nerve impulses
- To facilitate glandular secretions

Does this Process Take a Long Time?

Simple carbohydrates made up of one or two sugar (saccharide) units are broken down easily releasing energy quickly. On the contrary, complex carbohydrates (polysaccharides) are large, complex compounds of many saccharide units. Glycogen, the body's small amount of stored carbohydrates (sometimes called animal starch,) have a similar, large "tree-like" structure and sustain energy during brief fasting periods such as sleep hours.

Certain other carbohydrate compounds (fibrous polysaccharides) are indigestible because humans lack the enzymes to split their particular saccharide links. These compounds, especially those that are water-soluble, contribute valuable dietary fiber essential to our health.

Do Carbohydrates and Fats Yield the Same Amount of Energy?

Fats supply a concentrated source of fuel for the body's energy system, yielding over twice the energy of carbohydrates. Because the body can easily convert carbohydrates to fat and store it in the various body adipose tissues, fat is an important form of body fuel for energy reserves. Excess dietary fat, especially fat from animal sources, and excess dietary cholesterol, which is synthesized only by animals, can only be supplied in the diet by animal food sources and are serious health risk factors.

Energy Requirement

Do you think that everyone requires the same amount of energy?

The energy expenditure, or the amount of energy used by the body during the course of the day or even a lifetime, changes from person to person. It depends on the age, sex, occupation, the individual's level of physical activity and their state of body, i.e. whether they are well, sick, pregnant or lactating.

Age

With respect to the age factor, there is a tendency for young children to require more energy than adults because of their rapid growth rate. As their ages increase however, the need for large energy supplies decrease proportionally and physical activity is reduced.

Gender/Sex

Men tend to have higher metabolic rates than women and because of this, coupled with their larger body size, they utilize greater amounts of energy.

Occupation and Physical Activity

Different occupations as well as recreational/sporting activities lend itself to a greater demand for energy. Occupations are classified according to the amount of activity and energy they require.

- Sedentary workers include: teachers, journalist, medical doctors clergy, shopkeepers, pilots, taxi drivers and clerical workers.

- Moderately active workers include: assembly plant workers, postmen, light industry, laborers, farm attendants, street sweepers and plumbers.

- Very active workers include: dock workers, stevedores, iron and steel mill workers, builders, farm attendants, miners, track and field athletes, weight lifters, football players and basketball players.

The State of the Body

The state of the body is also an important factor to consider when examining an individual's energy requirements.

- During pregnancy ones energy requirement soars as both mother and baby have high demands on the mother's energy stores. The high demand for energy is necessary as the baby's development of bones, teeth and an excellent blood supply is paramount.

- During lactation additional energy is required for lactation and to upgrade or initiate the mother's fat stores. It is also necessary to ensure that there is enough energy to carry to term of the pregnancy and for milk production after the baby's birth.

- Illness also makes a demand on the body's energy supply as ones metabolism rates may be elevated during incidences of illnesses and fever. There is also the possibility of lowered or decreased metabolic rates as a result of very little or no physical activity.

We've come to the end of this session. Read the summary to help you remember the main points of the lesson.

Session Summary

Summary

In this session you learned:

- Energy provided by the food we eat enables us to perform various tasks. The primary energy-yielding nutrient is carbohydrates. Fats and protein also yield energy. Protein however only supplies energy after it has performed its primary function of bodybuilding and there is excess protein— or in cases of extreme cases of starvation.

- The energy obtained from the food we eat can be summarized by this equation:

Glucose, glycerol, fatty acid or amino acid + oxygen → energy in the form of ATP + carbon dioxide + water

- The energy requirements for each individual depend largely on their age, gender, occupation and physical activity. Sedentary and moderately active workers/persons require less energy than very active workers/persons. The state of the body including possible periods of pregnancy, lactation and illness also require additional energy.

Unit Summary

Summary

In this unit you learned there are different forms of energy that your body uses.

Different Forms of Energy

Energy Type	Description of Type of Energy
Mechanical Energy	Mechanical energy is used for the voluntary and involuntary movement of muscles in the body
Chemical Energy	Chemical energy is used in all chemical and metabolic responses/reactions e.g. making of new cells
Heat Energy	Heat energy is used to maintain the body temperature at 37C
Electrical Energy	Electrical energy is used in the body for the transfer of nervous impulses

How to calculate the amount of energy in food using the following information:

- The weight in grams of each nutrient we have consumed i.e. how much carbohydrate, fat and protein.

1 gram of carbohydrate = 4Kcal

1 gram of protein = 4Kcal

1 gram of fat = 9Kcal.

You also learned that digestion is the process by which food is broken down both physically and chemically into smaller units which can be easily absorbed and utilized by the body.

- You learned that digestion begins in the **mouth** where the food mixes with saliva which moistens it and facilitates the activity of the enzyme called *amylase*, which breaks down carbohydrates into starch and simpler sugars. The moisten ball of crushed food particles and digestive enzyme (*amylase*) is swallowed and passes from the mouth through the esophagus into the stomach by a wavy motion of muscles in he digestive tract called *peristalsis*.

- In the **stomach**, acids inactivate salivary enzyme *amylase* by the stomach's secretion of hydrochloric acid thereby stopping starch digestion. This secretion of hydrochloric improves the activity of *pepsin* during the further digestion of proteins. The addition of the enzyme known as *pepsin* then continues the breakdown proteins into smaller units of amino acid chains called *peptides.* Another enzyme present in the stomach is *rennin* which is responsible for clotting milk so that the *pepsin* can work much better on the molecules of milk and milk products. Also taking place in the stomach is the retardation

- The food then moves to **the duodenum** where the activity of the enzyme pepsin is stopped. The enzyme trypsin then takes over the digestive process and the break down the proteins into polypeptides continues. Also occurring here in the duodenum is the emulsification of fat where pancreatic lipase breaks down the fat molecules into glycerol and fatty acids.

- In the small intestine Maltose is broken down by maltase to form glucose, Sucrase acts on sucrose to produce glucose and fructose and Lactase breaks down lactose to form glucose and galactose.

- In the large intestine some of the fibre consumed is acted upon by bacterial enzymes and broken down to form fatty acids, water and gas.

- In the rectum the water is withdrawn from the chyme leaving a semi-solid waste material. The strong muscles of the rectum hold back the waste until it is time to excrete it or defecate

In the third session of this unit you learnt that metabolism is the chemical reactions in the body's cells that convert the fuel from food into energy thousands of metabolic reactions occur at the same time in order to keep our body's cells healthy and functioning.

The energy yielding nutrients, Carbohydrates, Fats and Proteins are

derived from the food we eat are broken down as follows;

- proteins into amino acids,
- fats into fatty acids and
- carbohydrates into simple sugars: such as sucrose, glucose and maltose
- These products of digestion are then transported by the blood stream to our body's cells where they are combined with enzymes such as Adenosine Triphosphate (ATP) which help speed up and regulate the metabolic process.
- During metabolism, energy from the amino acids, fatty acids and simple sugars are released and distributed for use as fuel by the body.
- The unutilized energy that we consume from food will store by the body for later use, if this trend continues and we do not engage ourselves in some form of physical activity to utilize the stored energy we become overweight and if we still continue not to utilize the excess energy we will be obese.
- **Obesity** is an abnormal accumulation of fat usually 20% or more over a person's ideal body weight. It occurs when a person ingests more calories than he /she can burn off. Constantly storing the excess energy may result in excessive weight gain which may result in many serious and potentially life threatening problems including hypertension, type II diabetes mellitus (non-insulin dependent diabetes) increased risk for coronary disease, hyper-lipidemia, infertility and a high prevalence of colon prostate cancer.

There are two major metabolic processes:

- **Anabolism (Constructive Metabolism)** Building and storing energy
- **Catabolism (Destructive Metabolism)** - converts the fuel in the food we've eaten into energy needed to power everything. This process produces the energy required for all activity in the cells

- The energy obtained from the food we eat can be summarized by this equation

Glucose, glycerol, fatty acid or amino acid **+ oxygen → energy in the**

form of ATP + carbon dioxide + water

The energy requirements for each individual depend largely on their age, gender, occupation and physical activity; with sedentary and moderately active workers/persons requiring less energy than very active workers/persons and the state of the body with periods of pregnancy, lactation and illness requiring additional energy.

Assignment

Assignment

Complete the following questions in the space provided below.

1. When we calculate the energy value of a food or a meal the unit of measure that is used to express the amount of energy contained in the food is called _____.

2. Michelle had two pieces of fried chicken and 200 grams of potato salad for lunch.

   Assume that the chicken contained 10 grams of protein each, 5 grams of oil and the potato salad contained 10 grams of fat, and 100 grams of carbohydrates.

   Calculate the energy value of the meal.

Answer all of the following questions by circling the BEST answer.

1. The digestive system is the body's:

   a) Respiratory or breathing system

   b) Blood transporting system

   c) Food processing system

d) Energy processing system

2. The process of digestion begins in the mouth. Which of the following statements concerning digestion in the mouth is false?

   a) The tongue helps to form the food into a ball

   b) Chewing exposes more of the surface area of the food to enzyme action

   c) The tongue aids in the digestion of food molecules.

   d) The tongue keeps the food in place in the mouth as it is being chewed.

3. Food is transported to the stomach via the

   a) Pyloric sphincter muscle

   b) Esophagus

   c) Rectum

   d) Mouth

4. Bile helps to _____in digestion

   a) Digest fats

   b) Emulsify fats

   c) Neutralize fats

   d) Break down fats

5. Food travels through these organs in the following order:

   a) Mouth, esophagus, stomach, small intestine, large intestine and rectum.

   b) Mouth, esophagus, stomach, large intestine, small intestine and rectum.

   c) Mouth, stomach, oesophagus, small intestine, large intestine and rectum.

   d) Mouth, stomach, gullet, small intestine, large intestine and rectum.

6. Carl had a whole wheat fried bake and shark sandwich, which garlic mayonnaise dressing.

a) List the nutrients that are present in this sandwich

b) Describe the digestion of this sandwich; include in your description the enzymes at work.

c) After the food is digested it is absorbed. Answer the following question

d) What are the end products of digestion of this sandwich?

e) Briefly explain what happens when nutrients are absorbed.

7. In the statements written below, fill in the blanks by using the following words; Metabolism, Anabolism, Catabolism

a) The complete set of chemical reactions carried out in the body_____

b) The chemical reactions that synthesize complex molecules_____

c) The chemical processes that breakdown complex molecules_____.

d) The breakdown of starch molecules into the simple sugar, glucose

e) The buildup of peptides form amino acids_____

8. Describe briefly the factors that determine how much energy an individual needs.

Contents

Unit 3

Macronutrients

Introduction

This is the first unit in this course that explores the chemical components of the foods we eat. All living things need food in order to survive. Why is this so? After you have completed this unit you should be able to answer this question.

Food is necessary for growth, for supplying energy and for keeping us healthy. All food is composed of complex chemical substances. Nutrition provides us with a study of the chemical components of food and how the body utilizes food.

Through this first unit you will learn that in order to be classified as a food, any food item must contain one or more chemical substances commonly referred to as 'nutrients'. Therefore, you will be introduced to foods' nutrients and the two groups into which they fall, namely: *macronutrients* and *micronutrients*. This unit will focus primarily on *macronutrients* which may also be referred to as the energy supplying nutrients, because they function optimally.

Outcomes

Upon completion of this unit you will be able to:

- *Explain* the importance of *macronutrients* in the diet
- *Classify* the nutrients based on the body's needs or their function in the body
- *State* the functions of the *macronutrients*
- *Outline* the food sources of all the nutrients
- *Explain* how heat affects each of the *macronutrient*
- *Explain* the relationship between the *macronutrients* and meal planning.

How Long?

You will need to devote fifteen (15) hours of study to this unit. Ten (10) hours of formal study and five (5) hours of self-study.

Terminology

Nutrients: The chemical substances found in food.

Nutrition: The study of food, the nutrients in food, and how food and its nutrients are used by our body.

Photosynthesis: *Photosynthesis* means 'putting together with light.' *Photosynthesis* is a chemical process in which green plants use the energy from sunlight along with carbon dioxide and water to make oxygen and other organic compounds.

Starch : A complex carbohydrate found chiefly in seeds, fruits, tubers, roots and stem pith of plants, i.e.corn, potatoes, wheat, and rice.

This Unit is Comprised of Four Sessions

Session 3.1 Nutrients

Session 3.2 Body Building Proteins

Session 3.3 Energy Giving Carbohydrates

Session 3.4 The Truth About Fats

Session 3.1 Nutrients

Introduction

All food is composed of mixtures of many nutrients both *macronutrients* and *micronutrients*. When the function of each nutrient is understood it is easy to realize the importance of each of these nutrients and why they are nutritionally good for you.

Outcomes

List the names of the nutrients present in food

State the foods in which each nutrient is found

Classify the nutrients found in foods

Identify the major nutrients

Describe the *macronutrients*

How Long?

You need to devote two and a half hours (2.5) hours of formal study to this unit and one and a half (1.5) hours of self-study to complete this session.

Terminology

Food: Any substance solid or liquid that provides the body with nourishment for growth maintenance and repair.

Macronutrients: The nutrients that humans require in the largest quantities.

Micronutrients: Essential nutrients that humans require in the smallest quantities.

3.1-1 Explaining Nutrients

What are nutrients? Below , read a few characteristics about nutrients. Then perhaps you can come up with a definition on your own.

- Nutrients are chemical substances
- Nutrients nourish, and help our bodies to function properly
- Nutrients are found in the foods we eat

Reflection

Think about the statements above for a minute. What are nutrients?

Can you come up with the something resembling the following definition?

Nutrients are chemical substances found in the foods we eat. Nutrients nourish, and help our bodies function properly.

If you came up with a definition resembling the one above, good job!. If you didn't, reread the description above. What are the names of these nutrients? Which foods are they found in? We'll answer these questions as we progress.

Note it!

Most foods contain mixtures of nutrients. No single food contains all the nutrients we need and that are why we must eat a variety of foods. However, many foods contain a lot more of one nutrient; these foods are therefore deemed to be a good or 'rich' source of these nutrients. Foods are usually grouped according to the major nutrient they contain.

3.1-2 Names of the Nutrients

There are six essential nutrients that humans need. These nutrients are essential because they must be supplied by our diet. The names of the nutrients are:

Figure 1**:** The Nutrients

Tip

An easy way to remember the names of the nutrients is by repeating the following statement: **P**lease **C**ome **V**isit **M**e **F**or **W**inter. Which nutrient do you think the capitalized first letter of each word stands for?

P-Protein

C-Carbohydrate

V-Vitamins

M-Minerals

F-Fats

W-Water

Activity

Draw an outline of your hand (as shown below) on a sheet of paper. Label each finger and the thumb using the names of five of the six food nutrients and label your palm with the other nutrient— water.

This diagram below illustrates that good health and good nutrition go hand in hand.

Feedback

Below is what your diagram should look like when you've completed the exercise:

Figure 2: Good Health and Good Nutrition go Hand in Hand

You may ask yourself, where nutrients are found. Nutrients are found in the foods we eat. But what is a food? Is food things we eat? Is milk a food? Are candy and alcohol food? Complete the exercise below and we will then define the term 'food'.

Activity

Place a tick or an x next to the items in the list below you would identify as food.

Items	Is it a Food?
Chicken	
Fruit Leather	
Potato Chips	

Items	Is it a Food?
Peanut Butter	
Fried Rice	
Orange Juice	
Carrot Muffin	
Black Forest Cake	
Whole Wheat Bagel	
Steamed Spinach	
Coconut Ice Cream	

Figure 3

Feedback

Did you tick off all of the items? No? Maybe you didn't tick off the juice or the soda or the ice cream as foods. However, each one of these items provide our bodies with some nourishment, thus they are all considered as food.

Items	Is it a Food?
Chicken	x
Fruit Leather	x
Potato Chips	x
Peanut Butter	x
Fried Rice	x
Orange Juice	x

Carrot Muffin	x
Black Forest Cake	x
Whole Wheat Bagel	x
Steamed Spinach	x
Coconut Ice Cream	x

What is food?

Food is any substance (solid or liquid) that provides our bodies with nourishment.

Before we move on, if nutrients are chemicals, foods are substances that nourish us, and good health and good nutrition are related, what is nutrition?

Activity

What is your definition of the term 'nutrition?' Write your answer in the space below.

Feedback

Was your answer similar to this?

Nutrition is the study of food, the nutrients in food, and how food and its nutrients are used by our bodies for growth, repair and maintenance.

3.1-3 Classifying Nutrients

We've discussed that nutrients are found in food. But why do we eat? The first thing that may come to mind is that we eat to satisfy hunger! That is correct! But why does anyone (babies, young children, your friends) eat? These people eat so that their body is nourished and given the nutrients it needs to function properly.

Nutrients are found in the foods we eat. These nutrients fall into two (2) different groups. You may ask " how are they grouped?" or " are different foods grouped based on the body's needs?" Or, "what does this mean?" Some nutrients are needed in larger amounts than others. The two (2) groups of nutrients are: *macronutrients* and *micronutrients*. Have you ever come across the words 'macro' or 'micro' before? Maybe you have. You'd have noticed that 'macro' means big and 'micro' means small, hence the names *macronutrients* and *micronutrients.*

Take a look at the table below:

Macronutrients	Micronutrients
Protein	**Vitamins**
Carbohydrates	**Minerals**
Fats	

Figure 4: Classifications of Nutrients

Classification of Nutrients Based on the Body's Needs

What about water? Into which group does water fall? Water is essential for life. Every activity that takes place in the body e.g. digestion, production of urine, tears and activities that take place in cells need water. We'll learn more about water in another unit.

Can we classify or group nutrients any other way? Yes! Nutrients can be grouped according to their function or what they do in our body. They can be classified as:

- Energy Giving i.e carbohydrates and fats

- Body Protecting i.e vitamins, minerals, water
- Bodybuilding i.e protein, minerals

The diagram below should help you understand this way of classifying nutrients.

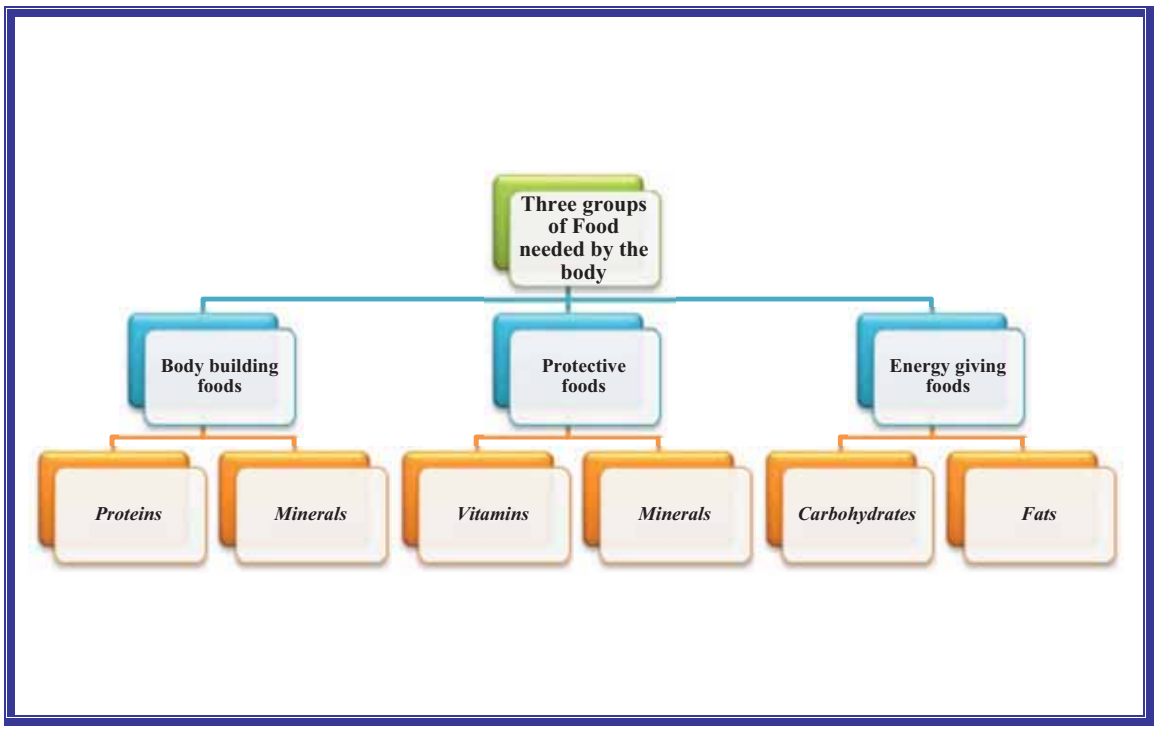


Figure 5: Classification of Nutrients Based on Functions

Activity

Answer the following questions about nutrients in the space provided below.

1. Which of the following are ways by which nutrients can be classified or grouped? Circle all that apply.

- The quantities needed by the body
- The amount found in a food
- The function or role they play in our body

2. Write the words *macronutrient* or *micronutrient* next to the following nutrient in the table

Nutrient	Classification
Vitamins	
Protein	
Carbohydrate	
Minerals	
Water	
Fat	

3. Identify what kind of the nutrient the following nutrients are. Write the type of nutrient in the blank space provided. The first one has been done for you.

a) Minerals- bodybuilding_____

b) Carbohydrates-_____

c) Vitamins- _____

d) Protein-_____

e) Fats- _____

Feedback

Let's see how you did. Check the answers below.

1. The quantities needed by the body, the function or the role they play in our body.

2.

Nutrient	Classification
Vitamins	Micronutrient
Protein	Macronutrient
Carbohydrate	Macronutrient
Minerals	Micronutrient
Water	Does not fall into any group, but is vital for good health
Fat	Macronutrient

3. b) Energy giving

   c) Protective

   d) Bodybuilding

   e) Energy giving

3.1-4 Nutrients: Who are They?

Here are some descriptive clues about each of the six nutrients. Do you think you can identify which nutrient it is? Write the answer in the space provided in the box.

1.

- I am made up of *amino acids*— two groups of *amino acids*; *essential* and *non-essential*
- I am responsible for building your muscles and repairing any damage to them
- I can be found in foods from animals e.g. chicken, seafood, meat (i.e. pork,) dairy foods (i.e. milk,) eggs and cheese
- I can be found in foods from plants such as dried peas and beans (i.e red beans, black beans, lentil peas, soya beans) and all types of nuts (i.e. peanuts)
- You can find me in some cereals such as rice and corn

Who am I?

a) Carbohydrates
b) Fats
c) Protein
d) Vitamins
e) Minerals
f) Water

_____

2.

- I give you energy for your body to do work e.g. walk, grow, and digest food etc
- Sometimes I am called sugary, starchy or fiber
- You can find me in cereal such as rice and corn, starchy roots and tubers such as potato
- I also give fruits and juice their sweetness

Who am I?

a) Carbohydrates
b) Fats
c) Protein
d) Vitamins
e) Minerals
f) Water

_____

3.

- I am a concentrated source of energy

- When I am in a liquid state I am called oil
- I can be *saturated* or *unsaturated*
- I am found in foods such as avocado, vegetable oil, margarine cakes and pastries

Who am I?

a) Carbohydrates
b) Fats
c) Protein
d) Vitamins
e) Minerals
f) Water

_____

4.

- I am needed in small amounts by the body
- I can be fat or water-soluble
- You can refer to me using a letter or my chemical name

Who am I?

a) Carbohydrates
b) Fats
c) Protein
d) Vitamins
e) Minerals
f) Water

_____

5.

- I am needed in small quantities by the body
- I am necessary because I am bodybuilding and in control of various body processes, e.g. transmission of nerve impulses

Who am I?

a) Carbohydrates
b) Fats
c) Protein
d) Vitamins
e) Minerals
f) Water

_____

6.

- I am necessary for all processes, such as digestion, in the body
- Over 70% of your body is made up of me
- I can be found in fruits, vegetables and in your taps
- I am the body's lubricant

Who am I?

a) Carbohydrates
b) Fats
c) Protein
d) Vitamins
e) Minerals
f) Water

_____

Feedback

The nutrients described above are:

1.Protein 2.Carbohydrates 3.Fats 4.Minerals 5.Vitamins 6.Water

3.1-5 Macronutrients

The *macronutrients* are: protein, carbohydrates and fats. They are called *macronutrients* because they are needed in large quantities in the body for growth, development and repair.

The *macronutrients* are made up of the chemical elements carbon, hydrogen and oxygen. Proteins are a little different because they also contain the chemical element 'nitrogen' which is important for growth and development of our body.

What do the *macronutrients* do? Proteins provide us with nourishment for the growth, maintenance and repair of the body while carbohydrates and fats provide us with energy. Next session you'll learn more about the *macronutrients.*

Session Summary

Summary

In this session you learned primarily about the nutrients in the food you eat.

Nutrient Names and Their Food Sources

Nutrient Name	Food Sources
Proteins	Food from animals, legumes, some cereals
Carbohydrates	Starch roots and tubers, fruit, cereals e.g. rice pasta

Nutrient Name	Food Sources
Fats	Vegetable oils, avocado, cakes and pastries
Vitamins and Minerals	Various plants e.g. green leafy vegetables, fruit and animal foods e.g. milk, eggs, meat, fish, poultry, etc
Water	Beverages, various fruit and vegetables

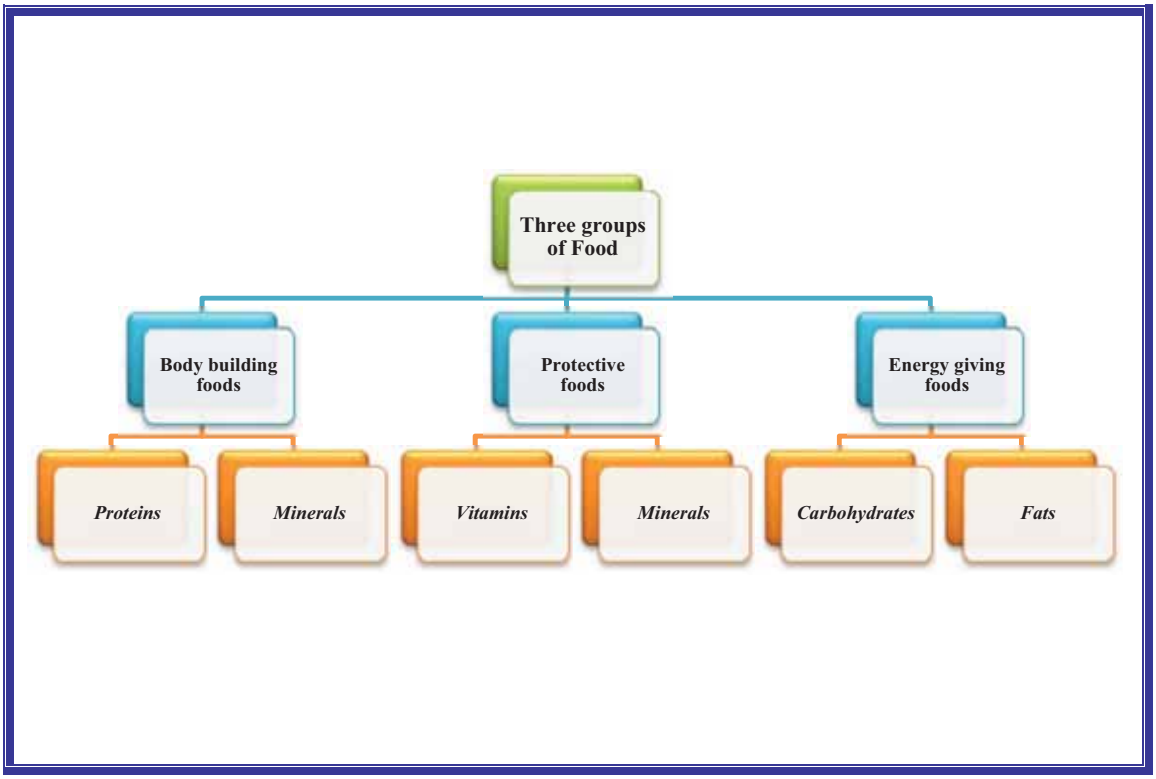
Figure 6

Classifying Nutrients

Based on the body's needs. See table below.

Macronutrients	Micronutrients
Protein	**Vitamins**
Carbohydrates	**Minerals**
Fats	

Based on the functions nutrients perform.



Description of Nutrients

Nutrient	Description
Protein	Made up of *amino acids* and can be found in foods such as meat, fish and poultry, peas and beans and cereals such as peas.
Carbohydrates	Provide energy to the body. Known as starch, sugar or fiber. Carbohydrates can be found in foods such as fruit, cereals, roots and tubers.
Fats	A concentrated source of energy. Fats can be *saturated* or *unsaturated.*
Vitamins and Minerals	Needed in small quantities,

Nutrient	Description
	vitamins and minerals are vital for all body processes.
Water	Needed for all body processes.

Figure 7

Macronutrients

Macronutrients include: proteins, carbohydrates and fats.

Assessment

Assessment

Answer the following questions about nutrients in the spaces provided below. Let's see how much you remembered.

Which nutrients do these things in your body, insert in the statements one of the following terms: ***carbohydrates, fats, proteins, vitamins, minerals, water.***

1. Helps your body change food into energy_____

2. Makes and repairs cells and tissues_____

3. Gives you strong bones and teeth_____

4. Protects the body and helps it to function properly_____

5. The body's chief source of energy_____

List at least one food that provides the nutrients listed below.

6. Carbohydrates_____

7. Minerals_____

8.Proteins_____

9. Water_____

10. Vitamins_____

What nutrients does a slice of pizza (toppings include pineapple, bacon and sweet pepper) provide you with? List the nutrients in the spaces provided below.

Feedback

This is your first assessment. How did you do? Surely you got all the answers! If you had any difficulty, please read the material before you move on.

1. Carbohydrates 2.Protein 3.Minerals 4.Vitamins/Minerals 5. Water

6. Fruit, starchy vegetables, roots, tubers, cereals

7. Any suitable plant or food from animal

8. Any suitable legumes, food from animal

9. Fruits, beverages, vegetables

10. Any suitable plant or food from an animal

11. Nutrients in the pizza

-Dough-carbohydrates

-Cheese-protein

-Bacon-protein, fat

-Pineapple-carbohydrate

-Sweet pepper-vitamins

-Tomato sauce-vitamins

Session 3.2 Body Building Protein

Introduction

I want muscles! What nutrient is a ready supply of material to build muscle? Proteins of course! In the previous units and lessons you were introduced briefly to this nutrient and why it is necessary in our diet. Life could not exist without proteins, as they are the main molecules from which living cells are made. They are the only nutrient that contains the chemical element 'nitrogen', which is vital for cell manufacture and growth. Therefore, protein foods are absolutely essential in the human diet.

In this session you will explore proteins more closely. What are proteins made up of? What chemical elements are proteins comprised of? How do the ways in which we cook protein foods affect them? We will discover this information and much more about protein. So review what we've learned up to this point and then let's move on!

Outcomes

Upon completion of this session you will be able to:

- *State* the chemical elements of which protein is comprised
- *Classify* proteins based on their structure and *amino acid* content
- *State* the functions of proteins in the diet
- *Explain* what is meant by the term 'protein sparing'
- *Explain* how proteins can be combined to promote optimum nourishment
- *Discuss* how heat affects protein

How Long?

You need to devote two and a half hours (2.5) hours of formal study to this unit and one and a half (1.5) hours of self-study to complete this session.

Terminology

Amino Acid: *Amino acids* are the smallest units of protein. *Amino acids* are small, water-soluble molecules.

Biological Value of Protein: Biological value is a measure of the quality of protein. The biological value of protein food is measured by the number of *essential amino acids* it contains in proportion to the body's needs.

Complementary Proteins: *Complementary proteins* are two or more incomplete protein sources that together provide

adequate amounts of all the *essential amino acids*.

Denaturation: This is the untwisting of protein molecules causing loss of structure and function. This process is irreversible.

Coagulation: The transformation of protein by heat or the addition of chemicals into a semisolid or solid mass.

Gluten: This is a type of protein found in wheat grains, which thus gives it its elastic property.

Textured Vegetable Protein: A meat extender or substitute made from processed soya beans.

Enzyme: *Enzymes* are proteins that speed up chemical reactions in cells.

Hormones: *Hormones* are chemical messengers in the body. They send messages from glands to cells to maintain the natural balance of the body.

Antibodies: *Antibodies* are proteins produced by your immune system and circulate in the bloodstream.

3.2-1 Chemical Elements that Make Up Protein

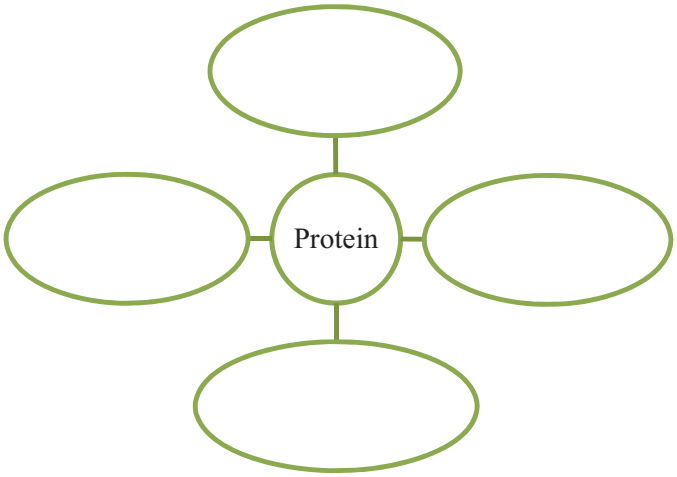
Life could not exist without proteins. Proteins are the main molecules from which living cells are made. Proteins are composed of the chemical elements: carbon, hydrogen, oxygen and nitrogen. Some even contain small amounts of sulphur, phosphorus and iron.

Proteins are the only nutrient that contains the chemical element which is vital for all cell manufacture and therefore for growth; nitrogen. Almost 80% of the air we breathe is made up of nitrogen. Humans cannot use the nitrogen in the air we breathe; therefore foods that contain protein are absolutely essential in our diet.

Nitrogen plays an important role in the digestion of food and growth. One specific period that this is especially important is during pregnancy. When a woman is pregnant, the nitrogen removed from food during digestion is needed to help the fetus grow properly.

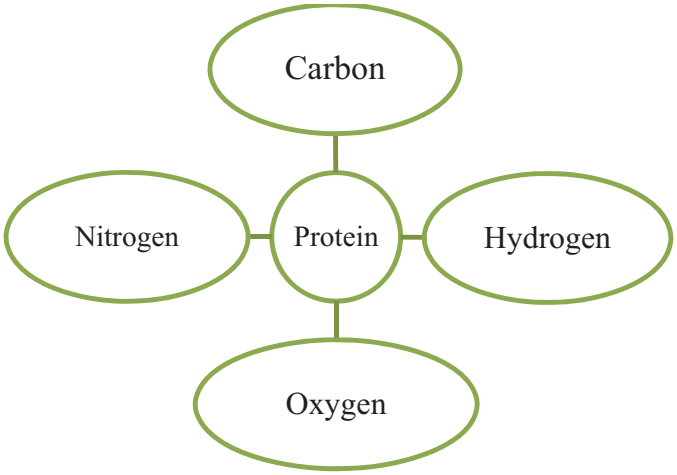
Activity

Simply list the elements that make up a protein in the space below.



Feedback

The following chemical elements make up a protein.



3.2-2 Classification of Protein

Proteins are classified based on their *amino acid* composition. What is an *amino acid*? Each protein is made up of smaller units called *amino acids*.

Amino acids are the smallest units of protein. *Amino acids* are small molecules that are water-soluble meaning they dissolve easily in water within nature.

Amino acids are considered the "building blocks" of protein. There are twenty-two different *amino acids* which are arranged like beads in a necklace in a vast number of combinations to form protein. The human body can manufacture or synthesize many of these *amino acids*.

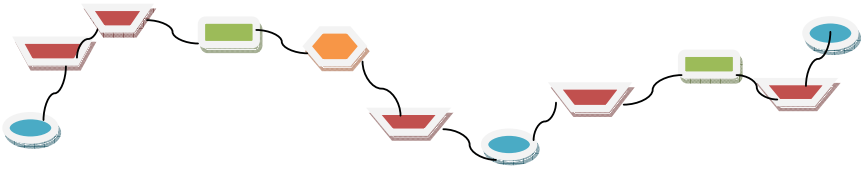


Figure 8: *Amino Acid* 'Necklace'

There are two groups of *amino acids*: *essential amino acids* and *non-essential amino acids*. What's the difference between these two groups?

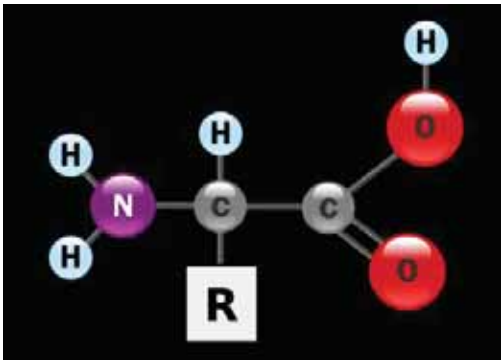


Figure 9: An *Amino Acid*

http://upload.wikimedia.org/wikipedia/commons/thumb/c/ce/AminoAcidball.svg/702px-AminoAcidball.svg.png

Essential Amino Acids

There are ten of the *amino acids* that the body cannot manufacture and which must therefore be obtained readily from the food that we eat. These are known as *essential amino acids* and are needed by children because they cannot make them fast enough for their own growing needs.

Non-Essential Amino Acids

These *amino acids* can be manufactured by our bodies, therefore they are called *non-essential amino acids*. The table below will give the names of all the *amino acids*.

Essential Amino Acids	Non-Essential Amino Acids
Arginine (necessary in children, not adults).	Alanine
Histidine	Asparagine
Isoluecine	Aspartic Acid
Leucine	Glutamine
Lysine	Glutamic Acid
Methionine	Glycine

Essential Amino Acids	Non-Essential Amino Acids
Phenylalanine	Proline
Threonine	Serine
Tryptophan	Tyrosine
Valine	

Figure 10: *Amino Acids*

We can classify or group proteins based on their biological value. A biological value is a measure of the quality of protein. The biological value of protein-dense food is measured by the number of *essential amino acids* it contains in proportion to body needs and is written as a percentage. There are two groups:

- Proteins of high biological value
- Proteins of low biological value

Proteins of High Biological Value (HBV)

- Contain all the *essential amino acids*
- Known as 'complete proteins'
- Are usually of animal origin
- One exception is the plant protein 'soya' which has a high biological value. That's why it is an ideal to use as a meat substitute for vegetarians

Strict vegetarians don't eat any meat products or meat by-products. Soy in the form of 'textured vegetable protein' (TVP).

Let's talk about HBV proteins first. Which foods contain HBV proteins?

Foods such as meat, fish and poultry, dairy products, eggs, milk and cheese contain HBV proteins.

Figure 11: HBV Proteins: Fish, Eggs, Milk and Cheese
Image: Simone Reid-Foster

Textured Vegetable Protein: Soya Beans in Food Preparation

The protein in a soya bean is of high biological protein.

Figure 10: Soya Beans Processed to Make TVP
Image: Winnond / FreeDigitalPhotos.net

An interesting fact about TVP is that it is a by-product of another process involving soya beans. It is made from defatted soy flour (after soybean oil has been produced) that is extruded from a nozzle into various shapes such flakes, chunks or even minced bits.

Activity

1. Make a list of the other products that are made using soya beans.
2. What's the name of another product that can be used as a meat substitute?

Write your answers in the box below.

1._____

2. _____

TVP is a dried product, thus it must be soaked in water. Soaking the TVP first softens it, and then the TVP is used in savoury dishes just like meat. Can you think of any dishes that use TVP?

List three dishes or items that can be made using TVP:

1 _____

2._____

3._____

Feedback

Let's see how you did answering questions about soya beans.

1. Soy sauce, milk, tofu, animal feed, flour etc.

2. Gluten (flour), quinoa (seed)

Three dishes made using TVP: 1.Casseroles 2.Savoury pastry pies 3. Meatballs, pastelle (empanadas) etc

Proteins of Low Biological Value (LBV)

- Lack one or more of the *essential amino acids*
- Called 'incomplete proteins'
- Gelatin, an animal protein, but of low biological value, is an exception

Gelatin in Food Preparation

Have you ever boiled or observed a cow's heel or pig's feet after it has been boiled and noticed that as it cools a clear gel like gluey substance forms and clumps the pieces of meat together? If you did then that is what gelatin looks like.

Gelatin is a protein that is extracted from the collagen that is present in the connective tissue (ligament and tendons), skin and bones of animals slaughtered for meat. At the end of the process what emerges is a tasteless, odourless, transparent and brittle powder. When mixed with water it swells, forming a gel. It is then heated further, yet when it cools it forms a solid in a process called *gelation*.

Gelatin is an 'LBV' protein of animal origin. Can you think of some of the uses of gelatin in food preparation? Write them down in the box below.

Uses of Gelatin:

1._____

2._____

3._____

4._____

Gelatin has many uses such as in desserts and jellies, stabilizers, and sweets, e.g marshmallows. With this brief introduction to gelatin, let's move on in our classification of proteins.

Protein Combination: (Complementary Value of Proteins).

What does the word 'complementary' mean? It means combining two things so that the lack in one is made up for in the other; completing the whole to make something perfect.

With proteins, the combination of proteins is what's important. Remember that 'LBV' proteins lack one or more of the *essential amino acids.*

Note it!

All the *essential amino acids* must be present simultaneously and in proper proportions for our bodies to utilize them. If one is lacking, even temporarily, the body's ability to use protein will fall accordingly.

Therefore, if these 'LBV' proteins are combined accurately then the deficiency in one protein is made up for in another. For *complementary protein*, remember this simple formula: milk products should always be served with grains and legumes should always be served with grains. An example of a legume and grain combination is pigeon peas and rice.

Which group of people do you think this news would be important for? One group of persons would be vegetarians.

One other way that protein can be classified is based on its structure.

Protein Structure

There are three different protein structures: *globular, fibrous* and *conjugated* . Why do you need to know about protein's structure? Proteins play a fundamental role in nearly all biological processes. Due to their diversity they can assume many different configurations and they can play varied roles in cells and tissues. Let's take a look at the different structures below.

Globular Structure

Globular protein is the name given to a protein with long chains of *amino acids* that fold around each other to form a fairly compact ball; much like a ball of yarn. Heat will cause all of the egg's proteins to unfold and expose *amino acids* that were once on the inside of the protein strand. The unfolding is generally irreversible. Further, heat will cause the egg's protein networks to solidify. Overheating creates too many bonds among the proteins and squeezes out water, resulting in food textures that are runny, lumpy, and/or rubbery. Have you ever had an egg like that?

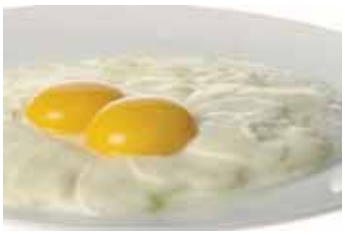


Figure 12: An Example of *Globular* Proteins

Examples of *globular* proteins include 'albumin' and 'globulin' which occur in milk and egg whites.

Fibrous Protein Structure

Fibrous proteins are made from polypeptides (many *amino acids*) chains that are twisted together into spring like, zig-zag coils. This gives these proteins an elastic property. This type of protein is found in 'elastin' the protein of arteries and tendons and gluten in flour.

The zig-zag structure produces a tough, non-elastic protein which forms part of the structure in organisms for support and protection, e.g. in connective tissues, tendons, bone matrix and muscle fiber.

Conjugated Proteins

This is a 'compound' protein. *Conjugated* proteins are usually chemically combined with non-proteins e.g. *hemoglobin*. *Hemoglobin* is a combination of the pigment that gives blood its red colour and the protein. *Lipoproteins*, which is a combination of lipid (fat,) protein and *phosphoproteins* (a group that combines phosphates and proteins) are other examples of *conjugated* proteins.

3.2-3 Food Sources of Protein

Activity

In what foods do we find protein? Write your answers in the spaces provided.

Food From Animals	Legumes	Cereals

Figure 13: Food Sources of Protein.

Feedback

Check the table below. Did your list contain these foods?

Food From Animals	Legumes	Cereals
Meats e.g. beef, pork, goat, lamb	Pulses e.g. red beans, black eye peas, black beans, lentils, channa (chick peas) etc	Rice, flour, pasta
Seafood e.g. fish, shark, shrimp etc	Nuts e.g. peanuts, cashews etc	
Poultry e.g. chicken, turkey		

Here are the names of some important proteins and the foods they are found in:

Protein Source	Protein Name
Lean meat	Myosin
Milk, Cheese	Lactalbumin
Eggs	Ovalbumin
Bones and Connective Tissue	Gelatin
Haemoglobin	Blood
Vitellin	Egg yolk
Connective Tissue	Collagen
Wheat	Gluten
Soya Bean	Glycinin

Protein Source	Protein Name
Rice	Oryzenin
Pulses e.g. (peas and beans)	Legumin
Nuts	Excelsin
Tuberin	Potato

Figure14: Protein Sources

Did you notice that some food not traditionally thought of as protein foods contain protein in them? What does this mean? The answer to this question is, simply that no food contains only one nutrient!

So what does protein do in your body?

3.2-4. Functions of Proteins

When we looked at protein structures, we discussed how the different structures correspond to different functions of proteins in our body. Each cell in the body contains protein that performs a different function.

1. Bodybuilding and growth- What does this entail? The protein 'collagen' helps build strong bones and teeth. Further, muscle protein helps our muscles contract and 'keratin' in hair, skin and nails helps to protect the body. Also, don't forget that in infants and children, growth and development is by virtue of the multiplication of all cells.

2. Proteins repair and maintain damage to our bodies- Have you ever experienced a cut? If so, the hard, crusty coating that forms over a cut is protein doing its work.

3. Proteins are an essential part of enzymes, hormones and antibodies.

4. Protein, like that in *hemoglobin* and *lipoproteins*, function as transporters of iron and fats around the body.

5. Protein also functions as regulators of fluid balance in the body.

6. Only if insufficient carbohydrates or energy giving foods are eaten, then protein is broken down to provide energy and *glucose*.

Protein Sparing

Let's deal with the term 'protein sparing' in a little more detail. Firstly, when protein is used to supply energy the protein is said to be 'deaminated'. Do you see the word *'amino'* inside of the word, 'deaminated'? The protein is broken down into

two parts in the liver. First, the nitrogen containing an *amino* group is converted by the liver into urea and eventually removed to the kidneys. Next, the *Carboxyl group* (see figure 7, an image of *amino acid* molecule) provides us with heat and energy. Therefore, protein is 'spared' the task of providing the body with energy once we consume sufficient energy producing nutrients such as carbohydrates.

3.2-5 Proteins in Food Preparation

Denatured! That's what essentially happens to protein foods that come into contact with heat, are whipped, or have chemicals such as vinegar added to them. Let's do the following activities to help us understand.

Proteins and Heat

Activity

Let's use an egg. Remember eggs contain protein. In this activity we'll heat the egg and observe what happens. What will you need?

You will neeed: a butter knife, a whisk saucer, a small deep mixing bowl, a skillet, a fish slice, four (4) eggs.

1. Crack the egg and beat with whisk until yolk and white are thoroughly mixed. Write in the space provided what you see.
2. Get a 10" skillet. Slide the cracked egg into the heated skillet.
3. After 10-15 seconds what do you notice?
4. After a further 10-15 seconds what do you notice?
5. Remove the skillet and discard the eggs. Write your observations below.

The cracked egg just after being cracked:

_____

_____

After beating with whisk:

_____

_____

Eggs After 10-15 Seconds	Eggs After 20-40 Seconds

Figure 15

Feedback

You should have observed the following:

When the egg was cracked, at first you should have seen the egg yolk and egg white as distinct from each other.

After the egg is beaten, the yolk and white are mixed together and there is the appearance of air bubbles.

Changes observed after first 10-15 seconds: eggs begin to coagulate, soft glossy curds (irreversible change) appear and changes color from transparent to opaque occurs. The changes that take place when an egg is fried is the loss of water molecules, additionally, the heat changes (denatures) the protein. The changes are visible, and they cannot be reversed.

Heat will cause all of the egg's proteins to unfold and expose *amino acids* that were once on the inside of the protein strand. As the globular protein unfolds, it will network and form weak bonds with *amino acids* of other unfolded proteins. The unfolding is generally irreversible. Further heating (the next 20-40 seconds) will cause the egg's protein networks to solidify. Further, overheating creates too many bonds among the proteins and squeezes out water. Also, the curds present become less glossy and more so dry with a resultant rubbery look.

If the heat was too high (higher than 70C) *synersis* takes place and the protein becomes over coagulated and separates from the liquid leaving a mixture resembling fine curds and whey. If curdling has not progressed too far, the food texture will likely be runny, lumpy, and/or rubbery.

Protein (Milk Proteins) and the Addition of Acids e.g. Vinegar

Activity

You will need a liquid measuring cup, 1 cup of milk, vinegar, measuring spoons.

1. Pour the milk into the measuring cup.
2. Measure one (1) tablepoon of vinegar.
3. Pour the vinegar into the milk and stir what do you observe?

Feedback

With the addition of the vinegar, you should observe small white particles like curds in the milk. The acid in the vinegar has denatured the protein in the milk causing it to precipitate or come to the surface. This is a useful occurrence in the manufacture of cheese, yogurt, or making soured milk for baking. It's not as useful when milk drinks are made using acidic fruit. It can be prevented if the acid is added slowly.

We've come to the end of this session. Let's move onto energy giving carbohydrates.

Session Summary

Summary

In this session you learnt that proteins are made up of the chemical elements, carbon, hydrogen and oxygen, as well as nitrogen, which is a very element in the chemical composition of protein. Some proteins also contain sulphur, phosphorus and iron.

You learned that proteins can be classified according to their:

a) *Amino acid* composition- *Amino acids* are the building blocks of all proteins. There are two groups of *amino acids*: *essential* and *non-essential amino acids.*

Essential Amino Acids	Non-Essential Amino Acids
Arginine (necessary in children, not adults)	Alanine
Histidine	Asparagine

Essential Amino Acids	Non-Essential Amino Acids
Isoluecine	Aspartic Acid
Leucine	Glutamine
Lysine	Glutamic Acid
Methionine	Glycine
Phenylalanine	Proline
Threonine	Serine
Tryptophan	Tyrosine
Valine	

Biological value- The biological value of a protein is the measure of its quality.

Proteins of High Biological Value (HBV proteins)

- Contain all the *essential amino acids*
- Also known as *complete proteins*
- Usually of animal origin. One exception is the plant protein soya, which has a high biological value. That's why it is ideal to use soya as a meat substitute for vegetarians

Proteins of Low Biological Value (LBV)

- Lack one or more of the *essential amino acids*
- Called *incomplete proteins*
- One exception is gelatin, which is an animal protein, but of low biological value

Complementary Value of a Protein

When two incomplete or 'LBV' proteins are combined, the *essential amino acids* that they each lack is made up for by the presence of bread or combination with legumes.`````

Protein Structure

There are three different types of protein structures:

- *Globular proteins*- long chains of amino acids that are folded around each other.
- *Fibrous proteins*- many *polypeptide* chains that are twisted together like springs in a zig-zag coil.
- *Conjugated proteins* or 'compound' proteins- combined with a non-protein compound e.g. *hemoglobin*.

Functions of Protein

While proteins can also supply the body with energy, protein is spared from doing this once there is a sufficient carbohydrate supplied by the diet. The major functions of proteins include:

- Bodybuilding and growth: What does this funcution entail? The protein 'collagen' helps build strong bones and teeth. Further, muscle protein helps our muscles contract and 'keratin' in hair, skin and nails help protect the body. Also, don't forget that in infants and children growth and development occurs by virtue of the multiplication of all cells.
- Proteins repair and maintain damage to our bodies: Have you ever experienced a cut? If so, the hard, crusty coating over the cut is protein doing its work.
- Proteins are an essential part of enzymes, hormones and antibodies.
- Protein, such as in *hemoglobin* and *lipoproteins* function as transporters of iron and fats around the body.
- Proteins also function as regulators of fluid balance in the body.

Protein Sparing

Proteins can also provide our bodies with energy, but this is not their primary function. The 'protein sparing' effect occurs as long we consume sufficient quantities of energy giving foods such as primarily carbohydrates, thus allowing protein to focus on its primary function of bodybuilding.

Food Sources of Protein

Food From Animals	**Legumes**	**Cereals**
Meats e.g. beef, pork, goat, and lamb	Pulses e.g. red beans, black eye peas, black beans, lentils, channa (chick peas) etc	Rice, flour, pasta
Seafood e.g. fish, shark, shrimp etc	Nuts e.g. peanuts, cashews etc	
Poultry e.g. chicken, turkey		

Finally, you have now learned how proteins behave in different food preparation activities such as with heat and acids.

In both heat and acidic enviroments, proteins are denatured. In heat this process is irreversible. When the protein is heated it coagulates or solidifies. In an acidic medium the proteins are precipitated out and the formation of curds and clumps can be seen.

Assignment

Assignment

Conduct a survey in your neighborhood/school. Survey twenty (20) people asking them to identify the major sources of protein in their diet.

To complete this exercise you need to do the following:

- Compile a list of various groups of foods that provide protein.

-Make copies of the list or ask each person individually (the persons must be randomly selected.)

- For each category state your answer as a percent of the whole amount surveyed.

- Represent the results of your survey as a pie chart.

- Submit your assignment to your subject facilitator at your respective centers. Please indicate name and contact information.

Assessment

Assessment

How much do you remember and understand about proteins? Answer the following questions below in the spaces provided.

1. List three (3) groups of people for whom you think that adequate consumption of protein is important.

   - Why do you think protein consumption is important for these groups of people?

2. Classify the following protein sources into their respective groups.

HBV, LBV, Globular, Conjugated, Fibrous

Write your answers in the table below.

Protein Source	Category of Protein
1. Chicken	
2. Hair	
3. Eggs	
4. Finger Nails	
5. Soya Beans	
6. Flour	
7. Muscle Fibers	
8. Cheese	
9. Red Beans	
10. Ground Beef	
11. Rice	

Protein Source	Category of Protein
12.Yogurt	
13. Almonds	
14. Enzymes	
15. Potato	

Figure 15

3. You learned that complete proteins are called 'HBV' proteins.

   A) How can we combine foods in the diet to make a complete protein?

   B) What is this process called?

   C) Give three (3) examples of dishes that combine foods to make *complete proteins*.

Session 3.3 Energy Giving Carbohydrates

Introduction

Carbohydrates are referred to as energy giving foods. They provide the energy in the form of calories that the body needs for work and other functions. Also, children need energy to grow, a pregnant mother needs energy to give to her child who is growing in her womb, and a nursing mother needs energy for breast-feeding.

We've already seen that most foods contain a mixture of nutrients. Further, some foods contain a higher concentration of one nutrient, for example, meat has more protein than it has other nutrients, and thus it is classified as a bodybuilding protein food. Similarly, energy foods have a higher concentration of carbohydrates compared to other nutrients. In this unit we'll learn all about carbohydrates, the chemical elements that they are made up of, the different types of carbohydrates and all about dietary fiber.

Upon completion of this unit you will be able to:

- *State* the chemical structure of carbohydrates
- *Describe* the process of *photosynthesis*

Outcomes

- *Classify* the various types of carbohydrates
- *Discuss* the importance of *dietary fiber* in the diet
- *List* the functions of carbohydrates
- *Explain* why carbohydrates are a more efficient source of energy than proteins
- *List* the food sources of carbohydrates
- *Choose* the best food sources of carbohydrates
- *Discuss* the effect of heat on carbohydrates

How Long?

You need to devote two and a half (2.5) hours of formal study to this unit and one and a half (1.5) hours of self-study to complete this session.

Terminology

Photosynthesis: *Photosynthesis* means 'putting together with light.' *Photosynthesis* is a chemical process in which green plants use the energy from sunlight along with carbon dioxide and water to make oxygen and other organic compounds.

Constipation: A condition where a person has a bowel movement fewer than three times a week or has difficulty in having a bowel movement.

Diverticulosis: *Diverticulosis* is the formation of abnormal pouches in the bowel wall, while *diverticulitis* is inflammation or infection of these pouches.

Maillard Reaction: The 'browning reaction,' that occurs when the denatured proteins on the surface of meat recombine with the sugars present to produce the "meaty" flavor and changes to the color of the meat. The *maillard reaction* occurs most readily at around 300° F to 500° F.

Cellulose: *Cellulose* is a *polysaccharide* consisting of many chains of linked *glucose* units. It is a major component of the cell walls of plants.

3.3-1 Chemical Structure of Carbohydrates

Like proteins carbohydrates are made of the chemical elements, carbon (**C**), hydrogen (**H**) and oxygen (**O**) with a ratio of hydrogen twice that of carbon and oxygen. The name "carbohydrate" means a "hydrate of carbon." The name derives from the general formula of carbohydrate is $C_x(H_2O)_y$, *Glucose* the simplest carbohydrate is written: $C_6(H_2O)_6$ or is more commonly written, $C_6H_{12}O_6$.

3.3-2 How are Carbohydrates Made?

Carbohydrates are initially synthesized in plants from a complex series of reactions. *Photosynthesis* is a complex series of reactions carried out by the leaves in plants, which utilize the energy from the sun. The simplified version of this chemical reaction is to utilize carbon dioxide molecules from the air and water molecules as well as the energy from the sun to produce a simple sugar such as *glucose* and oxygen molecules as a by- product. The simple sugars are then converted into other molecules such as starch, fats, proteins, enzymes, and DNA/RNA; i.e. all of the other molecules in living plants. All of the "matter " of a plant ultimately is produced as a result of this *photosynthesis* reaction.

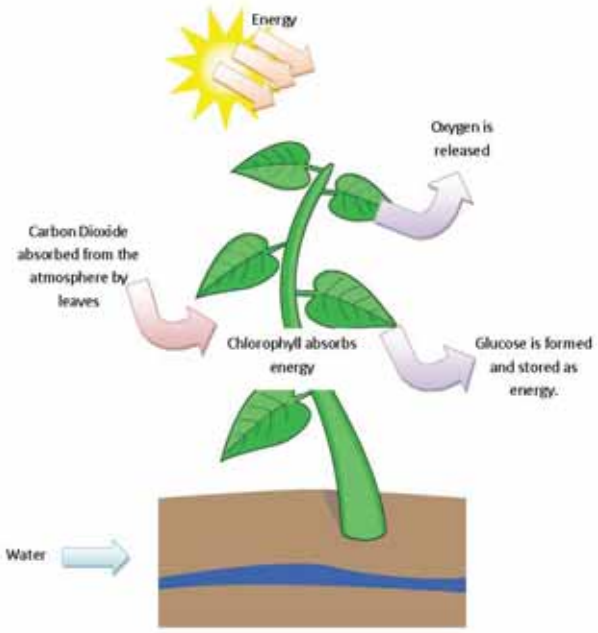


Figure 16: *Photosynthesis*
Image: DEU TT

3.3-3 Types of Carbohydrates

Have you ever heard the term 'complex carbs'? You may question as to what constitutes 'carbs'? There are two major types of carbohydrates in foods: *simple and complex*. The chemical structure of all carbohydrates is based on a simple sugar unit called a *monosaccharide*.

Simple carbohydrates or simple sugars are found in refined sugars, such as the white sugar you'd find in a sugar bowl. If you have a lollipop, or a soft drink (soda) you're eating simple carbohydrates. Don't despair, you'll also find simple sugars in more nutritious foods such as fruit and milk. It's better to get your simple sugars from foods like fruit and milk. Why? Because they contain vitamins, fiber, and important nutrients like calcium; whereas a soda does not.

Complex carbohydrates also called starches include grain products such as bread, crackers, pasta, and rice. As with simple sugars, some *complex carbohydrate* foods are better choices than others. Refined or processed grains, such as white flour and white rice, have been through a process, which removes nutrients and fiber. However, unrefined grains still contain these vitamins and minerals.

Unrefined grains also are rich in fiber, which helps your digestive system work well. Fiber helps you feel full, so you are less likely to over eat these foods. For example, a bowl of oatmeal fills you up more than sugary candy that has the same amount of calories as the oatmeal.

Figure 17: Whole-Grain Bread
Image: Simone Reid-Foster

Let's look at all the different types of carbohydrates. There are two major groups:

Simple Carbohydrates	
Monosaccharide: comprise different arrangements of the carbon, hydrogen and oxygen atoms.	*Disaccharide*: these are known as double sugars, formed when two *monosaccharides* combine with the loss of water.

Simple Carbohydrates	
Glucose, Galactose and Fructose	Sucrose: glucose + fructose Lactose: glucose + galactose Maltose: glucose + glucose

Figure 18: *Monosaccharides* and *Disaccharides*

Complex Carbohydrates: Comprise Many Sugar Units Bonded Together With Loss of Water	
Starch	Insoluble in cold water, starch is a form of carbohydrate found in plants that store food. Starch usually consists of long chains of *glucose* units.
Glycogen	The store of starch in animals, humans. *Glucose* is converted to starch and used as a store of energy. It is also stored in the liver.
Dextrin	The browned part on starchy foods e.g. breads that are heated with dry heat.
Pectin	Found in under ripe fruits and vegetables. This is important in the setting of jams and jellies.
Cellulose	*Cellulose* forms the structural framework of plants e.g. in stems, leaves, and outer covering (skin) of fruit and cereals. The *glucose* units that form *cellulose* are in a complicated branched network.

Figure 19: *Complex Carbohydrates*

Activity

In the following exercise, fill in the blanks with the words provided below:

glycogen, fructose, sucrose, photosynthesis, carbon dioxide, glucose, water, monosaccharides, sunlight, galactose, cellulose

The process by which plants produce carbohydrates is _____ and the ingredients needed for this process are _____, _____ and _____.

Simple carbohydrates also called _____ include _____, _____ and _____.

Disaccharides are also simple sugars. They include the one found in milk named _____ as well as what is found in table sugar; _____.

The common molecule in all *disaccharides* is _____.

One *complex carbohydrate* found in the cell wall of plants (i.e. lettuce) is _____. The complex carbohydrate that acts as an energy store for humans is _____.

Feedback

The process by which plants produce carbohydrates is *photosynthesis.* The ingredients needed for this process are carbon dioxide, sunlight and water. Simple carbohydrates also called *monosaccharides* include *glucose, fructose and galactose*. The *disaccharides* are also simple sugars. *Disaccharides* can be found in milk 'lactose' as well as in table sugar 'sucrose.' The common molecule in all *disaccharides* is *glucose*.

One complex carbohydrate found in the cell wall of plants such as lettuce is *cellulose*. The *complex carbohydrate* that acts as an energy store for humans is called *glycogen*.

How did you do? Were you able to fill in the answers accurately? If you had some difficulty go back and review the material.

3.3-4 Dietary Fiber

We are being encouraged to increase our fiber intake because it is good for us! But why? Let's find out.

Dietary fiber or 'roughage' is a non-nutrient because it is not digested or absorbed by the body. It helps to move food through the body and aids digestion by not only attracting water to the small and large intestines, but also, the water increases bulk in foods and keeps the mass of fiber, food particles and digestive juices soft and moving though the system.

Dietary fiber is thought to be a protective agent for certain diseases or conditions such as constipation, colon cancer, diverticulosis, and coronary heart disease. However, because many of the foods we eat are processed and refined, meaning that much of the fiber-rich parts are removed, it is suggested that that half of your choices from the staples group (at least 3-5 servings) should be whole grains. Whole grains (cereal grains that contain the germ, endosperm and bran), raw fruits and vegetables are the best sources of *dietary fiber* as are legumes, nuts and seeds. Foods from animals, such as meat, milk, eggs, and cheese do not contain *dietary fiber*.

Diverticulosis - out-pockets of weakened areas of the intestinal wall (like blow-outs in a car tire) can cause *diverticulitis. Diverticulitis* occurs if the pockets become inflamed or rupture. This is usually caused by high pressure in the intestine and prolonged transit time of waste materials. *Fiber* in the diet reduces both pressure and transit time.

Types of Fiber

There are two types of *fibre—insoluble* and *soluble.*

Insoluble Fibre

The insoluble is the type that comes to mind first. *Insoluble fibre* is the stuff in bran cereals that you eat "to keep things moving." *Insoluble fibre* is like a sponge, soaking up to 15 times its weight in water. Some sources of *insoluble fibre* include vegetables such as green beans and dark green leafy vegetables, fruit skins and root vegetable skins, whole-wheat products, wheat bran, seeds and nuts.

Figure 20: Fruits, a Source of *Insoluble Fiber*.
Image: DEU TT

How Does it Work?

Your bowel contents expand when you eat *insoluble fiber* (i.e wheat bran.) This swelling makes your stools softer and bulkier. The bulk increases pressure against the intestinal wall, stimulating it to contract and speeding the contents through your system. *Insoluble fiber* is a natural way to prevent constipation and haemorrhoids as well as pressure that causes veins in the rectum to swell and stretch out of shape caused from pregnancy, constipation, diarrhea, sitting too long, obesity, etc. A softer stool eliminates the wear and tear on the intestinal wall and may decrease the risk of colon and rectal cancers.

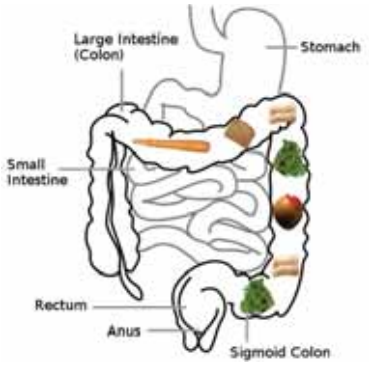


Figure 21: *Dietary Fiber* in the Large Intestine
Image: DEU TT

Soluble Fiber

Soluble fiber doesn't absorb water, insted it dissolves in water, forming a gummy or gel-like substance. *Soluble fiber* comes in handy to fight or prevent heart disease and treat diabetes. *Soluble fiber* is found in oatmeal, fruit e.g. oranges, bananas, dried peas e.g. chickpeas and beans e.g. red beans, flaxseed, roots and tubers e.g. sweet potatoes, carrots, and even soya beans and soy products. *Soluble fiber* slows the digestion and absorption of carbohydrates giving you a longer feeling of fullness.

Figure 22: Oats: A Source of *Soluble Fiber*.

Benefits of a High Fibre Diet

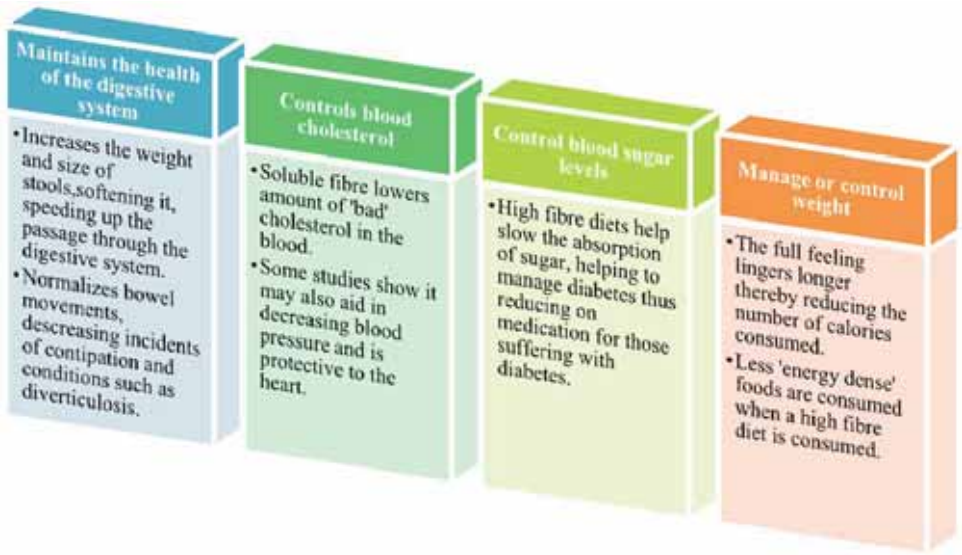


Figure 23: Benefits of *Fiber*

Activity

High Fiber vs Low Fiber

To Complete the Following Activity You Will Need:

-½ cup each of bran, whole wheat flour, white flour

- Three (3) glass jars, rubber bands or permanent markers

-1 cup of water for each of the glass jars

Instructions

- Place the measured bran, whole wheat flour and white flour in the separate jars. Label the jars.
- Place the rubber band or mark with the marker the original level of the bran and the flours.
- Pour ¼ cup of water into each jar until the bran and flours have absorbed all the water that they can.
- Answer the flowing questions:

    1. How does the absorption of water differ for each of the products?

2. Based on what you observed, if you used bran, whole wheat flour or white flour in your bread or bake, which bread or bake would have had the best fiber content?

3. How does *dietary fiber* work in the body to make us feel less hungry or fuller longer?

4. What other nutrient is needed to work along with *dietary fiber* in order for it to be beneficial to us?

Feedback

Here's what you should have observed.

1. The bran should have absorbed the most water; almost 1 ½ times its volume in water. The white flour should have absorbed the least amount of water..

2. If your bake or bread contained bran it would have had the best fiber content compared to the whole wheat and certainly the white flour.

3. *Dietary fiber* is not digested but instead it absorbs water, making it bulkier and thereby making us feel more full, or less hungry for a longer time.

4. Water is necessary to work alongside *dietary fibre* in order for it to be beneficial to us.

3.3-5 Functions of Carbohydrates

The primary function of carbohydrates is for short-term energy storage (sugars are for energy). A secondary function is intermediate-term energy storage (as in starch for plants and glycogen for animals). Other carbohydrates are involved as structural components in cells, such as *cellulose* which is found in the cell walls of plants.

1. Carbohydrates supply the energy for the body's automatic activity and for the performance of our daily tasks. The more physical work we perform daily, the more carbohydrates we must proportionately consume.

2. Carbohydrates play a vital part in digestion, assimilation (metabolism) and oxidation of protein and fat. If we take in more carbohydrates of any kind than is needed for immediate use, the unused portion is stored in the liver or converted into fat and deposited in the tissues for future use.

Carbohydrates do supply the body with energy indeed, but the other *macronutrients* also supply the body with energy. Therefore, what makes carbohydrates a better energy supplier?

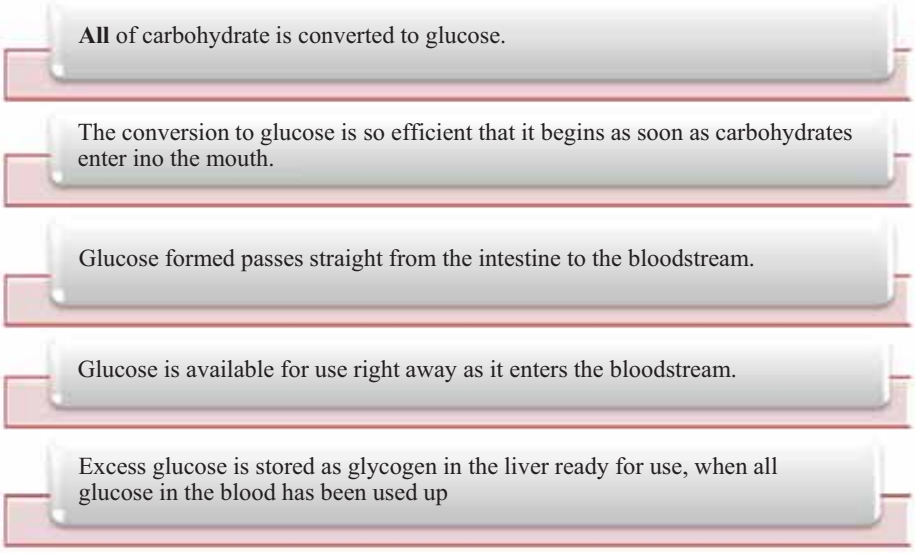


Figure 24: Why *Glucose* is a Better Source of Energy.

Let's move on the food sources.

3.3-6 Food Sources of Carbohydrates

Activity

In which foods do we find carbohydrates? Can you list some examples in the following categories? One has been done for you already. Read what we've covered so far, and then look at the answers are available below.

Categories	Food Sources
Sugar	Milk
Fruit	

Categories	Food Sources
Grains	
Vegetables	
Dried Peas and Beans	

Feedback

Categories	Food Sources
Sugar	Milk, fruits
Fruit	Citrus, mangoes, pawpaw etc
Grains	Rice, flour, pasta oats etc
Vegetables	Green leafy e.g. spinach, lettuce other types e.g carrots etc
Dried peas and beans	Chickpeas (channa) pigeon peas lentils etc, red beans black eye peas, nuts etc

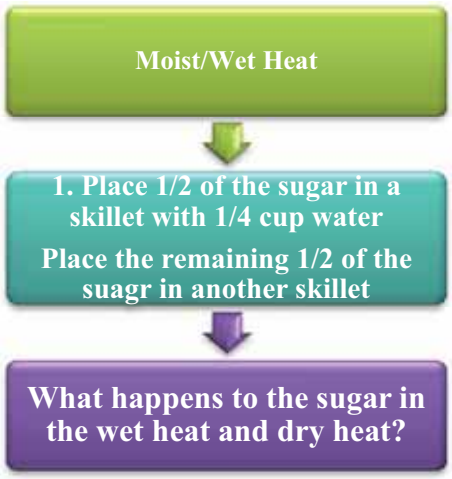
3.3-7 Effect of Heat on Carbohydrates

In this section words like *caremelization* and *gelatinization* begin to make sense. What happens when flour, potato or sugar comes into contact with heat? Is there a

difference between ‘wet heat’ e.g. steaming and boiling or ‘dry heat’ e.g. baking on starch?

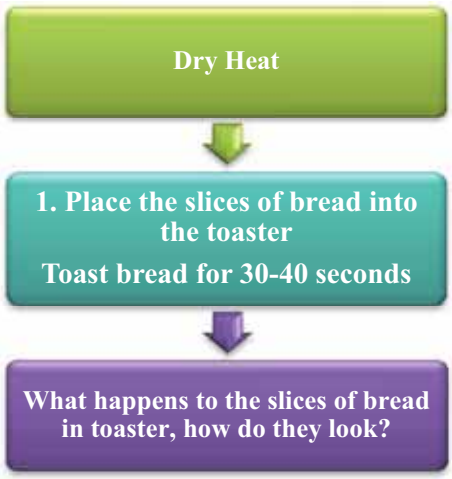
For this exercise you will need: ½ cup sugar, ½ cup rice, 2 slices bread and water, 2 non stick 10” skillets, 1 small sauce pan and a two slice toaster.

Sugar



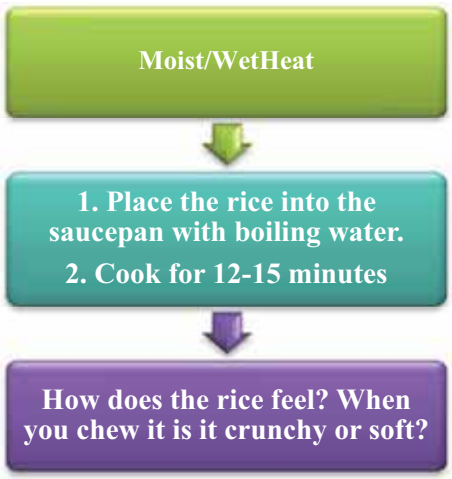
Starch

'Dry Heat'



Starch

'Moist/Wet Heat'


Moist/WetHeat
1. Place the rice into the saucepan with boiling water.
2. Cook for 12-15 minutes
How does the rice feel? When you chew it is it crunchy or soft?

Feedback

When we are cooking and 'dry heat' is applied to sugar, the following effects are seen:

- The sugar melts
- Then it caramelizes or changes into a brown colour
- Then the sugar burns, leaving a black residue

On the other hand we apply 'wet or moist heat' to sugar we will see the following happening:

- Sugar dissolves
- It becomes a syrup
- It caramelizes or changes colour
- It burns when the water has evaporated or dried out

Starch:

When applying 'dry heat' to starch the following changes would occur:

- The starch changes to *dextrin*. *Dextrin* is formed, when starchy foods are heated. Some of the very long starch chains are broken down into shorter chains called *dextrins*, with the loss of water. For example, when bread is toasted, the surface of the bread changes from white to a golden brown colour and it gets crisp, or when bread is baked the surface of the bread hardens and is a deep shade of brown while the inner part of the bread is still white

When we cook with or apply 'moist or wet heat' to starch the following happens:

- Starch grains soften, for example the hard cassava becomes softer or edible
- The starch grains absorb water
- The starch swells, for example an uncooked rice grain is small but it gets bigger or swells in 'moist heat'
- The starch grain ruptures or bursts
- Starch dissolves or dilutes in the liquid to form a paste such as if you added water to flour in a bowl stirring as the liquid was added

Session Summary

Summary

In this unit you learned that carbohydrates, like proteins, comprise carbon, hydrogen and oxygen. The process of *photosynthesis* in plants is responsible for making carbohydrates which we eat to supply us with carbohydrates since we can't make our own carbohydrates.

There were two groups of carbohydrates: 'simple carbohydrates' which comprised the *monosaccharides* and the d*isaccharides* and *complex*

carbohydrates or *polysaccharides*.

Simple Carbohydrates	
Monosaccharide: comprise different arrangements of the *carbon, hydrogen* and *oxygen* atoms	*Disaccharide*: these are known as double sugars, formed when two *monosaccharides* combine with the loss of water
Glucose, Galactose and Fructose	Sucrose: glucose + fructose Lactose: glucose + galactose Maltose: glucose + glucose

Complex Carbohydrates: Comprise Many Sugar Units Bonded Together With the Loss of Water	
Starch	Insoluble in cold water, starch is a form of carbohydrates found in plants to store food. Starch usually consists of long chains of *glucose* units.
Glycogen	The store of starch in animals, humans. *Glucose* is converted to starch and used as a store of energy. Glycogen is also stored in the liver.
Dextrin	The browned part on starchy foods e.g. bread that is heated with 'dry heat.'
Pectin	Found in under ripe fruits and vegetables. This is important in the setting of jams and jellies.
Cellulose	This forms the structural framework of plants e.g. in stems, leaves, and outer covering (skin) of fruit and cereals. The *glucose* units that form *cellulose* are in a complicated branched network.

You also learned that *dietary fiber* or 'roughage' is a non-nutrient since it cannot be digested or absorbed by the body. It helps to move food through the body and aids digestion by (1)attracting water to the small and large intestines, and (2) the water increases bulk in foods and keeps the mass of fiber, food particles, digestive juices soft and moving though the system.

Additionally, you learned that there are two types of *fiber—insoluble* and *soluble*.

Insoluble Fiber

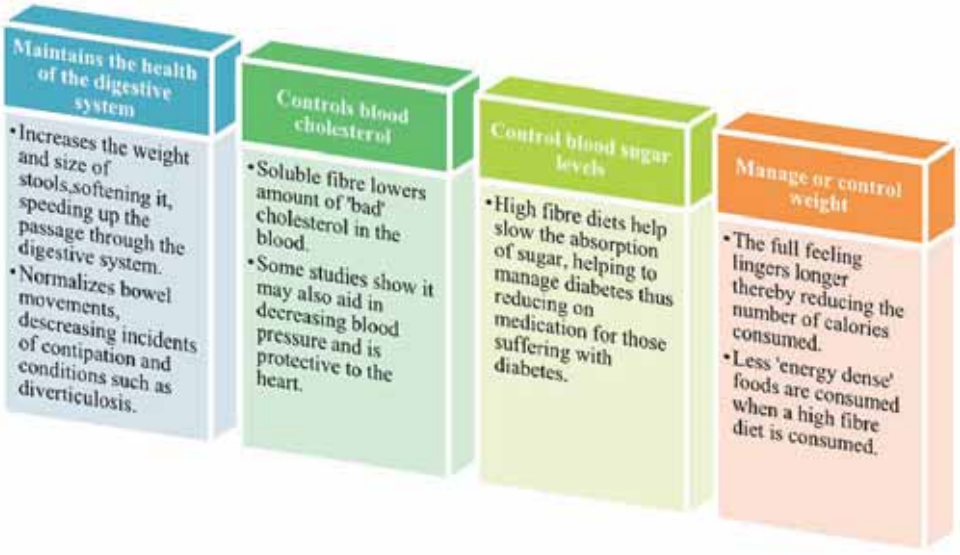
This type of *fiber* you eat "to keep things moving." *Insoluble fibre* works like a sponge, soaking up to 15 times its weight in water. Some sources of *insoluble fibre* include vegetables such as green beans and dark green leafy vegetables, fruit skins and root vegetable skins, whole-wheat products, wheat bran, seeds and nuts.

Soluble Fiber

Soluble fibre dissolves in water and forms a gummy or gel-like substance. *Soluble fiber* also helps to fight or prevent heart disease and treat diabetes. *Soluble fibre*, is found in oatmeal and fruit e.g. oranges, bananas, dried peas e.g. chickpeas and beans e.g. red beans, flaxseed, roots and tubers e.g. sweet potatoes, carrots, and even soya beans and soy products. Soluble fibre slows the digestion and absorption of carbohydrates giving you a longer feeling of fullness.

The benefits of *dietary fiber* are:

1.



Carbohydrates function in the body to:

1. Supply energy for the body's automatic activity and for the performance of our daily tasks. The more physical work we perform daily, the more carbohydrates we must proportionately consume.

2. Play a vital part in the digestion, assimilation (metabolism) and oxidation of protein and fat. If we take in more carbohydrates of any kind than is needed for immediate use the unused portion is stored in the liver or converted into fat and deposited in the tissues for future use.

You also learned that the food sources of carbohydrates include sugars, fruit, starches, grains and vegetables.

How does heat affect carbohydrates? You learned that when carbohydrates are heated using either 'dry or moist heat' they are affected in the following ways:

When we are cooking and 'dry heat' is applied to sugar, the following effects are seen:

- The sugar melts
- The sugar then caramelizes or changes into a brown colour
- The sugar then burns, leaving a black residue

On the other hand, if we apply 'wet or moist heat' to sugar we will see the following:

- Sugar dissolves
- It becomes a syrup
- It then caramelizes or changes colour
- It then burns when the water has evaporated or dried out

Starch

On applying 'dry heat' to starch the following changes would occur:

- The starch changes to *dextrin. Dextrin* is formed, when starchy foods are heated and some of the very long starch chains are broken down into shorter chains called *dextrins* along, with the loss of water. For example, when bread is toasted, the surface of the bread changes from white to a golden brown colour and it gets crisp, or when bread is baked the surface of the bread hardens and is a deep shade of brown occurs while the inner part of the bread remains white.

When we cook with or apply 'moist or wet heat' to starch the following occurs:

- Starch grains soften; for example the hard cassava becomes softer or edible
- The starch grain absorbs water
- The starch grain swells. For example an uncooked rice grain is small but it gets bigger or swells in 'moist heat'
- The starch grain ruptures or bursts

Starch dissolves or dilutes in the liquid to form a paste, such as if you were to add water to flour in a bowl stirring as the liquid is added.

Assignment

Assignment

Prepare a food pyramid using the different categories of carbohydrates.

Draw this pyramid on a separate sheet of paper.

Indicate which group goes at the base of the pyramid and which goes to the top.

For EACH carbohydrate category, list at at least three (3) foods that belong in that category.

Submit your response to the course facilitator at your centre.

Session 3.4 The Truth About Fats

Introduction

The word 'fat' may make it sound like something you shouldn't eat. But fat is an important part of a healthy diet. For example, young children, especially, need a certain amount of fat in their daily diets so that their brain and nervous system can develop correctly. Therefore, toddlers and children should not be fed reduced fat milk. Fat is a necessary constituent of the balanced diet, but not all fats are equal. The fat we eat is an essential component of our diet that needs to be understood and controlled.

Between the food commercials you see on television every day and the many nutrition bulletins and reports you hear about on the news every night; you get a large amount of information about the fats that you eat. Have you ever wondered what it all means, or why it matters? Why can't we just eat, drink and be merry? In this session, you'll find out exactly what these terms mean and how the various forms of fat you find in foods affect your body.

Outcomes

Upon completion of this session you will be able to:

- *Describe* the chemical structure of fat
- *Define* the term *lipid*
- *Explain* how the consumption of different types of fat is related to health

- *List* the health conditions that are related the overconsumption of fats
- *Distinguish* between 'good' and 'bad' *cholesterol*
- *Explain* the term 'hydrogenation' and its relation to health
- *Choose* the best sources of fat in the diet
- *Describe* the effect of heat on fats

How Long?

You need to devote two and a half (2.5) hours of formal study to this unit and one and a half (1.5) hours of self-study to complete this session.

Terminology

Triglyceride: A neutral fat molecule made up of three fatty acids joined to one glycerol molecule through a special chemical linkage called an 'ester'. *Triglycerides* are the main constituents of natural fats and oils in the body's blood.

Lipid: *Lipids* also known as fat are molecules that are 'hydrophobic' or 'insoluble' in water. There are four major categories of *lipids*: fats, phospholipids, waxes and steroids.

Fatty Acid: *Fatty acids* are the basic chemical units in fat. They may be either saturated, monounsaturated, or polyunsaturated. *Fatty acids* differ based on the amount of hydrogen they contain.

Hydrophobic: A water 'fearing' molecule that repels water or is unable to dissolve in water.

Smoke Point: The point at which cooking fat or oil begins to breakdown into its constituent glycerol and fatty acids, producing a bluish smoke.

Flash Point: The point at tiny wisps of fire begin to leap from the surface of hot oil. A blue haze is seen and the oil ignites momentarily but does not continue to burn.

Hydrogenation: *Hydrogenation* is a chemical process in which hydrogen gas is bubbled through liquid oil in the

presence of a catalyst, thus resulting in unsaturated fatty acids to accept additional hydrogen atoms and become at least partially saturated or solidified.

3.4-1 Chemical Structure of Fats

The group of molecules *lipids* comprises include *triglycerides, phospholipids, steroids* (like cholesterol), and some other related compounds. *Lipids* are biological chemicals that do not dissolve in water.

Triglycerides

What are *triglycerides* made of? The chemical elements that make up the group of *lipids* called *triglycerides* are carbon, hydrogen and oxygen. Further, the large proportion of carbon makes *triglycerides* the most concentrated source of fuel in the diet.

Lipids are formed when three fatty acids combine with glycerol. This gives them the name t*riglycerides.*

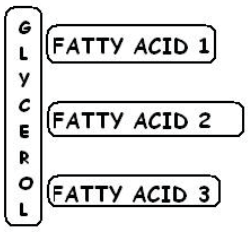


Figure 25: A *Triglyceride* Molecule
Rlawson at en.wikibooks [GFDL (www.gnu.org/copyleft/fdl.html) or CC-BY-SA-3.0-2.5-2.0-1.0

Fats and oils belong to the group of biological substances called *triglycerides*. What's the difference between fats and oils? Fats such as butter are solid at room temperature whereas oils are liquid.

Figure 26: Oils
Image: Simone Reid-Foster

Phospholipids

Phospholipids are major constituents of cell membranes especially in the brain. In food, the most popular *phospholipid* is 'lecithin' found in egg yolks. Other foods that contain *phospholipids* include liver, soya beans, wheat germ and peanuts.

'Lecithin' while not a major nutrient is important because eggs function as an emulsifier in cake mixtures, allowing the fats and water to mix. In the cells, *phospholipids* have a hydrophilic (water loving) head and hydrophobic (water hating) head, which help to keep fats suspended in the bloodstream as they are transported.

Phospholipids consist of two fatty acids and one or more phosphate group.

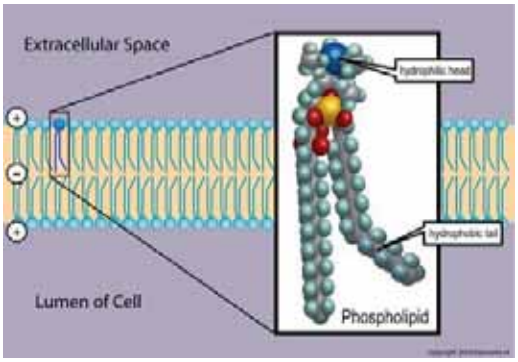


Figure 27: *Phospholipids* in the Cell
By Ties van Brussel / www.tiesworks.nl

Steroids or Sterols

You may have heard this word before in connection with sports and athletes. The term *steroid* and *sterol* simply refers to chemical molecules that share a common chemical ring structure. Both plant and animal foods contain *sterols* but only animal sources e.g. meat, fish, poultry and dairy products contain *cholesterol*.

The adrenal glands in your body make several types of *steroids,* each of which has a specific purpose. The types of *steroids* made by your body include: sex hormones (both male and female,) corticosteroids (cortisone and cortisol) which have a role in the immune system, mineralocorticoids (hormones that maintain the balance of sodium and potassium in the body,) bile salts or bile acid (made in the liver, and are essential for digestion and absorption of fats) as well as the *steros* cholesterol and others that help your body to make vitamin D (see unit 4) from sunlight.

Cholesterol

Cholesterol is a waxy substance your body uses to protect nerves, make cell tissues and produce certain hormones. Your liver makes all the *cholesterol* your body needs. Your body also gets *cholesterol* directly from the food you eat (such as eggs, meats and dairy products). Too much *cholesterol* can have negative impacts on your health.

Activity

Check your memory of the terms just learned by completing the quiz below. State whether the following statements are true of false. For those statements that are false, give the correct or 'true' answer.

Write 'T' next to the answers that are true and 'F' next o the answers that are false in the spaces provided below.

1. *Fatty acids* and glycerol combine to make the molecule *phospholipids*_____
2. *Cholesterol* is on type of *lipid*_____
3. The chemical elements that comprise *triglycerides* are carbon, hydrogen and oxygen_____.
4. Fats are liquid at room temperature_____
5. Both plant and animal foods contain *cholesterol*_____

List three food sources for the following *lipids:*

a) Phospholipids b) Cholesterol

_____

_____

_____

Check for the answers below. How did you do? If you are still a little confused, read over the information and attempt the quiz again.

Feedback

1. False – *fatty acids* and *glycerol* combine to make the molecule *triglycerides.*
2. True
3. True
4. False-fats are solid at room temperature.
5. False-both plant and animal foods contain *sterols*. Only animal foods contain *cholesterol.*
6. Food sources of:

   - *phospholipids*- eggs (egg yolk) liver, soya beans, wheat germ, peanuts.

   - *cholesterol*- eggs, shellfish, meats and dairy products.

3.4-2 Types of Fatty Acids and Their Food Sources

All dietary fats are made up of mixtures of three types of *fatty acids*.

Fatty acids are the basic chemical units in fat. They may be either *saturated, monounsaturated, or polyunsaturated.*

These *fatty acids* differ in the amount of hydrogen they contain.

Explaining Saturation

What does it mean when something is *saturated*? When we talk about *saturation* in weather, it refers to the fact that the atmosphere can't hold any more moisture and thus the result is that it must rain. In essence *saturation* describes the act of filling something until it can't take anymore. When we discuss *saturation* and fats, we are referring to the idea that the four bonds on each carbon atom is taken up by a hydrogen atom.

Saturation looks something like this:

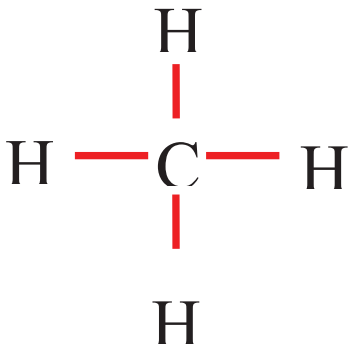


Figure. 28: *Saturated* Carbon Atom

Unsaturated fatty acids lack two hydrogen atoms and have at least one double bond.

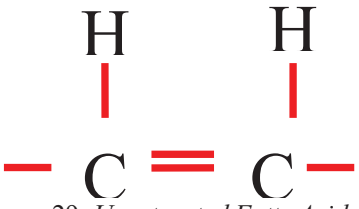


Figure 29: *Unsaturated Fatty Acid*

It's important that you are aware of how *saturation* or the degree of *saturation* affects fats. The affects include:

- The firmness of the fats- *saturated fats* are firm at room temperature, while *unsaturated fats* are liquid.
- The stability- fats that have spoiled have become rancid due to 'oxidation' (combining with oxygen). *Unsaturated fats* are more susceptible to 'oxidation' and thus more likely to become rancid.
- Hydrogenation- the addition of hydrogen molecules to liquid fat influences the degree of *saturation*. Oils that have been 'hydrogenated' become solid fats e.g. vegetable oils used to make table margarine, or spreadable 'plastic' fats via partial *hydrogenation*.

'Bad' Fats- Limit These in Your Diet

Saturated fat, *trans fat,* and *cholesterol* are the 'bad' guys when discussing fats. They are found in many food products that we enjoy e.g. pastries, cakes and fried foods. Why? Some of their properties remain solid at room temperature, are able to withstand high heat and overall make food taste good.

We need to exercise caution and control when eating foods containing these fats because of the health risks associated with their consumption. What are some of the risks of eating 'bad' fats? Write a few risks in the spaces below.

Did you include health concerns such as heart disease, elevated cholesterol levels, arthrosclerosis and obesity?

Let's explore these fats in greater detail.

Saturated Fatty Acids

Found in animal foods such as milk, cream, cheese, butter, meat and poultry. Plant sources of *saturated fats* are coconut and palm oil. *Saturated fats* are generally less healthy than *unsaturated fats* and appear to raise LDL or bad cholesterol. *Cholesterol* levels in the blood are related to the amount of *saturated fat* consumed as *cholesterol* can be made from *saturated fatty acids*.

Trans Fatty Acids

Trans fats are fats that are created by hydrogenating oils. During this process, hydrogen atoms are added to *monounsaturated* and *polyunsaturated fatty acids*. This reduces the number of double bonds and makes the fats increasingly *saturated.* Therefore due to this process, 'good' fats can become 'bad' fats. *Hydrogenation* is usually done commercially for baking and frying purposes and to ensure that products have long shelf lives. *Trans fats* can be found in fast foods or foods that are deep-fried, as well as in cakes, chips, cookies, crackers, donuts, imitation cheese, margarine, and shortening. On food labels, the words "hydrogenated" and "partially hydrogenated" indicate the presence of *trans fats*.

Cholesterol

'Good' vs 'Bad' Cholesterol

Let's introduce the players in this *cholesterol* saga.

Lipoproteins- clusters of *lipids* associated with proteins that serve as transport vehicles for lipids in the lymph and blood.

LDL or Low Density Lipoproteins- composed mainly of *cholesterol* circulating in the blood,that has been transported away from the liver and into the cells, heart muscles, fat stores and breasts. LDL cholesterol is linked to heart disease. This is an example of 'bad' *cholesterol*.

HDL or High Density Lipoproteins- carry *cholesterol* back to the liver, from the cells, for recycling and disposal. This is an example of 'good' *cholesterol*.

Saturated fats raise the LDL and HDL levels of *cholesterol* in the blood and *polyunsaturated fats* lowers both the LDL and HDL *cholesterol* levels in the blood. *Monounsaturated fats* lower LDL and raise HDL levels of *cholesterol* in the blood.

A diet of foods high in c*holesterol* and *saturated fat* will increase the 'blood cholesterol level' of many people. As a result, plaque can build up in the arteries (atherosclerosis) which increases the risk of heart attack and stroke. Over time, plaque can become hard and make your arteries narrow. If an artery that supplies blood to the muscles in your heart becomes blocked, a heart attack may occur. If an artery that supplies blood to your brain becomes blocked, a stroke may occur.

'Good' Fats

Unsaturated Fatty Acids

Unsaturated fatty acids have at least one double bond. The double bond has used up one place a hydrogen atom could connect to; therefore the chain is not connected (*saturated*) to all possible hydrogen atoms. There are two types of *unsaturated fatty acids*:

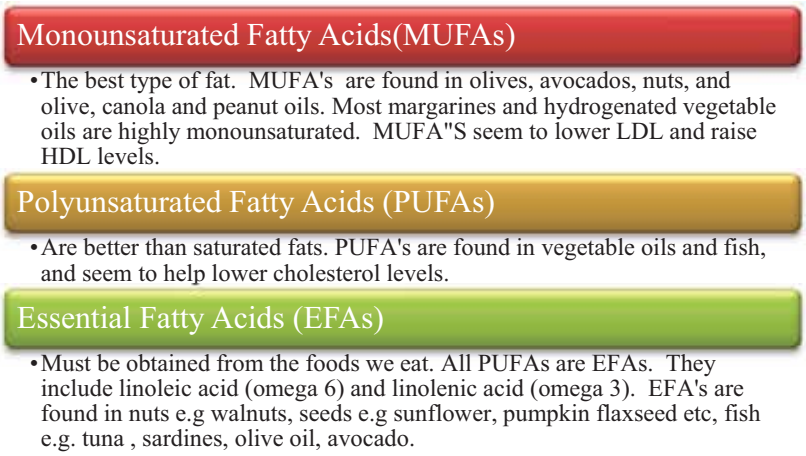


Figure 30: *UnsaturatedFfats*

Activity

So we've learned that we should limit our intake of *saturated fats* and *trans fats*- but how do we do this? Please answer the following questions.

What low-fat food item can you substitute for the following ingredients? Write your answer next to the word.

Butter

Mayonnaise

Sour Cream

Full Cream Milk

TunaPacked in Oil

Chicken thighs

Potato Chips

Ice Cream

Chocolate Frosted Cake

3. List three (3) conditions/diseases that are related to a diet high in *saturated fats*:

1. _____

2. _____

3. _____

4. a) What is 'bad' *cholesterol*?

5. What types of fats or *fatty acids* raise the level of 'bad' *cholesterol*? What type of fats should we consume to decrease the amount of 'bad' *cholesterol* in the blood?

Feedback

3.4-3 Managing Our Fat Intake

Before,we move on to discuss the functions of fats, let's just clarify some issues with the 'good' fat/ 'bad' fat story. We learned that the 'bad' fats such as *saturated fats, trans fats* and *cholesterol* should be consumed in limited amounts and that *monounsaturated* and *polyunsaturated* fats are the best types of fats to consume.

But how do we translate this into practice? Think about it, if the fat is found in the foods we eat and products are made using these fats, how then are we to manage our fat intake? Think about it under the following categories:'Foods/ Products

Choices' and 'Methods of Cooking.' Write down the ways we can manage or improve our fat intake in the table below.

Foods/Product Choices	Methods of Cooking

Figure 31

Does Your Response Include:

- Using reduced fat or fat free products e.g. skimmed milk, low fat mayonnaise, reduced fat salad dressing?
- Removing visible fat from meats, and skin from poultry?
- Choosing yogurt instead of ice-cream?
- Using more *unsaturated fat* products?
- Choosing to eat fruits and vegetables as close to raw as possible ?

What About Cooking?

Does Your response Include

- Using cooking methods that use little or no fat e.g. grilling/broiling, steaming?
- Using less fat, cutting it by about half the amount shown by a recipe?
- Avoiding the addition of butter to stews?

Now let's look at the function of fats.

3.4-4 Functions of Fats

- Fats are a concentrated source of energy. Fats provide more than double the energy than provided by either proteins or carbohydrates.
- Fats act as the carrier for the fat-soluble vitamins A, D, E and K.

- Fats are the source of the *essential fatty acids* (EFAs), *linoleic acid* (omega-6) and *alpha linolenic acid* (omega-3) which each play an important role in the formation of cell membranes particularly in nerve tissue.
- *Essential fatty acids* are converted into 'prostaglandins' and other biologically active compounds known as 'eicosanoids, 'which control biochemical reactions inside cells.
- Fats help to insulate the body and thus keep the body warm.
- Fats protect delicate organs such as the kidneys by acting as a cushion under the organs to absorb shock.

3.4-5 Fats and Oils in Food Preparation

Perhaps we should discuss how fats appear to us in food preparation.

Of the list of products below, identify which contain visible fats and which contain invisible fats by writing 'VF' for visible fats and 'IVF' for invisible fats next to the product.

Visible and Invisible Fats

French Fries	Mayonnaise
Nut	Chocolate Chip Cookies
Cream Cheese	Pumpkin Seeds
Extra Virgin Olive Oil	Pork
Sesame Seeds	Butter
Chicken Legs	Beef Pies
Milk	Margarine
Corn Oil	Tuna Packed in Oil

Figure 32: Fat on Lamb Chops
Image: Suat Eman / FreeDigitalPhotos.net

Figure 33: Fat Under Skin
Image: FreeDigitalPhotos.net

Figure 34: Olive Oil
Image: Idea go / FreeDigitalPhotos.net

All of the images above are of visible fats. Visible fats are those that we can see. Now let's 'see' those for invisible fats. Invisible fats are constituent parts of the food and can't be easily seen.

Figure 35: Pastry
Image: Grant Cochrane / FreeDigitalPhotos.net

Figure 36: Walnuts and Sunflower Seeds
Image: Maggie Smith / FreeDigitalPhotos.net

Figure 37: Frosted Cupcake
Image: John Kasawa / FreeDigitalPhotos.net

What fats and oils doe we use to cook with and what for? Read on below.

The Fat and Oils Used in Food Preparation

Forms of Fat	Used in Food Preparation
Butter	Butter is used in pastries, cakes and other baked goods for colour and flavor. Butter is also used to saute vegetables and as a spread on baked goods such as bread.
Margarine (Hard/Soft Margarine)	Substitute for butter, thus the uses are the same.
Shortening	Used for cakes and pastries even though it a colourless saltless fat.
Oils	Used for various types of frying.

Figure 38

Effect of Heat

When fats are heated there are physical and chemical changes that take place. Solid fats melt and liquid fats become thinner. High heat temperatures cause fats to reach to their smoke point at which a blue haze is seen and the odour of the fat begins to change. Continued heating brings the fat to its flash point where it easily ignites. For solid fats, such as butter, this happens at a lower temperature than for liquid fats. Due to the presence of salt, the fat gets browned and any food added at this time tastes strange and burnt. Liquid fats however, become thinner and breakdown. When liquid fats cool, the fat becomes thicker; viscous. Have you ever felt an unwashed baking sheet? If so, that thick gummy substance is the residual of the cooled oil.

It is important when frying with fats to ensure that the fat has reached the accurate temperature for frying, as foods soak up oil that is insufficiently heated. Have you ever noticed that the amount of oil you start cooking with is not the amount of oil you end with? What happened? Where did the oil go? The answer to these questions is that the oil 'disappeared' beacuse the food absorbed it. Further, fried foods should be drained on absorbent paper.

We have now come to the end of the unit on *macronutrients.* However, before we end let's tie it all together.

Macronutrients and Health

We've learned that *macronutrients* are the only nutrients that supply us with energy. Further, we have learned that excess energy is stored in the form of fat. Which may lead to obesity and other related health conditions such as cardio vascular disease, arthrosclerosis and hypertension.

How do we manage the development of these diseases? Even before we consider exercise and changing our way of cooking our first line of defense is our intake. Consuming excess is not the only problem, but consuming the wrong types of foods, especially in the case of fats (*saturated fats*) and carbohydrates ('simple sugars',) is also problematic.

In unit 2 we learned about energy balance and calories. The diagram below gives you an idea as to what your daily consumption of carbohydrates, proteins and fats should be. Think of it like a plate, when you have your meals does your plate resemble the one below?

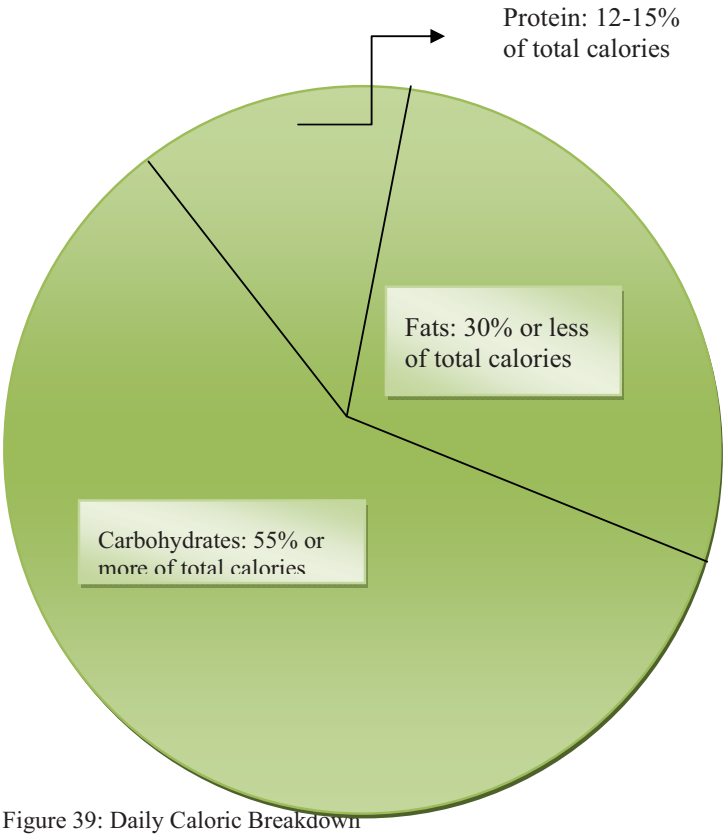


Figure 39: Daily Caloric Breakdown

Session Summary

Summary

In this session you learned that *lipids* are a group of hydrophobic substances that is made up of *triglycerides, phospholipids* and *sterols*; the most common being *cholesterol*.

- You learned that *triglycerides,* the most common *lipid* in the human body, are made up of the chemical elements carbon, hydrogen and oxygen.
- You learned that *saturated fats*, *trans fats* and *cholesterol* found mainly in animal foods e.g. meat, poultry and dairy products are qualified as 'bad' fats. Consumed in excess, they contribute to obesity, and raise the level of 'bad' *cholesterol* in the blood.
- You also learned that *unsaturated fats*, both *monounsaturated* and *polyunsaturated* are 'good' fats, contribute to our good health and are heart protective. Of course the best sources of fat in the diet for good health are the *unsaturated fats*, and oils e.g. nuts and seeds.
- You learned that, *unsaturated fats* are good since they provide the

essential fatty acids, which like its protein counterparts must be obtained from the diet.

- You also learned that with regard to heat and how it affects fats, it important that fat is heated the accurate temperature, with both solid and liquid fats. High heat only serves to breakdown fats changing the colour, flavour and consistency.

Unit Summary

Summary

In this unit you learned all about the *macronutrients*. In session one you learned that there are six major nutrients: protein, carbohydrates, fats, vitamins, minerals and water. You also learned that these nutrients can be classified according to the body's needs.

a *Macronutrients* are needed in large quantities by the body
b *Micronutrients* although vital are needed in smaller quantities

Nutrients can also be classified based on their function in the body:

c Bodybuilding- proteins and minerals
d Protective foods- vitamins and minerals
e Energy giving foods- carbohydrates and fats.

In the remainder of sessions you learned that the chemical elements of the *macronutrients* are: carbon, hydrogen and oxygen. Further, you learned that protein also contains nitrogen, a very import element for growth.

You also learned that each *macronutrient* is classified on various bases.

Proteins are classified according to their biological values, high biological value (HBV) and low biological value (LBV). Carbohydrates are classified as *simple carbohydrates* or sugars, and *complex carbohydrates* and fats are classified as either *saturated* or *unsaturated.*

You also learned that the food sources for macronutrients include:

a. Proteins- meat, seafood, poultry, legumes, and cereals
b. Carbohydrates- sugars in fruit, starchy roots and tubers as well as cereal
c. Fat- meat, seafood and poultry, nuts, seeds, dairy and vegetable oils

The functions of the *macronutrients* include:

a. Proteins- build and repair muscle tissue as well as are essential parts of enzymes, hormones and antibodies
b. Carbohydrates- the chief and most efficient source of energy
c. Fats- provide energy but more importantly supply our bodies with the *essential fatty acids* as well as protect our vital organs

In this unit you also learned that heat affects each *macronutrient* differently. You learned that if you heat proteins they become denatured, they coagulate, and this

process is irreversible. Carbohydrates in the form of sugar, melt, however with continued heating they caramelize and eventually burn. For starch, 'dry heat' forms a dry crust called *dextrin* and in 'moist heat' the cells swell and eventually rupture. It is also important to remember that fats (i.e solid fats such as butter) melt. Furthermore, heat changes the consistency of the fat, for example high heat changes the odour and makes them viscous when cooling.

If we are to tie together all the information you have learned, it is emphasized that the central issue surrounding *macronutrients* is associated with what happens in our body. You learned that consumption is a major challenge in regards to the quantity and the types of *macronutrients* that affect our health.

Assessment

Assessment

In pencil or pen, circle the BEST answers in the following quiz.

Section 1

1. Long term storage of carbohydrates is_____.

a) Cellulose

b) Glucose

c) Glycogen

d) Fat

2. The MAIN protein found in egg yolk is_____.

a) Lysine

b) Albumen

c) Myosin

d) Vitellin

3. *Cholesterol* is manufactured in the _____.

a) Liver

b) Blood

c) Pancreas

d) Gall bladder

4. All of the following foods are high in fat EXCEPT_____.

a) Full cream milk

b) Eggs

c) Nuts and seeds

d) Pasta

5. You should get _____% of your daily intake of calories from carbohydrates.

a) 70

b) 65

c) 60

d) 55

6. The nutrient that helps build and repair the body is _____.

a) Carbohydrates

b) Fats

c) Vitamins

d) Protein

7. Another name for *dietary fiber* is _____.

i) Roughage

ii) Cellulose

iii) Cereals

iv) Intrinsic carbohydrates

a). iii and iv

b) iii ii

c) ii and i

d) ii and iv

8. Someone who is following a low protein diet should consume which of the following combinations of food?

a) Creamy pumpkin soup and crackers

b) Fruit salad and ice-cream

c) Cheese and Tomato sandwiches

d) Cucumber and Tomato salads

9. Leafy vegetables, whole grains and unpeeled fruit are good sources of_____.

a) Glucose

b) Carbohydrates

c) Sugar

d) Fiber

10. Over consumption of 'bad fats' has been linked to all of the following health concerns EXCEPT

a) Diabetes

b) Cardiovascular disease

c) Hypertension

d) Muscle loss or wasting away

11. A very strict vegetarian will NOT eat which of the following snacks

a) Nuts

b) Peanut Butter

c) Cheese

d) Tofu

12. Which is a protein defined as HBV (High Biological Value)?

a) Meat

b) Sunflower seeds

c) Nuts

d) Legumes

13. Which of the following is suitable for use by a strict vegetarian?

a) Fat Drippings

b) Lard

c) Butter

d) Soya oil

14. Which type of protein in flour gives it the ability to stretch?

a) Gliadin

b) Legumin

c) Elastin

d) Gluten

15. Which of the following salad toppings contains heart healthy 'good' fat?

a) Bacon bits

b) Croutons

c) Avocado slices

d) Avocado slices

16. The carbohydrate that cannot be broken down or digested by the body is _____.

a) Dextrin

b) Starch

c) Cellulose

d) Sucrose

17. Which of the following best describes the term 'simple sugars'?

a) Starches

b) Polysaccharide

c) Monosaccharide

d) Cellulose

18. Eggs, fish, cheese and channa are excellent sources of which nutrient?

    a) Protein

    b) Carbohydrates

    c) Fats

    d) Vitamins

19. One source of invisible fat is _____.

    a) Butter

    b) Cookies

    c) Oils

    d) Shortening

20. An overweight, diabetic adult should consume which of the following meals?

    a) Meat lover's pizza

    b) Bake and shark sandwich

    c) Fruit salad

    d) Low fat ice cream

Section 2

1. You've been given the following recipe, how can you cut the fat in this recipe? Write you answers in the spaces provided.

   1 Cup sugar

   2 Tbsp cornstarch

   1 Cup of full cream milk

   2 Whole eggs

   2 Tbsp butter

   2 Ounces unsweetened chocolate squares

2. What can you add, take away or substitute to make the following dishes higher in fiber?

    1. Banana Muffins _____
    2. Spaghetti and Meat Balls _____
    3. White Bread _____
    4. Steamed White Rice _____
    5. Ice Cream _____

Section 3

Match the following statements with corresponding word in the next column.

1. This nutrient provides energy	Complementary value
2. This nutrient builds and maintain body tissues	Cholesterol
3. This nutrient transports the fat soluble vitamins in the body	Non-essential amino acids
4. Dry beans, peas and peanuts	Fats
5. Sugar, candy, and jam	Trans fats
6. Oranges, water melon, tomatoes and limes	Ten (10)
7. This is created by hydrogenating oils	Legumes/incomplete protein
8. Essential fatty acids	Simple sugars
9. This kind of fat is only found in animal foods	Fiber

10. The body can make these simple proteins	Carbohydrates
11. Vegetarians can meet their protein requirement using this	Lactose
12. Glactose + glucose	HDL and LDL
13. Saturated fats raise these	Protein
14. Another name for sugar	HBV
15. A complete protein	Fiber

Contents

Unit 4

Micronutrients

Introduction

Reflect on the following statements.

- You are tired and stressed out and your friend tells you should take some vitamin B pills.
- You were always told to "eat your vegetables" instead of scraping them to the side of the plate untouched.
- You have been told that milk gives you strong bones and teeth.

Each of these warnings and suggestions indicate the role that *micronutrients* play in the proper functioning of our bodies.

In the previous unit you learned about *macronutrients*. In this unit you will learn about *micronutrients*, the nutrients you need in smaller quantities than the macronutrients, yet are still vital to life. You will learn how to classify vitamins, the best food sources for *micronutrients*, the role/function of *micronutrients* in our bodies, as well as how best to prepare and store them as to minimize their nutrient loss. You will end the unit by learning about very vital nutrient; water. While it's not a *micronutrient,* water is a vital component of all bodily functions and bodily fluids. Water is vital to the optimal functioning of the body, therefore in this unit we will thoroughly explore the nutrient 'water.'

Upon completion of this unit you will be able to:

Outcomes

- *Classify* various *micronutrients*
- *List* the plant and animal sources of the various *micronutrients*
- *Describe* the ways in which you can minimize nutrient loss during storage, food preparation and cooking
- *Explain* the importance of water in the human body

How Long?

You will need fifteen (15) hours to study this unit. Ten (10) hours will be devoted to formal study and five (5) hours to self-study, which includes completion of the assessment exercises.

This Unit is Comprised of Four Sessions

Session 4.1 Water-Soluble Vitamins

Session 4.2 Fat-Soluble Vitamins

Session 4.3 Minerals

Session 4.4 Water

Terminology

Vitamins: Organic essential nutrients that are utilized in the regulation and maintenance of growth of the body and other metabolic reactions. Most of the vitamins with the exception of vitamin D and vitamin K must be obtained from the diet since our bodies cannot manufacture them.

Minerals: Minerals are *inorganic* i.e. do not contain carbon compounds which are not easily destroyed by chemical reactions.

Enzyme: A substance that speeds up a chemical reaction.

Co-enzyme: A substance that works along with an enzyme to enable a chemical reaction to occur.

Oxidation: The interaction between oxygen molecules and other substances.

Dietary Antioxidant: A naturally occurring chemical compound found in foods e.g. vegetables, fruits and plants that pairs or joins with a free radical in order to protect the body from the adverse effects of oxidation.

Electron: An extremely small part of an atom. An electron is also a negatively charged particle of an atom.

Free radical: Highly unstable reactive molecule that has one or more unpaired electrons.

Lipids: A large group of chemical compounds that do not

dissolve easily in water.

Lymph: Clear, yellowish fluid found throughout the body. It contains white blood cells and circulates freely throughout the body bathing cells with nutrients and oxygen, while removing bacteria and waste materials.

Neural Tube Defect: A structure that forms during the first six (6) weeks of pregnancy. It forms the spinal column which surrounds the brain and spinal cord. A neural tube defect occurs when in the formation of the neural tube an opening in the spinal column remains; which may then result in a group of disorders such as *anencephaly* (where the fetus may be born without a brain) or another disorder named *spina bifida.*

Session 4.1 Water Soluble Vitamins

Introduction

You may recall being told to, "eat lots of fruits" or that "vegetables are good for you!' In this session you will learn the value of eating all your fruits. First we will discuss how the different vitamins are grouped. We will then look at each water-soluble vitamin and discuss its functions in the human body as well as in which foods you can find them.

Since these vitamins are water soluble there are certain precautions that we should take when we use or cook the foods in which they are found. We must take precautions as vitamins in water-soluble foods can be easily destroyed by heat or leached (extracted from the vegetable) into the cooking water.

Outcomes

Classify vitamins

List the food sources of the vitamins

Examine the functions of the various water-soluble vitamins in the body

How Long?

You will need two and a half (2.5) hours of formal study and one and a half (1.5) hours of self-study to complete this session.

4.1-1 What's the Difference Amongst These Vitamins?

You may have heard or seen advertisements about the benefits of vitamins such as vitamins A, B, C and even D. In the advertisements you would've seen foods such as oranges, carrots and spinach listed as foods in which you'd find these vitamins.

But, what makes vitamin A different from vitamin C ? Differences between different vitamins include the fact that some vitamins dissolve in water and others dissolve in fatty substances. This difference between vitamins means that vitamins fall into two groups according to their solubility. One group of vitamins dissolves in water, while the other dissolves in fatty substances such and oils. You may question what it means for something to 'dissolve in water.' Let's do an experiment so we can understand better.

Activity

Take a glass of room temperature water. Then take a vitamin C tablet and drop it into the water. What do you notice? The tablet starts to fizz, and melts into the water. The water doesn't taste or look the same. It takes on the taste of the dissolved tablet, correct?

Water-soluble vitamins like vitamin C are normally found in watery type foods such as citrus fruits, while fat-soluble vitamins like vitamin A are usually found in fatty foods such as eggs, milk and cheese. Some exceptions do however exist since as vitamin A may also be found in some watery type foods such as lettuce or sweet peppers. Based on their solubility, the two groups of vitamins exhibit different properties or characteristics. In Figure 1 you will learn more about these.

Vitamins' solubility i.e. (their ability to dissolve in liquids) affects how they are absorbed, transported, stored and excreted (gotten rid of) from the body. These different properties or characteristics of vitamins are explained further in Figure. 1. Take a look at figure 1 and after you have read the information presented, attempt the activity to see how much you remember.

Properties of Vitamins

Properties of Vitamins		
	Properties of *Water-Soluble* Vitamins	**Properties of *Fat-Soluble* Vitamins**
Absorption	They are absorbed directly into the blood.	They are absorbed into the lymph first and then into the blood along with other *fat-soluble* nutrients.
Transport	*Water-soluble* vitamins are transported freely in the body's circulatory system with other water-soluble nutrients.	*Fat-soluble* vitamins are transported to the liver as part of 'lipoproteins' (a 'lipoprotein' is a combination of a protein and fat molecule.)
Storage	*Water-soluble* vitamins are not stored in the body, the body uses what it wants and the rest or excess is excreted (removed as waste) in the urine.	*Fat-soluble* vitamins are stored in the body's cells. The body uses what it needs and the excess remains stored in the liver.
Excretion	The excess *water-soluble* vitamins, those that our body does not use, are excreted (via the kidney) in the urine.	*Fat-soluble* vitamins are less readily excreted. *Fat-soluble* vitamins are stored in fat storage sites, such as the liver, until needed.
Requirements	Since they are not stored in the body, they are needed daily.	Your body only needs periodic doses, (weekly or monthly) of *fat-soluble* vitamins since excess fat - soluble vitamins are stored in the liver and not excreted like *water- soluble*

Properties of Vitamins		
		vitamins.

Figure 1: Properties of Vitamins

Activity

In Figure 2 below, fill in blanks with the name of the vitamin group described.

Vitamin Property	Vitamin Group
a. Only periodic doses e.g. weekly or monthly are needed	
b. The excess is stored in the liver	
c. These are absorbed directly into the blood	
d. These are transported around the body freely in the circulatory system	
e. These are first absorbed in the lymph and then into the blood	

Figure 2

Feedback

Here are the answers to the activities in this session. Hopefully you were able to answer the questions correctly. If you were not able to answer the questions you should review the material and try them again.

Vitamin Property	Vitamin Group
a) Only periodic doses e.g. weekly or monthly are needed	• ***Fat-soluble*** **vitamins**
b) The excess is stored in the liver	• ***Fat-soluble*** **vitamins**
c) Absorbed directly into the blood	• ***Water-soluble*** **vitamins**
d) Transported around the body freely in the body's circulatory system	• ***Water-soluble*** **vitamins**
e) Absorbed first in the lymph and then into the blood	• ***Fat-soluble*** **vitamins**

You have just completed studying the characteristics of the two groups of vitamins; *water-soluble* and *fat-soluble* vitamins. Now let's explore the *water-soluble* vitamins more closely.

4.1-2 A Closer Look at Water-Soluble Vitamins

Vitamins were discovered in the early 1900s, which may sound like a long time ago. However, it is not that long ago when you consider the discovery of other scientific disciplines such as physics and chemistry- both discovered in the 16th century. The 'B vitamins' were first discovered as a group of chemical compounds initially called vital 'amines' leading eventually to the name 'vitamin.'

You've heard of vitamin B, A, D, E C. K etc, but which of these belong to the *water-soluble* group?

Vitamin B, which is not really one single vitamin, but actually a group of vitamins, as well as vitamin C are the *water-soluble* vitamins.

Take a look at the list in Figure 3 below.

Note it!

a) Before we continue exploring the 'B vitamins,' you should note that the 'B vitamins' are a group of vitamins that are found in similar foods and perform similar functions in our bodies.

b) Some of the 'B vitamins' such as vitamin B6 work as *co-enzymes,* meaning that they help enzymes (by combining with an inactive protein) perform their job more efficiently in the body.

c) Most importantly as we discuss the 'B vitamins' and their functions it is important that we understand that 'B vitamins' help energy to be released from the foods that we eat. They don't give us energy!!

Let's proceed and discover the vitamins of the 'B complex.'

Vitamin Number	Chemical Name
Vitamin B1	*Thiamine*
Vitamin B2	*Riboflavin*
Vitamin B3	*Niacin*
Vitamin B6	*Pyridoxine*
Vitamin B12	*Cyanocobalamin*

Figure 3

One important 'B vitamin' is *folate*. *Folate* was originally known as 'Folic acid' or 'Folacin' (two forms of the same vitamin).

Each 'B vitamin' differs from another based on their chemical structure, however they are also similar because essentially they help energy to be released from energy giving foods (carbohydrates) and are also generally found in similar types of food. In Figure 4 you will find a brief description of each vitamin in the 'B complex' listed. Additional reading on vitamins can be found by using the recommended text for this course, '*Food and Nutrition'* by Anita Tull.

Now, let's explore each vitamin in the 'B complex.' The table below will give you a brief description about each vitamin including: its number, chemical name, food source, role/function in our body and the requirement for each of them.

Water-Soluble Vitamin	**Food Source**	**Function**	**Requirements**
Vitamin B1 (*Thiamine*)	-Whole grain cereals, outer covering of rice grains, germ and bran of wheat, legumes, nuts, lean pork, yeast and breakfast cereals.	- Important in the series of reactions that enable the release of energy from carbohydrates. -Required for normal growth of children and for general good health. -Necessary for the proper functioning and maintenance of the nerves.	-A daily supply of vitamin B1 is needed during pregnancy, lactation, illness and during extreme muscular activity.
Vitamin B2 (*Riboflavin*)	-Green leafy vegetables, cereal and other grain products, enriched and fortified bread, nuts, beef, liver, kidneys, milk and other dairy products.	-Required for the release of energy (particularly protein and fat) from foods by *oxidation*. -Needed for normal cell growth. -Necessary for red blood cell formation and respiration. -Helps to maintain healthy hair, skin and nails as well as good	A daily supply is needed even though small amounts can be stored in the liver and kidney.

Water-Soluble Vitamin	Food Source	Function	Requirements
		vision. -Serves as a co-enzyme in the release of energy from nutrients in all body cells.	
Vitamin B3 (*Niacin*)	-Protein-rich foods: meat, fish and poultry, legumes, fortified cereals and nuts. -*Niacin* can be made in the body by the conversion of the amino acid *tryptophan.*	-Necessary in helping to release energy from carbohydrate foods. -Enables enzymes to function in the body. -Maintains the health of cells and red blood vessels.	-Since *niacin* can be made in the body by the conversion of the amino acid *tryptophan*, the requirement of *niacin* is in the form of *niacin* equivalents.
Vitamin B6 (*Pyridoxine*)	Chicken, beef --- Liver, pork, fish- tuna, sardines, eggs and corn.	Important in --- The conversion of *tryptophan* to *niacin.* -It is a co-enzyme in the formation of protein and protein tissue. -Plays a role in boosting immune system functions, as well as brain and nervous system functions. -Helps in the	

Water-Soluble Vitamin	Food Source	Function	Requirements
		formation of *hemoglobin* and red blood cells.	
Vitamin B12 (*Cyanocobalamin*)	-Found in food from animals e.g. chicken and beef -For vegans, Vitamin B12 supplementation is necessary	-Works along with *folic acid* to make red blood cells -Necessary for the normal functioning of nerves -Necessary for the metabolism of amino acids and for the reactions that build up protein tissue	-Necessary in the diet of vegans (i.e. strict vegetarians who do not consume any foods from animals) -Vit B12 is produced by bacteria in animals' intestines
Folate (Folic Acid)	-Abundant in legumes and dark green leafy vegetables such as spinach, banana, grapefruit, oranges, peas, pulses and green beans.	-Important in the reduction of neural tube defects in the fetus during early pregnancy -Important in the formation red and white blood cells in the bone marrow. -Plays a key role in the breakdown of *homocysteine* an amino acid that factors strongly in the clotting of blood and arterial wall	-Since brain and spinal cord formation occurs early on in pregnancy, when most women do not even know they are pregnant, *folate* rich foods as well as supplements are required to be consumed by all women of childbearing age to prevent the development of a condition known as *spina bifida.*

Water-Soluble Vitamin	Food Source	Function	Requirements
		deterioration, as well as also factors in heart disease. -Essential in the formation of red blood cells. -Important in the formation of nucleic acids *DNA* and *RNA*.	

Figure 4: *Water-Soluble* Vitamins

Activity

In the table below, concerning the various 'B complex' vitamins, fill in the blanks.

B vitamin	Food Source	Function
1._____	1._____	1. Works with *folic acid* to make red blood cells
2. Vitamin B_____ *-Niacin*	1._____ 2._____	1.
3._____	1._____	1. It is a co-enzyme in the formation of protein and protein tissue

B vitamin	Food Source	Function
	2._____	
4.Vitamin B1 _____	1. 2.	1. 2.

Feedback

Here are the answers to your quiz. How did you do?

B Vitamin	Food Source	Function
1.Vitamin B12 (*Cyanocbalamin*)	-Found in animal foods e.g. beef, and chicken	-Works with *folic acid* to make red blood cells -Necessary for the normal functioning of nerves -Necessary for the metabolism of amino acids in the reactions that build up protein tissue
2. Vitamin B3 (*Niacin)*	-Meat, fish and poultry, legumes, nuts, fortified cereals and nuts	-Helps release energy from carbohydrate foods -Enables enzymes to function in the body -Maintains the health of cells and red blood cells
3. Vitamin B6 (Pyridoxine)	-Chicken, beef liver, pork, fish (i.e tuna, sardines) and eggs.	-It is a co-enzyme in the formation of protein and protein tissue.

B Vitamin	Food Source	Function
		-Important in the conversion of *tryptophan* to *niacin.* -Helps in the formation of *hemoglobin* and red blood cells. -Boosts immune system functioning, brain and nervous system functioning
4. Vitamin B1 (*Thiamine*)	- Whole grain cereals, the outer covering of rice grains, wheat germ and bran, legumes, nuts, lean pork, breakfast cereals.	-Important in a series of reactions that enable the release of energy from carbohydrates. -Required for the normal growth of children and general good health. -Necessary for the functions and maintenance of the nerves.

Food Sources of Vitamin C

Vitamin C's chemical name is *ascorbic acid*. Many people have claimed that taking Vitamin C before the onset of a cold has stopped its progression. Have you ever heard this? This statement has not been proven to be quite accurate, however, vitamin C is a very important *water-soluble* vitamin.

Figure 5: Citrus Fruis are a Good Source of Vitamin C
Image: Ambro / FreeDigitalPhotos.net

In what foods can you find vitamin C? Vitamin C is mainly found in plant foods, such as fruits i.e. oranges, grapefruit, passion fruit, soursop (or graviola as it is called in other countries), mango carambola or five finger and the West Indian cherry, known also as 'Acerola'. The West Indian cherry's vitamin C's content is so high that just eating one cherry supplies the daily requirement of vitamin C.

Figure 6: Five Finger or Carambola is an Excellent Source of Vitamin C
Image: nuttakit / FreeDigitalPhotos.net

Figure 7: West Indian Cherry or 'Acerola'
Source:http://upload.wikimedia.org/wikipedia/commons/2/2b/Acerola_Malpighia_glabra.jpg

Vitamin C is also found in other plant sources such as vegetables like green leafy vegetables e.g. spinach, callaloo bush (bhaji), patchoi/pak choi (bok choi), cabbage as well as green peppers and broccoli.

That's why you should eat your vegetables!

Figure 8: Broccoli
Image: Master isolated images / FreeDigitalPhotos.net

One overlooked but important food source of vitamin C is potatoes. Right under the skin of potatoes is the most abundant source of vitamin C, therefore, we should refrain from peeling potatoes in the preparation of potato dishes, and instead cook them with the skin intact and then peel them after cooking. More so, it is even more beneficial if you serve the potatoes in their skins.

Figure 9: Vitamin C - ATreasure Right Under the Skin
Image: Simon Howden / FreeDigitalPhotos.net

Functions of Vitamin C

Even though vitamin C has been publicized as the 'cure-all' for the common cold, results for several studies have been conflicting and controversial. What we do know about vitamin C's function in our bodies is as follows:

- Vitamin C is needed to facilitate the chemical reaction that makes the connective tissue
- Vitamin C enhances the absorption of iron form the small intestine during digestion
- Vitamin C helps the body fight off infections and heal wounds

- Vitamin C assists in the building and repair of bones and teeth
- Vitamin C acts as an *antioxidant* by combining with oxygen, to protect other important substances from damage by free radicals

Further, vitamin C also assists in the manufacture of hormones and as a co-factor in the manufacture of several other compounds in the body.

4.1-3 Food Preparation and Water Soluble Vitamins

In our discussion on *water-soluble* vitamins it is important to note that we are speaking about vitamins that are obtained from our foods and not those obtained by taking supplements.

We've learned about *water-soluble* vitamins in this lesson, and their ability to dissolve in water. This affects how they should be handled and cooked in order to minimize their destruction by heat or loss/leaching into the cooking water or atmosphere. Therefore we can ensure we receive the maximum amount from the foods we eat in order to support the proper functioning of our bodies. Figure 10 shows how the various *water- soluble* vitamins are affected by different conditions of heat, light, air etc and how to minimize their loss in food preparation.

How do we prevent the destruction of the vitamin in water, to the atmosphere and/or to heat? Take a look at Figure 10. Minimizing the loss of *water-soluble* vitamins in food preparation and you'll find the answers.

Vitamin	Precaution to Observe in Food Preparation
Vitamin B1-*Thiamine*	Prolonged cooking destroys *thiamine*. Especially in cases where foods are boiled, there is leaching of the vitamin. Use cooking methods such as steaming, microwaving to conserve this nutrient.
Vitamin B2- *Riboflavin*	Ultra violet rays from the sun, destroys *riboflavin*. So foods containing *riboflavin* should be stored in opaque plastic containers e.g. milk. *Riboflavin* is fairly stable in heat.
Vitamin B3– *Niacin*	While *niacin* is fairly stable in heat, as a *water-soluble* vitamin, it can leach into cooking water. Choose cooking methods that use a

Vitamin	Precaution to Observe in Food Preparation
	minimal amount of water e.g steaming, stir-frying.
Vitamin B6- *Pyridoxine*	Heat destroys *pyridoxine.*
Folate/Folic Acid	Heat and *oxidation* (destruction of nutrient when it is exposed to oxygen in the atmosphere) destroys *folate.*
Vitamin B12- *Cyanocobalamin*	Microwave heating destroys *cyanocobalamin.*
Vitamin C- *Asocorbic Acid*	This is very unstable in heat, and when exposed to air much is lost.

Figure 10: How to Minimize the Loss of *Water-Soluble* Vitamins During Food Preparation

Note it!

Based on what you have just read above in Figure 10, it is important to remember that heat and other practices like leaving cut or shredded leafy vegetables such as cabbage exposed to the atmosphere in food preparation can contribute to significant degradation of the amount its particular vitamins are available to be used by the body.

It is important then that we do the following when we are preparing fruit and vegetable dishes:

- Refrigerate fruits and vegetables to slow down the degradation of the vitamin content. Store them in the crisper at the bottom of the refrigerator.
- Store fruit and vegetables that have been cut in airtight containers and refrigerate to minimize the *oxidation* (destruction by oxygen) of vitamins.
- Wash fruit and vegetables before cutting to prevent loss of vitamins by washing them afterwards, which may allow the vitamins to leach out into the water, thus decreasing their nutritive value.

Figure 1: Wash Fruit and Vegetables Before Cutting
Image: Idea go / FreeDigitalPhotos.net

- Avoid soaking fruits and vegetables in water before cooking, as this will cause the vitamins to leach out in the soaking water which you just throw away.
- Keep the lids on the pot with the vegetables while cooking them to retain the vitamins and avoid the vitamins from leaching out into the atmosphere.
- Use methods of cooking such as steaming, microwaving and stir-frying or baking that uses less water and foods are exposed to heat for a short time; between 5-7 minutes. Vegetables should be slightly crisp, with a distinct crunch when eaten. Also, stir frying is a very quick method of frying that uses a minimal amount of fat.

Here are a Few Examples of the Types of Dishes that can be Prepared

1. Steam or stir-fry broccoli, cauliflower or patchoi/ pak choi (bok choi). Use any liquid in any sauce you may choose to serve it with.
2. If you have to boil the vegetables, reuse the water (in which they were boiled) in soups or sauces.
3. Choose to eat fruit and vegetables raw e.g. in smoothies, vegetables juices or fruit salads.

4. Cook potatoes in their skins and make dishes such as stuffed jacketed potatoes (stuffed potatoes retaining their skin). Make sure the potatoes are properly washed and all the dirt is removed.

Reading

Follow the link below to get some more information on the different ways to prepare fruit and vegetables.

Type the URL information below into your browser's address bar.

http://www.fruitsandveggiesmorematters.org/?page_id=1538

[Continue your body text here]

Activity

Getting the most nourishment from the foods we eat is important. In the case of the *water-soluble* vitamins we must take certain precautions in order to ensure that the destruction of vitamins by heat and *oxidation* is minimized during our handling of fruit and vegetables.

Complete the Following Activity

1. List four ways by which you can minimize the loss of *water-soluble* vitamins during the preparations of vegetables.

   1. _____

   2 _____

   3 _____

   4 _____

2. State two methods of cooking you can use to minimize nutrient loss during the preparation of vegetables.

   1. _____

   2. _____

3. For each vitamin listed in the table below, state how it is destroyed during food preparation.

Vitamin	How Vitamins are Destroyed in Food Preparation
1. Vitamin B12- *Cyanocobalamin*	
2. Folate	
3. Vitamin B2- *Riboflavin*	

Vitamin	How Vitamins are Destroyed in Food Preparation
4. Vitamin C- *Ascorbic Acid*	

Feedback

How did you do? If you had any problems remembering, read up on the *water-soluble* nutrients before moving on.

1. Refrigerate vegetables in the crisper at the bottom of the fridge
    a. Store vegetables in air tight containers
    b. Wash them before cutting
    c. Avoid soaking before cooking
    d. Cook with lids of pots on
2. Cook vegetables by steaming, microwaving, stir-frying or baking.

Vitamin	How Vitamins are Destroyed in Food Preparation
1. Vitamin B12- *Cyanocobalamin*	Microwaving
2. *Folate*	Heat and oxidation
3. Vitamin B2- *Riboflavin*	Ultraviolet rays from the sun
4. Vitamin C- *Ascorbic acid*	Heat and exposure to the air

Who Really Needs These Vitamins?

While vitamins are a necessary component of a healthy and balanced diet for everyone, the intake of these vitamins are especially important for particular groups of people because of the stage of life they may be in. During intense periods of growth and development, or when energy is in high demand such as

during the teen years, for growth of a developing fetus during pregnancy and for athletes who need more energy; adequate nutrition is critical.

Who are the groups of people that should ensure that they get adequate amounts of the *water-soluble* vitamins?

- Pregnant women, lactating (breastfeeding) women and women of childbearing age are especially in need of *folate*.
- A growing fetus needs *folate* and B12 for the formation of *DN.A*
- Young children between the ages of 5-12 need vitamin B1 and vitamin B2 to ensure that they grow normally.
- Teenagers, since they are in a definite period of growth and development.
- The elderly.

Session Summary

Summary

In this unit you learned about the properties belonging to the different groups of vitamins, how to classify vitamins, as well as the food sources of the various vitamins.

- Vitamins are classified on the basis of their *solubility* which affects how they are absorbed, transported, stored and excreted.
- There are two groups of vitamins: the *water soluble* vitamins (vitamin 'B complex' and vitamin C) and the fat-soluble vitamins (A, D, E, and K)
- Some information about the 'B complex' vitamins:

  a) A group of vitamins that are found in similar foods and perform similar functions in our bodies.

  b) Some of them such as vitamin B6 work as co-enzymes, meaning that they help enzymes (by combining with an inactive protein) perform their job more efficiently in the body.

  c) Most importantly as we discuss the roles/ functions of the 'B complex' vitamins, it is important for us to remember that 'B' vitamins help to release energy from foods, but do not give us energy!

- The 'B complex' vitamins include; B1- *thiamine*, B2- *riboflavin*, B3- *niacin*, B6- *pyridoxine*,

B12- *cyanocobalamin* and *folate.*

- The 'B complex' vitamins are found in the following foods: whole grain cereals, foods from animals e.g. pork, beef, liver, poultry, green leafy vegetables (such as broccoli,) patchoi/pak choi (bok choi), breakfast cereals etc.
- Vitamin C is found in citrus foods e.g. oranges, grapefruit, West Indian cherry, other fruit (such as mangoes,) green leafy vegetables (such as spinach,) cabbage and broccoli.
- It is important to note that these *water-soluble* vitamins are destroyed by prolonged heating, soaking in water or by *oxidation*. Therefore, we should prepare and cook the foods containing these vitamins carefully so that a minimal amount is lost due to improper storage, cooking methods or food preparation.
- We Should:.

    a) Refrigerate and store covered in the crisper.

    b) Wash carefully before cutting.

    c) Use cooking methods that require little liquid such as steaming, microwaving, baking or stir-frying

    d) Cook for a minimal amount of time e.g. between 5-7 minutes, or subject them to no cooking at all. The vegetables should still be tender/crisp when eaten.

    e) Reuse cooking water in soups and sauces.

- Special groups of people who should ensure that their diet supplies them with the *water- soluble* vitamins include pregnant and lactating women, young children between the ages of 5-12, teens and elderly people.

This lesson about 'B' vitimins and vitamin C brings us to the end of our lesson on the *water- soluble* vitamins. Before you move on, you should complete the assessment below. When you have completed the assignment, check how well you've remembered what you've learned in the lesson on the *water-soluble* vitamins by looking at the answers to this assessment that are provided at the end of the unit.

Assessment

Assessment

Let's see what you've learned so far. Complete the exercise on *water-soluble* vitamins below in the space provided. Check for the correct responses at the end of this session on *water-soluble* vitamins.

Assessment 4.1

Let's see what you've learned so far. Complete the exercise on *water-soluble* vitamins below in the space provided. Check for the correct responses at the end of this unit on *micronutrients.*

Indicate whether the following statements about vitamins are true or false:

If it is 'True' circle the word 'True' and if it is 'False' circle the word 'False".

1. i) The vitamin 'B complex' is a single, *water-soluble* vitamin.

   True False

ii) *Water-soluble* vitamins are stored in the cells associated with fat and are excreted in the urine.

   True False

iii) Solubility affects how *water-soluble* vitamins are absorbed, transported and stored in the body.

   True False

2. Match the following vitamins with the corresponding chemical names by drawing a line from the vitamin to the corresponding chemical name.

Vitamin	Chemical Name
a. Vitamin B2	*Niacin*
b. Vitamin B3	*Riboflavin*
c. Vitamin B1	*Pyridoxine*
d. Vitamin B12	*Thiamine*
e. Vitamin B6	*Cyanocobalamin*

3. From the list provided below, **circle** the foods which are sources of Vitamin C in the diet:

   White bread Eggs Oranges Milk Cabbage Peanuts

   Pork Grapefruit juice Spinach Carrots Cheese

   Broccoli Sweet Potatoes Bananas Callaloo Mangoes

4. What is the name of the ‘B’ vitamin that is important in the diet of pregnant women and women of child bearing age?

_____

5. This ‘B” vitamin is ONLY found in animal foods:

_____

6. Heat, light and exposure to air affect the amount of *water-soluble* vitamins available for use by the body. In the spaces provided below, suggest four possible ways in which you can minimize this loss when you prepare and cook foods in which these vitamins are present:

1. _____
2. _____
3. _____
4. _____

Assessment

Answers to Assessment

1. i) False ii) False iii) True

2. Vitamin B2- *riboflavin*, Vitamin B3- *niacin,* Vitamin B1- *thiamine*, Vitamin B12- *cyanocobalamin*, Vitamin B6- *pyridoxine*

3. Sources of Vitamin C: oranges, grapefruit, spinach, broccoli, callaloo and mangoes

4. Folate

5. *Cyanocobalamin*- Vitamin B12

6. i) Refrigerate fruits and vegetables and store in airtight containers to slow down degradation and minimize the *oxidation* of vitamins

ii) Wash fruits and vegetables before cutting them to prevent vitamin loss to the atmosphere

iii) Use cooking methods that use small amounts of water e.g. steaming or microwaving

iv) Store foods rich in 'B' vitamins away from sunlight

Session 4.2 Fat-Soluble Vitamins

Introduction

In the last session, you learned about the different *water-soluble* vitamins. Now we'll focus our attention on the *fat-soluble* vitamins.

You must have heard the following statements before. "Carrots are good for the eyes!" "Vitamin A is good for healing acne." In this session, you will learn much more about the different *fat-soluble* vitamins.

The *fat-soluble* vitamins are different from *water-soluble* vitamins. One significant difference is that a daily supply of *fat-soluble* vitamins from our diet is not necessary, since they are stored in the liver. As you have already learned, *fat-soluble* vitamins are:

- Absorbed first into the lymph, and then into the blood.
- Transported along with or are the vehicle of protein carriers; in the form of *lipoproteins*.
- Stored and readily excreted. Also, a daily dose is not needed.

Fat-soluble vitamins are just as important as the *water-soluble* vitamins to the proper functioning of our bodies. We'll discuss each *fat-soluble* vitamin separately; what they are, what they do and where they can be found. So here's what you should be able to do after you've finished this lesson.

Outcomes

Upon completion of this unit you will be able to:

- *Describe* the major functions of each *fat-soluble* vitamin
- *State* the food sources of each of these vitamins
- *Describe* the precautions that should be taken when preparing foods that contain *fat-soluble* vitamins
- *Describe* the *synthesis* of vitamin D in the body

How Long?

You will need two and a half (2.5) hours of formal study and one and a half (1.5) hours of self-study to complete this session

Terminology

Chlorophyll:	The pigment that gives plants and leaves of plants their green colour.
Visual Purple:	Visual purple is known as *rhodopsin*. It is the purple pigment in the retina of the eye that helps the eye adjust to low density or dim light.
Antioxidant:	A substance that pairs itself with a free radical (a highly unstable reactive molecule that has one or more un-paired electron.)
Oxidation:	Destruction of a nutrient when it is exposed to oxygen in the atmosphere.

4.2-1 Vitamin A

The *fat-soluble* vitamins include:

- Vitamin A – *Retinol / Beta-Carotene*

- Vitamin D - *Cholecalaferol*
- Vitamin E – *Tocopherol*
- Vitamin K

Let's begin by looking at vitamin A. Why do we have two different names associated with this vitamin? This was the first vitamin to be recognized. It occurs in two forms/states in the foods we consume.

- ***Retinol*** : found mainly in animal foods, *retinol* is also known as 'preformed vitamin A.' When foods such as eggs yolk and butter are eaten, the *retinol* they contain is converted by the body into vitamin A.

  Retinol is found in the foods listed below:

  - Milk, cheese, eggs
  - Oily fish, cod liver oil
  - Liver, kidney

Figure 12: Milk is an Excellent Source of Vitamin A
Image: John Kasawa / FreeDigitalPhotos.net

Figure 13: Eggs- Another Excellent Source of Vitamin A
Image: Simone Reid-Foster

Figure 14: Cheese a Good Source of Vitamin A
Image: Suat Eman / FreeDigitalPhotos.net

Beta – Carotene*:* an antioxidant that protects the cells against damage by *oxidation*. Found mainly in plant sources, *beta- carotene* is converted . The conversion occurs in the digestive tract, so it is more readily absorbed in your body.

Beta-Carotene can be found in the foods listed below:

- Deep yellow fruits and vegetables such as carrots, pumpkin, paw-paw and mango.

Figure 15
Image: Michelle Meiklejohn / FreeDigitalPhotos.net

- Deep green vegetables such as spinach, cabbage, callaloo (bhaji), patchoi/ pak choi (bok choi.)
- Tomatoes, sweet peppers, and sweet potatoes.

Figure 16
Image: Simone Reid-Foster

What functions do vitamin A perform in the body? Examine the list below for some of the functions of Vitamin A in the body.

Note it!

One clue in determining the source of plant foods rich in vitamin A is that *beta-carotene* gives plants their yellow- orange colour. In green vegetables the pigment chlorophyll masks the yellow orange colour.

Functions of Vitamin A in the Body

Let's look at the functions of vitamin A in our body.

- Vitamin A helps the cornea (i.e. the transparent membrane covering the eye) to remain crystal clear.
- Vitamin A makes a substance called *visual purple*. The cells of the retina of the eye make this pigment that enables the eyes to see in dim light.

Figure 17: Vitamin A- Good for the Eyes
Image: Simone Reid-Foster

- Vitamin A keeps the layers of *epithelial cells* (cells packed closely together in one or more layers that form the covering or lining of all external or internal body surfaces) that line the inside of the mouth, stomach and intestines as well as the mucous membranes moist and free from infection.
- Vitamin A also plays a major role in promoting the normal growth of bones and teeth of children.
- Vitamin A (in the form of *retinol)* promotes sperm development in men. In women it enables the fetus to develop properly.

Note it! /

What's important is that vitamin A is found in foods from animals such as egg yolks, milk, and cheese as well as in plant foods such as sweet peppers, tomatoes and carrots. Also, vitamin A can exist in two forms- *retinol* and *beta-carotene.*

Additionally, vitamin A plays a major role in the promotion of healthy vision, the growth and development of the fetus, strong bones and teeth and keeps our skin moist.

4.2-2 Vitamin D

Vitamin D is a very interesting vitamin because the body can synthesize (make it) with the help of sunlight. So we, in the Caribbean, are not likely to suffer a short fall in our vitamin D requirement.

However, vitamin D can also be supplied by the foods we eat. Here's is a list of the foods in which vitamin D is found:

- Liver
- Fish liver oils
- Oily fish e.g. herring, sardines
- Egg yolk, milk, cream, butter (in smaller amounts)

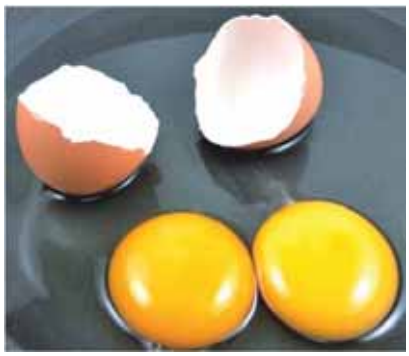


Figure 48: Egg Yolks are a Good Dietary Source of Vitamin D
Image: Nixxphotography / FreeDigitalPhotos.net

What functions do vitamin D perform in our body?

Function of Vitamin D in the Body

Vitamin D plays a major role in bone formation and growth. It helps to promote the absorption of the minerals calcium and phosphorus (we will discuss these two minerals later on in our lesson) by raising the blood concentration of these minerals thus contributing to the proper formation of bones and teeth.

How does your body make vitamin D? You may recall that earlier on in this lesson we briefly mentioned making vitamin D in our bodies with the help of sunlight. Figure 18 depicts how this is done. Take a look!

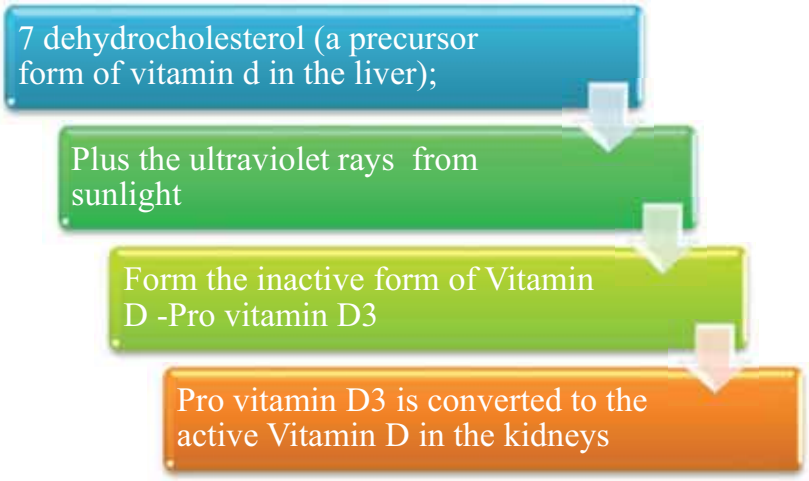


Figure 59: How Vitamin D is Made from Sunlight

Activity

Let's stop at this point and review what we've learned so far. Complete the following questions about Vitamin A and D in the spaces provided. Check to see how well you've done at the end of the unit.

Fill in the Blanks in the Following Sentences:

1. Vitamin A occurs in two forms in the foods we eat.

   a. _____

   b. _____

2. Foods such as milk, _____, and _____ are good sources of vitamin A.

3. Vitamin A plays a major role in:

(a) promoting the normal growth of _____

(b) keeping layers of skin's cells _____

(c) promoting normal growth of _____ and _____ in children

(d) _____ development in men and proper development of the fetus.

4. Vitamin D is made by the body with the help of _____.

5. Vitamin D's major role is that of promoting the absorption of the mineral_____ and _____ in the proper formation of _____ and teeth.

Feedback

1. a) *Retinol* b) *Beta-carotene*
2. Eggs, cheese, carrots, pumpkin, green leafy vegetables
3. a) Night vision b) Moist c) Bones and teeth d) Sperm
4. Sunlight
5. Calcium and phosphorus, bones

4.2-3 Vitamin E

Scientists discovered that *tocopherol* or vitamin E plays a role in the reproductive system of rats. Yes, you read it, rats! Hence the name *tocopherol* which means 'to bring forth offspring.' Which foods supply vitamin E? Read below and you'll see. While it is found in a wide variety of foods, it is particularly abundant in:

- Vegetable oils, germ oil, nuts, seeds
- Liver, egg yolks

That short list should be easy to remember. Let's learn about what Vitamin E does in our bodies.

Functions of Vitamin E in our Bodies

- Vitamin E largely functions as an *anti-oxidant* (see definition in previous session) by:
  - .1. Preventing the oxidation of vitamin A and other *polyunsaturated fatty acids*.
  - .2. Protecting cells from deterioration caused by substances that contain oxygen (free radicals).
  - .3. Protecting against heart disease by protecting low-density *lipoproteins* against *oxidation*.

- Vitamin E is used in the food manufacturing industry to stop fats from becoming 'rancid' (*oxidation* of fats that changes the colour, odour and taste.)

  Overall, vitamin E performs functions that are both preventive and protective.

4.2-4 Vitamin K

Now, let's discuss the last of the *fat-soluble* vitamins;Vitamin K. Similar to vitamin D, vitamin K can be synthesized in the body. Bacteria in our digestive track synthesize vitamin K that the body can absorb and use. Imagine good bacteria in our digestive tract! Yes, not all bacteria are harmful to our bodies. At the same time though we can also get vitamin K from foods that we eat.

- Vitamin K is found in a wide array of foods, such as green leafy vegetables e.g. spinach, callaloo, cabbage and lettuce.
- Cauliflower, broccoli
- Cereals, soya beans

Figure 20: Green Leafy Vegetables like Lettuce is a Good Sources of Vitamin K
Image: Simone Reid-Foster

The material synthesized by bacteria found in the intestinal tract is another source of Vitamin K.

What functions do vitamin K perform in our body?

The Functions of Vitamin K

Vitamin K, which stands for the Danish word 'koagulation' sounds like an English word you might know. If you said 'coagulation' then you would be right!

Vitamin K functions in the following ways in our bodies:

- Clotting of blood in wounds, so that we don't bleed to death.
- It assists in the production of coagulants in blood, turning liquid blood into a thick fibrous, solid mass in seconds.
- Vitamin K assists with the *synthesis* of bone proteins, by enabling the production of proteins that bind to the minerals responsible for bone formation.

Session Summary

Summary

In this unit you learned about the *fat-soluble* vitamins. You had quite a lot of new information to absorb here. What did you learn?

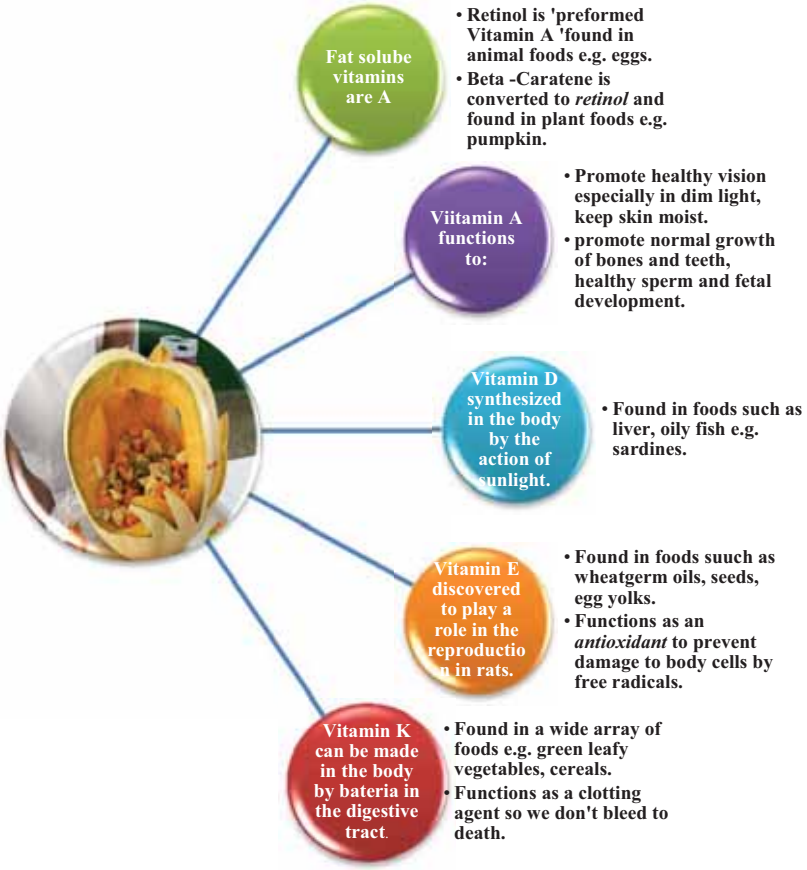


Figure 21: *Fat-Soluble* Vitamins Overview

Assessment

Assessment

What have you learned about *fat-soluble* vitamins? Answer the following questions about *fat-soluble* vitamins and see how much you have remembered.

Fill in the Answers in the Spaces Provided

1. Your mother read in a pamphlet that there are two forms of vitamin A.

Explain to her what this means. Give examples (at least two) of the types of food that contain each form of vitamin A

1. Vitamin A in the form of _____e.g:

   a.

   b.

2. Vitamin A in the form of _____ e.g:

   a.

   b.

2. Two of the *fat-soluble* vitamins can be made in your body. Identify which *fat soluble* vitamins they are and how they are made in the body.

1. Vitamin _____

2. Vitamin_____

3. For the menu listed below, identify the *fat-soluble* vitamins and the specific menu items in which they are contained:

Menu

Baked Fish with Tomato Sauce

Steamed Cassava

Broccoli Au gratin (Broccoli in Cheese Sauce)

_____

_____

_____

_____

4. In the space provided, record which *fat-soluble* vitamin is required in each of the following:

a) Candis is unable to see properly in dim lights- vitamin _____.

b) Mary's skin is dry and scaly- vitamin _____.

c). Sharon wants to ensure that calcium and phosphorus are thoroughly absorbed as her growing baby's bones is formed- vitamin _____.

d) Whenever Henry gets a cut, his blood runs heavily. What vitamin can help the blood to clot? Vitamin _____.

Assessment Answers

Answers to Assessment

1. A. Vitamin A in the form of *retinol*: eggs, cheese, milk

B. Vitamin in the form of *beta-carotene*: orange/ yellow vegetables and fruit, and green leafy vegetables

2. Vitamin D: sunlight activates inactive pro vitamin D3

Vitamin K; bacteria in the digestive tract

3. Baked fish/tomato sauce: vitamin A

Broccoli/Cheese Sauce: vitamin A, vitamin D

4. A) Vitamin A

b) Vitamin A

c) Vitamin D

d) Vitamin K

Session 4.3 Minerals

Introduction

Minerals, precious minerals! In this session we will discuss yet another group of *micronutrients;* minerals. They may not be rubies and diamonds but they are just as valuable to you. Minerals are different from vitamins in that they are *inorganic* substances and some of them e.g. calcium, are constituents of major tissue. You should note that even though minerals like vitamins are only needed in small amounts, they are vitally important to the proper functioning of our bodies.

In the sessions that follow, you will learn about the major minerals and their trace elements. You will learn about their food sources, their roles in the body and their requirements. As you progress you will do several activities and one assessment at the end of the lesson.

Upon completion of this unit you will be able to:

Outcomes

- *List* the major minerals and their trace elements
- *State* the food sources of the various minerals
- *Explain* the importance of minerals in the diets of various groups of people

How Long?

You will need two and a half (2.5) hours of formal study and one and a half (1.5) hours of self-study to complete this session.

Terminology

Inorganic Substances:	These substances do not contain carbon, are not easily destroyed or degraded and always retain their chemical identity.
Bioavailability:	*Bioavailability* refers to the extent and the rate at which a nutrient is absorbed and used.
Mucous Membranes:	The membranes that line the surfaces of body tissues. The mucous is a slippery substance secreted by particular cells of the gastro intestinal lining. It protects the cells from exposure to harsh digestive juices.
Hypertension:	*Hypertension* refers to the disease that describes higher than normal blood pressure known as 'high blood pressure.'
Hydrochloric Acid:	An acid normally produced in the gastric glands of the stomach, it is composed of hydrogen and chloride atoms.
Plasma:	*Plasma* is the liquid or fluid part of blood.
Cellulose:	*Cellulose* is a complex starch that forms the structural part of the cell wall of plants that makes up the skeletal framework of the plant.
Phytic Acid:	Found in the husks of grains, legumes and seeds. *Phytic acid* is capable of binding minerals such as calcium and iron to insoluble compounds in the intestines until they are excreted; unused by our body.

Oxalic Acid: A naturally occurring component of plants found mainly in green leafy vegetables. When ingested in foods, it combines with mineral calcium making it unavailable for use by our bodies.

Before you begin your journey in the discovery about the precious minerals needed by the body, you should recognize that:

Minerals are generally required in the body for:

a) Bodybuilding

b) Control of body processes e.g. muscle contraction

c) As constituents (part of) of essential bodily fluids such as blood

How are Minerals Different from Vitamins?

Minerals are generally described as:

- Inorganic compounds (not of a biological origin). Therefore minerals always remain the same no matter the circumstances. For example they are not changed by heat in cooking or cold or other chemicals e.g. acid— like vitamins are.

- Compounds that once they enter our bodies remain there until they are excreted (removed). Like vitamins, some minerals are freely absorbed into the body cells while others need a carrier to be absorbed and transported around your body. For example, iron is transported along with a protein forming the compound *hemoglobin*, with *heme* being the iron transported by the protein *globulin* in blood.

Let's begin by looking at the major minerals. Major minerals are minerals that are needed in larger quantities, than the trace elements, by the body.

- Calcium
- Phosphorus
- Iron
- Sodium / Potassium

We will then discuss the importance of trace elements:

- Iodine

- Fluoride

Let's begin with calcium— a very important mineral!

4.3-1 Calcium

We all have bones and teeth, but how were they formed and how are they kept from crumbling? Calcium of course! Calcium helps to build and maintain strong bones and teeth.

Calcium is an important mineral for everyone. It is especially important in the diet of pregnant and lactating (breastfeeding) women, toddlers, adolescents, and the elderly. Why? Well, these groups of people are in the midst of very important periods of growth and development in the human life span. A diet containing an adequate intake of calcium ensures we have developed a healthy skeleton and suffer minimal bone loss as we age. So what function does calcium perform in our diet? Take a look below and you'll discover why calcium is crucial in our diet.

Figure 22: Calcium a Major Constituent of the Skeleton
Image: Renjith Krishnan / FreeDigitalPhotos.net

Functions of Calcium in the Body

Take a look at the various functions of calcium in your body:

- The mineral phosphorus, works together with vitamin D, enabling the absorption of calcium in our body. The combination of calcium and phosphorus make *calcium phosphate,* which is what gives hardness to your bones and teeth.
- Calcium is also required as part of the mechanism that is responsible for the clotting of your blood.

- The transmission of nerve impulses, regulation of muscle contractions and activation of some enzymes is dependent on calcium intake.
- Calcium is also responsible for the activation of the protein *calmodulin*. This protein relays (sends) messages to the inside of the cell, which helps maintain normal blood pressure.

If calcium is responsible for all this in our bodies, where can we get it?

Food Sources of Calcium

Calcium is found in abundant supply in:

- Milk and milk products such as cheese and yogurt

Figure 63: Yogurt an Excellent Source of Calcium
Image: Simone Reid-Foster

Figure 74: Milk Another Source of Calcium
Image: Simone Reid-Foster

- Vegetables such as broccoli, cauliflower and watercress
- The soft edible bones of the canned fish and sardines are good sources of calcium

Figure 85: The vegetable Cauliflower is a Good Source of Calcium
Image: FreeDigitalPhotos.net

- Fortified bread and orange juice

How do we ensure we get the most calcium from the foods we eat? One way is to understand what the *bioavailability* of calcium means. Let's explore the concept of *bioavailability*. Do you remember what the term *bioavailability* means? Check the listing of terms at the beginning of this lesson.

Note it!

Bioavailability means the rate and extent at which a nutrient is absorbed and used by the body.

Calcium's Bioavailability

There are some substances in the foods we eat that may impact how much calcium your body is able to absorb— or calcium's *bioavailability*. It is important that you consume calcium-rich foods along with other foods. For example if you consume steamed vegetables with a cheese sauce, you should ensure that you consume other calcium-rich foods at other meals throughout the day to compensate for the diminished absorption of calcium during a particular meal. Listed below are some of the substances that affect the absorption of calcium;

- *Cellulose* in vegetables
- *Phytic acid* in whole grain cereals
- *Oxalic acid* in vegetables

Activity

What have you learned so far about calcium? Take a look at Figure 25 on the following page and answer the questions in the circles in the space provided.

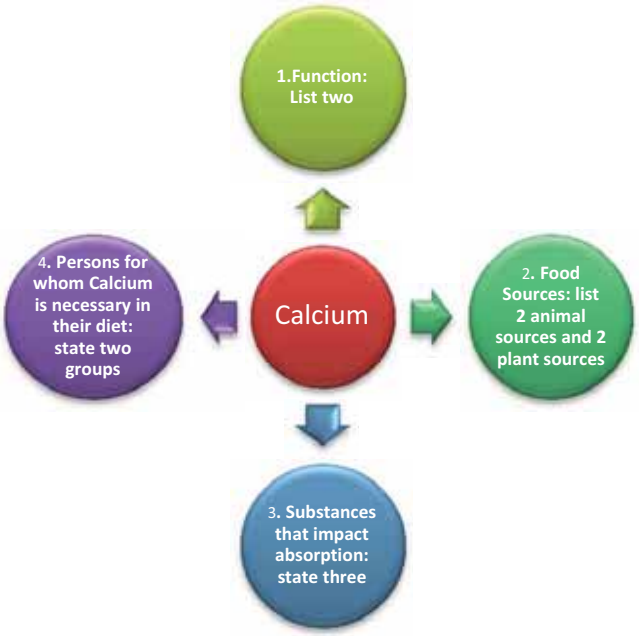


Figure 96

1.

2.

Animal sources of calcium:

Plant sources of calcium:

3.

1.

2.

3.

4.

a)

b)

Feedback

Check your answers below! Did you get them all?

- Along with phosphorus and vitamin D, the body is able to absorb calcium. The combination of calcium and phosphorus make *calcium phosphate,* which is what gives hardness to bones and teeth.
- Calcium is also required as part of the mechanism that is responsible for the clotting of blood.
- The transmission of nerve impulses, regulation of muscle contractions and activation of some enzymes is dependent on calcium intake.
- Calcium is also responsible for the activation of the protein *calmodulin*. This protein relays messages to the inside of the cell, which helps maintain normal blood pressure.

3. Foods from animal sources:

- Milk and milk products, soft bones of canned fish e.g. sardines and salmon.

Plant sources:

-Broccoli, cauliflower, watercress, fortified bread and orange juice.

3. *Cellulose* in vegetables, *phytic acid* in whole grain cereals, *oxalic acid* in vegetables.

4. Babies/infants/toddlers, adolescent boys and girls and pregnant women.

4.3-2 Phosphorus

Phosphorus is another important mineral. Phosphorus works along with vitamin D and calcium in maintaining the health of your bones and teeth. Does phosphorus do anything else in your body? Read the list that follows.

Functions of Phosphorus

- Phosphorus is necessary for energy production. It is a component of the ATP (*adenosine triphosphate*) molecule which is necessary for the regulation and production of energy in our body.
- As discussed in earlier lessons, phosphorus works along with calcium and vitamin D in the production and maintenance of strong bones and teeth.
- Phosphorus plays an important role in muscle contraction, proper kidney function and nerve transmission.
- Phosphorus is also important in *protein synthesis* (making of protein,) in the production of *DNA* and *RNA* (genetic material) and for hormones.
- Phosphorus as part of the *phospholipids*, forms part of the structural part of cells, the cell membranes, the specialized layers of cells that enclose or surround body cells and also help fats move through the bloodstream.

In order to make the best use of phosphorus in your body, you should get it from the foods you eat.

Food Sources of Phosphorus

Phosphorus by its very abundant nature is found in all natural foods. Abundant sources include:

- Milk and milk products
- Meats
- Cereals, nuts, legumes, beans, spinach
- Sun flower seeds

Reflection

Both calcium and phosphorus are very important minerals since they are involved in many important biological functions in our bodies. Since our bodies cannot manufacture them they must be obtained from the foods we eat. How does your diet stack up?

1. List the foods you ate for the last two days.

2. Indicate which foods are sources of calcium and phosphorus, by placing a tick next to them.

3. What do you think? If your diet was lacking, how can you make improvements to your diet? Suggest two (2) ways you can do this. Write your answers in the space below this cloud.

1. _____

_____

2. _____

_____

3. _____

_____

Let's continue to discover the minerals. We are now going to explore the mineral 'iron.'

4.3-3 Iron

Just like calcium and phosphorus, everyone needs iron in their diet. However newborn babies, pregnant and lactating (breastfeeding) women adolescent (teenaged) girls and adult women need to ensure that their diet contains foods with a rich supply of iron. What role/function does iron play in our body?

Function of Iron in our Body

- Iron is a component of *haemoglobin* a substance that gives blood its red colour and transports oxygenated blood around the body.
- Iron is also a necessary part of the protein molecule *myoglobin* in muscle tissue. Further, iron accepts, releases and stores oxygen for the muscles to do their work.
- Iron is also necessary for proper immune system functioning as it helps protect the body from infection.

Since iron is so important which foods are good sources of iron?

Foods Sources of Iron

- Foods from animals are usually very good sources of iron. These foods include: beef liver and other organ meats such as heart and kidney, beef, chicken, turkey, corned beef, cooked shrimp, egg yolk, tuna and salmon.

Figure 107: Ground Beef and Red Beans in Chilli
Image: Simone Reid-Foster

Figure 118: Sautéed Patchoi
Image: Simone Reid-Foster

- Other sources of iron in our diet include molasses, cocoa and curry powder. You may ask, "so chocolate really is good for you?" Yes, but only in moderation.

From the list above it appears that iron is available in a wide variety of foods. It surely is, but how much we absorb is very crucial to iron's optimum functioning in our bodies. Let's discuss iron absorption.

Iron Absorption

Ensuring that we obtain adequate amounts of iron form our diets is just as much as a concern as ensuring that we obtain adequate amounts of calcium from our diet.

Several issues impact iron absorption:

- The source of the iron: whether from an animal source (*heme* iron) or a plant source (*non-heme* iron.)
- The compounds that hinder iron absorption.
- Presence of compounds that enhance iron absorption.

Let's look at the source of the iron:

- *Heme* iron is found in foods from animals that originally contained *haemoglobin* i.e beef liver, liver and corned beef are easily absorbed and used by our bodies.
- *Non-heme* iron is found in plant foods such as green leafy vegetables like spinach and patchoi, and beans and fruits (as identified above). *Non-heme* iron is more difficult to be absorbed by our bodies.

Compounds that Hinder Iron Absorption

Even though iron is widely available in many foods, iron absorption from the foods we eat into the intestines and then into the bloodstream may be hindered by iron becoming bound (tied) up by some dietary factors such as:

- *Phytic acid* in whole grain and vegetables
- *Oxalic acid* in spinach
- Calcium and phosphorus in milk
- *Tannic acid* (a weak acid derived from plants) in tea, coffee, nuts

How can we overcome the difficulty in absorbing iron? We can do this by including the following foods when we eat iron containing foods:

- Foods that contain vitamin C such as citrus fruits including oranges and grapefruit enhance the absorption of *iron* from plant foods.
- Additionally, consume *iron*-rich plant foods such as spinach (*non-heme*) with iron rich animal foods (*heme* iron) such as meat, poultry or fish. These foods contain a factor called the *MFP factor* (meat, fish and poultry factor) that enhances the absorption of iron.

Note it!

When we are planning meals there are a few things that we need to do:

1. Improve our iron absorption
2. Include iron-rich foods from animal sources such as beef, liver etc
3. Include foods that are rich in vitamin C
4. Enhance the absorption of iron by eating lots of enriched or fortified grains, cereal and pasta products that have iron added to them
5. Avoid drinking tea or coffee that contains *tannic acid* as it hinders the absorption of iron by as much as fifty percent (50%)

There are certain groups of persons for whom the quantity of iron in the diet becomes a crucial issue.

Figure 129: Persons for whom Iron Quantity in the Diet is Important
http://1.bp.blogspot.com/_-rcFBgUNtQ0/SEpKrJycrdI/AAAAAAAAEBU/YRkYUt_9mkU/s400/balanan+lake+finale+5+006.jpg
http://upload.wikimedia.org/wikipedia/commons/9/98/Pregnant_woman.jpg

- A baby after its initial six (6) months supply of its mother's breast milk is depleted.
- Pregnant women who need increased blood supplies as they cater for the development of the baby's blood supply.
- Young girls and women during their menstrual cycle.

- After an injury or operation where great amounts of blood may have been lost.
- Athletes and very active people who need a ready supply of oxygenated blood for sport endurance.
- Strict vegetarians (vegans) do not consume any animal flesh and rely solely on iron from plant foods (which is not as easily absorbed as iron from animal foods.)

We have covered quite a lot about the mineral 'iron.' Let's stop for a bit and see how much we have remembered.

Activity

Complete the following exercise. Write your answers in the arrows next to the questions.

1. Which groups of people are especially in need of iron?
2. List two animal sources and two plant sources of iron in your diet.
3. State two functions of Iron in your body.
4. Iron exists in two forms in our foods. Name them.
5. Which form of iron is easily absorbed from the foods we eat?
6. Which *water-soluble* vitamin enhances the absorption of iron from the foods we eat?
7. State two substances that may hinder iron absorption from foods.

Feedback

1. Newborn babies, pregnant and lactating women, teen girls, adult women who loose blood to menstruation, people who may have had surgery or been injured badly athletes and active persons as well as strict vegetarians.

2. Animal sources of iron such as animal organ meats e.g. liver, kidney, heart, corned beef, beef, beef liver, cooked shrimp, tuna chicken turkey

Plant sources: dark green leafy vegetables e.g. spinach, callaloo, legumes; raisins, prunes, grapes, dried apricots, red, kidney, pinto beans, lentils, and chickpeas.

3.

- Iron is a component of the substance *haemoglobin*, the substance that gives blood its red colour.
- *Haemoglobin* is required for the transportation of oxygen around the body to various cells, for the production of energy.
- Iron is found in the protein *myoglobin* in muscle cells. The iron accepts, carries and releases oxygen for the muscle cells to do their work.

4. *Heme* iron and *non-heme* iron

5. *Heme* iron

6. Vitamin C

7. *Phytic acid, oxalic acid, tannic acid* and calcium and phosphorus in milk.

Let's move on to another important group of minerals.

4.3-4 Potassium, Sodium and Chloride

These minerals are vitally important in maintaining fluid balance in our body, meaning that we don't take in or lose too much fluid at any one time. You may have heard something about sodium and high blood pressure or *hypertension* before. However, potassium and chloride also impact our blood pressure, therefore we will study them together since they have similar functions in our body.

Function of Potassium, Sodium and Chloride in our Body

- All three are necessary in maintaining the appropriate acid-base balance (managing the acidity or alkalinity) in our body's fluids.
- Potassium, sodiumand Chloride are also important in the maintenance of the water balance in the body (see the following lesson on water.)
- Sodium and potassium play a major role in the transmission of nerve impulses and the contraction of our muscles.
- For the production of the *gastric juice* (very acidic, colourless liquid formed in the lining of the stomach) hydrochloric acid requires potassium, sodium and chloride.

In Which Foods can we Find These Minerals?

- Potassium- is found in meat, fish and poultry in appreciable amounts. Potassium is also abundant in fruit such as apricots, (dried and uncooked,) bananas, prunes, oranges, paw-paw, watermelon and raisins.

Figure 30: Bananas are a Good Source of Potassium
Image: Stoonn / FreeDigitalPhotos.net

- Potassium is also found in vegetables such as spinach, tomatoes, brussel sprouts, eggplant (melongene), broccoli and sweet potatoes.

- Sodium is found naturally in most foods. It is important to note that sodium is NOT salt; it is a component of salt or 'sodium chloride.'

- Sodium is added to foods such as processed meats like bacon, slated pigs tail, ham, salted fish e.g. cod and smoked fish and meats e.g. herring.

Figure 131: Salted Fish
Image: Simone Reid-Foster

- Sodium is also found in other preserved foods such as processed cheeses and those preserved in brine (salt solution) e.g. olives.

Other items in which you can find sodium include condiments and seasonings e.g. bouillon cubes, soy sauce, ketchup, tomato sauce, salted snack items e.g. potato chips, Worcestershire sauce, soy sauce, baking soda, as well as products that contain *monosodium glutamate* and *sodium benzoate*.

- Chloride much like potassium and sodium can be found in virtually all foods.

    1. Chloride is also found in table salt like sodium.

    2. High amounts of chloride can be found in seaweed, rye, lettuce, celery and olives.

4.3-5 Iodine

Iodine is a very important mineral even though you body only needs very small quantities. Have you ever seen someone with a huge swelling on their neck, which appeared as though they were bitten by a bug? It looked painful didn't it? What you actually saw was an enlarged thyroid gland, the result of insufficient iodine in the diet.

Figure 142: Woman with a Goitre
http://t3.gstatic.com/images?q=tbn:ANd9GcRE_75FsEQoSkzhEoWv_jgVcIvFImmzPVfT4AcUrPYy9tm8fm0lxw

The name of the disease associated with this condition is called 'goitre'. The thyroid gland, which is found at the lower part of the neck, is responsible for making the hormone *thyroxine*. This hormone is responsible for regulating body temperature,

blood pressure, energy metabolism and regulation of the growth and development of children.

If the mineral iodine is lacking in the diet, the thyroid gland is unable to make the hormone *thyroxine*, which as a result may lead to significant problems. Therefore, we must ensure that we get adequate amounts of iodine in our diet. Let's find the foods in which iodine is present.

Food Sources of Iodine

Iodine is found in the following foods:
sea foods such as seaweed or kelp (commonly called seamoss or Irish moss in the Caribbean), sea fish and sea salt.

Another good source of iodine that is widely available is iodized salt. Iodized salt is salt to which iodine has been added.

Other food sources that do contain iodine but are not as good as those mentioned above include: milk, yogurt, cereals, and green leafy vegetables such as spinach.

4.3-6 Fluoride

Fluoride is the final mineral that we will discuss in this lesson. Fluoride is important to the growth development and maintenance of strong bones and teeth. Fluoride helps reduce tooth decay and has been known to decrease the development of dental cavities in children by combining with tooth enamel to form a protective coat.

Figure 153: Dental Cavity
I, ISebestyen [GFDL (www.gnu.org/copyleft/fdl.html), CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0/) or CC-BY-SA-2.5-2.0-1.0 (www.creativecommons.org/licenses/by-sa/2.5-2.0-1.0)], via Wikimedia Commons

Sources of Fluoride

- Since fluoride plays a role in decreasing the occurrence of dental cavities in children, it is generally added to most toothpaste and mouthwash.
- In some countries, tap water has also been fluoridated to ensure that fluoride is widely available to the population.

- Although it is ultimately beneficial, some people have expressed concern about adding something into their water supply.

- Tea and seawater are the best naturally occurring sources of fluoride.
- Products prepared with fluoridated water also provide fluoride in the diet.

Figure 164: Fluoride may be Added to Toothpaste
Image: Ambro / FreeDigitalPhotos.net

Assessment

Assessment

How much do you remember? Answer the questions below.

Your school or church is holding a nutrition seminar. You have been asked to give brief talk to your classmates about the minerals calcium, iron, and iodine. Prepare your talk using the following headings:

- Roles/Function
- Food Sources
    - Meal Planning

Feedback

How much did you remember? Check your answers using the table below!

Assessment			
Mineral	**Roles/Function**	**Food Sources**	**Meal Planning**
Calcium	-Works with phosphorus and vitamin D to absorb calcium to make *calcium phosphate* which gives hardness to bones and teeth. - Plays a role in the mechanism responsible for the clotting of blood. -Responsible for the transmission of nerve impulses, regulation of muscle contractions and the activation of some enzymes. - Responsible for the activation of the protein *calmodulin* which helps to maintain blood pressure.	-Milk and milk products, and cheese. -Vegetables e.g. broccoli, cauliflower, and watercress. -Soft, edible bones of canned fish e.g. sardines. -Fortified bread and orange juice.	-When you consume calcium rich foods along with other foods e.g. steamed vegetables with a cheese sauce, you should ensure that you also consume other calcium- rich foods at other meals throughout the day to compensate for the diminished absorption of calcium during a particular meal.
Iron	-Iron is a component of *haemoglobin,* a substance that gives blood its red colour and transports oxygenated blood around the body. -Iron is also a necessary part of the protein molecule *myoglobin* in muscle tissue, which	-Animal sources: beef liver, beef, other organ meats, heart, kidney, corned beef, cooked shrimp, tuna and salmon -Plant sources: beans (e.g.	-Include the following foods when we eat iron containing foods: foods that contain vitamin C. For example citrus fruits such as oranges and grapefruit enhance the absorption of iron from plant

Assessment			
Mineral	**Roles/Function**	**Food Sources**	**Meal Planning**
	accepts, releases and stores oxygen for the muscles to do their work. -Iron is also necessary to proper immune system functions as it helps protect the body from infection.	kidney, red, pinto beans, lentils,) dark green leafy vegetables (e.g. spinach, patchoi, water cress,) fruit (e.g. raisins and dried apricots.) -Other sources: molasses, curry powder and cocoa powder.	foods. -Additionally consume iron rich plant foods such as spinach *(non-heme*) with iron rich animal foods (*heme* iron) such as meat, poultry or fish. These foods contain a factor called the *MFP factor* (meat, fish and poultry factor) that enhances the absorption of iron.
Iodine	-Needed to make the hormone t*hyroxin*, which is assists in controlling the body's metabolism	-Seaweed, sea fish, sea salt, iodized salt, milk, yogurt, cereals, green leafy vegetables e.g. spinach.	-Choose foods that contain iodine. -Prepare dishes using these foods- e.g. sea moss, smoothies using milk and yogurt.

Session Summary

Summary

In this unit you learned about the group of *micronutrients*; minerals. You learned about the major minerals and their trace elements, the food sources of the various minerals as well as about the importance of minerals in the diets of various groups of people.

Mineral	Food Source	Function
Calcium	-Milk and milk products, cheese. -Vegetables e.g. broccoli, cauliflower and watercress.	-Works with phosphorus and vitamin D to absorb calcium to make *calcium phosphate* which gives hardness

Mineral	Food Source	Function
	-Soft, edible bones of canned fish e.g. sardine. -Fortified breads and orange juice.	to bones and teeth. - Plays a role in the mechanism responsible for the clotting of blood. -Responsible for the transmission of nerve impulses, regulation of muscle contractions and the activation of some enzymes. - Responsible for the activation of the protein *calmodulin* which helps to maintain blood pressure.
Phosphorus	-Milk and milk products. -Meats -Cereals, nuts, legumes, beans and spinach. -Sunflower seeds	-Phosphorus is necessary for energy production. It is a component of the ATP (*adenosine triphosphate*) molecule. -Phosphorus works along with calcium and vitamin D in the production and maintenance of strong bones and teeth. -Phosphorus plays an important role in muscle contraction, proper kidney function and nerve transmission. -Phosphorus is also important in *protein synthesis* (making of

Mineral	Food Source	Function
		protein) and in the production of *DNA and RNA* (genetic material) and hormones. -Phosphorus forms part of the structural part of cells, namely the cell membranes which are the specialized layers of cells that enclose or surround body cells and also help fats move through the bloodstream.
Iron	-Animal sources: beef liver, beef, other organ meats; heart, kidney, corned beef cooked shrimp, tuna and salmon. -Plant foods: beans (e.g. kidney, red, pinto beans,) lentils, dark green leafy vegetables (e.g. spinach, patchoi, water cress,) fruit (e.g. raisin and dried apricots.) -Other sources include molasses, curry powder and cocoa powder.	-Iron is a component of *haemoglobin* a substance that gives blood its red colour and transports oxygenated blood around the body. -Iron is also a necessary part of the protein molecule *myoglobin* in muscle tissue, which helps to release and store oxygen for the muscles to do their work. -Iron also is necessary to proper immune system functioning as it helps protect the body from infection.

Mineral	Food Source	Function
Sodium/Potassium/ Chloride	-Potassium: meat, fish and poultry, dried apricots, bananas, prunes, oranges, watermelon, spinach and melongene. -Sodium: salted meats and fish e.g. pigs' tails, bacon, ham, cod; processed cheeses, pickled olives, bottled sauces (e.g. tomato sauce, Worchester sauce, soy sauce) salted snacks (e.g. potato chips baking soda, bouillon cubes.) Chloride: table salt, seaweed, lettuce and olives.	-All three are necessary in maintaining the appropriate acid-base balance (managing the acidity or alkalinity) in our body fluids. -These three are also important in the maintenance of the water balance in the body (see the following lesson on water). -Both sodium and potassium play a major role in the transmission of nerve impulses and the contraction of our muscles. -Production of the *gastric juice* (very acidic, colourless liquid formed in the lining of the stomach) *hydrochloric acid* requires potassium, sodium and chloride.
Iodine	-Seaweed, sea fish, sea salt, iodized salt, milk, yogurt, cereals and green leafy vegetables e.g. spinach.	-Needed to make the hormone *thyroxine*, which assists in controlling the body's metabolism.
Fluoride	-Tea, seawater or may be added to a country's water supply, also products prepared with fluoridated water.	-Strengthens teeth against decay by combining with teeth enamel to form a protective coat. -Reduces the incidence of tooth

Mineral	Food Source	Function
		decay.

You also learned about substances that impact the absorption of calcium and iron as shown in the table below,

Calcium	Iron
Cellulose in vegetables	*Phytic acid* in whole grain cereals and vegetables. *Oxalic acid* in spinach Calcium and phosphorus in milk *Tannic acid* in tea, coffee and nuts
Phytic acid in whole grain cereals *Oxalic acid* in green leafy vegetables	The source of the iron is important weather it is *heme* iron from animal sources which is more easily absorbed or *non-heme* iron which is not as easily available to the body for absorption.

How can we Ensure that we Absorb the Calcium and Iron that we Need?

- Consume calcium-rich food along with vegetable foods e.g. steamed broccoli with cheese sauce.
- Consume calcium-rich foods at other meals throughout the day to compensate for any diminished calcium absorption.
- Serve foods that contain vitamin C along with plant sources of iron to enhance its absorption.
- Consume iron-rich foods from animal source e.g. beef that contains the *MFP factor* (meat, fish, and poultry), together with plant sources of iron e.g. broccoli, spinach. The *MFP factor* enhances absorption of the iron.

Who Needs Calcium and Iron the Most?

Calcium: pregnant and lactating women, teenagers, athletes and the elderly.

Iron: pregnant and lactating women, newborn babies, strict vegetarians athletes and active persons, girls and women who lose blood due to menstruation after injury or operation where there has been a great loss of blood.

We are coming to the end. Our last stop is the vital nutrient; water.

Session 4.4 Water

Introduction

You are thirsty, your throat is dry and you are perspiring a lot. What's the beverage that will best quench your thirst? You may drink some fruit juice, but that doesn't seem to help much. The only beverage that will truly quench your thirst is water.

Sometime water is written as H_2O, which is its chemical formula. Have you ever seen water represented this way? Maybe you came across it in one of your science texts. Water performs amazing functions in our body. Did you know that you could stay hungry for several weeks and not die? Try staying thirsty for a few weeks; you will surely die! Without water you can only survive for a few days.

In this lesson you will learn about the roles that water plays in maintaining your body's health. You will also learn how water works to maintain the optimum fluid balance in your body. Water is neither a vitamin nor a mineral but it is certainly a very vital nutrient!

Outcomes

Upon completion of this unit you will be able to:

Explain the function of water

State the chemical components of water

Explain how water balance is maintained in the body

How Long?

You will need two and a half (2.5) hours of formal study and one and a half (1.5) hours of self-study to complete this session.

Electrolytes: These are the salts e.g. sodium that dissolve in water and disassociate into charged particles called *ions.*

Terminology

Constipation: This is the hardening of the feces. The feces move slowly through the intestine resulting in pain and discomfort.

Water Balance: The balance between our water intake and output.

Dehydration: A condition in which the body's output of water exceeds the input.

4.4-1 Water's Chemical Formula

Figure 175: A Glass of Water
Image: Sayan Samana / FreeDigitalPhotos.net

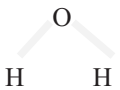
Water covers over 70% of the earth. Those of us who live on an island know that we are surrounded by water on every side. Water can exist in several forms- as a solid e.g. ice, as a gas e.g. water vapor or as a liquid. At room temperature water is colourless and odourless. Additionally many substances can dissolve in water .

Did you know that water is really a chemical? In fact, it can be written as H_2O.

Water is comprised of:

- Two hydrogen atoms
- One oxygen atom

It looks something like this.



Hence it is represented as H_2O.

Function of Water in our Bodies

Generally water is vital to your good health. Did you know that your body, just like the earth, is 70% water? Wow! Where is all this water stored?

- Water is distributed in blood plasma (this is the yellow colour fluid of the blood in which the red blood cells are suspended along with dissolved salts and other materials. It is 90% water).
- Water is also distributed within and around the cells.

Let's get back to our discussion about the functions of water in the body.

Water:

- Moistens the mucous membranes (thin layer of tissue lining bodily cavities) of the lungs and stomach.
- Water lubricates the joints acting as a shock absorber and keeps the membranes moist.
- Water delivers nutrients to the cells and also removes bodily waste such as *urea* (chemical compound found in urine) from the processing of protein and excess electrolytes such assodium and potassium.
- Water keeps the blood volume up (the amount of blood in a person's circulatory system- which can also be thought of as how much space our blood occupies in our body.)
- Water forms part of all body fluids e.g. sweat, semen, saliva and even vomit.
- Water assists in digestion and prevents constipation by softening the stool.
- Water also regulates our body's temperature through sweating.

Activity

Water does quite a number of things in our body! How much can you remember about water?

What are four (4) functions of water that you just learned? Write your answers in the spaces provided below.

1. _____

2. _____

3. _____

4. _____

_____

_____

Feedback

How well did you do at remembering the functions of water? Check your answers below!

1. (Choose any four)

- Moistens mucous membranes of the lungs stomach, mouth
- Lubricates the joints and membranes
- Removes bodily waste such as area from processing of protein, excess electrolytes like sodium and potassium
- Keeps the blood volume up
- Forms a part of all body fluids
- Aids digestion and prevents constipation by monitoring the stool
- Regulates body temperature through sweating

Do you believe that only water can supply you with your daily requirement of water? If you answered 'no,' you'd be correct! Actually, all foods contain some water, even though it may not be visible to our naked eye.

Food Sources of Water

Figure 186: Sources of Water in the Diet
Image: zirconicusso / FreeDigitalPhotos.net

Figure 197
Source:http://ictllp.wikispaces.com/file/view/cucumber.jpg/114610523/cucumber.jpg

Note it!

How much water should you consume daily? This depends on the amount of energy you expend. A good rule of thumb is eight (8) to ten (10) eight ounce (8oz) glasses daily.

Figure 208
Image: Sayan Samana / FreeDigitalPhotos.net

Ok, so far we've learned about:

- ✓ Water's chemical formula – H_2O
- ✓ The role/functions water performs in your body
- ✓ The food sources of water

Water Balance

How does your body ensure you don't burst by consuming too much water? Your body maintains what is called *water balance*. There are several components to *water balance*:

- Water intake or what you experience as thirst
- Water loss or what you experience when you urinate or sweat

Simply put, *water balance* is achieved when our water intake is matched by the amount of water that we excrete or expel.

Water Intake

The dry mouth sensation in your mouth accompanied by the thirst that drives you to desire water is the brain's signal response to the need for water in the body.

However your body wants water long before you express your thirst. Your kidneys have already begun to regulate your water level in your body.

The water you take in is via the beverages you drink, foods you eat and the metabolic processes that are taking place in your body.

Water Loss

Did you know that you must excrete two cups of water daily in order to maintain *water balance* in your body? How then do we lose this water?

Water is removed mainly thorough urination. The urine carries away waste products from the body's metabolic processes e.g. digestion.

Water is also lost through sweat and as water vapor from your lungs.

Believe it or not, water is also removed through your feces.

What is *water balance*?

Water balance (ensuring that the water supply in your body is never too much or too little) occurs when the amount of water taken in is identical to the amount of water expelled.

Factors that Impact Water Balance

- **Exercise** - have your ever observed someone running a marathon? They drink a lot of water and even bathe themselves with water when they get to the water station. This is because someone involved in that kind of intense exercise or activity loses a lot of water, via perspiration, which needs to be replenished.

- **Environment** - even where you live, impacts your water balance. People who live in tropical regions such as the Caribbean where it's hot and humid year round, usually perspire a lot and need to have their water reserves constantly replenished.

- **Dehydration** - this occurs when our water loss exceeds our water intake, which is usually brought on by excessive water loss. The point at which you experience dehydration is long after your thirst mechanism has been deployed.

Symptoms of Dehydration Include

- Weakness
- Low blood pressure
- Rapid heart beat
- Dry skin
- Thirst

When is Extra Water Needed?

Even as we have just discussed with *water balance,* there are some instances when your body needs extra water:

- During illness especially if your body temperature is elevated (through a fever).
- If you have been vomiting or have had diarrhea (especially in babies).
- After surgery or blood loss and burns.
- When you are pregnant and/or breast-feeding so that you can produce milk.
- When you are involved in sporting activities.
- If you consume alcohol or caffeine in large amounts.

Session Summary

Summary

In this unit you learned the chemical components of water, the role/functions of water in your body, the foods that contain water and how to maintain the water balance in your body.

- Water's chemical formula is H_2O.
- Approximately 70% of your body is made up of water.
- Water performs several roles/functions in your body such as moistening the mucous membranes, removal of bodily waste, lubrication of your joints and regulating body temperature etc.
- Water is found in foods such as fruit, vegetables and of course water.
- *Water balance* occurs when the water we intake (which is stimulated by your thirst) is equivalent to our water output; the amount of water we expel or excrete.

You've finally reached the end of this unit on *micronutrients*. Take a few moments to go over some of the important points you've learned in the unit.

Unit Summary

Summary

In this unit you learned about the various categories of *micronutrients* and about the nutrient water.

You learned that there are two groups of *micronutrients* needed by our bodies for proper function: vitamins and minerals.

Vitamins are classified into two groups: the *water-soluble* vitamins and the *fat-soluble* vitamins.

Water-soluble vitamins include:

- B1- *thiamine,* B2- *riboflavin*, B3- *niacin,* B6- *pyridoxine,* B12-*cyanocobalamin,* and *folate*.
- Vitamin C- *ascorbic acid*

The 'B' vitamins are found in foods such as green leafy vegetables, whole grain cereals lean pork and various peas and beans.

You also learned that the 'B' vitamins in general do not provide us with energy but instead help carbohydrate foods release energy from foods. The 'B' vitamins are also necessary for normal growth and development of children.

Vitamin C is found in abundance in the West Indian cherry. You learned that citrus fruit like oranges and grapefruits are also good sources of vitamin C. Additionally, vitamin C is also found in green leafy vegetables such as cabbage, spinach etc.

Vitamin C is very important in the healing of wounds and fighting off infections. It is also a key nutrient in enhancing the absorption of iron from plant foods that contain the mineral iron.

As we explored the *water-soluble* vitamins present in the various vegetables and fruits, we discovered that they are easily dissolved in water, into the atmosphere and destroyed by prolonged heat during cooking. Therefore, the amount of the vitamin that is available for use by our body is diminished. As a result, in order to minimize the amount of the nutrients lost we should use various precautions during our preparation of vegetables and fruit such as:

- Washing before use

- Only cutting or chopping close to the time they are to be cooked or served
- Storing the vegetables or fruits in airtight containers if they are cut

When we cook these fruits and vegetables we should:

- Use cooking methods such as steaming, baking and stir-frying each of which utilize a small amount of water
- The cooking time should not should not exceed 5-7 minutes

Fat-Soluble Vitamins

You learned that the *fat-soluble* vitamins are:

- Vitamin A- *Retinol/ Beta-Carotene*
- Vitamin D- *Cholecalciferol*
- Vitamin E – *Tocopherol*
- Vitamin K

These vitamins are generally found in foods such as eggs, liver, milk, butter, oily fish and fish liver oils.

Vitamin A in its *beta-carotene* form is found in orange and yellow coloured vegetables and fruits such as pumpkin, carrots, paw- paw and mango, green leafy vegetables, cabbage, tomatoes and sweet peppers.

When we explored the roles/functions of these vitamins in the body, we discovered that vitamin A is necessary for the promotion of healthy vision, growth and development of the fetus strong bones and teeth and is also necessary to keep our skin moist.

Vitamin D plays a major role in bone growth and development as it enhances the absorption of calcium and phosphorus. You also learned that vitamin D can be made in the body with the help of sunlight.

Vitamin E plays a role in the body as an *antioxidant*, preventing the *oxidation* of vitamin A and protecting against the development of heart disease.

Vitamin K, like vitamin D, can be made in the body, synthesized from bacteria in our digestive tract. Vitamin K is found in a wide array of dark green and leafy vegetables e.g. cabbage, spinach and patchoi. Vitamin K also plays major role in allowing our blood to clot ensuring that we don't bleed to death.

Minerals

You learned about the precious minerals needed by our body for:

- Bodybuilding e.g. bone formation.

- Control of body processes, the balance of fluids and the contraction of muscle tissues.

- Formation of major constituents of essential body fluids e.g. *hydrochloric acid* in the stomach.

You learned that the minerals much like vitamins, were divided into two groups - the major minerals such as calcium, phosphorus, iron, sodium and potassium and the trace elements or minerals such as iodine and fluoride.

Major Minerals

Calcium is primarily responsible for bone and growth development and maintenance. Calcium also plays a major role in the contraction of muscle tissue and the transmission of nerve impulses.

Calcium is found in foods such as milk, cheese, yogurt and green vegetables e.g. broccoli and cauliflower.

You also learned that calcium, although widely available in vegetables, might be difficult to be absorbed due to the presence of compounds such as *cellulose, phytic acid* and *oxalic acid.*

You learned that in order to enhance calcium absorption from vegetables, we should eat the vegetables with calcium rich foods, such as cheese, and include other calcium-rich foods in our other meals throughout the rest of the day.

Ensuring that your diet supplies you with adequate calcium is important for everyone; however it is especially important for pregnant and lactating women, teenagers, young children and the elderly.

Phosphorus

Similar to calcium, phosphorus is necessary for the development and maintenance of strong bones and teeth. You learned that phosphorus is also necessary for energy production. Phosphorus is found in foods such as milk and milk products, cereals and green leafy vegetables.

Iron

Another important mineral that we discussed in this unit was iron. Iron, similar to calcium, is particularly important in the diet of pregnant and lactating women, newborn babies, teenage girls, athletes and very active people, strict vegetarians, as well as individuals who may experience an injury or operation (surgery).

Iron is part of the compound *haemoglobin* that transports oxygenated blood around the body and releasing oxygen for the muscle cells to do their work. Iron is also important for proper immune system functioning.

Iron is found in foods in two forms (or states):

-*Heme* iron mainly found in foods from animals such as: beef liver, beef, and other organ meats which originally contained *haemoglobin*. This form of iron is easily absorbed from the food into our intestines.

-*Non-heme* iron is chiefly found in foods from plant sources such as: green leafy vegetables, beans and fruit as well as appreciable amounts in curry powder and cocoa.

Iron absorption from *non-heme* food sources e.g. vegetables may be hindered by compounds such as *phytic acid* in whole grain cereals, *oxalic acid* in spinach, calcium and phosphorus and *tannic acid* in tea and nuts.

Iron absorption can be improved by doing the following:

- Consuming foods that contain vitamin C e.g. citrus fruit along with plant foods containing iron

- Consuming iron rich plant foods such as spinach (*non-heme*) with iron rich animal foods (*heme*) such as meat, poultry or fish. These foods contain a factor called the *MFP factor* (meat, fish and poultry factor) that enhances the absorption of iron.

Potassium, Sodium and Chloride

- These three minerals are important in maintaining the proper fluid balance and acid-base balance in our bodies.

- They are found in a wide variety of foods such as olives, salted meats and ordinary table salt.

Iodine

Iodine is a very important mineral needed in very minute amounts but responsible for production of the hormone *thyroxine* which controls the body's metabolic processes and body temperature.

Iodine is found primarily in seaweed (seamoss, Irish moss) or kelp as well as in iodized salt.

Fluoride

Fluoride is found in tea and seawater. Fluoride, because of its very important role in reducing tooth decay in young children and forming a protective coating around the enamel of our teeth, is a very important mineral in our diet.

Lastly we discussed the nutrient 'water.'

Water

Water is neither a vitamin nor a mineral, although it is a vital nutrient in the proper functioning of our bodies. All of the major systems in our bodies e.g. our circulatory and digestive systems, depend on water. Some functions of water in our body are:

- Moistening the mucous membranes of the lungs, stomach and mouth.

- Lubricating your joints and keeping your membranes moist.
- Keeping the volume of blood in our body consistent.
- Delivering nutrients to our cells and removing waste from our bodies.

Aside from tap or bottled water, water is found in a number of fruits and vegetables such as citrus, lettuce and cucumber.

How does your body maintain *water balance*?

Water balance is important so that all body processes function as normal and we don't suffer the effects of dehydration i.e. when our water output exceeds the amount of water that we intake.

You have achieved *water balance* when your water input or intake signalled by your thirst matches the amount of water you lose through perspiring or urination.

Assignment

Assignment

You have one week to complete this assignment. Upon completion you are to place it in a large envelope and deposit at the designated Student Support Centre.

Assignment:

You have received an e-mail from your friend who recently got married to a national athlete, stating that she is expecting her first baby. She is excited and would like you to advise her about the dietary practices that she and her husband should adopt. In doing so, please give her reasons for your suggestions.

Contents

Unit 5

Nutrition during the Early Years

Introduction

This is the first unit of three that deals with nutrition for life. Oftentimes you may have heard adults remark "how you start something is how you will end it" simply meaning that a good start predicts a good finish. In nutrition this is ever so important as good nutrition and positive eating habits early in life ensure good health later on in life. In light of this it is important that you understand the foundational nutrition principles presented throughout these lessons.

In this unit you will learn about the nutritional needs as well as how to plan meals for for pregnant and lactating woman so that their various nutritional needs are met. You will also learn how to plan meals for infants and toddlers as well as how to make mealtime a more positive experience for a young child.

Outcomes

Upon completion of this unit you will be able to:

- *Describe* the nutritional needs of pregnant and lactating women.
- *Describe* the nutritional needs of an infant.
- *List* the guidelines for the complementary feeding of infants.
- *Describe* the nutritional needs of a school aged-child.
- *List* the guidelines for developing positive eating habits in young children.
- *Plan* meals for a toddler and school-aged child.
- *Plan* meals for pregnant and lactating women.

How Long?

You need to devote approximately fifteen (15) hours to complete this unit. Nine (9) hours of formal study and six (6) hours of self-study.

This Unit is Comprised of Three Sessions

Session 5.1. Nutrition During Pregnancy and Lactation

Session 5.2. Breastfeeding and Beyond

Session 5.3 Nutrition in the Toddler Stages: Developing Positive Eating Habits in Young Children

Terminology

Colostrum:	A milk-like, watery substance produced in the first five days after delivery; before milk appears. It provides essential nutrients and immunity to the infant.
Edema:	Swelling of body tissue caused by retention of fluids.
Fetus:	The developing embryo eight (8) weeks after conception.
Kilocalorie:	A calorie is the unit by which energy from food is measured. A kilocalorie is equal to 1000 calories.
Lactation:	Production and secretion of breast milk, which is used to nourish the baby
Placenta:	An organ that develops inside the uterus, through which the fetus receives nourishment and oxygen. The placenta also serves to remove carbon dioxide and other waste products from ones body.
Trimester:	Pregnancy is divided into three periods or trimesters which last approximately three (3) months each. Each period has its own unique characteristics for both the mother and fetus.
Umbilical Cord:	A rope like structure through which the veins and arteries of the fetus reach the placenta to provide nourishment for the fetus.
Growth:	Human growth mainly deals with the physical aspects of development. It means that the there is increase in size or number.
Development:	In humans, development includes physical growth but also includes the process by which there is transformation in different stages of organs as well as a psychological transformation.

Session 5.1 Nutrition During Pregnancy and Lactation

Introduction

A pregnant woman can eat whatever she wants! After all she is eating for two, right? Wrong! A pregnant woman should eat wisely and not for two! During pregnancy, many changes are taking place in a woman's body and it is important that she prepares her body for these changes.

A healthy pregnancy means a healthy baby. But how do you ensure this? Complete this unit and you'll find out. Some of the things you will learn will equip you to help friends or family members who are already pregnant or contemplating pregnancy. You will be able to help them understand the changes that take place during pregnancy and why these change require us to behave wisely concerning our nutritional choices. You will learn also how to plan meals for pregnant and lactating women.

Upon completion of this unit you will be able to:

Outcomes

- *Outline* the physiological changes that take place in a woman's body during pregnancy, in relation to nutrition concerns.
- *Explain* the term lactation.
- *Explain* why there is a need for increased amounts of specific nutrients during pregnancy and lactation.
- *Explain* what the term 'eating for two' means.
- *Plan* meals for pregnant and lactating women.

How Long?

You need to devote three (3) hours of formal study to this unit and two (2) hours of self-study to complete this session.

DNA: Deoxyribonucleic Acid. This molecule contains the code to construct all other cells in the body and controls what an organism looks like.

Terminology

Neural Tube: The neural tube forms a spinal column which surrounds the brain and spinal cord.

Neural Tube Defect: Occurs when an opening remains in the spinal column during formation of the neural tube. This opening may result in a group of disorders such as *spina bifida* or the baby may be born without a brain.

Critical Period: During pregnancy this describes a period of intense growth and development and rapid cell division.

5.1-1 Changes in a Woman's Body During Pregnancy

What do we mean when we say that someone is pregnant? We mean that there is a growing person, a fetus inside of the woman. The period of growth for this fetus until it becomes full grown lasts for approximately forty (40) weeks. Forty weeks! Yes that is a long time for a woman to house this growing human inside her body. These forty (40) weeks are divided into three (3) month periods called trimesters. The fetus remains inside the woman's body until it is developed enough to fend on its own outside of the woman's body. This development of the fetus is helped along by the mother's good nutrition choices throughout this period.

Many physiological changes take place in the woman's body during pregnancy. Have you ever observed a pregnant woman? The most obvious feature is her growing abdomen, however along with her growing abdomen there are other changes taking place in her body that may not be as easily observed. Adequate nutrition during this period makes for a healthy baby and creates a good foundation for enjoying good health into adulthood.

Let's look at the illustration below. Do you notice the growing stomach and breast size?

Figure 1: Changes in the Woman's Body

http://pad3.wikihow.com/images/thumb/6/61/Pregnancy-Progression-1950.jpg/800px-Pregnancy-Progression-1950.jpg

Other changes occur which may not be as visible, such as:

i) The growing uterus

ii) Increased blood volume

iii) The need for extra energy carry around all the extra weight

iv) Bone development and growth of the fetus which impacts both the mother and fetus

The changes that take place in a woman's body don't only prepare the body for the growing fetus but also prepare the woman's body for feeding the fetus or lactation. In the next section we'll explore what the term lactation means.

5.1-2 Introduction to Lactation

Figure 1: A Woman Breastfeeding her Baby
http://images.cdn.fotopedia.com/flickr-2530902082-original.jpg
photo by hdptcar on Flickr

Lactation follows pregnancy. It may seem that we are talking about the end (lactation) without discussing the beginning (pregnancy) however the nutrition concerns of a pregnant woman are similar to those of the lactating mother.

Note it!

What you should note is that, the common issue shared by both pregnancy and lactation is that both periods are important in terms of the nourishment of the baby becauseof the significant amount of growth and development that occurs.

Lactation is the production and secretion of milk via the mammary glands or breasts. The milk produced is used to feed the infant, via breastfeeding in order to provide nourishment for the child. Glands in the breast called the mammary glands secrete the milk. During the time of physiological changes in pregnancy, hormones promote the growth and development of the milk producing cells.

How Does the Milk Move From the Breasts to the Baby?

The diagram below will tell you how.

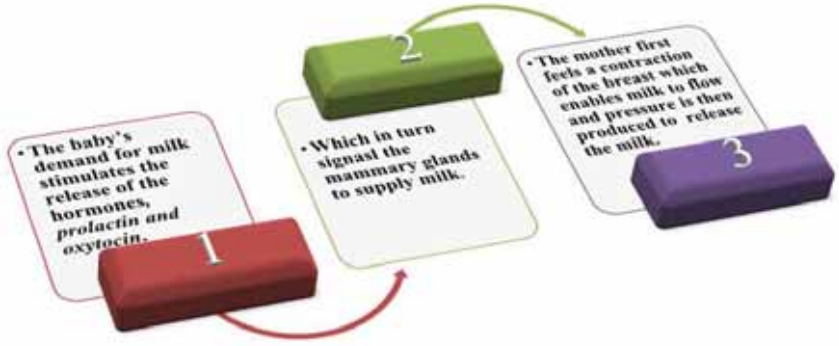


Figure 2: The Process of Lactation

We will look at actual breastfeeding in the next lesson. We are only just getting started!

Good nutrition ensures a healthy incident free pregnancy, healthy baby and lays the foundation for good health during adulthood. Before we move any further in this lesson, let's check to see if you understood what was covered above. In the table below, see if you can match each cause to an effect.

Activity

Draw a line from each cause to it matching effect. Use a pen or a pencil to draw the lines.

Cause	Effect
Pregnancy	Production and secretion of milk

Lactation	Increase in blood volume
Lactation	Increased energy needs
Pregnancy	Hormones, signal the mammary glands to supply milk
Pregnancy	Uterus grows

Hopefully you got all of them! If you didn't, try it again after you've re-read the previous material . Let's now move on to the actual nutrition needs during pregnancy and lactation.

Feedback

Cause	Effect
Pregnancy	Production and secretion of milk
Lactation	Increase in blood volume
Lactation	Increased energy needs
Pregnancy	Hormones, signal the mammary glands to supply milk
Pregnancy	Uterus grows

5.1-3 Specific Nutrients Needed During Pregnancy and Lactation

Before we move on, let's do a brief review of the *macronutrients* and *micronutrients.*

- The *macronutrients* are: protein, carbohydrates and fat.
- The chief function of *macronutrients* is to provide our bodies with energy for optimal functioning. Also, protein specifically aids in the growth and repair of body tissues.
- The *micronutrients* are vitamins and minerals.

- The *micronutrients* function in the body is to control or regulate body processes, such as energy release, growth and maintenance of bones and teeth, production of DNA and RNA (heredity material), transmission of nerve impulses and a number of other functions.

Now that we've done our brief review, let's continue. The *micro* and *macronutrients* n are important in pregnancy due to the very nature of pregnancy. During pregnancy the woman's body needs some extra amounts of specific nutrients for the rapid pace of growth and development that takes place with the fetus inside of her. If the needs are not met by the womans diet, the baby, (which is like a parasite as some people say) takes what it needs from the mother.

Figure 4: The Placenta- Very Important to Fetal Nourishment
Image: DEU

How Does the Baby Behave like a Parasite*?*

Nourishment for the fetus passes from the mother to the fetus via the placenta. Not only do nutrients pass through to the baby, but any waste material from the fetus passes back through the placenta as well. This is not a biology course but it important that you understand this, so that you can appreciate the significance of the mother consuming a balanced diet with nutritious foods during this period. Do you see the placenta and the umbilical cord in the illustration above? The illustration below also shows this image.

Note it!

If the mother's diet is nutritionally imbalanced, the baby's needs are satisfied first. A good example of this occurrence is with the nutrient calcium which is crucial for the growth and development of the fetal skeleton. If the intake and absorption of calcium is lacking in the mother's diet the mother's own calcium stores in her skeleton are depleted and supplied to the fetus. Why is this important? If this happens, the mother's bones and teeth are weakened. Can you see why the mother's diet should be nutritionally balanced?

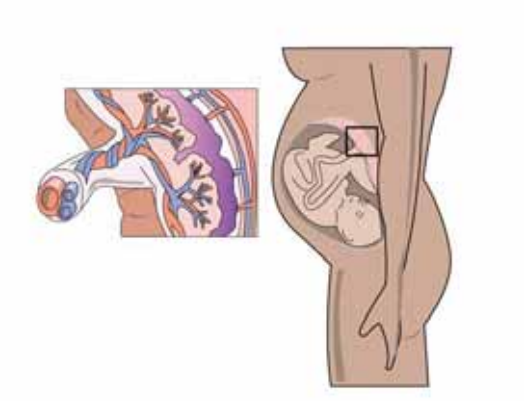


Figure 5: The Placenta- Central to the Fetus' Nourishment

Let's continue discussing the nutrients needed by the growing fetus.

What are the nutrients needed by the growing fetus? We'll start our list by looking at the vitamins and minerals, and then we'll look at the the *macronutrients*.

The vitamins we'll discuss are folate, vitamin B12, and vitamin D. The minerals we'll discuss are calcium and iron.

Folate or Folic Acid Two Forms of the Same Vitamin

Why is folate important? Folate is important for the synthesis of DNA and new cells. Folate is needed at a critical period in the baby's development. What do we mean by a critical period? A period is described as critical because particular cellular activity e.g. development of the central nervous system in the first few weeks of pregnancy or development of the legs and arms which occurs during the fourth to eighth week of pregnancy. Any adverse events that occur at this time, such as inadequate nutrition, will have irreversible effects on the development of the cells or organs even as the pregnancy progresses.

Folate is also important in the development of the brain and nervous system. Since many women only know that they are pregnant a few weeks after conception by this time the baby's brain has already begun to develop. Therefore women of childbearing age are encouraged to take a folic acid supplement containing 0.4mg folic acid as a preventive measure; even before pregnancy. Further, vitamin B12 is also necessary along with folate for DNA synthesis.

Foods that are a good source of folate include fortified cereals and green leafy vegetables.

Figure 4: Folate Rich Broccoli
Image: m_bartosch / FreeDigitalPhotos.net

Figure 5: Whole Grain Bread
Image: Grant Cochrane / FreeDigitalPhotos.net

Iron

Why is iron so important? During pregnancy the mother's blood supply increases, which provides an increased blood volume for both mother and fetus as an increase in the mother's blood facilitates the needs of the developing fetus.

Iron requirements increase during pregnancy since the mother must have a supply of iron for herself as well as for the baby and its growing blood supply in the first six (6) months of its life. In order to meet these extra needs, iron supplementation is recommended for some women.

Foods in which iron can be found include: red meat, corned beef, organ meats (e.g. liver, kidney, curry powder,) cocoa, raisins, dried fruit, as well as green leafy vegetables.

Figure 6: A Good Source of Iron is Beef
Image: Suat Eman / FreeDigitalPhotos.net

Calcium / Vitamin D

Why are calcium and vitamin D important to the pregnant woman? These two nutrients are especially important for the growth and development of bones/skeleton of the fetus. Further, the last few weeks of pregnancy is another critical period, as during this time there is rapid skeletal development.

Sufficient calcium and vitamin D are an especially important for both mother and baby. A shortfall in the diet of the mother will result in the loss of calcium from her skeleton, leading the weakening of her bones and teeth. Why does this happen? It is important to note that the baby's needs are more important than the mothers needs during this time!

Foods in which calcium are found include: milk and milk products, edible soft bones of canned fish as well as fortified breads and orange juice. Calcium is also found in vegetables such as broccoli and cauliflower.

Figure 7: A Glass of Milk
Image: Ambro / FreeDigitalPhotos.net

Figure 8: Edible Bones of Sardines
Image: Carlos Porto / FreeDigitalPhotos.net

Figure 9: Cauliflower
Image: FreeDigitalPhotos.net

Fats

Fats are not all bad! Essential fatty acids such as Omega 3's (specifically linoleic acid) are important in the diet of the pregnant women. Why are they important? Essential fatty acids are important for the optimum growth, function and structure of the fetus' brain. It is also important to recognize that humans make special fatty acids from fatty acids in breast milk.

Foods in which essential fatty acids are found include: vegetable oils, meats, nuts and seeds, shellfish and fish.

Figure 10: Nuts are a Good Source of *Unsaturated* Fats
Image: Maggie Smith / FreeDigitalPhotos.net

Energy Needs

Why does a woman need more energy during pregnancy? To support the various metabolic demands of pregnancy of course! During pregnancy, an extra 300 calories are needed but only in the second and third trimester. Do you remember what a calorie is? A calorie is a unit of energy. It is used as a measure of the amount of energy a particular food provides to the body.

Pregnant teenagers and underweight women may need more than the recommended 300 extra calories.

Carbohydrates are a chief source of energy. Foods that provide energy include: cereals e.g. rice pasta, starchy roots and tubers e.g. potato, ground provisions (i.e.sweet potato, cassava and starchy vegetables,) bananas and breadfruit as well as other fruits that provide sugars and dietary fiber important for the prevention of constipation.

Figure 11: Ground Provision

Figure 12: Green Bananas- A Carbohydrate-Rich Food
Image: Simon Howden / FreeDigitalPhotos.net

Figure 13: Spaghetti
Image: Suat Eman / FreeDigitalPhotos.net

Protein

Proteins are important for tissue growth and development of mother and child. Extra protein in the diet should be consumed only during the second and third trimester. Protein foods the mother should consume include: meat, fish, poultry as well as dairy products.

Water

Water is very important especially for the lactating mother. A lactating mother needs water to help in the production of milk for breastfeeding. Foods that contain water include: all fruit and vegetables, plain old water and other beverages such as fruit juices.

Now that we've gone through this long list let's check to see if you remembered what nutrients were needed for what process in pregnancy.

Activity

Your friends are curious to know about pregnancy and the many issues concerning it. Explain to them how the following conditions may have developed.

a) The baby was born with a neural tube defect such as *spina bifida*

b) The mother had dental problems after pregnancy

c) The fetus' brain development was stunted

d) The pregnant woman became constipated

Feedback

Here's what you should have been able to explain to your friends:

a) The neural tube defect *spina bifida* was as a result of the incomplete closure of the spinal cord as a result of an inadequate intake of the 'B' vitamin folate.

b) The mother's dental problems after pregnancy were a result of poor calcium and vitamin D intake during pregnancy . The mother's calcium stores in her skeleton and bones were depleted to provide for the baby's more urgent need for the development of its bones and teeth.

c) The baby's brain development was stunted because of the inadequate intake of the essential fatty acids omega 3 and 6, which are crucial to brain development.

d) The pregnant woman became constipated because of inadequate intake of foods that supply dietary fibre and water. The result was a hardened stool and difficulty having a bowel movement,.

5.1-4 'Eating for Two' or 'Like Two'

When people discover someone is pregnant they may likely exclaim "ah you are eating for two now!" What does that really mean? Should the woman wolf down food all day every day? It is important to distinguish 'eating for two' from 'eating like two,' since this could mean the difference between becoming overweight and experiencing other health complications during and after delivery. What does 'eating for two' mean? Let's start with what it does not mean?

'Eating for two' does NOT mean eating twice the amount of food.

After all, it's not two full sized adults you are eating for! It DOES mean however, that the diet of a pregnant woman is the sole source of nutrients for the baby and therefore the nutrients are more efficiently absorbed to satisfy the demands of the growing and developing fetus.

‘Eating for two’ really means that the woman’s diet should provide sufficient nutrients to cope with the demands of the growing and developing fetus as well as still be able to meet the woman’s nutritional needs.

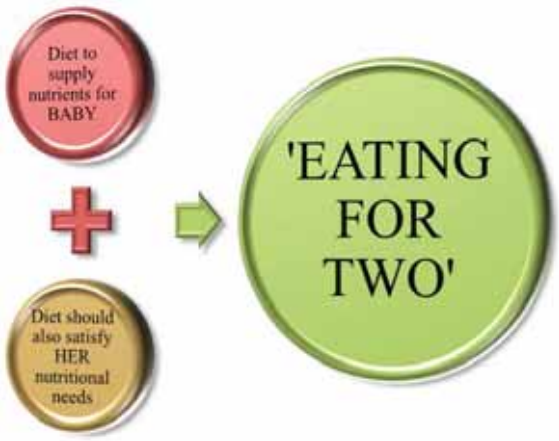


Figure 16: ‘Eating for Two’

We’ve already discussed the nutritional needs relating to the pregnant and lactating woman. But how does this translate into the dietary practices a woman should adopt during her pregnancy?

Dietary Practices a Pregnant Woman Needs to Adopt

- A pregnant woman needs extra calories, 300 to be exact. This is only necessary in the second and third trimester. Do you remember what’s a trimester is?

- The extra calories translate into any one of the following foods:

1. 1 cup of yogurt

Figure 14: Yogurt

Image: Simone Reid-Foster

- A peanut butter sandwich

Figure 15: Peanut Butter Sandwich
Image: DEU

- 1 small fruit e.g. an orange

Figure 16: An orange
Image: Keattikorn / FreeDigitalPhotos.net

- For the duration of the entire pregnancy a woman should gain an overall total of 25 -30 pounds, when starting at a normal weight. Take a look at the illustration below to see where the extra weight goes.

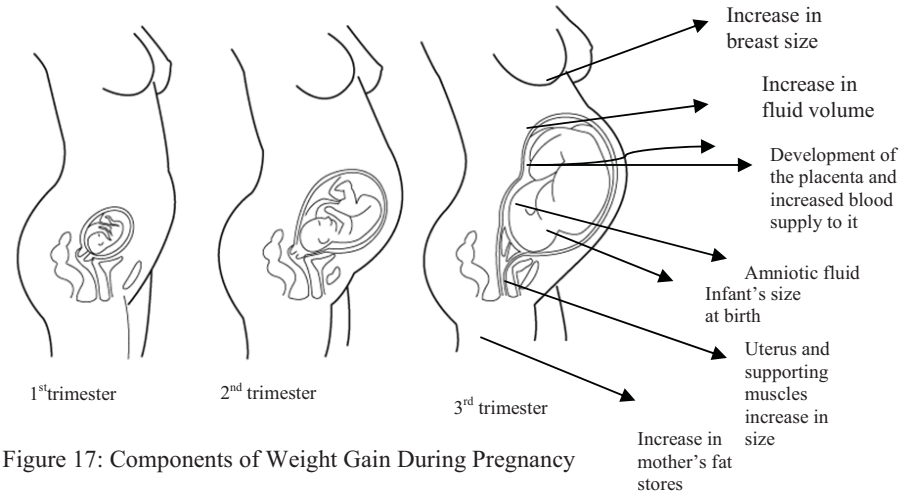


Figure 17: Components of Weight Gain During Pregnancy

- The pregnant woman needs to avoid empty calorie or energy dense foods. Empty calorie foods are foods that provide lots of calories (see unit 2) and not other nutrients e.g. high fat or sugary foods like sweets. Instead she should consume nutrient dense foods e.g. nuts, yogurt, fresh fruit and vegetables.

Note it!

Nutrient density refers to a measure of the nutrients a food provides relative to the energy it provides. The more nutrients and fewer calories, the food provides the higher the nutrient density of the food.

Eat a variety of foods as close to their natural state as possible such as fruits and vegetables that have had minimal cooking or processing .

You should clearly understand the concept of 'eating for two' during pregnancy, since the health impact for both the mother and infant can have long lasting effects. How well do you understand this concept? Answer the questions in the activity below.

Activity

Explain in a paragraph how a pregnant woman ‘eats for two’ during her pregnancy.

Feedback

Below are a few ways in which a woman ‘eats for two’ during pregnancy:

A pregnant woman can ‘eat for two’ during her pregnancy by consuming an extra 300 calories which is necessary during her 2nd and 3rd trimester.

Consume nutrient dense foods such as nuts and/or yogurt that contain more nutrients than energy.

A woman ‘eating for two’ during her pregnancy consumes enough food with the requisite nutritional value to meet the baby’s nutritional needs as well as her own. She does not need to eat twice the amount of food.

5.1-5 Meal Planning for the Pregnant and Lactating Woman

Figure 18: Preparing her Meal
James Gathany: http://phil.cdc.gov/PHIL_Images/7905/7905_lores.jpg

In the previous section we learned how pregnant women should 'eat for two.' In this section we'll look at factors to consider when planning meals for pregnant women.

Our six food groups (staples, leafy and yellow vegetables, legumes, fruit, foods from animals and fats and oils) form the basis upon which we plan meals. The servings of food for each group should serve as a guide for the quantity to be consumed daily.

Do you remember, how may servings of each food group you should consume? The diagram below should give you an idea of the quantity or size of a single serving of some popular foods.

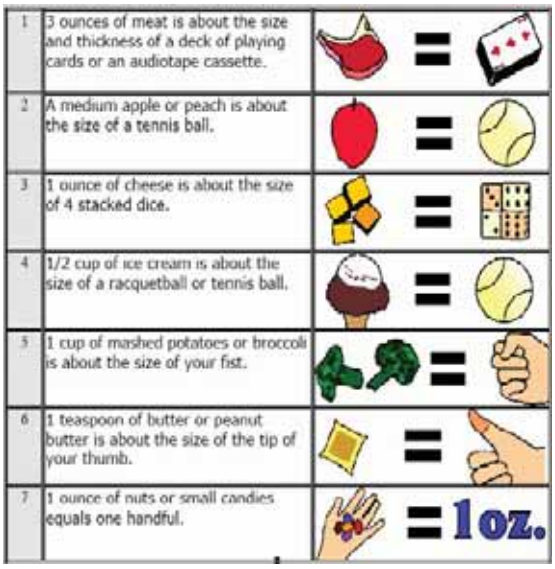


Figure 19

Now that your memory is refreshed, let's look at the guidelines that we should follow when planning meals for pregnant and lactating women.

Breakfast, Lunch or Dinner

- Include foods from at least four of the food groups to ensure a healthy breakfast e.g. staples such as bread or bagels food from animals such as salted cod fish or eggs, fruits such as oranges or papaya, and dark green leafy and yellow vegetables such as spinach or ochroes.
- Ensure foods rich in the nutrients protein e.g. chick peas or chicken, carbohydrates e.g. whole grain muffins, oatmeal, fats, e.g. avocado, vitamins and minerals e.g. carrots, and bananas are chosen

Snacks

Look at the photo of the pregnant lady below, what's in her hand? This should give you a good idea of the appropriate snacks for a pregnant woman.

Figure 20
James Gathany: http://phil.cdc.gov/PHIL_Images/04281999/00001/40G0033_lores.jpg

- Snacks should be nutrient dense foods e.g. nuts, fruit, vegetables and sandwiches. Here are a few examples:

Figure 21: Fruit Parfait an Excellent Snack
James Gathany:http://phil.cdc.gov/PHIL_Images/13089/13089_lores.jpg

Figure 22: Oats, Raisins and Nuts
Image: Michelle Meiklejohn / FreeDigitalPhotos.net

Beverages

- Beverages should also be nutrient dense e.g. fruit smoothies, milk drinks as well as fruit juices and of course water; especially important for the lactating woman.

Figure 23: Fruit Smoothies are an excellent snack
James Gathany: http://phil.cdc.gov/PHIL_Images/13076/13076_lores.jpg

Activity

a) Plan and write a breakfast menu you intend to serve to your pregnant aunt.

i. Indicate which food group the major ingredient in each dish belongs to, e.g. scrambled eggs belong to the food from an animal group.

ii. Indicate which food/dish contains the nutrients necessary in the diet of a pregnant woman.

b) List four items suitable as a snack for pregnant women.

1.

2.

3.

4.

Feedback

Breakfast for a pregnant woman should follow the following format and food groups:

a) Fruit, staples (cereal), food from animals, breadstuff (staples), beverages (hot/cold)

b) Suitable snack items include: fresh/dried fruit, dairy products (e.g. cheese cubes, milk drinks, puddings, yogurt,) smoothies, granola, cookies, vegetable sticks etc.

5.1-6 Food Substances to Avoid During Pregnancy and Lactation

As we have discussed, good nutrition during pregnancy has great benefits for the mother, unborn child and even their grandchildren. Even more important is how this nutritious food gets to the fetus. Food is passed from the placenta to the fetus. Therefore, it stands to reason that just as nutritious substances get to the fetus, unhealthy substances also have an opportunity to get to the fetus. As a result, unhealthy substances should be omitted from the diet of a pregnant woman, to prevent the risk of infection from contaminated foods, or other birth complications e.g. *fetal alcohol syndrome*

a) Avoid food poisoning by avoiding the following foods:

   i. Seafood with high levels of mecury e.g shark, tuna, raw fish dishes e.g. sushi.

   ii. Soft cheeses e.g. brie and feta and unpasteurized milk products.

   iii. Raw/undercooked meat, poultry, eggs e.g. in homemade salad dressings such as mayonnaise.

b) Avoid consumption of these substances:

Figure 27: No Smoking if you're Pregnant
Image: Idea go / FreeDigitalPhotos.net

Figure 28: No Alcohol of you're Pregnant
Image: Danilo Rizzuti / FreeDigitalPhotos.net

   i. Alcohol

   ii. Tobacco

   iii. Medicinal (except prescribed by a doctor) or illicit or drugs (which should be avoided at all times!)

   iv. Herbal supplements

   v. Caffeine

Session Summary

Summary

In this unit you learned about the nutritional concerns that relate to pregnant and lactating women.

Good nutrition during pregnancy and lactation is important for the proper growth and development of the fetus as well as the mother.

We started off by discussing the changes that take place during pregnancy. These changes drive the need for extra nutrients in the mother's diet.

So what are these nutrients and why are they needed?

Nutrients	Importance	Food Sources
Folate	Needed for DNA manufacture, cell and red blood cell manufacture, prevention of birth defects, neural tube defects e.g *spina bifida.*	Green leafy vegetables, fortified cereals.
Iron	Needed due to the increased blood volume in the mother used to supply the needs of the developing fetus, and therofore provide the baby with a ready source of iron during the first six months of life.	Foods from animals such as red meat, corned beef. Also cocoa, curry powder, dried fruit and raisins contain iron.
Vitamin B12	Needed for DNA and cell production.	Foods from animals.
Calcium / Vitamin D	Necessary for the development of strong bones and teeth. Vitamin D helps the efficient absorption of calcium and phosphorus.	Milk, milk products, soft edible bones of canned fish.

Fats	Especially essential fatty acids such as: Omega 3 and 6, linoleic, linolinic acid	Necessary for brain development of the fetus. Humans make special fatty acids from these fatty acids which are found especially in breast milk.
Energy needs	Necessary to support various metabolic demands of pregnancy.	Carbohydrates.
Protein	Needed for the growth and development of the cells and tissues of the fetus and mother.	Foods from animals as well as plant sources: e.g. meat, fish and poultry, legumes, peas and beans.
Water	Especially important for a lactating mother.	Fruits, vegetables, water and beverages.
Fibre	Prevention of constipation.	Fruits and vegetables

'Eating for Two'

- Means that the pregnant woman's diet should be sufficiently nourishing to provide nutrients for the growth and development of the fetus and herself.
- What it does NOT mean is that the pregnant woman should eat twice as much food.
- The pregnant woman should consume at least 300 extra calories to cope with the energy demands of pregnancy.
- Should occur in the second and third trimester. It is important that a pregnant womans diet consists of nutrient dense foods. Nutrient dense foods are foods that posses an energy contribution less than the nutrients it contains.

Meal Planning for the Pregnant and Lactating Woman

Guidelines:

- Include foods from at least four of the food groups to ensure a healthy breakfast
- Ensure foods rich in the nutrients protein, carbohydrates, fats, vitamins and minerals are chosen
- Snacks should be nutrient dense foods e.g. nuts, fruit and vegetables
- Beverages should also be nutrient dense, i.e.fruit smoothies, milk drinks as well as fruit juices and of course water, especially important for the lactating woman

Food Substances to Avoid:

- Seafood with high levels of mercury e.g. shark and raw fish dishes
- Soft cheeses and unpasteurized milk products
- Raw/undercooked meat, poultry and eggs
- Alcohol
- Tobacco
- Illicit drugs, some types of medicines
- Caffeine

Now that we've come to the end of this lesson, you need to check that you not only understood, but also remember all that we did thus far. Complete the assignment below.

Assignment

Assignment

Answer the following questions about pregnancy and lactation to check your understanding of this period in life.

1. Explain why good nutrition during pregnancy and lactation is important under the following categories:

   Pregnancy outcome

Fetal growth and development

2. Develop a brochure for the health centre in your neighbourhood showing why the following nutrients are important during pregnancy:

i) *Macronutrients:* CHO, protein, fats

ii) *Micronutrients*: vitamin D, vitamin B12, folate

iii) Minerals: iron, calcium

3.. List five (5) foods suitable to be served at the following meals for a pregnant and/or lactating woman:

Breakfast

Snack

Lunch/Dinner (include a suitable dessert)

Session 5.2 Breastfeeding and Beyond

Introduction

Breastfed is best fed! What does this mean? Research has shown that there are certain benefits such as better health and bonding with the mother that a breast fed baby enjoys as opposed to a bottle fed baby. The picture on the left demonstrates the bond between mother and baby. In this lesson we'll explore this concept.

Many people, men and women alike have a negative concept about breastfeeding. Some feel it negitivly affects the body's shape, some women experience, discomfort during breastfeeding, and breastfreeding in public often also warrants negitive pubic reactions, however after you've completed this lesson you will understand the many positive benefits of breastfeeding to both the infant and mother. We will also explore the concept of good nutrition for the infant after breastfeeding.

Upon completion of this unit you will be able to:

Discuss in writing the benefits of breastfeeding to the infant and the

Outcomes

mother.

Explain why some mothers bottle feed their babies.

Explain why breastfeeding is more advantageous to the infant than bottle feeding.

Define the term 'replacement feeding.'

State the guidelines for successful complementary feeding of infants.

How Long?

You need to devote three (3) hours of formal study to this unit and two (2) hours of self-study to complete this session.

Terminology

Mammary Glands: The glands in female's breasts that produce and secrete milk for the nourishment of the baby.

Oxytocin: A hormone that stimulates the mammary glands to increase contraction of the uterus during labor and stimulates the ejection of milk into the ducts of the breasts.

Prolactin: A hormone that acts on the mammary glands to begin and sustain milk production.

Lactation: The production and secretion of breast milk that is used to feed the infant.

Uterus: The organ in the lower part of the female within which the infant develops before birth.

Placenta: The organ that develops inside the uterus early on in pregnancy through which the fetus receives nutrients and oxygen and the waste and carbon dioxide are eliminated.

Complementary Feeding: Giving other foods in addition to breast milk to the baby. 'Complementary feeding' usually begins at six (6) months and ends at twenty-four (24) months.

Multi- Mix Principle: A system of combining foods from food groups to ensure that the right balance and combination of foods are selected for our meals.

5.2-1 Benefits of Breastfeeding

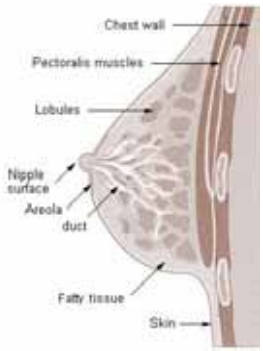


Figure 24: Mammary Glands or Breast

Before we even talk about the benefits of breastfeeding, we need to talk about what breastfeeding is. Breastfeeding is a learned behaviour. There are two components to breastfeeding.

1. Firstly, the mother's mammary glands, through the action of hormones, secrete milk that is eventually fed to the infant. This process begins before delivery in the last few weeks of the final trimester (see terminology).

2. The second component/phase of breastfeeding occurs after the delivery of the infant. The mother's body, with the help of the hormones oxytocin/prolactin via what is called the 'let-down reflex, urged on by the hormone oxytocin, release the milk that the infant is then fed.

Is Breastfeeding a Learned Behaviour?

Yes. Breastfeeding is supposed to be a naturally occurring event. After all it is the way that the infant is nourished at the very least for the first six (6) months of its life! However, for the baby and mother to enjoy the benefits of breastfeeding, the baby should be introduced to the breast soon after delivery as this helps the infant latch onto the breast accurately. The mother must also learn how to overcome any anxiety or physical discomfort that she may experience as well as how to position her body so that both she and the infant are comfortable. The diagram below, gives you a summary of the breastfeeding process.

Figure 25: The Breastfeeding Process

Breastfed is best fed! Check out the table below, to find out why a breast fed baby is best fed. There are benefits to both the mother and the infant. The first table shows the benefits to the mother and the second shows the benefits to the infant. Tick off each benefit as you read it.

#	Benefits of Breastfeeding to the Mother	☑
1	Development of strong bond between mother and child	❑
2	Convenient, readily available, no preparation needed	❑
3	Contracts the uterus	❑
4	The milk is at the temperature and consistency the baby needs	❑
5	May protect against cancer	❑
6	Lengthens the intervals between pregnancies by delaying the return of regular ovulation	❑

#	Benefits of Breastfeeding to the Baby	☑

#	Benefits of Breastfeeding to the Baby	☑
1	Provides essential nutrients in the correct quantity and mix	❑
2	Provides the infant with immunity from diseases, infections as well as the development of allergies; due to colostrum and sterile milk	❑
3	Action of sucking produces hormones that in the baby's body that develops the intestines and make for more efficient absorption of nutrients	❑
4	Less chance of an overweight baby, since the baby only takes what it needs.	❑
5	All milk is digested, leading to a feeling of satiety	❑
6	There's a reported positive association between breastfeeding and an intelligent child	❑

Activity

Complete the following activity on why breastfeeding is important.

Write down five (5) reasons why breast feeding is beneficial to:

i) The mother

ii) The infant

1. _____

2. _____

3. _____

4. _____

5.

Feedback

Five (5) reasons breastfeeding is beneficial to the mother:

1. Creates a bond between the mother and infant.
2. Convenient and needs no preparation, and the mother has more time to herself.
3.Contracts the uterus.
4.The milk is at the temperature required by the infant.
5.Lengthens the time between pregnancies.

Five (5) reasons why breastfeeding is beneficial to the baby:

1. Provides essential nutrients in the correct quantity and mix. . 2. Provides immunity from diseases and infections as well as the development of any food allergies. 3. There is less chance of an overweight baby, since the baby only eats what it needs.
4. The sucking action produces hormones that develop the baby's intestines and makes for a more efficient absorption of nutrients. 5. All of the milk is digested leading to a feeling of satiety 6. There has been a positive association established between a breastfed child and an intelligent child.

Look back at the table, how did you do? If you did not do well, re-read the information and try the quiz again.

It is important that overall pregnant and lactating mothers adopt good breastfeeding practices.

Note it!

Here are some good breastfeeding practices:

Feed the baby on demand, rather than on a rigid schedule because feeding the baby on demand helps the baby develop its own feeding timetable and not be over fed.

Breastfeeding take time to be properly established.

Expect some problems sore, cracked nipples, engorgement and infection.

Have you begun to change your mind about some of the misconceptions surrounding breastfeeding? If you are still unconvinced about the benefits of breastfeeding you can check out the World Health Organization's (WHO)

website which may provide you with additional information to help you decide about the benefits of breastfeeding. Here's the address; http://www.who.int/features/factfiles/breastfeeding/en/index.html type the URL into your browser and click enter.

5.2-2 Bottle Feeding

Figure 26: Which Should He Choose?

If breastfeeding is so beneficial, why are some babies bottle fed?

Why Bottle Feed?

Figure 27: Why are Some Babies Bottle Fed?

Breastfeeding may not be an option for some women. Why is this so? While breastfeeding may be a natural function, it may not be a natural instinct for some women. Some mothers, before they are taught or instructed, have difficulty getting their baby to attach to their breast and/or may suffer some physical discomfort. Also, due to health issues such as HIV/Aids, or other critical health concerns, sometimes mothers are unable to choose breastfeeding as an option.

A premature baby, one with birth defects or one that has difficulty suckling, may be unable to breastfeed.

Generally though when mothers choose to bottle feed their newborn it is usually because of the following:

- Negative societal feelings toward breastfeeding especially from the baby's father, members of the public who may frown on the mother for breastfeeding in public or restrictions in public institutions.
- The mother chooses to bottle feed because of her concerns for her body image, work or travel commitments.
- Health reasons as discussed above.

Advantages and Disadvantages of Bottle Feeding

Can bottle feeding be advantageous to the baby? Yes, if done as instructed. Here's a list of the advantages of bottle feeding Even though there are advantages there are also disadvantages to bottle feeding.

Advantages of Bottle Feeding	Disadvantages of Bottle Feeding
Bottle fed babies need to be fed less often since formula is digested slower than breast milk leaving the baby fuller for longer periods of time.	It is expensive.
Bottle feeding leaves the mother with more time to herself, since she is not feeding the baby on demand.	It is time consuming, since bottles have to sterilized and washed as well as formula to be mixed.
The mother can return to 'normal' life much sooner, since, her dress and diet regime is not centered on the baby's need for nourishment. She can also use any method of contraception she chooses.	May encourage the development of infections and put a strain on the baby's kidneys if incorrectly done.
Anyone can feed the baby,	Keeps the mother to a rigid feed

Advantages of Bottle Feeding	Disadvantages of Bottle Feeding
allowing the mother time to rest.	timetable.
The mother knows exactly how much the baby has had and how much nourishment it has received.	Facilitates the overfeeding of the baby and disturbs the development of the baby's (natural) physiological hunger mechanism.
	Encourages tooth decay known as bottle tooth decay.
	Baby formulas may not adhere to set nutrient standards for baby milk.

Precautions to Observe when Bottle Feeding

If a woman chooses to bottle feed, there are some precautions she should take. It is important to note at the outset though that babies who are bottle fed at not at any disadvantage IF the following are observed:

Figure 28: Baby Bottle
By Jjackoti (Own work) [GFDL (www.gnu.org/copyleft/fdl.html) or CC-BY-SA-3.0-2.5-2.0-1.0

- Milk- (formula) milk- is prepared exactly as instructed, using the measurement given by the manufacturer. Too much or too little of the milk powder can result in malnutrition.

- Bottles, teats (nipples), sterilized after each use- so that bacteria do not develop.

Figure 29: Teat or Nipple for Baby's Bottle
By Dobromila (Own work) [GFDL (www.gnu.org/copyleft/fdl.html) or CC-BY-SA-3.0-2.5-2.0-1.0

Activity

a. Visit a grocery store in your neighbourhood:

   i. Record the price of two different brands of baby formula.

   ii. Record how many possible feedings can be had in one week

   iii. Calculate how many cans of formula may be needed to be purchased in one month. How much does it cost to bottle feed for one month.

   Write your answer in the spaces below:

b. List below the possible steps involved in bottle feeding a baby. Do the same for breastfeeding.

   i. Which activity has the least amount of steps?

Feedback

Steps in bottle feeding: Sterilize teats and bottles, heat water for formula, measure and mix formula as directed by manufacturer, check to see formula is at room temperature, feed baby, wash and sterilize bottle.

Steps in breastfeeding: Place baby to suckle at breast, baby latches on and is fed.

Breast feeding has the least steps.

5.2-3. 'Complementary Feeding'

What does the word 'complementary' mean? It means combining two things so that the lack in one is made up for in the other thus completing the whole to make perfect. 'Complementary feeding' or 'weaning' as it is sometimes called, means removing the young child off breast milk and gradually introducing solid foods. The baby is fed solid foods in addition to being breastfed.

Figure 30: Baby Being Fed Semi Solid Foods
Image: federico stevanin / FreeDigitalPhotos.net

Remember that up until the age of six (6) months the infant is receiving its nourishment solely from breast milk The baby's supply of iron as well as other necessary *micronutrients* from the mother's breast milk is depleted after six (6) months, although at this time the baby's energy needs also increase therefore these nutrients must be supplied from other foods. Additionally, the period after six (6) months up to twenty-four (24) months is a period of critical growth and

development of the infant. In order to prevent malnutrition it is important that the baby's diet of milk is supplemented or complemented.

Note it!

What is 'Complementary Feeding?'

It is the giving of other foods (solid food) in addition to breast milk to the baby. 'Complementary feeding' usually begins at six (6) months and ends at twenty-four (24) months.

'**Replacement feeding'** is not 'complementary feeding!' What is it? It is feeding given to a child who is not receiving any breast milk with a diet that provides all the nutrients the child needs.

The mother may make specially prepared foods that she mashes up so it is easier for the baby to eat or she may take foods directly from the family pot, mash them up and serve them to the baby. Commercially prepared foods may be bought, but that is unnecessary. At the end of the period of 'complementary feeding,' the baby should be fully shifted to eating solid foods along with their other family members.

You may question, "what's all the fuss about 'complementary feeding?'" "What happens if we don't begin at the right time?" "What about babies who were bottle fed, do they need 'complementary feeding' as well?" Let's start with the first question.

What's all the Fuss About 'Complementary Feeding?'

Babies are at a critical period of growth and development between the period of four (4) to six (6) months, their energy needs increase and for those who are solely fed breast milk the nutrient stores of iron and other *micronutrients* begins to be depleted. 'Complementary feeding,' during which solid foods are added to the baby's diet in addition to breast milk is a perfect way to solve this dilemma of adequately meeting the baby's nutrient needs.

Physiologically and socially, 'complementary feeding' also helps develop the baby's motor skills, coordination skills and provides another opportunity for the baby and mother (or other important family member) to bond.

What Happens if 'Complementary Feeding' does not Begin at the Right Time?

The ideal time to start 'complementary feeding' is at six (6) months because:

- The baby's enzyme system and gastrointestinal wall have adequately matured to digest a variety of foods.
- The baby's head and neck muscles are strong enough for head control and the coordination of the tongue, lips and swallowing.
- The baby's oral reflexes have developed to swallow semi-solid and solid foods.

- The baby's immune system is ready to handle other foods and to protect against bacteria that may be present in food or improperly handled food and allergies.
- The baby's kidney system will not be overloaded.

Activity

Complete the following exercise about 'complementary feeding' in the spaces provided.

1. 'Complementary feeding' is the giving of _____in addition to _____.

2. 'Complementary feeding' is also known as _____and it begins from the age _____months to _____months.

3. State three reasons why 'complementary feeding' is important.

1. _____

2. _____

3. _____

_____

Feedback

'Complementary feeding' is giving a baby other foods in addition to milk. 'Complementary feeding' is also known as 'weaning' and it begins at six (6) months and ends at twenty-four (24) months.

Three reasons why 'complementary feeding' is important:

1. Babies are at a critical period of growth and development between the periods of four (4) to six (6) months.

2. As a baby's energy needs increase, breast milk alone will not meet the energy demand.

3. For those babies who are solely fed breast milk, the nutrient stores of iron and other *micronutrients* begin to be depleted.

Characteristics of 'Complementary' Foods

Suitable foods for 'complementary feeding' have the following characteristics:

- High in energy giving nutrients, supplied by staple foods.
- Good sources of iron and other *micronutrients* such as calcium for strong bones and skeletal development, vitamin A and vitamin C to protect from infection and folate for red blood cell and DNA development.
- Free from added salt and sugar or even pepper.
- Free from any dietary restrictions (e.g. reduction of fat) especially for children under two (2) years of age.
- Prepared and served in a clean and safe environment i.e. that are from any disease causing bacteria, contain no toxins, free from bones, pits from fruit and are served at body temperature, not boiling hot and are normally crushed, mashed, cubed or pureed.
- Easy to prepare.

Foods that Pose a Hazard to Young Children

Very young children should avoid foods that are they may easily choke on. These foods include: nuts, peanut butter, popcorn, small round foods such as grapes and small pieces of hot dog.

Suitable Foods for 'Complementary Feeding'

These foods as we discussed earlier may be specially prepared or served from the family pot.

They should include:

Staple foods that supply energy include:

- E.g. cereals, rice, pasta, starch vegetables, breadfruit, green banana, ground provisions, cassava (yucca), dasheen (taro), eddoes etc.

Figure 31: Green Bananas
Image: Simon Howden / FreeDigitalPhotos.net

Figure 32: Ground Provisions
Image: DEU

Staple foods alone are unable to meet the nutrient needs, therefore they should be served with other foods such as:

Protein Foods from both Plant and Animal Sources

- Plant sources include dried peas and beans e.g. blackeye peas, channa (chick peas), split peas, lentils, soyabeans, peanuts as well as cashew nuts.

Figure 33: Channa or Chick peas
Image: Simon Howden / FreeDigitalPhotos.net

Figure 34: Pigeon Peas or Gungo Peas
Image: Simone Reid-Foster

- Animal sources of protein include meat, fish and poultry which all supply vital nutrients. Dairy foods are also sources of high biological value protein as well as are eggs, cheese, milk and yogurt.

Figure 35: Eggs and Milk
Image: winnond / FreeDigitalPhotos.net

Figure 36: Chicken
Image: Suat Eman / FreeDigitalPhotos.net

Iron

- Foods with a high iron content and contain the type of iron that is easily absorbed (*heme* iron) include; ground beef, and organ meats e.g. liver.

Figure 37: Ground Beef
Image: Suat Eman / FreeDigitalPhotos.net

- Foods with good iron content include green leafy vegetables, egg yolks, and cereals fortified with iron. Further, each of these foods' iron absorption can be increased by consuming foods that contain vitamin C in the same meal e.g. fruits such as oranges, guava, mangoes, etc.

Figure 38: An Assortment of Vegetables
Image: winnond / FreeDigitalPhotos.net

Vitamin A and C

- Dark green leafy vegetables e.g. spinach, patchoi (bok coi), broccoli.
- Other vegetables such as carrots, pumpkin, tomatoes etc.

Figure 39: Pak Choi
Image: Simone Reid-Foster

Figure 40: Good Sources of Vitamin A
Image: Michelle Meiklejohn / FreeDigitalPhotos.net

Sugar, Fats and Oils- Especially Those that Supply Essential fatty Acids Omega 3 and 6.

- Fats and oils e.g. butter, peanut butter and other seed oils, olive oil, coconut oil and full cream milk.

Figure 41: Full Cream Milk- A Source of Essential Fatty Acids
Image: John Kasawa / FreeDigitalPhotos.net.

Activity

Fill in the following table with examples of suitable 'complementary' foods. One example has been done for you already.

Food Group/Nutrient	'Complementary' Food
Staples/Carbohydrates	Cereals, starchy roots, tubers etc.

Food Group/Nutrient	'Complementary' Food

Figure 47

Feedback

Here are the answers to the assessment. How did you do?

Food Group/Nutrient	'Complementary' Food
Staples/ Carbohydrates	Cereals, starchy roots, tubers etc.
Protein Foods (foods from animals/vegetable legumes)	Any type of meat, poultry fish/seafood or dairy products, legumes/pulses.
Iron	Red meat, organ meats and green leafy vegetables.
Vitamin A and C	Fruits (citrus, papaya, mangoes etc) green and yellow/orange vegetables.
Sugar, Fats/Oils (essential fatty acids)	Full cream milk, olive oil, butter etc.

Guidelines for Developing Positive Eating Habits in the Infant and Toddler

The entire aim of 'complementary feeding' is to successfully integrate a wide variety of solid food that is nutritious to the growing child, and in the process also inculcate positive eating habits in the child.

Here are a few guidelines for developing positive eating habits:

Guidelines for Developing Positive Eating Habits

a. Meal time environment- ensure that mealtime is not hustled and stressful, but pleasant and relaxed.

b. Quantity- serve food in small portions and small sizes so that they are easily managed by the child.

c. Utensils- ensure the utensils are colorful and easy to hold by the young child.

Mixing 'Complementary' Foods

As we discussed earlier, a mixture of foods ensure that the child is supplied with all of the necessary nutrients in adequate amounts for their growth, energy and developmental needs. The system of mixing is called the multi-mix principle. This principle was explained earlier in unit 1.

The multi-mix principle is a guideline for combining foods from complementary food groups to assure nutritional balance and the correct combination of foods are selected for our meals.

You should remember we discussed three possible mixes:

a) The two-mix

b) Three-mix

c) Four-mix

- Staples form the base of the diet

-The four foundational food groups: staples, foods from animals, legumes and vegetables are used.

The multi-mix principle is used for planning the breakfast, midday meal and evening meal for the child.

Two-Mix

The first of the three types of mixes uses food from the staple food group and either a legume e.g. lentils, peanut butter, or food from an animal e.g. fish or chicken etc.

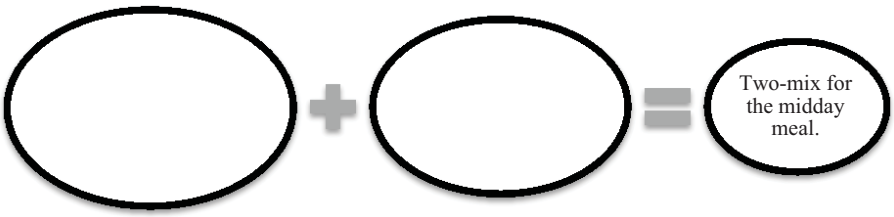
Figure 42
Image: Simone Reid-Foster

Figure 49: Two-Mix that Would be Suitable to be Served for Breakfast
Image: Simone Reid-Foster

Activity

Can you write your own two-mix meal? Choose any two foods from the foods listed to make your own two-mix meal.

Creamed green peas, pureed pumpkin, mashed cassava, crushed white fish, oatmeal with milk, steamed rice.



Feedback

Here are the answers how did you do? Remember you can have any combination of the following: a staple + a food from animal.

Three-Mix

In the three-mix you use a staple food, food from an animal and a vegetable; which may be green and leafy or orange coloured. What's important is that the meal must be suitable for the young child, therefore it should have small portions, be nutritionally balanced and easy to eat.

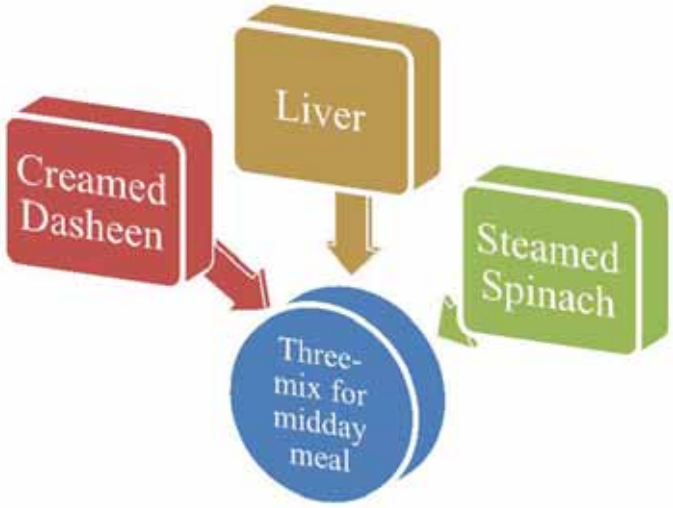
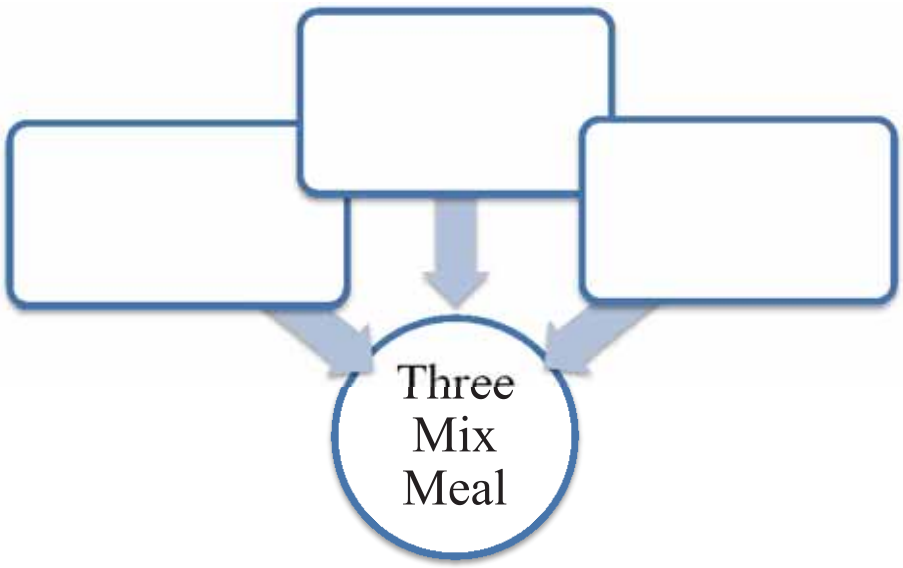


Figure 43: A Three mix Suitable for a Midday Meal
Image: Simone Reid-Foster.

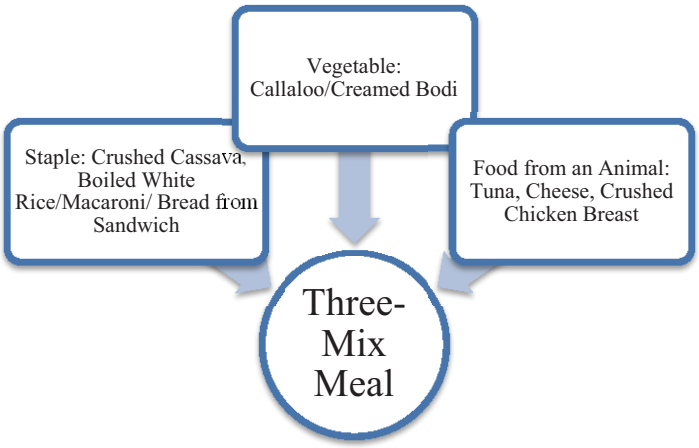
Activity

Now let's try a three-mix meal. Choose the appropriate foods from the dishes listed: Stewed, crushed chicken breasts, callaloo, crushed cassava, boiled white rice, macaroni and cheese, creamed bodi, tuna salad sandwich.



Feedback

How did you do?



Four-Mix

The four- mix is another multi-mix combination. This mix should comprise a staple food, food from an animal, legume and vegetable.

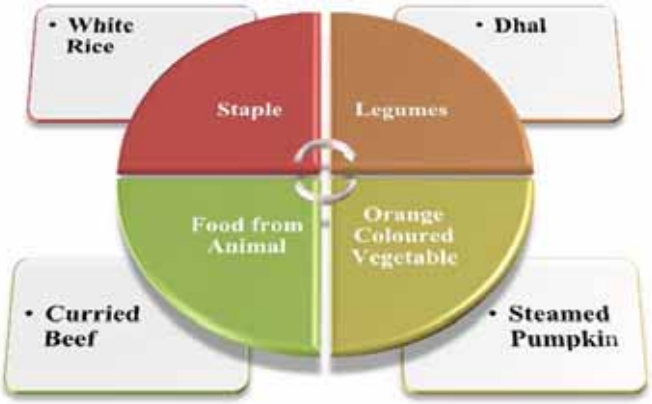


Figure 44: Four-Mix for a Midday or Evening Meal
Image: Simone Reid-Foster

Activity

Come up with your own foods for the four-mix. Write them in the space provided in the diagram below. Here are some clues to help you.

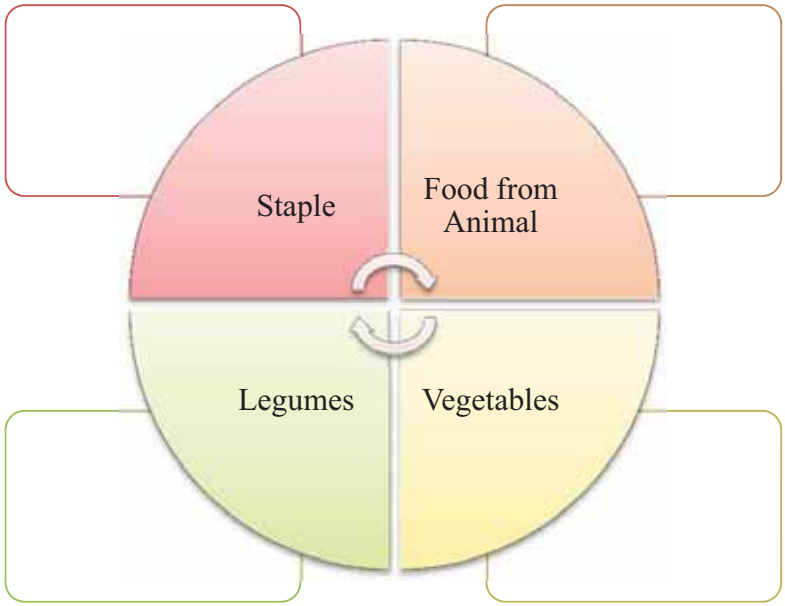


Figure 45

Image : Simone Reid-Foster

Feedback

What did you come up with?

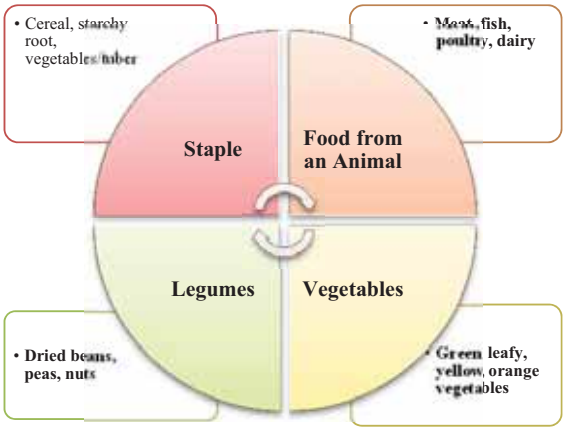


Image: Simone Reid-Foster

Do Young Children Need to use Vitamin Supplements?

A full term, exclusively breastfed baby would have had all of its nutrient requirements met for its first six (6) months of its life.

However, when 'complementary' foods are introduced, care needs to be taken to mix the appropriate foods (foods from the foundational food groups) to ensure continued adequate nourishment for the baby.

What About Snacks?

Snacks have been given a bad reputation! Snacks are important in the diet of a young child to fill the energy and *micronutrient* gap. Good snacks contain a variety of nutrients.

Suitable Snack Foods Are:

- Fruits that are crushed or cubed or used in smoothies e.g. bananas, mangoes, papaya.
- Vegetables pureed e.g. pumpkin, spinach and carrots.
- Milk and milk drinks e.g. peanut punch, yogurt and milk puddings.
- Biscuits e.g. oatmeal.

Session Summary

Summary

In this session you learned about breastfeeding, how breast milk is produced and the benefits of breastfeeding.

Benefits of Breastfeeding- There are Benefits to Both the Mother and the Child.

Mother	Infant
Development of strong bond between mother and child.	Provides essential nutrients in the correct quantity and mix.
Convenient, readily available no preparation needed.	Provides immunity from diseases, infections and development of allergies; due to colostrum and sterile milk.
Contracts the uterus.	Action of sucking produces hormones in the baby's body that develops the intestines and make for more efficient absorption of nutrients.
The milk is at the temperature and consistency the baby needs.	Less chance of an overweight baby, since the baby only takes what it needs.
May protect against cancer.	All milk is digested, leading to a feeling of satiety.
Lengthens the intervals between pregnancies by delaying the return of regular ovulation.	A positive association between breastfeeding and an intelligent child.

Why Some Mothers Choose to Bottle Feed their Babies

Generally when mothers choose to bottle feed their newborn it is usually because of the following;

- Negative societal feeling toward breastfeeding especially from the baby's father, members of the public who may frown on the mother for breastfeeding in public or restrictions in public institutions.

- The mother may choose to bottle feed because of her concern for her body image, work or travel commitments.

- Health reasons.

  -Premature babies, those with birth defects or those who may have difficulty in attaching to the breast and suckling, may be unable to breastfeed

  -Some mothers may experience physical discomfort when attempting to breastfeed and as such may be unable to breastfeed their infant.

  - HIV/Aids, or other critical health concerns make some mothers unable to choose breastfeeding as an option.

Advantages/Disadvantages of Bottle Feeding

Advantages of Bottle Feeding	Disadvantages of Bottle Feeding
Bottle fed babies need to be fed less often since formula is digested more slowly than breast milk leaving the baby fuller for longer periods of time.	It is expensive.
Bottle feeding leaves the mother with more time to herself, since she is not feeding the baby on demand.	It is time consuming, since bottles have to sterilized and washed and formula has to be mixed.
The mother can return to 'normal' life much sooner, since, her dress and diet regime is not centered on the baby's need for nourishment. She can also use any method of contraception she chooses.	May encourage the development of infections and put a strain on the baby's kidneys if incorrectly done.
Anyone can feed the baby, allowing the mother time to rest.	Keeps the mother to a rigid feed timetable.
The mother knows exactly how	Facilitates the overfeeding of the

Advantages of Bottle Feeding	Disadvantages of Bottle Feeding
much the baby has had and how much nourishment it received.	baby and disturb the development of the baby's (natural) physiological hunger mechanism.
	Encourages tooth decay known as bottle tooth decay.
	Baby formulas may not adhere to set nutrient standards for baby milk.

Figure 46: Advantages and Disadvantages of Breastfeeding

'Complementary feeding' consists of giving other foods (solid or semi solid) to the baby in addition to breast milk. It begins at six (6) months and ends when the infant is around twenty-four (24) months. 'Complimentary feeding' usually ends when there is a successful integration of a wide variety of solid foods that are nutritious for the growing child and positive eating habits inoculated in the child. You also learned that 'complementary' foods should be high in energy, iron and calcium, vitamin C, free from salt and pepper and any dietary restrictions e.g. low fat. Also, 'complimentary' foods are normally served crushed, mashed, or pureed, free from bones and/or pits and served at room or body temperature.

A few guidelines for developing positive eating habits for an infant or toddler are:

a. Meal time environment- ensure that mealtime is not hustled and stressful, but pleasant and relaxed.

b. Quantity- serve food in small portions and small sizes so that they are easily managed by the child.

c. Utensils- ensure the utensils are colourful and easy to hold by the young child.

Suitable snacks for a toddler who is being 'weaned' off breast milk are: fruits that are crushed or cubed or in smoothies e.g. bananas, mangoes, papaya. Vegetables pureed e.g. pumpkin, spinach, and carrots, milk and milk drinks e.g. peanut punch, yogurt and milk puddings, as well as biscuits e.g. oatmeal.

Session 5.3 Nutrition During Childhood

Introduction

This is the last session in the unit on nutrition during the early years. In this session we will explore the important aspects of nutrition during childhood. If you've ever been around a toddler or child, their level of energy is noticeable. Their features are also changing from a chubby baby to a young boy or girl they are to become. There are so many physical and physiological changes are taking place, therefore it is important that their nourishment keeps pace with their continual growth and development. Let's explore how this can be done.

Outcomes

Upon completion of this unit you will be able to:

- *Explain* how positive eating habits are developed in the young child.
- *Plan* a balanced diet for a child.
- *Explain* the importance of specific nutrients to the child.
- *Discuss* why children become obese.
- *Explain* how to prevent childhood obesity.

How Long?

You need to devote three (3) hours of formal study to this unit and two (2) hours of self-study to complete this session.

Terminology

Balanced Diet:	A diet that supplies all of the necessary nutrients in the quantities required.
Snack:	Small portions of food or light refreshments that are nutritious and consumed between meals.
Obesity:	An abnormal or excessive fat accumulation that presents a risk to health.

5.3-1 Developing Positive Eating Habits in the School-Aged Child

Are there certain foods that you just don't eat or like? How did you arrive at your decision? Are there foods that that you've never eaten? Eating habits are formed early in life and remain into adulthood and also normally influence our attitudes to foods throughout our entire life.

Here are a few guidelines to help you develop positive eating habits in a young child between the ages of five to twelve (5-12) years old.)

Behavior

How do you encourage the child to develop positive eating habits?

Figure 47: Enjoying his Meal
Image: photostock / FreeDigitalPhotos.net

- Adults such as parents and other family members should model appropriate eating behaviors for youngsters in the home by eating a variety of foods. This in turn demonstrates to the child and encourages them to select a wide variety of foods and be more accepting of new or different foods.

- Offer choices to the child. The options should be between similar foods or groups of foods so that similar nutrients are included in their diet.

- Don't force children to eat more than they want, remember you don't want to encourage the development of childhood obesity. Give more attention to eating well (mixture of foods and textures) than less (quantity of food) when they are trying to gain attention by refusing food.

Foods

- Provide a variety of nutritious foods e.g. fruit, vegetables at regular intervals. Ensure that the foods are nutrient dense and not energy dense.

- Foods should be flavorful and colorful.

Figure 48: Fruit Cut in Fancy Shapes
Image: Keattikorn / FreeDigitalPhotos.net

Figure 49: Salad with Frankfurters
Image: Piyachok Thawornmat / FreeDigitalPhotos.net

- -Introduce new foods e.g. spinach with old favorites e.g. cheesy mashed potatoes.
- Serve small portions of foods e.g. half of an apple instead of the whole apple, and save the other half for later.

Figure 50: Small Portions of Fruit
Image: Master isolated images / FreeDigitalPhotos.net

Environment

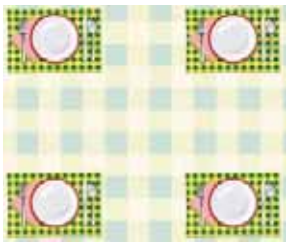


Figure 51: Dining at the Table
Image: Idea go / FreeDigitalPhotos.net

- Encourage children to eat at the table, away from the television. The room should be well ventilated and lit.
- Sit with the child and eat the same foods he's eating. Encourage pleasant conversation.

Activity

Give two examples of how a child's eating habits are formed or influenced. Write your answer in the spaces provided.

Feedback

Eating habits are formed or impacted by the following:

-Behavior of adults and in types and amounts of foods eaten.

-Whether children are offered choices in the types of foods eaten.

-If children are forced to eat or not, if mealtime is a battle or if it is pleasant and if children eat at the table in a well ventilated area or in front of the television set.

-Whether variety nutritious foods are eaten, new foods are introduced correctly and portions sizes.

(Any two of the above points)

5.3-2 Balanced Diets for a Young Child

A balanced diet should contain all the nutrients needed by an individual in the correct quantities. How can you achieve this balance? Choose a variety of foods that contain more than one nutrient.

Nutrients

The diet of the young child should contain foods from a majority of food groups. These foods should contain the nutrients necessary for 'going, growing, glowing.'

Foods

The foods should vary in texture e.g. crunchy/soft, color e.g. some orange, red, green and taste or flavor e.g. savoury, sweet etc.

The use of the six food groups for planning meals will help you do this.

5.3-3 Nutrients Necessary in the Diet of the School Aged Child

When we discuss the young and school-aged child in this section we are looking at children between the ages of 4-11 years old. They are no longer toddlers but not yet adolescents. At whatever age your diet should be balanced, however the specific nutrients needed are linked to the period of growth/ development that the young child is in. Take a look at the table below.

Nutrient	Reason	Suitable Foods
Protein	For growth and repair of muscles.	Meat, fish, poultry, dairy, plant sources e.g. soya, red beans, pigeon peas etc.
Carbohydrates	For energy needs.	Fruits, starchy roots

Nutrient	Reason	Suitable Foods
		and tubers, e.g. potato, eddoes, cereals, pasta, rice.
Fats (omega 3 and 6)	For brain development.	Milk, avocado, vegetable oils etc.
Vitamins (*water soluble* as well as *fat soluble*) especially Vitamin A	For healthy eyesight and fighting infection.	Vegetables e.g. carrots, pumpkin, sweet peppers, fruit, papaya, mangoes, eggs, cheese and milk and butter.
Vitamin D	For development of strong bones and teeth in the growing child. Important to help with the absorption of calcium.	Exposure to sunlight activates vitamin D.
Vitamin C	Important for healthy skin, gums and teeth. Important to assist with the absorption of iron.	Citrus fruit e.g. oranges, guavas, West Indian cherry, green leafy vegetables e.g. watercress, spinach.
Minerals (especially iron)	Growing blood supply needs iron for the building of red blood cells.	Red meat e.g. beef, organ meats, liver, green leafy vegetables e.g. spinach.
Calcium	Needed for the development of strong bones and teeth.	Milk and milk products e.g. yogurt, cheese and green leafy vegetables.
Water	Necessary for all body fluids e.g. blood, digestive juices, sweat, saliva etc.	Beverages (hot or cold) and fruit.

Figure 52: Nutrients Needed in the Diet of the School-Aged Child

5.3-4 Making Mealtimes a Nutritious and Pleasant Experience

Now let's look at some of the dishes that we can include in the various meals of the day for the young child.

Breakfast

What do you think are suitable breakfast foods? Make a list of at least three items/dishes that may be suitable for a child.

What did you come up with? Do any of your ideas resemble the pictures below?

Figure 60: Cereal and Milk
Image: healingdream / FreeDigitalPhotos.net

Figure 61: A Serving of Bread
Image: Carlos Porto / FreeDigitalPhotos.net

Figure 62: Eggs for Breakfast
Image: kongsky / FreeDigitalPhotos.net

Figure 63: Bread and Channa or Chick Peas
Image: Pixomar / FreeDigitalPhotos.net

Figure 53:Milk- An Important Beverage for Children
Image: photostock / FreeDigitalPhotos.net

Figure 54: Pineapple Cubes Contain Vitamin C
Image: PANPOTE / FreeDigitalPhotos.net

Lunch

What about lunch? What would be suitable for a child's lunch? How do we make their packed lunches interesting, and nutritious?

Packed Lunches

Packed lunches, like all other meals, should be nutritionally balanced. Take a look at some of the possible lunch bag items.

Figure 55: A Sandwich
Image: luigi diamanti / FreeDigitalPhotos.net

Figure 56: Remember the Vegetables
Image: Suat Eman / FreeDigitalPhotos.net

Figure 57: Possible Packed Lunch
Image: Suat Eman / FreeDigitalPhotos.net

Did you notice that the packed lunch ideas in the images above are relatively easy to pack, carry, handle and consist of a variety of textures? It is also important to include a beverage in a packed lunch. The beverage should preferably be a real fruit or milk based beverage rather than a carbonated, high in sugar beverage. Further, it is best if the beverage is thoroughly chilled.

Snacks

You ate your breakfast, but it's so long until lunch. What should you do? Have an early lunch? Maybe you can have a snack instead?

What items are suitable snacks? Some items suitable to be served as snacks include: small pieces of fruit, nuts, yogurt granola, celery sticks, whole grain muffins, real fruit juices, fruit and yogurt smoothies, crackers etc.

What do you notice about all of the items listed? Write down your thoughts in the spaces below.

If you wrote that the items are small portions of foods, or light refreshments that are nutritious and are had between meals, you accurately described a snack!

Figure 58: A Muffin- A Suitable Snack Item
Image: Paul / FreeDigitalPhotos.net

Pleasant mealtimes at school begin with the right choices at home. The meals taken to school should be served in small portions and manageable sizes for the child.

Activity

Plan a suitable packed lunch for a child to take on a picnic. Include two suitable snacks they could have in the afternoon.

Feedback

A suitable packed lunch should include foods rich in protein, carbohydrates, vitamins A, C, D and the minerals calcium and iron.

A packed lunch should also be easy to carry and handle.

Suitable snacks include: fruits, vegetables, whole grains etc.

5.3-5 Childhood Obesity

Figure 59: What is He Being Fed?
Image: DEU

Activity

Take a look at the illustration above. What are some things you notice about the child in the picture? Write your answers in the space provided.

Feedback

Did your answers about the child in the picture address his size or weight, the food he's being fed, who is feeding him and what he's doing?

What a child is fed, who is feeding them and a child's activity level are some of the situations that contribute to childhood obesity. What is obesity? What can you do to prevent or control becoming obese?

Obesity Defined

The terms overweight and obesity are used interchangeably. The World Health Organization defines overweight and obesity as an abnormal or excessive fat accumulation that presents a risk to health. How do you determine if you are overweight? There are two components to this discovery; your height and your weight. These two components are used to calculate what is called *BMI*. What do these letters mean?

BMI or Body Mass Index

Your *BMI* is an approximate measure of how much body fat you have. You calculate *BMI* using your height and weight. To calculate your *BMI* you divide your weight in kg (kilograms) by your height in meters squared.

Weight status for a child is determined differently than the categories used for adults. A child's appropriate weight is also based on gender and age in children. Why do you think this is so? The reason is because children's body composition varies as they age and also varies between boys and girls.

Reading

Type the following URL link into the address bar on your browser:
http://www.who.int/growthref/who2007_bmi_for_age/en/index.html

Select the '*BMI* for age charts' with labels for boys and then for girls. Complete the following activity.

Activity

Answer the following questions after you've viewed the *BMI* charts as instructed.

1. What is considered the normal *BMI* for a) boys b) girls
2. What is considered the *BMI* range of an overweight a) boy b) girl

Select the '*BMI* for age' charts with percentiles. The percentiles are used to determine the weight categories of children. Weight categories are determined based on these percentiles and are defined as:

Underweight < 5th percentile
Normal- 5th to < 85th percentile
At risk of overweight- 85th to <95th percentile
Overweight- 95th percentile and above

Let's move on. Overweight and obese adults have been cause for concern because of the many health implications of obesity. However, what has been of even greater concern is overweight and obese children. Why do you think this

be a problem? In the last few years this has been a phenomenon that has grown, and with it the attendant lifestyle diseases such as particularly diabetes type I

Factors Contributing to Childhood Obesity Include

- Parental obesity or genetics may play a role in childhood obesity.
- Eating habits or behavior is a significant cause of a child becoming overweight or obese.
- Children who consume more calories than they use. Those who eat many high fat, high fat, sugar and salty snacks and foods.
- Children who engage in little or no physical activity i.e. opting to sit in front of the television or computer instead of engaging in some kind of physical activity.

Reading

The passage below is an excerpt from the *Trinidad Guardian* published on October 26th 2010 written by Ruth Osman-Rose. Read the passage and then complete the activity that follows.

Tips for Preventing and Treating Obesity

Obesity can be dealt with on a family level. It will require patience, support and positive role modelling but it is possible. The following are some tips that will help. It is important to watch what you eat while pregnant, as. mothers-to-be do not need to 'eat for two.' Although good nutrition is critical, overeating can put you and your child at risk for obesity. Lead by example. Cook and eat healthy foods and involve your children in the preparation process. Exercise in some way, everyday, and invite your children to join you. Schedule regular meal times and limit dining out. The routine keeps snacking to a minimum and ensures that the whole family eats healthy, home-cooked meals. Eat the rainbow. Brightly coloured fruits and vegetables contain the anti-oxidants, vitamins and minerals that your body needs as well as fibre, which will make you feel more full and cause you to eat less.

Limit juice and soft drinks. Sweet drinks and bottled juices are full of 'empty calories'—sugars that will just go into storage. Water, on the other hand, is an important part of all our biological processes and has no calories. Reduce screen time. Set limits on your child's television, video-gaming and web-surfing, so they don't spend too much time sitting around. Don't use food as a reward. Rewarding good behavior with food reinforces behavioral patterns that may work against your child in the future. Spend time with your child. Whether you're playing, cooking, or just 'liming' together, any time spent with your children will help boost their esteem and encourage positive behavior.

Activity

Based on the information presented above, how can you prevent or control childhood obesity? Write your answers in point form.

Session Summary

Summary

In this session you learned how to develop positive eating habits in a young child, why particular nutrients are important in the diet of the school-aged child and how to plan a balanced diet for the school-aged child. You also briefly explored childhood obesity.

First, you looked at developing positive eating habits in the school-aged child. You learned that parents and other significant adults should model the eating behaviors that the child should practice, the foods should be eaten away from the television set in a pleasant surrounding and the foods given to a child should be a healthy and nutritious mix of foods.

What nutrients are important to the school-aged child?

Important Nutrients For a Child	Reasons They are Important
Protein	Important for growth and development of muscle tissue.
Carbohydrates	Supply growing body's energy needs.
Vitamins A, C, D	Vitamin A is important for the development of eyesight and fighting off infection. Vitamin C is important to help with the absorption of iron, develop healthy skin and gums and vitamin D is important to help with the absorption of Calcium.
Minerals: Calcium, Iron	Calcium is important for the development of strong bones and teeth, and iron is important for the growing blood supply.

Figure 3

#	Meals for the School Aged Child Should Be:	☑

#	Meals for the School Aged Child Should Be:	☑
1	Meals should be colorful and flavorful	❑
2	Packed lunches should be easy to transport, easy to handle and include a milk or real fruit based beverage	❑
3	Snacks are small portions of foods, or light refreshments that are nutritious and are had between meals. Suitable snack items include small pieces or cubes of fruit and vegetables, nuts,yogurt etc	❑

Childhood obesity as defined by the World Health Organization (WHO) is an abnormal or excessive fat accumulation that presents a risk to health.

How do you determine if you are overweight? Your *BMI* (body mass index) measurement, an approximate measure of how much body fat you have, tells you whether you are overweight You calculate *BMI* using your height and weight. To calculate your *BMI* you divide your weight in kg (kilograms) by your height in meters squared.

Some factors that contribute to childhood obesity include:

- Parental obesity or genetics may play a role in childhood obesity.
- Eating habits or behavior is a significant cause of a child being overweight or obese.
- Children who consume more calories than they use. Those who eat many high fat, high fat, sugar and salty snacks and foods.
- Children who engage in little or no physical activity, i.e. opting to sit in front of the television or computer instead of engaging in some kind of physical activity.

You also learned how to prevent or treat obesity, by following the guidelines below:

- Being knowledgeable about nutrition and how behaviours and attitudes towards food could put a child at risk for being overweight.
- Include exercise and physical activity in the daily routine.
- Limiting television viewing and computer use time.
- Choosing water as the beverage of choice instead of empty calorie juices and carbonated drinks.
- Eat more healthy home cooked meals, and brightly coloured fruits and vegetables.

Unit Summary

Summary

In this unit you learned about nutrition during the early years and about the importance of having a good start. Below is a review of some things you learned..

Good nutrition during pregnancy and lactation is important for the proper growth and development of the fetus as well as the mother.

We started off by discussing the changes that take place during pregnancy. These changes drive the need for extra nutrients in the mother's diet.

So what are these nutrients and why are they needed?

Nutrients	Importance	Food Sources
Folate	Needed for DNA manufacture, cell and red blood cell manufacture, prevention of birth defects, neural tube defects e.g *spina bifida.*	Green leafy vegetables and fortified cereals.
Iron	Needed because of the increased blood volume in the mother to supply the needs of the developing fetus, supplying the baby with a ready source of iron during the first six (6) months of life.	Foods from animals including: red meat and corned beef. Good sourses of iron also include: cocoa, curry powder and dried fruit i.e. raisins.
Vitamin B12	Needed for DNA and cell production.	Foods from animals.
Calcium / Vitamin D	Necessary for the development of strong bones and teeth. Vitamin D helps the efficient absorption of calcium along with phosphorus.	Milk, milk products and soft edible bones of canned fish.

Fats	Especially essential fatty acids i.e. omega 3 and 6, linoleic and linolinic acid.	Necessary for brain development of the fetus. Humans make special fatty acids from these fatty acids, found especially in breast milk.
Energy needs	Necessary to support various metabolic demands of pregnancy.	Carbohydrates
Protein	Needed for the growth and development of the cells and tissues of the fetus and mother.	Foods form animals as well as plant sources e.g. meat, fish, poultry, legumes, peas and beans.
Water	Especially important for the lactating mother.	Fruits, vegetables, water and beverages.
Fibre	Prevention of constipation.	Fruits and vegetables.

- You learned that 'eating for two' means that the pregnant woman's diet should be sufficiently nourishing to provide nutrients for the growth and development of both herself as well as the fetus. The pregnant woman should consume at least 300 extra calories to cope with the energy demands of pregnancy. However, the pregnant woman needs only to do this in the second and third trimester. It is also important that a pregnant womans diet consists of nutrient dense foods. Nutrient dense foods are foods which provide an energy contribution less than the nutrients it contains.

  You also learned that in order to plan nutritious meals for both the pregnant and lactating woman you should follow the following guidelines. Include foods from at least four of the food groups to ensure a healthy breakfast and ensure foods rich in the nutrients protein, carbohydrates, fats, vitamins and minerals are selected.

  You learned also that snacks should be nutrient dense foods e.g. nuts, fruits and vegetables.

- Beverages should also be nutrient dense, including: fruit smoothies, milk drinks as well as fruit juices and of course water; which is especially important for lactating women.

- You learned that there are some food substances pergnant women should avoid such as: seafood with high levels of mercury e.g. shark; raw fish dishes, soft cheeses, unpasteurized milk products, raw/undercooked meat, poultry, eggs, alcohol tobacco, illicit drugs,some types of medicines and caffeine.

Benefits of Breastfeeding- There are Benefits to Both the Mother and the Child

Mother	Infant
Development of strong bond between mother and child	Provides essential nutrients in the correct quantity and mix.
Convenient, readily available no preparation needed	Provides immunity from diseases, infections development of allergies; due to colostrum and sterile milk.
Contracts the uterus	Action of sucking produces hormones that in the baby's body that develops the intestines and make for more efficient absorption of nutrients.
The milk is at the temperature and consistency the baby needs	Less chance of an overweight baby, since the baby only takes what it needs.
May protect against cancer	All milk is digested, leading to a feeling of satiety.
Lengthens the intervals between pregnancies by delaying the return of regular ovulation	A positive association between breastfeeding and an intelligent child.

Why Some Mothers Choose to Bottle Feed Their Babies

Generally, when mothers choose to bottle feed their newborn it is usually because of the following:

- Negative societal feelings toward breastfeeding especially from the baby's father, members of the public may frown on the mother for breastfeeding in public or the mother may face restrictions against breastfeeding in public institutions.

- The mother chooses to bottle feed because of her concern for her body image, work or travel commitments.

- Health reasons.

  -Premature babies, those with birth defects or those who may have difficulty in attaching to the breast and suckling may be unable to breastfeed.

  -Some mothers may experience physical discomfort when attempting to breastfeed and thus may be unable to breastfeed their infant.

  - HIV/Aids, or other critical health concerns make some mothers unable to choose breastfeeding as an option.

Advantages/Disadvantages of Bottle Feeding

Advantages of Bottle Feeding	Disadvantages of Bottle Feeding
Bottle fed babies need to be fed less often since formula is digested slower than breast milk, thus leaving the baby fuller for longer periods of time.	It is expensive.
Bottle feeding leaves the mother with more time to herself, since she is not feeding the baby on demand.	It is time consuming since bottles have to sterilized and washed and formula must be mixed.
The mother can return to 'normal' life much sooner, since, her dress and diet regime is not centered on the baby's need for nourishment. She can also use any method of contraception she chooses.	May encourage the development of infections and put a strain on the baby's kidneys if incorrectly done.
Anyone can feed the baby, allowing the mother time to rest.	Keeps the mother to a rigid feed timetable.
The mother knows exactly how much the baby has consumed and how much nourishment it received.	Facilitates the overfeeding of the baby and disturbs the development of the baby's (natural)

Advantages of Bottle Feeding	Disadvantages of Bottle Feeding
	physiological hunger mechanism.
	Encourages tooth decay known as bottle tooth decay.
	Baby formulas may not adhere to set nutrient standards for baby milk

Figure 4

You learned that 'complementary feeding' is the giving of other foods (solid or semi solid) to the baby in addition to breast milk. It is begun at six (6) months and ends when the infant is around twenty-four (24) months and has successfully integrated a wide variety of solid food that is nutritious to the growing child, and positive eating habits have been inoculated in the child. You also learned that 'complementary' foods should be high in energy, iron, calcium, vitamin C, free from salt and pepper as well as free from any dietary restrictions e.g. low fat. 'Complimentary' foods are normally served crushed, mashed, or pureed, free from bones and/or pits and served at room or body temperature.

A few guidelines for developing positive eating habits in an infant or toddler include;

a. Meal time environment- ensure that mealtime is not hustled and stressful but pleasant and relaxed.

b. Quantity- serve food in small portions and small sizes so that it is easily managed by the child.

c. Utensils- ensure the utensils are colorful and easy to hold by the young child.

Suitable snacks for the toddler who is being weaned off breast milk include: fruits that are crushed or cubed or in smoothies e.g. bananas, mangoes, papaya, vegetables pureed e.g. pumpkin, spinach, carrots, milk and milk drinks e.g. peanut punch, yogurt, milk puddings and biscuits e.g. oatmeal.

In the final session you explored how to developing positive eating habits in a school-aged child. For example, the parents and other significant adults should model the eating behaviors that the child should practice, the foods should be eaten away from the television set in a pleasant surrounding and the food should be a healthy and nutritious mix.

What nutrients are important to the school-aged child?

Important Nutrients to the School-Aged Child	Reasons they are Important
Protein	Important for growth and development of muscle tissue.
Carbohydrates	Supply growing body's energy needs.
Vitamins A, C, D	Vitamin A for development of eyesight and fighting off infection, vitamin C to help with the absorption of iron and develop healthy skin and gums and vitamin D to help with the absorption of calcium.
Minerals: Calcium, Iron	Calcium for the development of strong bones and teeth, and iron for the growing blood supply.

Figure 73

#	Meals for the School-Aged Child Should Include:	☑
1	Meals should be colorful and flavorful	❑
2	Packed lunches should be easy to transport, easy to handle and include a beverage that is milk or real fruit based	❑
3	Snacks are small portions of foods, or light refreshments that are nutritious and are consumed between meals. Suitable snack items include small pieces or cubes of fruit and vegetables, nuts, yogurt etc	❑

Childhood obesity as defined by the World Health Organization (WHO) is an abnormal or excessive fat accumulation that presents a risk to health.

How do you determine if you are overweight? Your *BMI* (body mass index) measurement, an approximate measure of how much body fat you have, tells you whether you are overweight. You calculate *BMI* using your height and weight. To calculate your *BMI* you divide your weight in kg (kilograms) by your height in meters squared.

Some factors that contribute to childhood obesity include:

- Parental obesity or genetics may play a role in childhood obesity.
- Eating habits or behavior is a significant cause of a child becoming overweight or obese.
- Children who consume more calories than they use. Those who eat many high fat, high fat, sugar and salty snacks and foods.
- Children who engage in little or no physical activity i.e. opting to sit in front of the television or computer instead of engaging in some kind of physical activity.

You also learned how to prevent or treat obesity by following the guidelines below:

- Being knowledgeable about nutrition and how behaviours and attitudes towards food could put a child at risk for being overweight.
- Include exercise and physical activity in the daily routine.
- Limiting television viewing and computer use time.
- Choosing water as the beverage of choice instead of empty calorie juice and/or carbonated drinks.
- Eat more healthy home cooked meals, and brightly coloured fruits and vegetables.

Assignment

Assignment

Complete the following assignment.

1. Marie discovers she is pregnant, list five (5) changes that she'll observe taking place in her body.

1

2

3

4

5

2. How does lactation differ from breastfeeding?

3. What does the term ‘eating for two’ mean?

4. A) Good nutrition is important in pregnancy. List five (5) guidelines that you should follow when planning meals for the pregnant woman.

1 _____

2 _____

3 _____

4 _____

5 _____

B) Plan a nutritious breakfast for a pregnant woman. Fill in the spaces next to each 'category of dishes' in the table.

Categories of Dishes	Items/Dishes
Fruit	
Cereal	
Protein Dish	
Bread Stuff	
Beverage	

Figure 74

5. Explain to your friend Marie why she should choose to breastfeed her baby instead of bottle feeding.

_____

_____

6. What does ‘complementary feeding’ mean?

7. Identify which of the following foods are suitable to be served as ‘complementary’ foods. Circle or underline your answers.

   Explain why the foods not selected are unsuitable to be served as a ‘complementary’ food item.

Peanuts, spicy shrimp, jerk grilled chicken cubes, pureed pumpkin, dhal, caramel popcorn, callaloo (creamed spinach), low-fat yogurt, mashed dasheen (taro), crushed liver, french fried potatoes**.**

8. Tomas is six (6) years old his mother complains that she can't get him to eat anything that she prepares. His meal choices include cookies, ice cream and salted cheese snacks.

   Explain to Tomas' mother three possible reasons for these problematic eating habits.

Suggest three suitable snack items Tomas might enjoy.

9. In the following table, fill in the blanks with the necessary nutrients in the diet of a school aged child.

Nutrient	Reason	Suitable Foods
Protein	1.	Animal sources: Plant sources:
Carbohydrates	For energy needs.	
Fats (Omega 3 and 6)	1.	Milk, avocado, vegetable oils etc.
Vitamins (*water soluble* as well as *fat soluble*) especially Vitamin A	For healthy eyesight, fighting infection.	Animal sources Plant sources .
Vitamin D	1. 2.	Exposure to sunlight activates vitamin D.
Vitamin C	Important for healthy skin, gums and teeth. 2.	Citrus fruit e.g. oranges, guavas, West Indian cherry, green leafy vegetables e.g. watercress and

Nutrient	Reason	Suitable Foods
		spinach.
Minerals all, but especially Iron	1.	Animal sources: Plant sources:
Calcium	Needed for the development of strong bones and teeth.	Milk and milk products e.g. yogurt, cheese and green leafy vegetables.
Water	1.	Beverages (hot or cold) and fruit.

10. As a nutritionist you have been asked to explain to the PTA (Parent Teacher Association) of your son's school why some children at the school are becoming obese.

    Write a brief presentation you intend to give.

Suggest one (1) way under the various headings that obesity can be treated.

Diet

Activity

Habits

Contents

Unit 6

Nutrition during the Adult Years

Introduction

Who is an adult? An adult is someone who is fully developed and mature. The adult years legally begin at the age of eighteen (18) and end at an elderly age. An elderly age is regarded as 65 years and over. During the adult years, adults will have different energy and nutrient needs. Adults need the correct amount of nutrients in their diet to maintain optimal health. As adults age, they experience physiological changes along with factors that may adversely affect their nutritional status. Some elderly persons may have no appetite to eat food, while others may suffer from nutrition-related disorders.

In previous units you learnt all about the nutrients and how to plan meals. The knowledge gained from these units has laid the foundation on which we can build on in this unit. This unit provides information on the nutritional needs of adults and the elderly. We will also examine changes with aging and nutrition-related diseases affecting the elderly. This unit ends with guidelines on how to improve the nutritional status of the elderly. This information will assist you to plan and prepare nutritionally sound meals for the aging adult.

Outcomes

Upon completion of this unit you will be able to:

- *Explain* the role of the essential nutrients in the diet of the adult.
- *Explain* the impact of physiological changes and other factors on the nutritional status of the elderly.
- *Explain* the role of proper nutrition in the management of nutrition-related diseases in the elderly.
- *Explain* how adults and the elderly can maintain general good health.

How Long?

You will need to devote fifteen (15) hours to work on this unit. Ten (10) hours for formal study and five (5) hours for self-study and for completing assessments/assignments.

This Unit is Comprised of Four Sessions

Session 6.1 Adult Nutrition

Session 6.2 .The Aging Process

Session 6.3 Nutritional needs of the Elderly

Session 6.4 Improving Nutritional Status

Terminology

Adult: An adult is someone who has attained the legal age of 18.

Balanced Diet: A balanced diet is a diet that provides the correct amount of nutrients for the needs of an individual.

Basal Metabolism: A basal metabolism is the amount of energy required to maintain the body of an individual in a resting state.

Elderly Person: An elderly person is a person 65 years of age or older.

Kilocalories: Kilocalories (sometimes written as calories) are the amount of heat energy that is required to raise the temperature of 1 kilogram of pure water by 1ºC.

Nutrition: Nutrition is the process of providing the food necessary for growth and general good health.

Nutritional Status: Nutritional status is the state of a person's health that is influenced by the intake and utilization of nutrients.

Physiological Changes: Physiological changes relate to changes in accord with the normal functioning of living organisms.

Session 6.1 Adult Nutrition

Introduction

Have you ever prayed to become an adult? As an adolescent you are just a few years away from becoming an adult. The adult years of an individual begin at eighteen (18). During these years, adults are faced with a number of roles,

responsibilities and challenges. Hence, they need to be healthy physically, emotionally and mentally to be able to cope with life's challenges.

It is therefore important for adults to make wise food choices to support the general health of their bodies. Throughout adulthood, foods should be selected in a manner to promote health, prevent disease and slow down the aging process. Aren't you happy that you have a chance to do this session before becoming an adult? If you are already a young adult, this session will give you information to make wise food choices.

Outcomes

Upon completion of this session you will be able to:

Identify the essential nutrients required in the diet of an adult.

Explain the importance of the nutrients in the diet of an adult.

Explain the factors influencing the energy needs of adults.

How Long?

You will need to devote two and a half (2 ½) hours of formal study and one and a half (1 ½) hours of self-study to complete this session.

Terminology

Amino Acids:	Amino acids are building blocks of proteins. They are organic compounds containing a carboxyl (=COOH) and an amino (=NH2) group.
Biological Value:	Biological value (BV) is a measure of protein quality assessed by measuring the amount of protein nitrogen that is retained from a given amount of protein nitrogen absorbed.
Cholesterol:	Cholesterol is a fat produced by the liver and is transported in the blood plasma of all animals.
Essential Amino Acid:	An essential amino acid is an amino acid that cannot be produced in the body and therefore must be provided through dietary intake.
Essential Fatty Acids:	Essential fatty acids are those fatty acids that cannot be produced in the body and therefore must be provided through dietary intake.
High-Density	High-density lipoprotein is the lipoprotein that transports cholesterol from the tissues of the body

Lipoprotein:	to the liver to be excreted.
Low-Density Lipoprotein:	Low-density lipoprotein is the lipoprotein that transports cholesterol and triglycerides from the liver to tissues of the body.
Saturated Fat:	A saturated fat is a fat with all its carbon atoms saturated with hydrogen atoms.
Unsaturated Fat:	An unsaturated fat is a fat with one or more double bonds.

6.1-1 Essential Nutrients for Adult Nutrition

Good nutrition is important to provide adults with the energy and nutrients needed to maintain proper body functions and promote good health. For adults to maintain good nutrition they need to know the essential nutrients and their food sources. In this part of the session, we will look at the essential nutrients for adult nutrition. Later on in this unit we will explore the importance of these nutrients in the diet of an adult.

Let's look at the essential nutrients for adult nutrition:

- Protein, carbohydrate, fat, vitamins A, D, C and 'B complex,' minerals-calcium, phosphorus, iron and water.

Protein

Adults can obtain their supply of protein from both foods from animal and vegetable sources. Proteins obtained from animal sources are of a high biological value because they contain all the essential amino acids. Do you remember what is meant by high biological value and what essential amino acids are? Let's go over these terms.

First let's refresh your memory on the meaning of amino acids.

Proteins are composed of units joined together in a chain.

These units are the amino acids that made up the protein. In other words amino acids are the building blocks of proteins. Figure 1 shows an illustration of a protein chain. Each different shape seen in Figure 1 represents a different amino acid. Amino acids are made in the body and also obtained through dietary intake.

The essential amino acids are those obtained through dietary intake. It is therefore very important to include protein foods that contain all the essential amino acids. Examples of such food include: milk, cheese, meat, chicken, fish, and eggs.

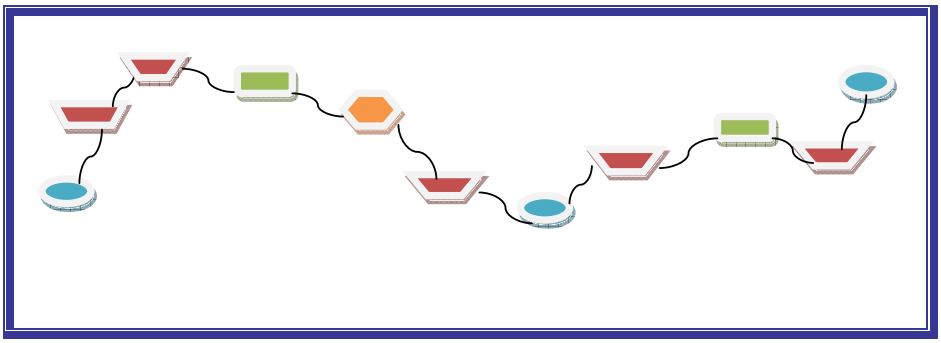


Figure 1: Protein Chain
Image: Earla Louis

Adults can also obtain their supply of protein from vegetable sources. However, you should note that protein obtained from vegetable sources lacks one or more of the essential amino acids. You are probably wondering how individuals who do not eat foods from animals obtain their supply of high biological value protein. The answer lies in their combination of foods.

A combination of legumes (peas and beans) and cereals will provide high biological value proteins in the diet. Legumes are poor in the amino acids *methionine* and *tryptophan*. Cereals are deficient in the amino acid *lysine*. When legumes and cereals are eaten together their amino acids complement each other. What does this mean?

This means that the low levels of *methionine* and *tryptophan* in legumes are made up by higher levels in cereals. Also, the low level of *lysine* in cereals is made up by a higher level in legumes. When the combination is in the right proportion, the protein is of high biological value. Examples of combinations of legumes and cereals are: rice and pigeon peas (see Figure 2) corn meal dumplings and kidney beans and a lentil-burger sandwich.

Figure 1: Peas and Rice Combination
http://commons.wikimedia.org/wiki/File:Indian_mixed_vegetable_rice.jpg

Carbohydrates

Where can adults get their supply of carbohydrates to include in their diet? Carbohydrates can be supplied to the diet by including cereals, starchy roots and tubers and starchy fruits. Examples of cereals include: rice, wheat flour, bread, corn, oats, and barley. Examples of starchy roots and tubers examples

include: cassava, yam, sweet potato, dasheen, and eddoes. Examples of starchy fruits include: green bananas, plantain, breadfruit and breadnut.

Figure 2: Assorted Ground Provisions
Image: DEU

Sugar also provides carbohydrates in the diet. Sugar is found in molasses, honey, syrup, jams, candies, cakes and cookies. When you hear the term sugar do you solely think of the sugar you buy from the supermarket? This is not the only form of sugar! Sugar is also found in its natural form in fruits and vegetables e.g. mango, pineapple, pawpaw and oranges supply carbohydrates in the form of sugar. Vegetables such as carrots, beets, ripe plantains and sweet potatoes, also contain some sugar.

Figure 4: Sources of Sugar
Image: DEU

Fat

It is important for adults to know which type of fat should be included in their diets. The nutrient fat can be obtained from both animal and vegetable sources. Animal sources of fat include: cream, butter, cheese, milk, egg yolk, meat fat, suet, lard, oily fish and fish liver oils. Vegetable sources of fat include: coconut oil, olive oil, avocado, margarine and cocoa. Fats are of two types – saturated fats and unsaturated fats. Saturated fats remain solid at room temperature. While unsaturated fats remain liquid at room temperature.

Figure 5: Different Types of Fat
By Bill Branson (photographer) (National Cancer Institute: page, image) [Public domain], via Wikimedia Commons

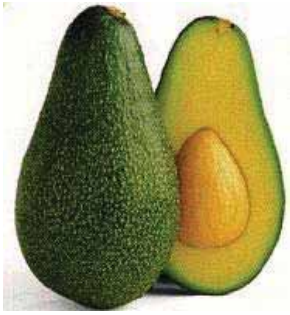


Figure 6: An Avocado- Another Source of Fat
http://commons.wikimedia.org/wiki/File:Avocado.jpeg

Saturated fats are mainly found in foods from animals such as: beef fat, pork, butter and cream. Some vegetable sources of saturated fats are coconut oil, palm oil and cocoa butter. Saturated fats contain dietary cholesterol and contribute to high blood cholesterol. Have you learned the term cholesterol before? You should have covered it in Unit 3. Regardless, let's look at it again. Cholesterol is a chemical substance produced naturally by the liver. It is necessary for cell membranes and hormones in your body. Every cell in your body contains cholesterol. High amounts of saturated fats in the diet increase the blood cholesterol levels. Thus, saturated fats increase the low-density lipoprotein (LDL) in the blood. Low-density lipoprotein is a molecule of lipid and protein that transports cholesterol from the liver to the tissues of the body. When there is too much low-density lipoprotein circulating in the blood this leads to the thickening of the walls of the arteries. This condition is called atherosclerosis. This is the reason that low-density lipoprotein is referred to as 'bad cholesterol.'

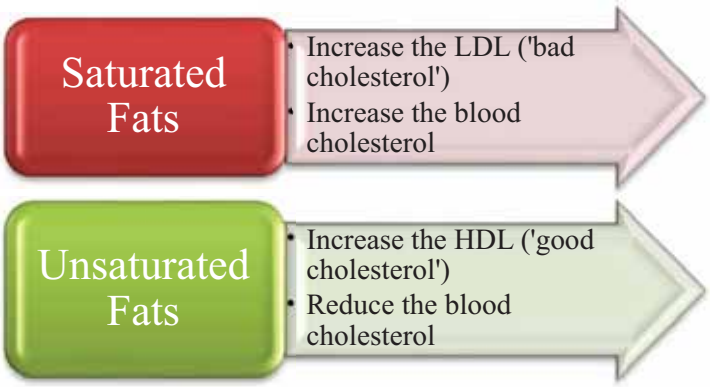


Figure 7: The Role of Saturated Fats and Unsaturated Fats in the Diet

Adults should minimize the consumption of saturated fats because they are linked with atherosclerosis and heart diseases. It is better for them to include unsaturated fats in their diet. This type of fat increases the high-density lipoprotein (HDL) and decreases the low-density lipoprotein (LDL). High-density lipoprotein is a molecule of lipid and protein that transports cholesterol in the blood. HDL serves to remove excess cholesterol from the body tissues to the liver to be metabolized for excretion. Therefore, HDL protects you from heart disease and is referred to as 'good cholesterol'

Adults should pay attention to the guidelines given in Figure 8 below regarding saturated fats and unsaturated fats when selecting fats for their diets.

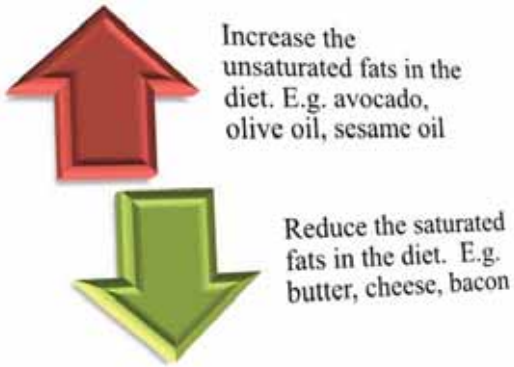


Figure 8: Guidelines for Dietary Fat Selection

Unsaturated fats may be either *monounsaturated* or *polyunsaturated*. Monounsaturated fats are generally liquid at room temperature but solidify when chilled. *Monounsaturated* fats include olive oil, canola oil, peanut oil, sesame oil and avocado. The *polyunsaturated* fats are essential to the diet of an adult. These fats supply the essential fatty acids omega 3 and omega 6 fatty acids in the diet.

Omega 3 and omega 6 fatty acids are essential because the human body cannot produce them and they are needed to carry out important metabolic functions. It is important for adults to include *polyunsaturated* fats that will provide both omega 3 and omega 6 fatty acids in their diets.

Polyunsaturated Fats – Rich Sources of Omega 3 Fatty Acids	*Polyunsaturated* fats – Rich Sources of Omega 6 Fatty Acids
Oily Fish – e.g. salmon, herring and sardines	Wheat germ oil and hemp oil
Seaweed	Grapeseed oil, walnut oil and soybean oil
Flaxseed oil, rapeseed oil, hemp oil, walnut oil and soybean oil	Sunflower oil
Wheat germ oil	Corn oil

Figure 9: *Polyunsaturated* Fats- Sources of Omega 3 and Omega 6 Fatty Acids

Note it!

Omega 6 and omega 3 essential fatty acids should be eaten in a balance. They are best consumed in a ratio of about 3:1. This means that for every three serving sizes of omega 6 fatty acids in the diet, there should be one serving size of omega 3 fatty acids. Adults should select their fats in a manner to promote the maintenance of good health.

Vitamins

Vitamin A

The body of an adult needs to get its supply of vitamins from the diet. Vitamin A can be obtained in its pure form only from animal sources. Milk, cheese, egg yolk and oily fish are rich sources of vitamin A. Beta-carotene is a carotenoid substance found naturally in plants. It is responsible for the orange colour of some fruits such as mango and pawpaw and in vegetables such as carrots and pumpkins. Beta-carotene is also found in green vegetables such as spinach and watercress. When foods containing beta-carotene are eaten, the body converts it into vitamin A.

Vitamin D

Did you know that there are no plant sources of vitamin D? Vitamin D can either be obtained from animal sources, such as oily fish, egg yolk, milk and cheese, or from sunlight. Adults who are vegetarians have to ensure that they are exposed to the sunlight for their supply of vitamin D.

Vitamin 'B Complex'

Vitamin 'B complex' is a group of vitamins including vitamin B_1, vitamin B_2, niacin, vitamin B_6, folate and vitamin B_{12}. This group of vitamins is chiefly found in whole grain cereals, pulses, nuts, brewer's yeast, liver, eggs, and green leafy vegetables. The diet of an adult must include food sources of vitamin 'B complex' daily.

Vitamin C

Fresh fruits and vegetables are excellent sources of vitamin C. These include West Indian cherries, oranges, pineapples, guavas, cucumber, watercress, tomato and cabbage. Foods supplying the body with vitamin C should be eaten daily.

Minerals

Calcium

Generally, people connect calcium with drinking milk. However, milk is not the only source of calcium. Adults can get their supply of calcium from both animal sources and plant sources. Animal sources include: canned fish eaten with bones, (e.g. sardines, mackerel and salmon), milk, cheese, yogurt and eggs. Plant sources of calcium include: green vegetables, (e.g. patchoi, watercress, broccoli and cabbage,) legumes, such as dried peas and beans (e.g. black eyed peas, chickpeas, pinto beans, navy beans and lentils,) nuts and seeds, (e.g. almonds, pecan, walnuts cottonseed and sesame seeds,) dried fruits (e.g. apricots, sultanas and currants) and blackstrap molasses are also rich sources of calcium. View the table below to see some calcium rich foods.

Calcium Foods	Pictures of Foods
Bones of Fish	 By Rl (Own work) [GFDL (www.gnu.org/copyleft/fdl.html), CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0/) or CC-BY-SA-2.5-2.0-1.0 (www.creativecommons.org/licenses/by-sa/2.5-2.0-1.0)], via Wikimedia Commons

Calcium Foods	Pictures of Foods
Milk and Milk Products	 By MigGroningen (Own work) [CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0) or GFDL (www.gnu.org/copyleft/fdl.html)], via Wikimedia Commons
Green Vegetables	 See page for author [CC-BY-3.0 (www.creativecommons.org/licenses/by/3.0)], via Wikimedia Commons. http://commons.wikimedia.org/wiki/File:Broccoli_Super_Food.png
Legumes, Nuts and Seeds	 Image: DEU

Figure 10: Calcium-Rich Foods

Phosphorus

Do you know that phosphorus is found in all plant and animal cells? Phosphorus is an important component of all living organisms and is found in most foods. Dairy products, meats and fish are rich sources of phosphorus. Examples of these foods include: milk, cheese, yogurt, pork, hamburger,

chicken, tuna and lobster. Adults who are vegetarians can get their supply of phosphorus from foods such as bread, corn, rice, peas, sunflower seeds, potatoes and broccoli.

Iron

Let's now look at the mineral iron. Have you ever heard someone say they need to take an iron supplement? An iron deficiency may be due to diets low in iron, pregnancy and lactation, poor absorption of iron by the body or blood loss. You need to know that iron is available in two forms: *heme* iron and *non-heme* iron. Look at the table below for the sources of iron. *Heme* iron is found mainly in animal sources. *Non-heme* iron is found in vegetable sources. *Heme* iron is absorbed more efficiently by the body than the *non-heme* iron.

Heme Iron Rich Foods	*Non-Heme* Iron Rich Foods
Chicken Liver	Lentils
Corned Beef	Blackstrap Molasses
Turkey	Tofu (a soy product)
Tuna	Spinach

Figure 11: Food Sources of Iron

Tip

Absorption of Iron:

- You can improve the absorption of *non-heme* foods by consuming them with vitamin C rich foods e.g. citrus juices.
- You can also combine *heme* iron foods with *non-heme* iron foods to improve the absorption of the *non-heme* iron e.g. tuna and lentils.

Water

How many glasses of water do you drink daily? Although plain water is our main source of water, all foods have a percentage of water content. Other than drinking water, adults can obtain their water supply from fruits, vegetables, liquid foods (i.e. soups, milk) and beverages such as: fruit juices, vegetable juices, teas, coffee, shakes and carbonated drinks.

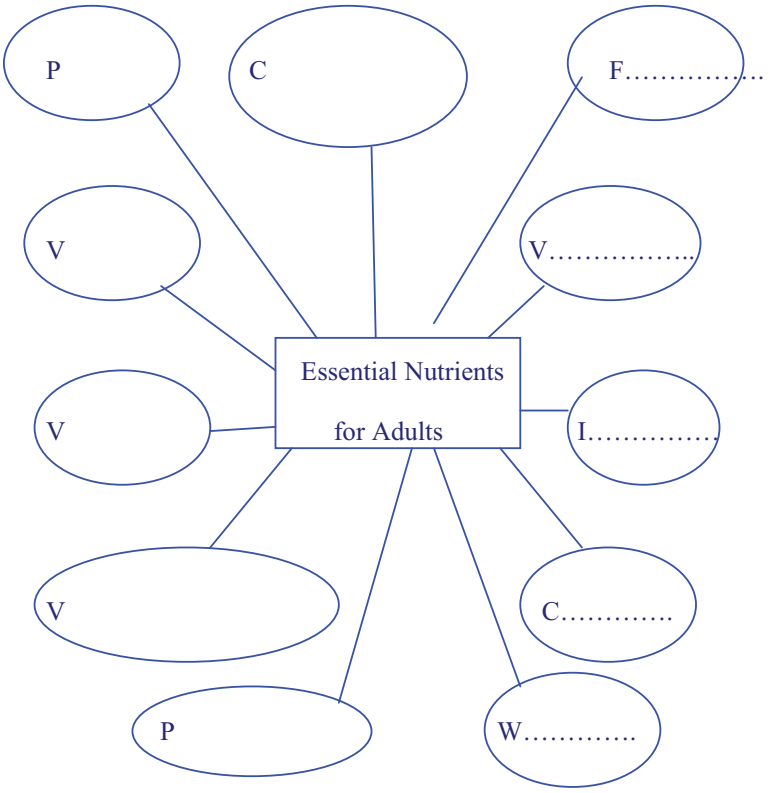
Image: DEU

Image: twobee / FreeDigitalPhotos.net

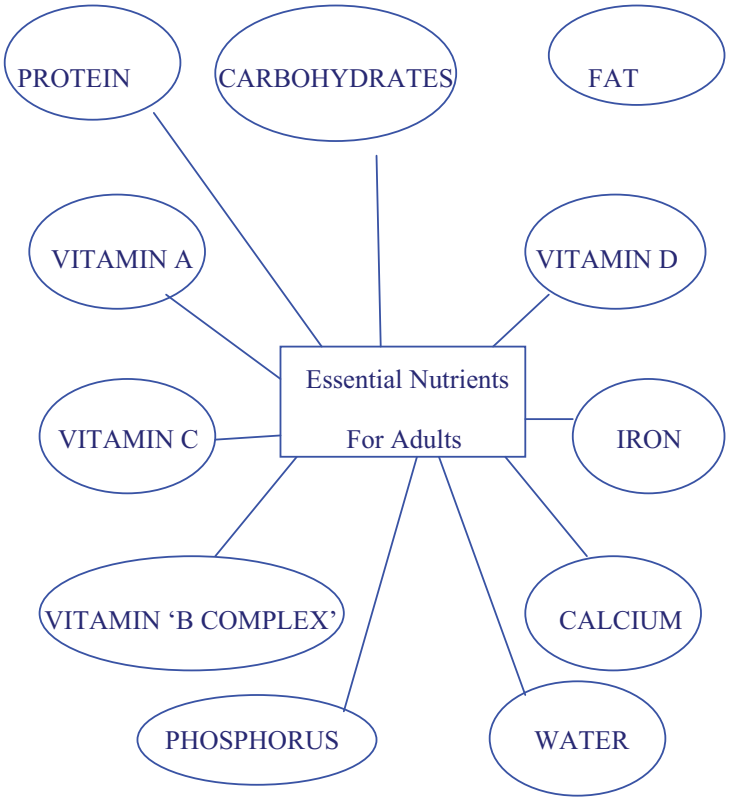
Figure 12: Additional Sources of Water in the Diet

Activity

Complete the following graphic organizer by writing in the essential nutrients required.



Feedback



Were you able to complete the graphic organizer above correctly? If you were not able to complete the activity, review this part of the session and try again.

6.1-2 Importance of the Essential Nutrients

Now that we have covered the essential nutrients, let's look at their importance in the diet an adult.

Protein

How many cells do you think make up your body? Was your answer millions? Our bodies are made up of millions of cells. On a daily basis worn out cells are discarded by the body. Hence, protein is an essential nutrient in an adults diet.

- Protein is necessary for the maintenance and repair of body cells. Our skin, hair and nails are made up of protein. In order for adults to have healthy skin, hair and nails they need to consume protein in the correct amount. Protein is important to keep skin, hair and nails healthy by replacing the cells as they die.
- Protein is also essential for the production of hormones, enzymes, antibodies, blood clotting factors and blood transport proteins in the bodies

of adults. Are hormones, enzymes, antibodies, blood clotting factors and blood transport proteins new terms to you?

Let's spend some time to explain these terms and show their role in maintaining good health.

Hormones are chemical messengers in the body. They send messages from glands to cells to maintain the natural balance in the body.

Enzymes are proteins that speed up chemical reactions in cells. They are important to sustain life and work together with vitamins and minerals to maintain good health.

Enzymes carry out various chemical functions such as the digestion of food, energy production and detoxification of the blood. In order to benefit from the food we eat, digestive enzymes are important to break it down into nutrients.

Antibodies are proteins produced by your immune system and circulate in the bloodstream. Antibodies act as the defenders of your immune system.

Antibodies defend your body against foreign substances, such as viruses, bacteria and fungus.

Antibodies attach themselves to the foreign substances until they are destroyed. Therefore, protein is important for adults to have a strong immune system.

When you cut yourself, you feel assured that it will heal soon. If it does not, you would become very concerned about its healing process. Blood clotting factors are proteins required for the normal clotting of blood. The formation of blood clotting factors are important to ensure that the blood clots when an injury occurs. Tissue repair cannot begin unless the bleeding has stopped. A lack of blood clotting factors causes prolonged bleeding and may lead to death.

Blood transport proteins are proteins that transport oxygen, carbon dioxide, lipids (fats), hormones and vitamins. *Haemoglobin* is an example of a blood transport protein. *Haemoglobin* is the protein in red blood cells that carries oxygen from the lungs and carbon dioxide from the tissues to the lungs.

Can you see how important it is for adults to include the correct amount of protein in their diets?

- Protein performs another important function by maintaining and regulating the fluid balance between the blood and tissues in the body. Did you know that our bodies are made up of two-thirds water? This water has to be in balance with the tissues of the body. A lack of blood proteins result in tissue swelling or clinical *oedema*. Tissue swelling or clinical *oedema* occurs due to insufficient pressure to pull back the fluid from the tissues into the blood.

- Protein also provides our bodies with a secondary source of energy. Carbohydrates and fat are responsible for supplying our bodies with energy. If insufficient amounts of carbohydrates and fat are consumed, the body uses protein to satisfy its energy needs. The use of protein for energy compromises its primary function of tissue maintenance, growth and repair.

Carbohydrates

- How do you feel when you don't have any energy to carry out your activities? Not well? Carbohydrates supply our bodies with energy. Adults need to consume sufficient amounts of carbohydrates to carry out their activities. This is necessary for the efficient use of the nutrients protein and fat.

Fat

- The nutrient fat provides your body with a concentrated source of energy. This is based on the fact that one gram of pure fat yields nine (9) kilocalories compared to one gram of carbohydrates or protein which yields four (4) kilocalories. Do you remember what is meant by the term kilocalories? Energy is measured in kilocalories. A kilocalorie is the amount of heat required to raise the temperature of one kilogram of pure water by 1ºC. Fat provides the body with a higher amount of kilocalories than those of carbohydrates and protein. Adults should include moderate amounts of fat in their diet. This is important for the maintenance of their body weight.
- Fat is also necessary to provide the essential fatty acids in the adult's diet. The essential fatty acids are omega 3 and omega 6 fatty acids. These fatty acids are obtained from *polyunsaturated* fats. Omega 3 and omega 6 fatty acids are regarded as essential because the body cannot produce them. This is a good time to review the information on the essential fatty acids covered earlier in this session.
- *Fat-soluble* vitamins A, D, E, and K can only be dissolved in fat. Fat is therefore necessary for the body to use the *fat-soluble* vitamins. Fat serves as a vehicle for transporting these *fat-soluble* vitamins in the body.
- Fat also plays a protective role in the diet of an adult. Fat forms a sheet of fat cells just beneath the skin to prevent excessive heat loss from the body. Internal organs, such as the kidney and liver, are protected from injury by layers of fat around them.

Physical Factors Influencing the Energy Needs of Adults

Now that we have studied the nutrients that supply our bodies with energy, let's look at the factors influencing the energy needs of adults.

The energy produced in the body is used for basal metabolism as well as by the muscles for physical work and to maintain posture. You may be wondering what basal metabolism is. Basal metabolism is the amount of energy needed to maintain the body in a resting state. This energy is used to maintain body functions such as breathing, body temperature, blood circulation and digestion.

The energy requirements to carry out vital bodily functions and physical activities vary according to the individual's age, gender, occupation, physical activity and the condition of his or her body. Let's look at the factors that influence the energy needs of an individual.

Age

The need for energy by adults decreases as they increase in age. As adults get older their bodily processes slow down. Adults may also follow a lifestyle of reduced activities. Hence, their energy requirements may be reduced.

Gender

Gender is another factor that determines energy needs. Adult men tend to have a larger body size and higher metabolic rate than women. What does the term metabolic rate mean? The metabolic rate is a measure of how fast your cells convert food into energy. Men have a higher metabolic rate and therefore may use more energy than women.

Occupation

The occupation and physical activities of adults also influence their energy needs. Occupations may be categorized according to their level of activity. Occupations are regarded as sedentary, moderately active or very active. Sedentary occupations are jobs where workers spend most of the time sitting down. Moderately active occupations involve jobs that require more standing and are not strenuous in terms of energy demands. Very active occupations engage workers in strenuous work regularly. These jobs usually involve heavy lifting and manual labor. Take a look at the table below.

Types of Occupations	Examples of Occupations
Sedentary Occupations	Teachers, lawyers, drivers, office and clerical workers.
Moderately Active Occupations	Masons, plumbers, carpenters, painters, post workers and food industry workers.
Very Active Occupations	Dock workers, steel workers, forestry workers and laborers.

Figure 12: Different Types of Occupations

Physical Activities

Adults' recreational activities also influence their energy needs. These activities may involve walking, jogging, running, swimming, cycling and doing home chores. If these activities are done on a regular basis more energy would be required.

Condition of Body

The condition of our bodies also determines its energy needs. A woman who is pregnant needs extra energy for the growth of the baby and for her body's adjustment to the pregnancy. Extra energy is also required during the period a woman breastfeeds her infant. Energy is needed for the production of milk for the infant. Illnesses also impact on the energy needs of an individual. The metabolism of your body is the amount of energy it burns to maintain itself. So during an illness the metabolism of the body may increase because more energy is required for the body to maintain itself. However, sometimes during an illness the body's metabolism may decrease due to the person being less active. For example, sick people who are bedridden need less energy than those who can do light activities.

Activity

Answer all the following questions in short sentences.

1. List four reasons why adults should include sufficient protein foods in their diets.

1. _____

2. _____

3. _____

4. _____

2. Why does the body require carbohydrates?

_____

_____

_____

3. Why is fat regarded as a concentrated source of energy?

4. State five factors that influence the energy needs of adults.

1.

2.

3.

4.

5.

Feedback

The following are answers to the above questions:

1. Four reasons why adults should include sufficient protein foods in their diets are:

- For maintenance and repair of body tissues.
- For the production of hormones, enzymes, antibodies, blood clotting factors and blood transport proteins.
- For the maintenance of body fluid balance.
- To provide a secondary source of energy.

2. Carbohydrates are required to provide the body's main source of energy. It helps the body to use fat efficiently and protein for growth and repair of body tissues.

3. Fat is a concentrated source of energy as one gram of pure fat yields 9 kilocalories, compared to one gram carbohydrate or protein which yields 4 kilocalories.

4. Five factors that can influence the energy needs of an adult are: age, gender, occupation, physical activity and condition of body.

The Importance of Vitamins, Minerals and Water in the Diet of Adults:

Vitamin A

- Necessary for eyes to adjust in dim light.
- Keeps the lining of mouth, nose, throat and digestive tract moist and resistant to infection.
- Necessary for the maintenance of healthy skin.

Vitamin D

- Maintains adequate levels of calcium and phosphorus in the blood.
- Promotes the absorption of calcium and phosphorus for the maintenance of strong bones and teeth.
- Provides protection from osteomalacia. Osteomalacia is a deficiency disease that is related to the softening and weakening of the bones in adults. Look at Figure 13 below to see the deformity caused by osteomalacia. This condition causes adults' bones to break easily.

Vitamin 'B Complex'

Vitamin B_1 (Thiamin)

- Assists with the release of energy from carbohydrate foods.
- Maintains the healthy function of the nervous system.
- Promotes good appetite and digestion of food.

Vitamin B_2 (Riboflavin)

- Assists in the release of energy from amino acids and high fat foods.
- Helps maintain good vision.
- Keeps skin around nose and mouth smooth.

Niacin

- Assists in the release of energy from carbohydrate foods.
- Promotes healthy skin, tongue, digestive system and nervous system.

Vitamin B_6

- Assists in the release of energy from amino acids (protein foods) and fat foods.
- Promotes healthy red blood cells.
- Maintains a healthy immune system.
- Maintains the healthy function of the nervous system.
- Helps prevent osteoporosis. Osteoporosis is a condition in which there is a decrease in bone density, bone strength and fragile bones in adults. See Figure 13 for a picture of bone density in osteoporosis.

Figure 13: Woman with Osteoporosis
By James Heilman, MD (Own work) [CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0) or GFDL (www.gnu.org/copyleft/fdl.html)], via Wikimedia Commons

Folate (Folic Acid)

- Necessary for the formation of red blood cells.
- Assists in the release of energy from amino acids (protein foods).
- Essential for cell growth and division. Folate helps in the production of DNA (a genetic material within every cell). It is important for women to take extra folate during pregnancy. Folate is essential for healthy development.

Vitamin B_{12} (Cobalamin)

- Necessary for the release of energy from amino acids (protein foods).
- Helps in the production of red blood cells
- Helps in the maintenance of the central nervous system.

Vitamin C (Ascorbic Acid)

- Necessary for the strengthening of blood vessels.
- Assists with the absorption of the mineral iron.
- Important for healthy teeth and gums.
- Necessary for the healing of wounds.

- Builds resistance to infection.

Calcium

- Necessary in conjunction with phosphorus for the maintenance of bones and teeth.
- Helps blood to clot after an injury.
- Necessary for the proper functioning of nerves, muscles and heart.
- Phosphorus.
- Plays an important part in the production of energy in the body.
- Works in conjunction with calcium for the maintenance strong bones and teeth.
- Helps to regulate the acid –base balance in the body. This means that phosphorus helps to maintain the body at a slightly alkaline level.

Iron

- Combines with protein to form *haemoglobin.* *Haemoglobin* is the substance that gives red blood cells their red colour. Figure 14 shows red blood cells. *Haemoglobin* transports oxygen from the lungs to every cell in the body.

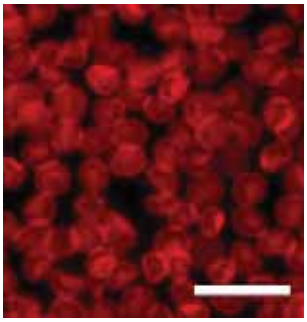


Figure 14: Red Blood Cells
By MDougM (Own work) [Public domain], via Wikimedia Commons.
http://commons.wikimedia.org/wiki/File:Sedimented_red_blood_cells.jpg

Water

- Necessary for all body fluids such as blood, saliva, digestive juices, sweat and urine.
- Helps in the digestion and absorption of food.
- Acts as a lubricant in joints, linings of membranes and the digestive tract.
- Necessary for the removal of waste from the body.
- Regulates the temperature of the body.

Activity

Matching Activity

Match the phrases in the right hand column correctly to the nutrients on the left. Write the correct phrase in the space provided. Vitamin A was done as an example for you.

Nutrients	(Functions) Correct Matching	(Functions) Incorrect Matching
Vitamin A	10). Helps eyes adjust to dim light.	1) Promotes good appetite.
Vitamin D		2) Necessary for the formation of *haemoglobin*.
Vitamin B_1		3). Protects against osteomalacia.
Vitamin B_2		4). Assists with the absorption of iron.
Niacin		5) Regulates the body's acid-base balance.
Vitamin B_6		6) Promotes healthy tongue and digestive system.
Folate		7) Assists with the removal of waste from the body.
Vitamin B_{12}		8) Necessary for DNA production.
Vitamin C		9) Helps prevent osteoporosis.
Calcium		10) Helps eyes adjust to dim light.
Phosphorus		11) Maintains the central nervous system.
Iron		12) Helps blood clot.

Water		13) Keeps skin around nose and mouth smooth.

Figure 15

Feedback

Answers for the above matching activity are as follows:

Nutrients	(Functions) Correct Matching
Vitamin A	10) Helps eyes to adjust to dim light.
Vitamin D	3) Protects against osteomalacia.
Vitamin B_1	1) Promotes good appetite.
Vitamin B_2	13) Keeps skin around nose and mouth smooth.
Niacin	6) Promotes healthy tongue and digestive system
Vitamin B_6	9) Helps prevent osteoporosis.
Folate	8) Necessary for DNA production.
Vitamin B_{12}	11) Maintains the central nervous system.
Vitamin C	4) Assists with the absorption of iron
Calcium	12) Helps blood clot.

Nutrients	(Functions) Correct Matching
Phosphorus	5) Regulates the body's acid-base balance.
Iron	2) Necessary for the formation of *haemoglobin*.
Water	7) Assists with the removal of waste from the body.

Figure 16

Were you able to complete the matching activity correctly? If you were not able to complete the activity review the part of the session and try again.

Session Summary

Summary

In this session you learned about the essential nutrients required, their sources and their importance in the diet of an adult.

- Protein can be obtained from both animal and vegetable sources. Protein is necessary for the maintenance and repair of body cells, production of hormones, enzymes, antibodies, blood clotting and blood transport factors, regulation of body fluid balance and as a secondary source of energy.
- Carbohydrates can be obtained from starchy and sweet foods. Adequate carbohydrates in the diet are necessary for the supply of energy and the efficient use of protein and fat.
- Fat can be obtained from animal and vegetable sources. These fats may be either saturated or unsaturated. Adults should increase their diets with unsaturated fats to regulate their blood cholesterol levels. Fat is important as a concentrated source of energy of which provides essential fatty acids,to dissolve *fat-soluble* vitamins A, D, E and K, to protect the body from heat loss and the internal organs from injury.
- The energy needs of an adult are influenced by age, gender occupation, physical activity and the condition of the person's body.
- Vitamin D is important for the maintenance of strong bones and teeth; and the protection from osteomalacia.
- Vitamin 'B complex' is necessary for the release of energy from foods.

- Calcium is important for the maintenance of bones and teeth, blood clotting, nerves, muscles and heart function.
- Phosphorus is important for energy production, maintenance of strong bones and teeth, and regulation of the acid-base balance in the body.
- Iron is necessary for the formation of *haemoglobin,* which transports oxygen from the lungs to every cell in the body. Iron foods and vitamin C foods should be eaten together to enhance the absorption of iron.

Water is vital for all body fluids such as blood, saliva, digestive juices, sweat and urine. Water is also necessary to regulate body temperature and to remove waste from the body.

Assessment

Assessment

Now that you have completed this session, it is time to see how much you have understood. Answer all of the following questions.

1. Why should adults consume protein of high biological value?

2. Which type of fat is the best choice for adults? Give a reason for your answer.

3. Identify the vitamins that are necessary for the maintenance of general good health of adults.

4. What are the major minerals that should be provided in the diet of adults?

5. Explain how the age, gender and occupation of individuals influence their energy needs.

6. Nutrients work in conjunction with each other. Identify the vitamins that work together for the following functions:

- Absorption of iron

- Absorption of calcium

7. Which nutrients are responsible for the following functions in the body of an adult:

- Releasing energy from foods.

- Promoting healthy bones.

- Producing healthy red blood cells.

Feedback

The following are answers to the above assessment.

1. Adults should consume protein of high biological value to ensure their bodies are provided with all the essential amino acids to function effectively.

2. Unsaturated fats are the best choice for adults. These fats increase the high-density lipoprotein in the blood and reduce the blood cholesterol level.

3. The vitamins necessary for the maintenance of general good health of adults are: vitamin A, vitamin D, vitamin B_1, vitamin B_2, niacin, vitamin B_6, folate, vitamin B_{12} and vitamin C.

4. The major minerals that should be provided in the diet of adults include: calcium, phosphorus and iron.

5. Age influences the energy needs of individuals because as they grow older their bodily processes slow down and they pursue a lifestyle of reduced activities.

6. Gender influences the energy needs of individuals as men tend to have a larger body size and higher metabolic rate than women.

7. An adults occupation influences the energy needs of individuals in relation to the amount of energy needed to carry out the different tasks of an occupation. For instance, occupations that involve manual labor require more energy than those that involve long periods of sitting down. For example, a construction worker requires more energy than a secretary.

8. Vitamin C aids in the absorption of iron.

9. Vitamin D aids in the absorption of calcium.

10. Releases energy from foods: vitamin B_1, vitamin B_2, niacin, vitaminB_6, vitamin B_{12} and phosphorus.

    Promotes healthy bones: vitamin D, calcium and phosphorus.

    Produces healthy red blood cells: vitamin B_6, folate, vitamin B_{12}, vitamin C and iron.

Did you answer all the questions correctly? If you were not able to answer all of the questions correctly, review the relevant part of the session and try again.

Session 6.2 Changes Influencing the Nutritional Status of the Elderly

Introduction

Have you ever thought of growing old? Growing old is a natural process. Each day we live causes us to become older than the day before. The aging process may impact people differently. Some individuals may show signs of aging as young as age 30. Others may show signs of aging at age 55. However, as we grow older, the vital organs, such as the heart, lungs, liver and kidneys, slow down in their functions. As a result, our bodies undergo a number of progressive changes.

These changes involve all the systems in the body such as skeletal system, muscular system, nervous system, endocrine system, circulatory system, immune system, respiratory system, digestive system, urinary system and reproductive system. This session examines the physiological, psychological, economic and social changes that influence the nutritional status of the elderly. Information on these changes will assist you to see the role nutrition plays in reducing the impact of aging.

Outcomes

Upon completion of this session you will be able to:

State the physiological changes of the aging process.

Indicate how physiological changes influence the nutritional status of the elderly.

Identify the other factors that influence the nutritional status of the elderly.

How Long?

You will need to devote two and a half (2 ½) hours of formal study and one and a half (1 ½) hours of self-study to complete this session.

Terminology

Andropause: Is the name give to menopause-like symptoms in elderly men.

Estrogen: Estrogen is a group of steroid hormones that promote the development and maintenance of female characteristics of the body.

Dehydration:	Dehydration is the excessive loss of water from the body because of an illness or fluid deprivation.
Malnutrition:	Malnutrition is a condition that results from incorrect intakes of nutrients in the diet of an individual.
Menopause :	Menopause is the stage of a woman's life, typically between the ages of 45 and 55, when she stops having menstrual periods.
Testosterone:	Testosterone is a steroid hormone that stimulates development of male secondary sexual characteristics, produced mainly in the testes, but also in the ovaries and adrenal cortex.
Progesterone:	Progesterone is a steroid hormone released by the *corpus luteum* that stimulates the uterus to prepare for pregnancy

6.2-1 Physiological Changes of Aging

Physiological changes are changes characteristic of the normal functioning of the human body. Our bodies are made up of millions of cells. These cells form tissues, the tissues form organs and the organs form systems. The physiological changes start at the cellular level. All cells become larger and are less able to divide and reproduce as they age. This leads to tissues becoming stiff and organs becoming smaller in size. An aging organ gradually decreases in its maximum function capacity. This decrease in organ function impacts on the system of the body to which the organ is related.

All the physiological changes of aging will be dealt with according to the different systems of the body. So let's start to look at these changes that occur due to aging shall we?

Changes in the Integumentary System

The integumentary system, which includes the skin, hair and nails, undergoes significant changes during the aging process. The visible changes in this system may be the first indication of an individual growing older. Did you know that the skin is the largest organ of the body? The skin provides protection for internal structures, prevents the entry of microorganisms, regulates body fluids and body temperature, and eliminates waste products.

What Happens as we Age?

Have you ever wondered what causes skin to wrinkle and sag? The structure of the skin becomes thin and weakens as the skin ages. This is due to the skin losing its fat and collagen. Collagen is a protein used to connect and support

body tissues. The sebaceous glands under the skin secrete sebum. Sebum is an oily substance that helps to prevent the skin and hair from drying out. A decrease in sebum production leaves the skin dry, scaly and itchy. This causes the skin to wrinkle and sag. The thinnest of the skin may therefore experience frequent skin injuries, tearing and infections. The healing process for a skin injury may take longer in the elderly than in a much younger person. For example, if an injury takes about two weeks to heal completely in a person aged 18-25, the same injury in a person aged 65- 75 can take four to six weeks to heal; increasing the risk of infection.

Figure 17: Wrinkled Skin
By Old_zacatecas_lady.jpg: Tomas Castelazo derivative work: Dobromila (Old_zacatecas_lady.jpg) [CC-BY-3.0 (www.creativecommons.org/licenses/by/3.0) or GFDL (www.gnu.org/copyleft/fdl.html)], via Wikimedia Commons. http://commons.wikimedia.org/wiki/File:Skin_folds(Old_zacatecas_lady_cropped).jpg

The dermis is the innermost and thickest layer of the skin. As we age the blood supply to the dermis and the sweat gland activity are reduced. This presents a challenge for the body to regulate the body temperature in the elderly. As a result, the internal heat of the body is not regulated efficiently. During extreme temperatures, hot or cold, it can be harmful for the elderly.

Aging also affects the hair and nails of an individual. The hair color fades to gray or white, and the hair thins with aging. Generally men begin to bald with a receding hairline and women develop thinner, finer hair with aging. With aging, nails grow slowly, develop ridges and become hard, brittle, thick and discolored.

The age changes on the integumentary systems may impact different individuals differently. These changes are visible and may cause elderly persons to have a low self-esteem and feel depressed at times. This may also affect their appetite and nutritional status.

Changes in the Skeletal System

Do you know how important your bones and joints are? The functions of the skeleton are to support tissue and muscle; to protect internal organs; assist in movement; storage of minerals and production of blood cells. As we age our bones become more porous as they lose density. This condition called osteoporosis.

Osteoporosis is a progressive bone disease that weakens bones and makes them susceptible to bone fractures.

What Happens as We Age?

This loss intensifies in women during and after menopause. As the body grows older it is less able to replace lost bone. The vertebrae become thinner and its padding wears away during aging. Joints become stiff and lose their flexibility. The connecting ligaments between the hip and knee joints also lose their elasticity and eventually degenerate.

Figure 18: The Skeletal System
By Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC-BY-2.5 (www.creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

How do these physiological changes in the skeletal system affect the nutritional status of elderly persons? These physiological changes in the skeletal system are very likely to affect the mobility of the elderly. This would result in a decrease in physical activities and social interactions, which could thus adversely impact their nutritional status.

Changes in the Muscular System

Do you know that as we grow older our muscle is replaced by fat? Older persons tend to lose muscle mass and gain body fat. The loss of muscle mass starts around age 25 and continues throughout the individual's life. The

majority of the muscle mass is lost by age 80. This decrease in muscle mass is possibly due to the muscles being used less and thus they have begun to shrink. A reduction in muscle mass causes people to lose their ability to move and maintain balance. Therefore, the likelihood of falls may also impact the nutritional status of a person.

What Happens as we Age?

Body fat typically doubles by age 75 compared to what it was during young adulthood. However, some men may gain weight until about age 55, and then lose the weight. This weight loss may be due to a drop in the male sex hormone testosterone. Women may also gain weight until an older age. As body fat increases the lean body mass decreases. Too much body fat can increase the risk of health problems.

Changes in the Nervous System

How do you know that you have a cut? The nervous system sends a message to notify the brain that you have a cut. The nervous system is responsible for the direct responses to stimuli by coordinating the activities of other systems. The nervous system is composed of the brain, spinal cord and a network of nerve cells and fibers. As we age, natural changes occur in the nervous system. The brain and spinal cord are reduced in size and weight.

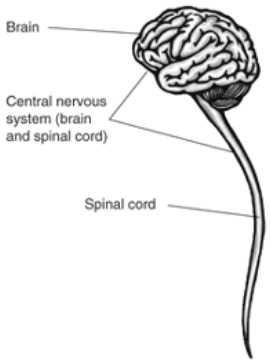


Figure 19: Central Nervous System

What Happens as we Age?

The nerve cells may transmit messages more slowly than before. The breakdown of nerve cells cause plaques and tangles to form on the brain. This breakdown of nerves can affect the bodys senses. The five body senses are sight, smell, taste, touch and hearing. These senses are connected to the nervous system and the brain, and help individuals to communicate with their environment. For example, through the sensations of touch, pressure, pain, heat and cold, individuals do whatever is necessary to protect themselves.

When these senses are affected, an individual might experience reduced or lost reflexes or sensation. This would present a challenge for the elderly to carry out daily activities safely or may interfere with the ability of elderly persons to obtain adequate nourishment. Elderly persons who are unable to carry out normal activities, such as cooking and eating, may experience depression. As a result, this could affect their normal eating behavior and nutritional status.

Changes in the Endocrine System

Do you know that hormones induce, regulate and control almost all bodily functions? Some disorders and diseases may result from hormonal imbalances. The endocrine system is made up of organs and tissues that produce, store and secrete hormones.

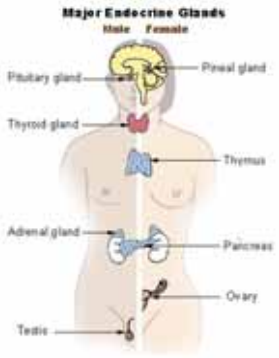


Figure 20: Major Endocrinal Systems
http://commons.wikimedia.org/wiki/File:Illu_endocrine_system.jpg

What Happens as we Age?

As we age, the levels and activity of some hormones produced by the endocrine glands are decreased. Growth hormone levels decrease and lead to a decrease in muscle mass. Also during and after menopause there may be a decline in the concentration of estrogen in the body.

Some tissues also become less responsive to their controlling hormones as we age. For example, insulin produced by our pancreas enables the movement of sugar from our blood into our cells, where it can be converted to energy. When the cells in our bodies do not respond to insulin, a condition called diabetes occurs. Diabetes causes the sugar level to increase after a meal and takes longer to return to normal level. Elderly persons who are diabetics may face the challenges of sensory losses, impaired mobility and depression. If these challenges are not managed well they may negatively the nutritional status of elderly persons.

Changes in the Circulatory System

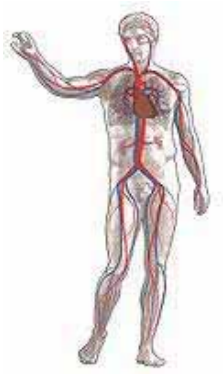


Figure 21: The Circulatory System
By User:Sansculotte (self-drawn) [CC-BY-SA-2.5 (www.creativecommons.org/licenses/by-sa/2.5)], via Wikimedia Commons

The circulatory system involves the blood, heart, arteries, veins and capillaries. It is responsible for transporting cells, nutrients, wastes and gases in the body.

What Happens as we Age?

As we age, the capabilities of the circulatory system decline gradually. The heart muscle weakens and its ability to pump blood through the body as we grow older declines. The walls of the arteries thicken and harden with cholesterol and other fatty deposits that block the arteries eventually. This condition is called atherosclerosis and the arteries become less tolerant of sudden increases in blood pressure. Take a look at the figure below. When this happens, the heart has to pump harder for the blood to circulate throughout the body. As a result, the elderly may experience poor circulation.

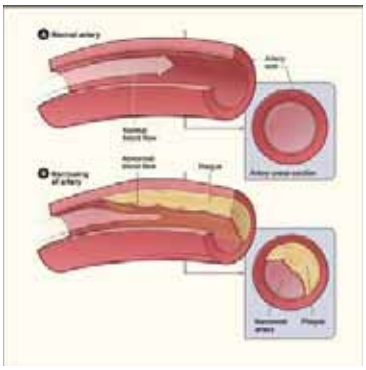


Figure 22: Artherosclerosis
By NHLBI [Public domain], via Wikimedia Commons.
http://commons.wikimedia.org/wiki/File:Atherosclerosis_diagram.gif

Diseases such as heart disease and high blood pressure may result if the changes in the circulatory system are not managed well. These diseases require special diets for their management. If the elderly is not able to afford or prepare these special diets their nutritional status can be affected.

Changes in the Immune System

The immune system is responsible for keeping you well by fighting against infection and disease.

What Happens as we Age?

As age advances, the immune system becomes less able to fight off diseases and infections. The cells primarily responsible for immunity are the T cells and the B cells. The T cells attack specific invaders as they enter the body. While the B cells produce antibodies after an infection. As we get older, these cells become less responsive to the invasion of foreign bodies or infections. As a result, an elderly person becomes at risk for developing diseases and infections, which definitely weaken the elderly nutritional status. Also, during an illness, people lose appetite and interest in foods, which leads to loss of weight and poor nutrition.

Changes in the Respiratory System

What happens when we breathe? Our bodies are supplied with oxygen. The respiratory systems primary function is to provide the blood with oxygen so it can deliver oxygen to all parts of the body. This function is performed through the process of breathing. The respiratory system consists of the nasal cavity, pharynx (throat), larynx (voice box), trachea (windpipe), bronchi, lungs and diaphragm.

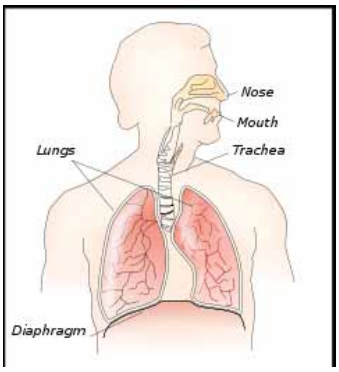


Figure 23: Respiratory System
By User Theresa knott [CC-BY-SA-2.5 (www.creativecommons.org/licenses/by-sa/2.5), GFDL (www.gnu.org/copyleft/fdl.html) or CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0/)], via Wikimedia Commons. http://commons.wikimedia.org/wiki/File:Respiratory_system.svg

What Happens as we Age?

The tissue of the lungs becomes less elastic as we advance in age. This reduces the ability of the lungs to inflate and deflate during the breathing process. The muscles involved in breathing tend to weaken. The number of air sacs and capillaries in the lungs are reduced. These changes result in less oxygen being absorbed from the air inhaled.

The presence of oxygen allows the body to use food efficiently in the energy conversion process. The respiratory age-related changes cause less oxygen to be absorbed by the lungs. This may lead to the inefficient use of food for the energy conversion process. The nutritional status of the elderly can therefore be negatively affected in the long term.

Changes in the Digestive System

Do you know how the body makes use of the food we eat? The digestive system breaks down food into simple substances, so that it can be absorbed and utilized by the body. The digestive system is made up of the mouth, esophagus, stomach, small intestine large intestine, rectum and anus.

What Happens as we Age?

During the aging process, there is a decrease in the smooth muscle tone along the digestive tract. This weakens the contractions necessary to move and breakdown the food in the digestive tract. The slow movement of food through the digestive system may lead to constipation. In the stomach, there is a decrease in the secretion of *hydrochloric acid*. Protein is digested by the action of *hydrochloric acid* and the enzyme *pepsin*. Insufficient *hydrochloric acid* in the stomach causes incomplete digestion of protein and a lack of the absorption of calcium and iron causing a loss of muscle mass and malnutrition.

Changes in the Urinary System

The urinary system eliminates waste and extra fluid from the body. The urinary system is made up of the kidneys, ureters, bladder and urethra. The kidneys produce urine by filtering the blood. The kidneys have filtering units called *nephrons*. As we grow older, the number of *nephrons* decrease and the kidneys get smaller. In the elderly, the ability of the kidneys to balance the amount of salt and acid in the body decreases as the kidneys start to lose their functions and urine is not filtered out effectively.

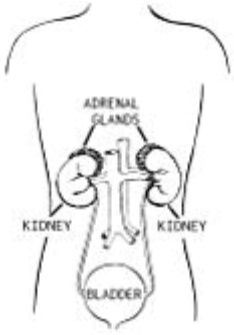


Figure 24: Urinary System
By Pearson Scott Foresman [Public domain], via Wikimedia Commons
http://commons.wikimedia.org/wiki/File:Adrenal_gland_(PSF).jpg

What Happens as we Age?

Aging causes the bladder tissue to become less elastic and the bladder tends to hold less urine. The muscles of the bladder weaken and urine may be left in the

bladder after urination. The sensation of needing to urinate may be delayed and then become sudden and urgent. Thus, there may be an incomplete emptying of the bladder.

As the kidneys age, they may be less able to remove waste from the blood. The kidneys may also be unable to conserve salt efficiently, resulting in increased dehydration. The elderly with bladder problems might have a fear of urinating too often. This may cause them to avoid drinking too much liquid, which can affect their nutritional status.

Changes in the Reproductive System

The reproductive system is mainly concerned with the production of egg and sperm cells and the production sex hormones. The aging process affects the reproductive systems of both men and women. Aging changes in the male reproductive system may include changes in sperm production, testicular tissue and erectile function. These changes occur gradually during a process called andropause. The testes produce sperm cells at a slow rate. The testicular tissue mass decreases and the hormone testosterone decreases slightly. The elderly male may also experience problems with erectile function.

The most dramatic change in the female reproductive system occurs at menopause. Menopause is that time in a woman's life when her ovaries stop releasing eggs and her menstrual period stops. This is as a result of a decline in the levels of hormones estrogen and progesterone in the body. The reduced estrogen levels have been linked to osteoporosis which is the loss of bone density. This results in fractures which lead to a decrease in physical activity and social interaction of the elderly, which can also negatively affect the nutritional status of the elderly.

Activity

Indicate by putting an X in the box provided to state whether the following statements are "True" or "False."

1. The skin becomes thin, dry and weakens as we age.

   True☐ or False☐

2. Osteomalacia is a condition that involves the loss of bone mass.

   True☐ or False☐

3. An elderly person tends to lose muscle and gain body fat.

   True☐ or False☐

4. The brain and spinal cord are increased in size and weight during aging.

True☐ or False☐

5. The skeletal system secretes hormones in the body.

   True☐ or False☐

6. Fatty deposits in the walls of the arteries lead to poor circulation.

   True☐ or False☐

7. Older people are more prone to diseases and infections.

   True☐ or False☐

8. The bladder is less able to balance the salt and acid in the body as we grow older.

   True☐ or False☐

9. The slow movement of food through the digestive system may lead to constipation.

   True☐ or False☐

10. During menopause the level of the hormone estrogen declines.

    True☐ or False☐

Feedback

The following are the answers to the above true or false questions:

1. True	2. False
3. False	4. False
5. True	6. False
7. False	8. True
9. True	10. False
11. True	12. False

Did you answer all the questions correctly? If you answered any of the questions incorrectly, review the relevant part of the session and try again.

6.2-2 Factors Affecting Nutritional Status

Apart from the age-related physiological changes, there are other factors that influence the nutritional status of the elderly. These factors can be categorized as the psychological factors, the economic factors and the social factors. These factors impact the ability and willingness of the elderly to eat..

Psychological Factors

Have you ever been depressed? Did you feel like doing anything? Depression is a common condition amongst the elderly. When older adults experience grief and sadness at the loss of a spouse, friend or a family member they can suffer from depression. Elderly persons who do not have meaningful interactions with friends and live away from their children experience loneliness. Illnesses and the fear of death can cause the elderly to become anxious. Older adults who have loss of memory and mental disorders can be irritable, confused and suffer from dementia.

All these changes affect the ability of the elderly to perform simple tasks, such as going to the grocery and market, and preparing balanced meals. Elderly persons experiencing these psychological changes lose their appetite and the willingness to cook and eat. When older adults experience depression, loneliness, anxiety and mental challenges their nutritional status is adversely affected. Support and companionship of family members or friends in preparing and eating meals can enhance the appetite and food intake of the elderly.

Economic Factors

How do you feel when you cannot buy the things you need? Food is a basic commodity and some elderly persons cannot afford it. You have to bear in mind that most elderly individuals no longer work for a living. Therefore, they either have to depend on their life savings, support from family members or on available support systems. The income available to the elderly influences their food selections, eating habits and nutritional status. For example, persons living on a low income would be unable to purchase a wide variety of foods to maintain good health. Their meals might be comprised of the same type of foods daily, such as bread and cheese or rice and peas or flour porridge.

Inadequate food preparation, storage and cooking facilities also influence the food choices and meals eaten by older adults. Being low income limits the availability of proper facilities to prepare balanced meals. The elderly may not have a variety of cooking utensils to prepare a variety of dishes. They may not have storage facilities such as a refrigerator to store perishable foods i.e. fish, meat and vegetables. The cooking facilities may also influence the type of

meals prepared. The availability of a one burner stove puts a limit on the types of dishes that can be prepared. Elderly persons living on a low income are likely to have inadequate food and nutrient intakes. Family members or friends should assist older adults to access the various support programs to enhance their quality of life.

Social Factors

Older adults who are uneducated, who live alone and who are institutionalized experience poor nutrition, as they may experience challenges in reading and accessing the available resources. For instance, an elderly person who is not educated might be reluctant to apply for food stamps, which assist in the supply of food, and may also tend to eat very little food thus leading to nutritional deficiencies. These actions may be a result of not being able to read and understand what is required.

Do you like to be alone? Sometimes you may want to be alone but not for long periods. Just think about the older adults whose children have left home to start their own families. Some elderly persons live alone due to the death of their spouses and their children living away from them. They may experience some challenges in shopping for food, preparing food and eating their meals. These challenges might also be due to illness and impaired mobility. Additionally, being in an institution such as a hospital, nursing home or an elderly home can bring about feelings of loneliness.

The elderly need support from those around them. Family members or friends can arrange mealtimes for the elderly to be shared with others. This will enhance their appetite and improve their nutritional status.

Activity

Multiple Choice Activity:

The following four (4) questions have four (4) suggested answers from which you are to choose the correct answer. Indicate the correct answer by placing an "X" in the box provided near to the letter of the correct answer.

1. All of the following factors adversely affect the nutritional status of the elderly EXCEPT:

   (a) ☐ Depression

   (b) ☐ Loneliness

   (c) ☐ Social Interaction

   (d) ☐ Low Income

2. Depression, loneliness, anxiety and mental challenges can be classified as _____ that are common in the elderly.

(a) ☐ Mental Changes

(b) ☐ Psychological Changes

(c) ☐ Economic Changes

(d) ☐ Social Changes

3. Which of the following factors has the MOST influence on the food choices and meals prepared by older adults?

(a) ☐ Cooking Facilities

(b) ☐ Available Income

(c) ☐ Food Storage Facilities

(d) ☐ Available Transportation

4. Which of the following ways will NOT improve the nutritional status of the elderly?

(a) ☐ Sharing mealtime with others

(b) ☐ Spending time with friends

(c) ☐ Living alone

(d) ☐ Including a variety of foods in the diet

Feedback

The following are answers to the above multiple choice questions:

1. C Social Interaction
2. B Physiological Changes
3. B Psychological Changes
4. B Available Income
5. C Living Alone

Did you answer all the questions correctly? If so, well done! If you were not able to answer all the questions correctly, review the relevant part of the session and try again.

Session Summary

Summary

In this session you learned about the physiological changes during the aging process as well as other factors that adversely influence the nutritional status of the elderly.

- There is a loss of bone mass as we grow older. This weakens the bones and makes them prone to fractures. As we age, joints also lose their elasticity and eventually degenerate.
- An elderly person tends to lose muscle mass and gain body fat. This reduction in muscle mass causes people to lose the ability to move and maintain their balance. It also contributes to the loss of muscle strength.
- During the aging process, the brain and spinal cord are reduced in size and weight. There is also a breakdown of nerve cells that cause reduced or lost reflexes or sensation.
- As we age, there is a reduction in the secretion of some hormones by the endocrine system. Some tissues also become less responsive to their controlling hormones.
- The heart of an elderly individual slows down and is less able to pump blood through the body. The blood vessels lose their elasticity and become less tolerant of sudden increases in blood pressure.
- The immune system becomes less able to fight off diseases and infections during the aging process, thus older people are more prone to diseases and infections.
- The lungs ability to inflate and deflate during the breathing process is reduced as we age. Less oxygen is absorbed from the air inhaled as we grow older.
- Older adults are more likely to suffer from constipation. This is due to the slow movement of food along the digestive tract. The stomach secretes less *hydrochloric acid,* which hinders the proper digestion of protein as we age.
- The kidneys do not filter urine effectively in elderly persons. The muscles of the bladder weaken and urine may be left in the bladder after urination in an older adult.
- In women, there is a decline in the level of the hormone estrogen in the body during menopause. This reduction in estrogen may lead to osteoporosis. Also, in elderlymen, their testes produce sperm cells at a slower rate.
- Other factors influencing the nutritional status of the elderly include psychological factors, economic factors and social factors. These factors may contribute to poor food choices and nutrient deficiencies. The elderly may also need to overcome depression which may improve their appetite.

Assessment

Assessment

1. State two (2) physiological changes that occur in the following systems of the body:

- The skeletal system.

- The muscular system.

- The circulatory system.

- The digestive system.

2. Indicate how the following physiological changes influence the nutritional status of the elderly:

- The loss of muscle mass.

- The loss of teeth.

- The accumulation of cholesterol in the arteries.

- Insufficient *hydrochloric acid* secreted in the stomach.

3. Identify other factors that influence the nutritional factors of the elderly.

Feedback

The following are answers to the above questions:

1. Physiological changes that occur in the following systems of the body are:

The Skeletal System

- Loss of bone density.
- Teeth loss and gum disease.

- Ligaments lose their elasticity.
- Vertebrae become thinner.

The Muscular System

- Loss of muscle mass.
- Increase in body fat.

The Circulatory System

- The heart muscle weakens.
- The walls of the arteries thicken and harden with cholesterol.

The Digestive System

- Slow movement of food through the digestive system.
- Insufficient *hydrochloric acid* secreted in the stomach.

2. Indicate how the following physiological changes influence the nutritional status of the elderly:

The Loss of Muscle Mass

The loss of muscle mass causes the elderly to lose their ability to move and maintain their balance. The likelihood of falls and impaired mobility could interfere with their meal preparation. As a result, their nutritional status may be adversely affected.

The Loss of Teeth

The loss of teeth could make chewing difficult. Even the use of dentures is not as effective as natural teeth. Teeth loss leads to the elimination of certain foods from the diet of the elderly. The diet of elderly persons may lack foods such as fruits and vegetables. This results in poor nutrition.

The Accumulation of Cholesterol in the Elderly

The accumulation of cholesterol in the arteries leads to poor circulation. Diseases such as heart disease and high blood pressure may result if the changes in the circulatory system are not managed well. The nutritional status of the elderly may be adversely affected if special diets are not consumed for the management of these diseases.

The Weakened Immune System

Older people tend to be prone to diseases and infections because of their weak immune system. During their illnesses, they lose their appetite and suffer poor nutrition.

Insufficient *Hydrochloric Acid* Secretion

Insufficient *hydrochloric acid* in the stomach interferes with the digestion of protein and the absorption of calcium and iron. As a result, the nutritional status of the elderly is affected adversely. This is evident by the loss of muscle mass and malnutrition.

3. Identify other factors that influence the nutritional status of the elderly:

Psychological factors - depression, loneliness, anxiety and mental challenges, may cause elderly persons to lose their appetite and their willingness to cook and eat food. These psychological changes affect the ability of elderly persons to perform simple tasks, such as going to the grocery and market, and preparing balanced meals.

Economic factors – the income available to the elderly influence their food selection and eating habits. Facilities for food storage, food preparation and cooking are also determined by the available income of the elderly. If these facilities are inadequate, the diet of the elderly may be monotonous and result in poor nutrition.

Social factors – elderly persons who are uneducated, who live alone or are institutionalized in a hospital or elderly home tend to eat very little food which leads to nutritional deficiencies. An elderly individual who is uneducated may not be able to access food programs to improve their nutritional status. Elderly persons who live alone or who are institutionalized may not be encouraged to cook or eat food. This might be due to a lack of interaction with their families and close friends.

Session 6.3 Nutritional Needs of the Elderly

Introduction

Due to the physiological changes of aging, older adults may be at risk of lacking certain nutrients that are necessary for their general good health. It is important that the diet of an elderly person includes a variety of foods thus ensuring that the nutrient needs of the elderly are met. Did you know that proper nutrition can play a role in slowing down the effects of the aging process? . Each nutrient performs a specific function in the body. Once there are certain nutrient deficiencies in the diet over a prolonged period of time certain diseases are likely to occur. Older adults suffer from conditions that present effects on the body that could be minimized by certain nutrients. .

In this session we are going to look at the nutrients of concern to the elderly. These nutrients are of concern because of the age-related changes experienced by the older adults. We will also look at some nutrition-related diseases affecting the elderly and how proper nutrition can help in the management of these diseases. This session will lay the foundation for planning and preparing meals for the elderly

Upon completion of this session you will be able to:

Outcomes

Explain the nutritional needs of the elderly.

Identify rich food sources of the nutrients required by the elderly.

Explain how proper nutrition assists in the management of nutrition-related diseases amongst the elderly.

How Long?

You will need to devote two and a half (2 ½) hours of formal study and one and a half (1 ½) hours of self-study to complete this session.

Terminology

Atherosclerosis: Atherosclerosis is a condition in which artery walls thicken with fatty substances such as cholesterol.

Atrophic Astritis: Atrophic gastritis is the inability of the stomach to secrete sufficient hydrochloric acid to kill bacteria.

Basal Metabolic Rate: Basal metabolic rate (BMR) is the rate at which the body uses energy for the maintenance of these bodily functions.

Dietary Fiber: Dietary fiber refers to the cell walls of plants, which cannot be digested by the body. It is found in fruits, vegetables and grains

Homocysteine: Homocysteine is an amino acid used in cellular metabolism and the manufacture of proteins by the body.

Nutrient-Dense Foods: Nutrient-dense foods are high in nutrients in relation to their calorie contents.

Osteoporosis: Osteoporosis is a condition that causes bones to become less dense which makes them weaker and more brittle.

6.3-1 Nutrient Needs of the Elderly

Although we require less energy as we get older, it is important to provide our bodies with all the necessary nutrients for proper bodily functions. A balanced

diet will provide elderly persons with adequate energy and proper nutrition for general good health.

In this part of the session, we will look at the nutrients that are of great concern to the elderly.

Carbohydrates

Elderly persons should consume more complex carbohydrates because it is important to provide the body with energy. An adequate supply of carbohydrates in the diet supports the use of protein for growth and repair of tissues. They are high in dietary fiber and are digested into glucose more slowly than simple carbohydrate foods. This serves to stabilize the blood sugar and ensures a steady flow of energy throughout the day. Complex carbohydrate foods provide a longer satisfied feeling after a meal. Most elderly persons experience constipation. Complex carbohydrate foods will benefit them by improving digestion and maintaining proper bowel movement. Examples of these foods include: whole grain cereals (e.g oatmeal, corn, brown rice and whole wheat bread, bran and wheat germ,) legumes (e.g.lentils, beans and peas) and starchy tubers or roots such as yam, cassava, sweet potatoed, and breadfruit.

Energy Needs

Do you know what the basal metabolic rate is? The basal metabolic rate (BMR) is the rate at which heat is produced by an individual in a resting state. The body burns calories for breathing, heartbeat, regulating body temperature, kidney function, brain function and other bodily functions to keep us alive. The basal metabolic rate (BMR) is the rate at which the body uses energy for the maintenance of these bodily functions.

Our lean body mass decreases with age. As a result, the basal metabolic rate of elderly persons is lower than when they were young. This means that the basal metabolic rate is dependent on the amount of lean body mass. Older people also tend to involve themselves in less physical activities. For these reasons, the energy needs of elderly persons are reduced. Less energy needs means fewer calories. Excess calories are stored as fat when more calories are consumed than those required by the body.

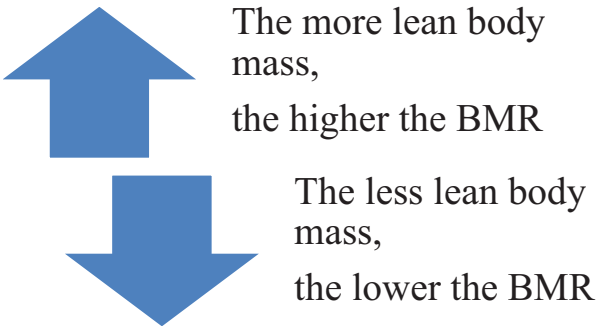


Figure 25: The Basal Metabolic Rate

Note it!

Although the energy needs of the elderly are reduced, their nutrient needs must be met. Older adults can meet their nutrient needs and consume fewer calories by selecting nutrient-dense foods. What are nutrient dense foods? Nutrient-dense foods are high in nutrients in relation to their calorie contents. For example, low-fat yogurt is a nutrient-dense food compared to regular yogurt. The low-fat yogurt has the same nutrient content as in the regular yogurt, but it has fewer calories.

Some examples of nutrient-dense foods are: lean meat, salmon, tuna, low-fat dairy products, oatmeal, cornmeal, brown rice, broccoli, spinach, carrot, oranges, and cherries.

Tip

Are you wondering how you can identify nutrient-dense foods?

All foods that are low in refined sugar and low in fat can be regarded as nutrient-dense foods.

Protein

As we age, our stomachs secrete less hydrochloric acid. This stomach acid is important for protein digestion. A reduced secretion of hydrochloric acid interferes with the complete digestion of protein. Older adults also tend to absorb protein less efficiently than younger adults.

Do you remember what the main function of protein in the body is? Protein is primarily responsible for the growth and repair of tissues. Older adults tend to lose muscle mass and increase their body fat. Therefore, there is a need to include adequate high quality protein in their diets. This is important to maintain lean muscle mass and to support a healthy immune system. It is suggested that protein intake for the elderly should be 1.0 -1.25 grams of protein per kilogram of body weight daily.

Examples of protein foods from animal sources include: milk, cheese, meat, chicken, fish, and eggs. These proteins contain all the essential amino acids in sufficient amounts and are of high biological value or of a high quality.

A combination of legumes (peas and beans) and cereals will also provide high biological value proteins in the diet. Examples of combinations of legumes and cereals are: rice and pigeon peas, corn meal dumplings and kidney beans, and a lentil-burger sandwich.

Vitamin D and Calcium

Vitamin D and calcium work together ensure healthy bones and teeth. There is usually a low level of vitamin D in the body of the elderly. This may be due to

a limited intake of vitamin rich foods, such as: oily fish and dairy products. Limited exposure to the sunlight also affects the elderly even more so as, aging decreases the ability of the skin to synthesize vitamin D. Aging also affects the ability of the kidneys to convert vitamin D to its active form. Vitamin D assists in promoting the absorption of calcium.

As we age, there is a decline in the capacity of certain body mechanisms that provide sufficient calcium. In an effort to meet the calcium needs, the body breaks down the bones to access its calcium. As a result, the calcium needs for bone and teeth maintenance increase with age. Calcium is a very important nutrient for the building and maintenance of bones and teeth. It is necessary for the elderly to consume calcium rich foods to avoid bone loss and reduce fracture risk.

To prevent bone loss elderly persons need to include rich sources of vitamin D and calcium in their diets.

Vitamin D can either be obtain from animal sources, such as oily fish-salmon, sardines and mackerel, egg yolk, milk and its products –cheese and yogurt, or sunlight. Calcium sources include green leafy vegetables and legumes e.g. channa/chick peas etc. Elderly persons who are vegetarians have to ensure that they are exposed to the sunlight for their supply of Vitamin D.

Vitamin B_6

There may be low levels of vitamin B_6 in the diet of elderly persons. This may be due to a decrease intake of meat, poultry and fish. Many older adults do not have the money to purchase these foods. Prescription drugs may also interfere with the absorption of vitamin B_6. Older adults need vitaminB_6 in their diets for energy metabolism, healthy red blood cells, proper immune function, normal nerve function and heart health. Vitamin B_6 reduces high levels of homocysteine in the blood of the elderly. High levels of homocysteine appear to be a risk factor for heart disease.

Sources from which the elderly can obtain vitamin B_6 include: salmon, tuna, chicken, turkey, pork, beef, beans, peas, nuts, cereals and broccoli.

Vitamin B_{12}

Elderly persons may be deficient in vitamin B_{12}. This is mainly due to a condition called atrophic gastritis. You may be wondering what is atrophic gastritis?

Atrophic gastritis is a condition that stems from the inability of the stomach to secrete sufficient hydrochloric acid to kill bacteria.

Hydrochloric acid, also known as stomach acid, is necessary for the absorption of dietary vitamin B_{12} by the body. Vitamin B_{12} plays an important role in energy metabolism, the formation of blood, normal nerve functions and heart

health. The elderly can obtain rich sources of vitamin B_{12} from liver, kidneys, corned beef, eggs and sardines.

Folate

The ability of the elderly to absorb folate efficiently decreases with age. This is as a result of a decline in the secretion of hydrochloric acid in many elderly people. Folate may not be absorbed due to side effects of certain medications. Elderly persons need to have an adequate dietary intake of folate daily because folate helps to generate red blood cells and prevent a condition called anemia. Anemia may cause the elderly to feel tired. It also helps in protein metabolism and the regulation of appetite.

Folate plays a major role in reducing high levels of homocysteine in the blood. Homocysteine is an amino acid that is produced as a byproduct consumed meat. Adequate folate is needed to convert homocysteine to *cystein*e. Homocysteine is toxic to the lining of blood vessels, and can lead to hardening of the arteries called arteriosclerosis. This increases the risk of heart attacks, strokes and blood clot formation. Sources of folate include: yeast extract, green leafy vegetables, dried peas and beans and liver.

Vitamin C

Vitamin C absorption declines with age. The capacity of our bodies to absorb vitamins decrease as we grow older, thus the vitamin C in the blood and tissues are lower. Therefore it is necessary for elderly persons to pay attention to their dietary intakes of vitamin C. It is required for the formation of collagen. Collagen is a structural component of bones, teeth, tendons, muscles and blood vessels. Collagen is needed for healing wounds and repairing bones and teeth. Vitamin C also plays an important role in the absorption of the mineral iron.

Sources of vitamin C include fresh fruits and vegetables, such as: cherries, oranges, watermelon, pineapples, cabbage, cucumbers, tomatoes and lettuce.

Iron

Iron is necessary for healthy red blood cells. Iron deficiency in older adults may be due to a number of reasons. These reasons include an inability to secrete *hydrochloric acid* in the stomach. This stomach acid is important for the absorption of iron. The regular use of antacids and certain drugs that bind with iron are also causes of iron deficiency in the elderly. Disease conditions causing severe blood loss also influence the level of iron in the body.

Do you remember what some rich iron foods are? Some rich iron foods that elderly persons should include in their diets are chicken liver, turkey, tuna, lentils, tofu, spinach, watercress and dasheen leaves.

Water

Dehydration is common in elderly persons. The thirst of elderly persons diminishes and they are not likely to drink water without consciously thinking about it. Dehydration also results from a conscious restriction of liquids by those who have lost bladder control. A lack of water causes fluid buildup and

salt retention. The salt draws water out of the tissues and increases dehydration. This leads to poor blood circulation, which causes headaches, dizziness, fatigue and a loss of mental alertness. Elderly persons should ensure an intake of 6 – 8 glasses of water daily. Water is necessary for elderly to improve bowel movement, lubricate joints and muscles, and improve blood circulation

Activity

Let's take some time to see how much you have learned in this session so far. Answer the following questions in the space provided below.

1. Why should the elderly consume more complex carbohydrates foods?

2. What determines the energy needs of the elderly?

3. Why is there a need for elderly persons to include high quality protein in their diet?

4. Which nutrients are responsible for the following functions in the elderly?

- Bone health

- Healthy red blood cells

- Lowering homocysteine blood levels

Feedback

The following are answers to the above questions:

1. Elderly persons should consume more complex carbohydrate foods for the following reasons:

- To stabilize their blood sugar.
- To provide a steady flow of energy throughout the day.
- To give a satisfied feeling after a meal.
- To maintain proper bowel movement.

2. The basal metabolic rate and the physical activity level of elderly persons determine their energy needs.

3. There is a need for elderly persons to consume high quality protein to maintain lean muscle and a healthy immune system.

4. The following nutrients are responsible for the following functions:

- Bone health – vitamin D and calcium.
- Healthy red blood cells – vitamin B_6, vitamin B_{12}, folate, vitamin C and iron.
- Lowering homocysteine blood levels – vitamin B_6 and folate.

Did you answer all the questions correctly? If you were not able to answer all the questions correctly, review the relevant part of the session and try again.

6.3-2 Nutrition-Related Diseases in the Elderly

Every food provides certain nutrients to the body when consumed. Can you think of a food that will provide us with all the necessary nutrients we need for a healthy body? Some may say milk is a complete food, but even milk is deficient in certain nutrients i.e. vitamin C and iron. So how can we provide our bodies with the necessary nutrients to maintain a healthy body? We can do this by eating a variety of foods. In this way we will ensure our nutrient requirements are met.

What is meant by the term nutrition-related diseases? Nutrition-related diseases are those diseases that occur due to nutrient deficiencies or excesses in our diets. Now remember that every nutrient performs certain functions in our bodies. Our diets should provide nutrients in the correct amount according to our individual needs. A lack of one or more nutrients in our diets over a prolonged period of time initiates the development of a disease. Similarly, when our diets provide excess of nutrients which become be stored in our bodies, certain conditions may develop in the long term.

Nutrition-related diseases of the elderly may occur as a result of nutrient deficiencies or excesses in the diet. Many older people may not consume a balanced diet over a prolonged period for some of the reasons we discussed above. A balanced diet provides the correct amount of nutrients to meet an individual's needs. As we get older certain conditions become evident because our bodies can no longer function normally with certain nutrient deficiencies or excesses.

Nutritional Challenges the Elderly Face

Most elderly people face a number of challenges that prevent them from meeting their daily nutrient needs. Do you know what some of these challenges are?

- Some elderly people are unable to chew food properly, due to teeth loss and ill-fitting dentures.
- Some elderly people may restrict certain foods from their diets to manage certain health conditions being experienced.
- There are also some elderly people who are unwilling to eat because their appetites are reduced.
- The bodies of some elderly people may be less able to absorb certain nutrients efficiently. For example, vitamin B_{12} may not be absorbed because of a reduced secretion of *hydrochloric acid* in the stomach. *Hydrochloric acid* is needed for the absorption of vitamin B_{12} by the body.

Let us now look at some of the nutrition-related diseases that elderly people are most likely to experience.

Iron-Deficiency Anemia

Oxygen is required by every cell for the body to function properly. How does the oxygen from the air we breathe get to all the cells of the body? *Haemoglobin,* a protein in red blood cells, carries oxygen to the cells of the body. Iron plays a major role in the formation of *haemoglobin*. Iron-deficiency anemia is a disorder in which there is a decrease in red blood cells caused by too little iron. If *haemoglobin* is not formed in the blood, as a result, oxygen is not utilized efficiently by the body. Iron-deficiency anemia occurs after the normal iron stores in the liver and bone marrow have been depleted. Insufficient iron in the elderly occurs as a result of poor absorption of iron, too little iron in the diet and chronic gastrointestinal bleeding, such as from gastric ulcer and gastrointestinal cancer.

Symptoms of Iron-Deficiency Anemia

Iron-deficiency anemia in elderly persons may cause them to have poor appetites, pale skin color, weak muscles, short breath, headache, and feel tired and irritable.

What is the Relationship Between Nutrition and Iron-Deficiency Anemia?

Iron and vitamin C are needed to assist with the prevention of iron-deficiency anemia. The mineral iron plays a vital role in the formation of *haemoglobin*. Vitamin C is needed to assist in the absorption of iron. If there is a deficiency of iron and vitamin C in the diet over a prolonged period anemia can occur. Elderly persons should ensure that rich sources of iron and vitamin C foods are included in their diet. Do you remember which foods supply you with iron?

Diabetes Mellitus Type II

The hormone insulin is necessary to move glucose from the bloodstream into fat, liver and muscle cells. Glucose is stored in these cells for energy. Diabetes mellitus type II is a chronic disease that causes high levels of glucose in the blood. Diabetes mellitus type II is commonly seen in the elderly. This condition causes the body not to respond correctly to insulin. This means that fat, liver and muscle cells do not respond to insulin. What do you think occurs when blood glucose cannot enter these cells? High levels of glucose build up in the blood. This is referred to as *hyperglycemia*. Over a prolonged period, the cells of the body become resistant to high levels of insulin in the blood. Overweight elderly persons are more likely to have insulin resistance cells. Body fat interferes with the ability to use insulin normally. Excess body weight, reduced physical activity, poor diet and hypertension increase the elderly risk for diabetes.

Symptoms experienced by people with diabetes mellitus type II include: blurred vision, fatigue, increased appetite, increased thirst, increased urination and slow healing infections.

What is the Relationship Between Nutrition and Diabetes Mellitus Type II?

Carbohydrates are used for energy by breaking down into glucose. A large consumption of carbohydrates increases the secretion of insulin. High insulin levels in the blood results in the body utilizing blood glucose as fuel for energy. In other words, the body will not utilize fat stored as fuel for energy.

The type of carbohydrate determines the rate our blood increase in sugar. Processed or refined carbohydrate foods such as white flour or rice affect our blood sugar more than complex carbohydrate foods. They raise blood sugar quickly, because they take a shorter time to pass through the digestive system. List five examples of complex carbohydrate foods below.

Hypertension

How is our blood able to flow to different parts of our bodies? The pressure of our blood enables it to flow throughout the entire body. The blood pressure is the force exerted on our artery walls by the blood flowing through our body. Our blood should flow at a normal pressure through our arteries to prevent any damage to our artery walls. However, sometimes our blood pressure may either be above or below what is regarded as normal. When our blood pressure is above our normal blood pressure this is called *hypertension* or high blood pressure.

How do we know whether or not our blood pressure is high?

Note it!

Normal blood pressure readings fall below120/80. You may be wondering what this reading represents? The top number (120) represents the systolic pressure. This indicates the pressure when our heart beats. Whereas, the lower number (80) represents the diastolic pressure. This indicates the pressure at rest between heartbeats. Our blood pressure is high when pressure readings are 140/90 and higher.

Hypertension is a common condition among elderly people. Do you know an elderly person who suffers from hypertension? What do they look like? Do you know what foods they eat regularly? As people age increased body weight may be evident. Diets high in animal fat also contribute to the increase in weight. Excess body weight places a strain on our heart and increases our risk of high blood pressure. A diet high in animal fat also leads to the formation of plaque on the artery walls. Plaque formation causes our arteries to lose their flexibility and increases our blood pressure.

Elderly people with high sodium (salt) intake may be at risk for hypertension. As we age, our sense of taste and smell decrease. The elderly might tend to increase the amount of salt in their diet to improve the taste of food. Too much salt can cause an increase in blood pressure. Salt raises blood pressure by

causing the body to retain fluid. This fluid retention places a strain on the heart and leads to an increase in blood pressure.

What is the Relationship Between Nutrition and Hypertension?

Excessive body weight and high salt intake are factors influencing high blood pressure. Our body weight increases as we age. This is due to the excess calories in our diet and a reduction of physical activities. Calories in our diets are provided by fat and carbohydrate foods. The elderly can control their blood pressure by consuming adequate calories according to their energy needs. This will contribute to their maintenance of normal body weight.

High salt intake causes our bodies to retain fluid and increase blood pressure. Potassium works together with sodium to regulate the fluid balance of the body. Older persons can decrease sodium and increase potassium in their diets to control hypertension.

Tip

Elderly people can maintain normal blood pressure to by eating more:

Fresh fruits – watermelon, guava, pineapple

Fresh vegetables – lettuce, tomato, cucumber, carrot, cabbage

Low-fat dairy products – low-fat yogurt, low-fat milk

Fish – salmon, tuna, sardines

Poultry – turkey, chicken, duck

Whole grain cereals – cornmeal, oatmeal, brown rice

Legumes – red beans, lentils, pigeon peas, split peas

Atherosclerosis

The blood vessels used to transport blood from the heart to the entire body are called arteries. Diseases occur in the part of the body where there is a partially or completely blocked artery. How do our arteries become blocked? As we get older our arteries become hard and stiff. What causes this to occur? Conditions such as high blood pressure and diabetes cause injury to our artery walls. Over a prolonged period our artery walls become lined with scar tissue. This makes it easier for deposits of fat, cholesterol and calcium to form a plaque on the walls of our arteries. This disease is called atherosclerosis and is commonly experienced by the elderly. Atherosclerosis restricts the blood flow through the arteries. The effects of atherosclerosis depend on where it is occurring.

Atherosclerosis	Disease
In the arteries of the heart	Coronary disease –angina or heart

Atherosclerosis	Disease
	attack.
In the arteries of the brain	Transient ischemic attack or stroke
In the arteries of the arms, pelvis or legs	Peripheral artery disease

Figure 27: Effects of Atherosclerosis

What is the Relationship Between Nutrition and Atherosclerosis?

Do you know that fat is not the only component of our diet we should reduce to prevent atherosclerosis? Generally, when we think about blocked arteries we make a connection with too much fat in our diet. Yes, excess dietary fat and cholesterol, which is found in foods from animal such as meats, cheese and eggs, can affect our heart health however, excess dietary fat and cholesterol are not the only component of our diet that is stored as body fat.

Carbohydrate-rich foods include sweet and starchy foods. When we consume more carbohydrate-rich foods than our bodies need, the excess carbohydrate is converted into a storage form of fat known as *triglycerides*. *Triglycerides* are transported by the blood and stored in the fat cells of our bodies. The levels of triglycerides and cholesterol in our blood determines our risk of heart disease.

What can the elderly do to maintain healthy arteries? The elderly can consume a diet with adequate carbohydrates, low in total fat and cholesterol. This type of diet should include nutrient-dense foods, such as fresh fruits, vegetables, whole grain cereals – oatmeal, cornmeal and wheat bran, legumes – peas and beans, lean meat, fish – salmon, tuna and sardines.

Osteoporosis

Do you know that old bones are replaced with new bones throughout our lives? As we get older our bones lose density and strength, causing them to weaken. This condition is called osteoporosis, causing our bones to become thinner as we age. What do you think occurs as our bones get thinner? Our bones are likely to break easily if we fall. Older women are more likely to suffer with osteoporosis than older men. The reasons for this are that women have small bones and lose bone rapidly after menopause. Osteoporosis occurs without symptoms. Do you know what this means? This means that any sudden bump, strain or fall can cause a bone to break. Elderly persons suffer greatly when their bones are broken. The broken bone may cause the elderly to undergo surgery or experience impaired mobility.

What's the Relationship Between Nutrition and Osteoporosis?

Calcium and vitamin D are necessary for bone health. Vitamin D enhances the absorption of calcium in the body. A deficiency of either calcium or vitamin D causes the body to remove calcium from the bones. If the calcium or vitamin

D deficiency continues, osteoporosis is likely to occur eventually. Therefore, the elderly need to include foods rich in calcium and vitamin D in their diet.

Activity

Let's take some time to see how much you have learned in this part of the session. Each of the following statements pertains to a particular age-related disease. Identify the disease in each case.

Number 1 was done for you as an example.

1. Insufficient iron in the elderly may occur due to gastric ulcer and gastrointestinal cancer.

E.g. Iron-deficiency anemia

2. Overweight elderly persons are more likely to have insulin resistant cells.

3. A diet high in animal fat leads to the formation of plaque in the walls of the arteries.

4. Our bones lose their density and become thinner as we age.

5. A high level of glucose in the blood is referred to as *hyperglycemia.*

6. High salt intake causes our bodies to retain fluid.

Feedback

The following are the answers to the above questions.

1. Iron-deficiency anemia
2. Diabetes mellitus type II
3. Hypertension or atherosclerosis
4. Osteoporosis
5. Diabetes mellitus type II
6. Hypertension

Did you answer all the questions correctly? If so, well done! If you were not able to answer all the questions correctly, review the relevant part of the session and try again.

Session Summary

Summary

In this unit you learned about the nutritional needs of elderly persons and some of the common nutrition-related diseases they may experience.

- A balanced diet is essential to provide the elderly with adequate energy and proper nutrition for general good health.
- The elderly need an adequate supply of carbohydrates in their diets to provide energy and support the use of protein for growth and repair of tissues.
- The elderly should use more complex carbohydrate foods in their diets. These foods serve to stabilize the blood sugar and ensure a steady flow of energy throughout the day.
- The energy needs of the elderly are reduced due a low basal metabolic rate and less physical activities preformed.
- Older adults need to meet their nutrient needs and consume fewer calories by selecting nutrient-dense foods.

- Older adults tend to lose muscle mass and increase in their body fat. Adequate protein is needed in their diets for the maintenance of their lean muscle mass.
- Vitamin D and calcium are necessary to prevent bone loss and reduce fracture risk in the elderly.
- Vitamin B_6 reduces high levels of homocysteine in the blood of the elderly. High levels of homocysteine are a risk factor for heart disease.
- The elderly may be deficient in vitamin B_{12} due to a condition called 'atrophic gastritis.'
- Folate helps to generate red blood cells and converts homocysteine to *cysteine*.
- Dietary intake of vitamin C is required by the elderly to enable the formation of collagen. Collagen is needed for healing wounds and repairing bones and teeth. Vitamin C also plays an important role in the absorption of the mineral iron.
- Water is necessary for the elderly to improve bowel movement, lubricate joints and muscles, and improve blood circulation.
- Nutrition-related diseases of the elderly include: iron-deficiency anaemia, diabetes mellitus type II, hypertension, atherosclerosis and osteoporosis. These diseases can be managed through proper nutrition.

Assessment

Assessment

Now that we are at the end of this session, let's do an assessment to see what you have learned.

Answer all of the following questions in the space provided below.

1. As we grow older it becomes more critical for us to meet our nutritional needs. Explain the nutritional needs of the elderly.

2. Identify two rich sources of the following nutrients needed by the elderly.

- Carbohydrates

- Protein

- Calcium

- Vitamin D

- Vitamin B_6

- Vitamin C

- Iron

3. Explain how proper nutrition assists in the management of nutrition-related diseases of the elderly:

- Iron-deficiency anemia.

- Diabetes mellitus type II

- Osteoporosis

Feedback

The following are answers to the above questions.

1. Although as we grow older and we need less energy, our bodies need all the necessary nutrients for proper bodily functions. The nutrients of importance are carbohydrates, protein, calcium, vitamin D, vitamin B_6, vitamin B_{12}, folate, vitamin C, iron and water. These nutrients play a very important role in keeping the elderly healthy.

   The energy needs of elderly persons are influenced by their basal metabolic rate and physical activity level. The elderly should eat more complex carbohydrate foods. These foods ensure a normal blood sugar level, a steady flow of energy and proper bowel movement. Elderly persons need adequate high quality protein to maintain their muscle mass and a healthy immune system. This is important because we lose muscle mass and are unable to resist infections as we grow older.

   The bones of the elderly lose density and they become weak and brittle. Calcium and vitamin D are needed in the diet of the elderly to maintain strong bones and teeth. Vitamin B_6 and vitaminB_{12} play a role in energy metabolism, formation of blood, normal nerve function and heart health. Folate is needed for protein metabolism and to convert homocysteine to *cysteine.* High levels of homocysteine lead to the hardening of arteries. These functions are important for the elderly to perform daily activities.

   Iron-deficiency anemia is commonly experienced by the elderly. Iron is needed for the formation of *haemoglobin*. *Haemoglobin* is necessary for the transport of oxygen to the cells of the body. Vitamin C is necessary for the absorption of iron by the body. Vitamin C helps in

the healing process of wounds and repair of teeth and bones. Also, water is necessary to prevent dehydration; common in the elderly. Water is also necessary to regulate the body temperature and bowel movement in the elderly.

2. Rich sources of the following nutrients needed by the elderly are:

- Carbohydrates – oatmeal, corn, brown rice whole wheat bread, bran, wheat germ, lentils, red beans, channa, yam, cassava, dasheen and sweetes potato.
- Protein – milk, cheese, meat, chicken, fish, eggs, pigeon peas, lentils and red kidney beans.
- Calcium – Bones of canned fish, low-fat milk, low-fat yoghurt, eggs, watercress, peas, beans and nuts.
- Vitamin D – oily fish-salmon, sardines and mackerel, egg yolk, milk, cheese, yogurt, or sunlight.
- Vitamin B_6 – salmon, tuna, chicken, turkey, pork, beef, beans, peas, peas, nuts, cereals and broccoli.
- Iron – chicken liver, turkey, tuna, lentils, tofu, spinach, watercress and dasheen.

3. Proper nutrition assists in the management of nutrition-related diseases of the elderly.

- Iron-deficiency anemia

  Iron-deficiency anemia is a disorder in which there is a decrease in red blood cells caused by too little iron. Iron and vitamin C are needed to prevent iron-deficiency anemia. The mineral iron is needed by the body to form *haemoglobin*. *Haemoglobin* is a protein in red blood cells that carry oxygen to the cells of the body. Vitamin C is necessary for the absorption of iron by the body. If iron and vitamin C are deficient in the diet over a prolonged period, iron-deficiency anemia can occur. Elderly persons should ensure that rich sources of iron and vitamin C foods are included in their diets. This will reduce the likelihood of iron-deficiency anemia occurring.

- Diabetes mellitus type II

  Diabetes mellitus type II is a disease that causes high levels of glucose in the blood. Carbohydrate-rich foods are broken down into glucose after a meal. When the glucose enters the blood, insulin is secreted in response to the increased blood sugar. Insulin stores the glucose in fat, liver and muscle cells. A large consumption of carbohydrates increases the secretion of insulin. High insulin levels in the blood result in the body utilizing blood glucose as fuel for energy. In other words, the body will not be able to utilize fat stored as fuel for energy. Over a prolonged period, the cells of the body become resistant to high levels of insulin in the blood. Overweight elderly individuals are more likely to have insulin resistance cells, as fat interferes with the ability of the body to use insulin normally.

  The type of carbohydrate-rich foods consumed determines how quickly the blood sugar increases. Processed carbohydrate foods affect our blood glucose more than complex carbohydrate foods. Processed carbohydrate

foods are stripped of their nutrients and fiber and are easily digested. However, complex carbohydrate foods have all their nutrients and fiber is slow to digest. Glucose from these foods is released slower into our blood. Elderly individuals can manage diabetes by consuming more complex carbohydrate foods to satisfy their adequate supply of carbohydrates.

- Osteoporosis

  Calcium and vitamin D play a vital role in the maintenance of strong bones. Vitamin D helps our bodies absorb and use calcium. As we age, the body is less able to provide sufficient calcium to maintain strong bones. In an effort to satisfy the calcium needs, the body breaks down bones to access its calcium. If a deficiency of calcium or vitamin D continues, our bones lose their density and strength eventually. This condition is called osteoporosis, and results in thin, brittle bones. The elderly needs to consume rich sources of calcium and vitamin D to maintain healthy bones.

Session 6.4 Improving Nutritional Status

Introduction

So far in this unit, you have learned about the nutritional needs of adults, the changes during the aging process, factors affecting the nutritional status of the elderly, and nutrition-related diseases of the elderly. How can we use this information to improve and maintain the nutritional status of aging adults? In this session we are going to look at ways of improving and maintaining the nutritional status of the aging adults. The guidelines given will ensure that the energy and nutrient needs of the aging adults are met.

In the second part of this session, we will look at how to plan meals for adults and the elderly. Meal planning is important especially for working adults and the elderly. Meal planning contributes to satisfying the nutritional needs of individuals, planning meals within a budget, making use of food available, and maximizing the available time for food preparation.

Outcomes

Upon completion of this session you will be able to:

Explain ways of improving the nutritional status of the elderly.

Explain the important considerations when planning meals for adults and the elderly.

Plan nutritionally sound meals for adults and the elderly.

How Long?

For this session you need two and a half (2½) hours for formal study time and one and a quarter (1¼) hours for self study time to review concepts and complete activities.

Terminology

Complex Carbohydrates: Complex carbohydrates are made up of sugar molecules that are linked together in long complex chains.

Nutrient-Dense Food: Nutrient-dense foods are those foods that provide substantial amounts of vitamins and minerals and relatively few calories.

Nutritional Status: Nutritional status is the condition of a person, influenced by the intake and utilization of nutrients.

Serving Size: A serving size is a unit of measure that indicates the recommended amount of a certain food.

6.4-1 Guidelines for Improving Nutritional Status

The nutritional status of adults determines their quality of life. In the previous session you learned how changes through aging could adversely impact an adult's nutritional status. We are not able to stop the aging process, however, there are guidelines we can follow to enjoy a high quality of life as we age. The following guidelines are necessary for good nutrition of the elderly:

Figure 27: Elderly Person Preparing a Meal.
Photo Credit: Cade Martin. http://phil.cdc.gov/phil/details.asp

1. Include Nutrient-Dense Foods

You have learned that as people get older their basal metabolic rate and physical activities decline. The elderly need to consume fewer calories to meet their nutrient needs. Excess calories would cause the elderly to increase in weight. Nutrient-dense foods should be included in the diet of the elderly. These foods are high in nutrients in relation to their calorie contents. For instance, low-fat yogurt is a nutrient-dense food compared to regular yogurt. The low-fat yogurt has the same nutrient content as in the regular yogurt, but it has fewer calories.

Some examples of nutrient-dense foods include: lean meat, salmon, tuna, low-fat dairy products, oatmeal, cornmeal, brown rice, broccoli, spinach, carrot, oranges, and cherries.

Yogurt

Pigeon Peas/Gungo Peas

Oats

Figure 28: Examples of Nutrient Dense Foods
Image: Simone Reid-Foste

2. **Include a Variety of Foods**

A variety of foods are important in the diet of the elderly to meet their essential nutrient requirement. A wide variety of foods promote the likelihood that all nutrient needs being met. A variety of foods adds different colors, textures and flavors to the meals of the elderly which thus aid in adding variety to the diet. Meals should look colorful and attractive. Every food has its own texture and unique flavor; therefore in meal preparation use a generous mix of crunchy, crisp, smooth tender and chewy foods.

3. Choose Complex Carbohydrate Foods

Many older people are prone to constipation and insulin resistant cells. As we get older, the contractions necessary to move and breakdown the food become weak. The slow movement of food through the digestive system may lead to constipation. Complex carbohydrate foods will benefit them by improving digestion and maintaining proper bowel movement. Complex carbohydrate foods are digested into glucose more slowly than simple carbohydrate foods. This serves to stabilize the blood sugar and ensures a steady flow of energy throughout the day. Examples of complex carbohydrates include: vegetables - spinach, carrots, cucumber; fruits – mango, pineapple, watermelon, cereals – brown rice, corn meal, oatmeal, legumes – pigeon peas, kidney beans, lentils and nuts.

A.Salmon

Image: lobster20 / FreeDigitalPhotos.net

B.Assorted nuts
By Roozbeh Taassob (Own work) [Public domain], via Wikimedia Commons

C.Olive oil
By Miansari66 (Own work) [Public domain], via Wikimedia Commons

4. Use More Unsaturated Fats

The elderly should minimize the consumption of saturated fats because they are linked with atherosclerosis and heart diseases. Saturated fats are mainly obtained from animal sources. Examples of saturated fats are: butter, bacon, cream, cheese, lamb and pork. These fats will increase the cholesterol level in the blood. It is better for the elderly to consume more unsaturated fats in their diets. Unsaturated fats increase the high-density lipoprotein in their bloodstream. High-density lipoprotein is a molecule of lipid and protein that transport cholesterol in the blood. High-density lipoprotein serves to remove excess cholesterol from the body tissues to the liver to be metabolized for excretion. Further, high-density lipoprotein will protect the elderly from atherosclerosis, which leads to hypertension and heart disease. Elderly persons should consume more oily fish such as salmon, tuna and sardines; avocadoes, olive oil, canola oil, walnuts, pecans sunflower seeds, sesame seeds and almonds.

Figure 30:3 Sources of Unsaturated Fats

Activity

Now let's see if you can answer the following question:

Suggest four (4) guidelines to a caregiver to ensure that the necessary nutrients are provided in the diet of the elderly.

1. _____

2. _____

3. _____

4. _____

Feedback

Four guidelines to ensure that elderly persons are provided with the necessary nutrients in the diet are as follows:

- Include nutrient-dense foods.
- Include a variety of foods.
- Include unsaturated fat foods.
- Choose complex carbohydrate foods.

5. Flavour Meals with Herbs

Many elderly individuals have a diminished sense of taste and smell. This means that they have lost their sense of pleasure for food. Therefore many have no desire to eat the food. When older people do not eat, it adversely impacts their nutritional status. In an effort to enhance the flavor and taste of their meals, the elderly might add too much salt. High salt intakes can cause hypertension, which leads to strokes and heart diseases.

Elderly individuals' meals can be flavored by adding fresh or dry herbs as a seasoning instead of using salt. Some herbs that can be used to enhance the flavor and taste of food include: garlic, ginger, onion, thyme, rosemary, basil, oregano, pimento and chive. These herbs will add flavor to meals for the elderly with very little need for salt.

Figure 29: Assortment of Herbs
By tannaz from los angeles (herbs for sabzi polo) [CC-BY-SA-2.0 (www.creativecommons.org/licenses/by-sa/2.0)], via Wikimedia Commons. http://commons.wikimedia.org/wiki/File:Herbs_for_sabzi_polo.jpg

6. Eat Small Frequent Meals

Have you ever experienced not having any appetite for food? As we grow old, the changes our bodies undergo may affect our attitude to food. It is therefore not uncommon for the elderly to have diminished appetites. Some older people

experience burning sensations in their stomachs after eating large meals. This causes discomfort and the elderly may choose not to eat.

It is important for elderly persons to get all the energy and nutrients necessary for their general good health. Instead of eating large meals, the elderly can eat small, frequent meals. This will ensure a steady their supply of nutrients, blood glucose and energy throughout the day. Smaller meals prevent the overloading of their digestive systems. These meals should be regular and served at the same time daily. This will eventually begin a natural feeling of hunger at the set meal times.

7. Drink Adequate Water

It is common for many older people to experience being dehydrated on a regular basis. This may be as a result of diminished thirst and conscious liquid restriction. Dehydration leads to poor blood circulation, which causes headaches, dizziness and affects mental alertness. Adequate water is necessary for elderly to improve bowel movement, lubricate joints and muscles, and improve blood circulation. Elderly persons have to make a conscious effort to drink an adequate amount of water daily. They should not wait for the thirst sensation to drink water. It may be useful for the elderly to measure six to eight glasses of water in a jug or bottle. This is helpful to keep track of daily water intake.

8. Moderate Exposure to Sunlight

The elderly who remain indoors and do not get the health benefits from sunlight. Moderate exposure to sunlight can improve the elderly individuals' nutritional status.

9. Be Creative in Preparing Meals

Some older individuals make poor food choices due to dental problems. They may also lose their appetite, which may lead to depression. Elderly persons may not eat certain foods because of its hard texture, as a result, they may eventually lose weight and suffer from certain nutritional deficiencies. Persons preparing meals for the elderly have to be creative. The food processor, blender and grater can be used to modify the textures of foods. For example, foods such as carrots, christophene and cauliflower can be pureed and added to soups and sauces. Foods can also be shredded, grated or chopped finely and used to enriched dishes. For example, finely shredded carrots can be added to rice, noodle or potato dishes, enriching the dish and making it more appealing. Creativity can ensure that the elderly gets the required nutrients to maintain general good health.

Figure 30: Stuffed Sweet Pepper- An Attractive Small Meal
Photo Credit: James Gathany. http://phil.cdc.gov/phil/details.asp

10. Maintain an Ideal Body Weight

Older people tend to lose bone density and muscle mass and gain body fat as they age. This leads to the elderly feeling tired and weak, being less able to move around and maintain their balance, increasing their risk for falls. Can you see why it is important for the elderly to maintain an ideal body weight? The elderly can maintain an ideal body weight by proper nutrition and moderate physical activities. This will improve their muscle mass, bone density, balance, strength and stamina. Proper nutrition includes adequate calories and protein foods in the diet. Calorie intake should meet energy needs of the elderly.

Figure 31: Exercise
By Catherine from Australia (Exercise Machines) [CC-BY-2.0 (www.creativecommons.org/licenses/by/2.0)], via Wikimedia Commons. http://commons.wikimedia.org/wiki/File:Exercise_Machines_(2103264189).jpg

11. Maintain Proper Oral Health

The elderly must pay attention to their dental health. Neglecting it may affect their entire body. There are many elderly individuals who have lost their teeth and have difficulty chewing food properly. Some elderly persons may have ill-fitting dentures , which also present a challenge to chew food properly. To avoid pain and discomfort, elderly persons select soft and easy to prepare foods. These choices may lack variety to their diets. Fresh fruits and vegetables may not be included in their diet. The elderly will therefore not benefit from the nutritive value of fruits and vegetables.

The elderly need to observe a daily dental routine of flossing and brushing teeth after meals. They should visit their dentist every six months to check their teeth and gums. Dentures should be cleaned regularly and adjusted to suit the gums if they are fitting poorly.

12. Share Meals with Others

How would you feel if you had to prepare meal for you alone every day? Do you think you would be encouraged to cook every day? You might think it does not make sense cooking for one person. Some elderly who live alone might think the same way. Especially if they were accustomed to preparing meals for their spouse and children, however now, they live alone due to the death of their spouse and their children being on their own. Elderly persons are often lonely and do not spend much time on preparing meals. As a result, they may have poor appetite, make poor food choices or eat too little food. This impacts their nutritional status adversely. Arrangements can be made for the elderly persons to share meals with their friends, family members or neighbors. The elderly can also consider joining a community group that meets to have a meal at least once a month.

Figure 32: Family Mealtime
By Amandajm (Own work) [CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0) or GFDL (www.gnu.org/copyleft/fdl.html)], via Wikimedia Commons.
http://commons.wikimedia.org/wiki/File:Christmas_in_Australia_01.JPG

13. Embrace Social Interaction

Humans are social beings and should enjoy interacting with others. As we grow older, relationships developed through the years may change or diminish. Ones spouse, family, relatives and close friends may die leaving the elderly alone for many years. Therefore, it may sometimes be difficult for the elderly to keep in touch with friends and family who are far distances away; bringing on a feeling of loneliness which can lead to depression. Elderly individuals in this state of mind lose their appetite and the motivation to cook. Although it may be challenging to make new connections, the elderly has to develop and maintain a social network.

Figure 33: Happy Family Time
Image: photostock / FreeDigitalPhotos.net

Social interaction plays a vital role in preventing feelings of isolation, depression and anxiety from overwhelming the elderly. The elderly persons can use the available technology, such as emails, Skype and telephone, to keep in touch with their friends and family. They can also choose activities, such as visiting with friends, sightseeing or volunteering in community work. These activities may therefore improve the appetite and general well being of the elderly.

14. Access Available Services

Most elderly persons are retired and do not have a regular source of income. For this reason, many elderly persons cannot afford to consume a balanced diet. In some countries, there may be support services to improve the nutritional status of the elderly. There may be a food stamp or food card system that assists the elderly to buy certain foods. Certain communities may have a home-delivered meal service or soup kitchens. There might also be a service for the elderly to receive a pension after a certain age. Caregivers as well as the elderly should contact the relevant authorities and find out what social services are available. Every effort should be made for the elderly to access these services.

Activity

Let's take some time to see how much you have learned so far in this session. Complete the following statements (numbers 1 to 6) by filling in the blanks with the correct words. The first statement is completed as an example for you.

1. Nutrient-dense foods are high in nutrients in relation to their <u>calories</u> contents.

2. A variety of foods add different colors, _____ and flavors to the meals of the elderly.

3. Complex carbohydrate ensures a steady flow of _____, throughout the day.

4. Unsaturated fats increase the _____ lipoprotein in the bloodstream.

5. Adequate water is necessary improve _____ movement in the elderly.

6. Meals for the elderly can be flavored with herbs instead of too much _____.

7. What guidelines can be followed to manage the following challenges commonly experienced by the elderly?

- Constipation

_____

_____

- Chewing difficulties

_____

_____

Feedback

The following are the answers to the above questions:

1. Calories
2. Textures
3. Energy
4. High-density
5. Bowel
6. Salt

7. The guidelines to manage the following challenges commonly experienced by elderly are as follows:

- Constipation
- Choose complex carbohydrate foods
- Drink adequate water
- Chewing difficulties
- Modify food texture
- Maintain proper oral health

6.4-2 Meal Planning for Adults and the Elderly

Why do we eat food? We eat food to meet our energy and nutrient needs. These needs should be met adequately. Meal planning contributes to meeting the nutritional needs of adults. In meal planning a number of factors are considered to ensure adequate nutrition is met. Before we continue with this session, take some time to review the factors to consider when planning meal (unit 5).

In this part of the session, we are going to look at the factors that influence the type and number of meals adults consume on a daily basis.

Factors to consider when planning meals for an adult include:

1. **Age**

The age of the adult influences the energy needs and the importance of nutrient-dense foods in the diet. Adulthood can be divided into two stages: the young adult and the elderly. The body of the young adult has the capacity to replace its worn out tissue efficiently. However, the body of the elderly no longer has the capacity to replace its worn out tissue adequately. There is also a decline in the bodily functions and a reduction of physical activity in the elderly.

2. **Gender**

Gender influences the nutrient needs of the adult. Do you know why this is so? Generally a man has more lean muscles than a woman. This influences their energy and protein needs. The basal metabolic rate in men is higher than women. Recommended dietary intakes for proteins are linked to the adult's body weight, with male adults requiring more protein than their female counterparts. Conversely, women have higher iron needs than men; as a result of women losing extra iron during menstruation, pregnancy and lactation.

3. **Occupation or Activity Level**

Adults should consume adequate energy-rich foods to meet their activity levels. If energy-rich foods consumed exceed the amount of energy required by the adult, the excess is stored as body fat. Very active occupations engage workers in strenuous work regularly. These jobs usually involve heavy lifting and manual labor. Adults who work in sedentary jobs require less energy than those working in very active jobs.

4. **Economic Status**

The income of an adult determines the variety and amount of foods included in each meal. Adults of a low income level have limited income. They are unable to purchase expensive foodstuffs, such as meat, fish, milk, fruits and vegetables. These foods may be seldom included in their daily diets. However, low income earners can apply the multi-mix principle, which was discussed earlier in this unit. This principle enables adults to plan nutritious meals at a low cost.

Activity

Let's see if you can answer the following questions:

Why should the following factors be considered when planning meals for adults?

(a) Age

(b) Gender

(c) Occupation

(d) Economic status

Feedback

The following are the answers to the above question.

(a) The age of an adult influences the energy needs and the importance of nutrient-dense foods in their diet. This is as a result of a decline in bodily functions and a reduction of physical activity as we age.

(b) The gender of adults influences their energy, protein and iron needs. The energy and protein needs are higher for men than for women. Women require a higher amount of iron than men.

(c) The occupation of adults influence their energy needs. An adult whose occupation is strenuous will need more energy than someone working in an office.

(d) The economic status of adults influences the variety and amount of food included in each meal. The diet of an adult of low income may tend to be monotonous. Expensive foods such as meat, fish milk fruits and vegetables may be seldom included in their diet.

5. Nutritional Needs of an Adult

Adults need the necessary nutrients to maintain body functions and promote general good health. As we grow older, you have learned that our bodies decline in the way they function. This makes it essential that certain nutrients are provided through dietary intakes. Do you remember which nutrients these are? The nutritional needs of an adult can be achieved by using a variety of foods from each food group.

6. Add Variety to Meals

How many food groups are there in the Caribbean? There are six (6) food groups in the Caribbean. In planning meals for an adult consideration should be given to all the food groups. Can you think of the variety of colors, flavors and textures of the foods in each food group? Think of the red tomatoes, orange carrots, white rice, green spinach, yellow split peas and purple eggplant. Foods of different colors should be combined in a manner to prepare a colorful and appealing meal.

What are the different flavors of foods? The different flavors of foods are pungent, sweet, sour, bitter, salty and astringent.

Food Flavor	Examples of Food
Pungent	Onion, chive, clove, parsley, ginger, chili

Food Flavor	Examples of Food
(Hot)	pepper and pimentos.
Sweet	Milk and its products, cereals (rice wheat) sweet potato, ripe plantain, banana, beet, carrot, and sweet fruits (mangoes, pawpaw.)
Sour	Citrus fruits (lemons, limes) fermented products (yogurt, cheese, sour cream, vinegar, pickle, sauerkraut, soy sauce.)
Bitter	Dark, leafy vegetables (watercress, lettuce, spinach) eggplant, turmeric, and caralli.
Salty	Salt, seaweed, kelp.
Astringent	Legumes (lentils, red beans) raw fruits (pear, cranberries) and vegetables (broccoli and cauliflower.)

Figure 34: Examples of Food Flavors

The skilful blending of the six (6) food flavours makes a tasty meal. The flavours of the foods should enhance each other. Attention should be paid to the flavours of dishes planned for each meal so that these tasty and appetizing meals are thoroughly enjoyed by the adults consuming them.

Can you think of the different textures of foods? Food textures include smooth, tender, chunky, crisp and crunchy. In planning meals for adults, utilise the different food textures to make meals interesting. It is better to combine smooth and crisp textures together. For instance, a meal including creamed potatoes (smooth) and a raw vegetable salad (crisp) gives a contrast of textures.

7. Food Availability

What are the foods available to you in your community? Is there a grocery or supermarket close to your home? How far is the market from where you live? The availability of foods to adults may depend on where they live, their access to markets or groceries, and the foods that are in season. Where do you live? Do you live in a rural area or an urban area? You are probably wondering what is meant by the words “rural” and “urban.” ‘Rural’ refers to the country area and ‘urban’ refers to the city or town area. For instance, in the ‘rural’ areas most people grow their food in a garden. Foods readily available might be breadfruit, yams, plantain, dasheen and its leaves and ochro. If you live in a fishing village, fish might be available at a reasonable price. Access to markets and

groceries also assist with the availability of foods. As a meal planner, you need to know the seasons of the different fruits and vegetables.

8. Food Acceptance

The food acceptance of adults depends on their likes or dislikes and religious customs and traditions. How would you feel if you prepared a meal for your family and it was not eaten? Surely you would not feel appreciated. Adults may have their likes and dislikes of food choices. It might be a good idea to find out why the individual dislikes the particular foods. With this information you may either modify the form in which the food is incorporated in the meal or select another food that provides the same nutrients. For instance, some adults dislike drinking milk. Milk can be added to bread, casseroles and sauces. In this way the nutrient needs of the adult are maintained. Other foods such as low-fat cheese and low-fat yogurt can also be used.

9. Time Available to Prepare Meals

Have you ever seen how some people rush out of their homes to get to work on time? Some of them may not have breakfast. Others may pack a snack and lunch to carry with them to work. The time available to working adults influence the number and types of meals they consume daily. Individuals consume different number of meals according to their work schedules. A meal plan shows the number and types of meals consumed daily.

Meal Plans	Meal Plans
1. Breakfast Packed Lunch Dinner	2. Breakfast Packed Lunch Dinner
3. Mid-morning Snack Lunch Dinner Night Snack	4. Breakfast Mid-Morning Snack Packed Lunch Afternoon Tea Dinner

Figure 35: Possible Meal Plans Followed by Working Adults

Let's look at some examples of different meals that may be prepared depending on the time available.

Examples of Breakfast Menus

Examples of Breakfast Menus
Chilled Orange Juice Bread Slice with Shredded Cheese Hot Tea **(Light breakfast)**
Cubed Pawpaw Fried Sausages Whole Wheat Muffins Hot Cocoa **(Medium breakfast)**
Chilled Mango Slices Cream of Wheat Porridge Fried Fish in Tomato Sauce Boiled Dasheen Slices **(Heavy breakfast)**

Figure 36: Sample Breakfast Menus

A mid-morning snack is a food item eaten to delay hunger until lunch time. Suggested food items are:

- Baked items – muffins, banana bread slices, cheese scones
- Sandwiches – filled with cheese, fish, meat, egg
- Fruits – watermelon, pineapple, pawpaw, mango
- Raw vegetables – celery sticks, carrot sticks
- Low-fat yogurt

Packed lunches are prepared and packed in suitable containers and carried to work by adults. It is important that adults plan balanced packed meals. Suggestions for packed lunches include:

- Sandwiches – filled with cheese, fish, meat, egg
- One pot / dish meal – casseroles, pelau, soups, roti, chicken salad

Dinner is the heaviest meal of the day. It is more elaborate than lunch. A suggested dinner menu is as follows:

- Grilled fish steaks
- Cassava au gratin
- Callaloo
- Tossed salad with french dressing

10. Suggested Serving Sizes

Adults need to consume adequate amounts of food from the six (6) food groups. How much should we eat from the six (6) food groups? The information in the following table serves as guidelines for adults to meet their energy and nutrient needs. Take time to review the illustration of serving sizes below.

Food Groups	Number of Serving Sizes
Starchy Staples • Cereals • Ground Provisions	 6-9 servings (6-9 oz) 3-4 servings (3-4 oz)
Legumes	2-3 servings (12-18 oz)
Food from Animals	2-3 servings (4-6 oz)
Fruits and Vegetables	7-10 servings (1¾ - 2½ lb)
Fats and Oils	6-10 servings (1-1½ oz)

Figure 37: Serving Sizes of Various Foods

Note it!

A number of physiological changes occur during the aging process. These changes interfere with the energy and nutrient dietary intake of the elderly. In order to promote good nutrition certain considerations need to be made in the planning of meals for the elderly.

1. Modify food texture
2. Make meals attractive and appealing
3. Include fruits and vegetables
4. Small frequent meals
5. Include water

Now let's look at an example of a meal plan for the elderly.

Meals	Suggested Food Items
Breakfast	1 medium banana

Meals	Suggested Food Items
	1 poached egg 2 slices of whole wheat toast 1 cup of hot tea with low-fat milk
Mid-Morning Snack	½ cup of oatmeal porridge with low-fat milk.
Lunch	1 cup of pigeon pea soup with pumpkin, chicken, yam or sweet potato.
Mid-Afternoon Snack	½ cup of low-fat yogurt.
Dinner	3 oz of steamed salmon fillet with tomato slices 1 slice of breadfruit ½ cup of callaloo ½ cup of pawpaw sorbet 1 cup of water
Evening snack	3 wheat crackers 1 cup of hot milo

Figure 38: Possible Daily Meal Pattern for an Elderly Person

Activity

Now let's see if you can answer the following questions.

1. List three (3) points that determine the availability of foods to adults for daily meals:

2. Although time may be limited for working adults, they should plan balanced meals to maintain good nutrition. In the table below, identify the food items/dishes that can be prepared quickly when time is limited. Indicate these foods by placing an "X" in the space provided in the table. An example is done for you.

Foods	Foods Prepared in Limited Time
Cheese Sandwich	X
Roast Beef	
Cassava Pone	
Oatmeal Porridge	
Vegetable Soup	
Grilled Stuffed Chicken Breasts	
Tossed salad	
Pelau	

Figure 41

Feedback

The following are answers to the above questions.

1. Three (3) points that determine the availability of foods to adults for their daily meals are:

- The location where the adults live (whether in the 'urban' or 'rural' area.)
- The ease of access to the market, grocery store or supermarket.
- The foods that are in season.

2. The foods prepared in a limited time are indicated in the table below.

Foods	Foods Prepared in Limited Time
Cheese Sandwich	X
Roasted Beef	
Cassava Pone	
Oatmeal Porridge	X
Vegetable Soup	X
Grilled Stuffed Chicken Breasts	
Tossed Salad	X
Pelau	X

Session Summary

Summary

In this session you learned the guidelines to improve the nutritional status of the elderly. The factors to be considered when planning meals for adults and the elderly were also looked at in this session.

- Good nutrition for an adult can be maintained by including nutrient-dense foods, a variety of foods, complex carbohydrate foods and foods with unsaturated fats in the diet.
- The elderly can flavour meals using herbs, eat small frequent meals, share meals with others and embrace social interactions to improve their appetite.
- Inclusion of adequate complex carbohydrate foods and water are necessary for proper bowel movement.
- Age, gender and occupation determine the energy and nutrient needs of the adult.
- The available food, food acceptance, available time and the economic status of the adults determine the types of foods prepared for their daily meals.
- Foods with hard textures can be modified by chopping, grating or shredding finely; making these foods easier to chew and digest.

Assessment

Assessment

Now that we are at the end of this session, let's do an assessment to see how much you have understood.

Answer the following question in the space provided.

1. The nutritional status of some elderly persons may be adversely affected due to poor appetite. Explain four (4) relevant guidelines to improve their appetite and nutritional status.

Feedback

The following are the answers to the above question.

1. Four guidelines to improve the appetite and nutritional status of elderly persons are:

- **Flavour meals with herbs**. Our sense of taste and smell diminish as we age. This leads to poor appetite and the elderly eating very little food. The meals for the elderly can be flavoured with herbs to enhance their flavour and taste. This will encourage elderly persons to eat their meals and promote a healthy appetite.
- **Eat small frequent meals**. Some elderly individuals experience discomfort after eating large meals. As a result they may not have a desire to eat their meals. The elderly can eat small frequent meals. Smaller meals tend to present no discomfort to the elderly and encourage the desire to eat food.
- **Share meals with others**. Many elderly people may live alone and feel lonely at meal times. This eventually leads to poor appetite and adversely impacts their nutritional status. The elderly can share meals with a family member or close friend. This tends to improve one's appetite.
- **Embrace social interaction**. The elderly has to deal with feelings of isolation, depression and anxiety. These feelings cause elderly persons to lose their appetite for food. The elderly should embrace the opportunity to interact socially. For instance, they can get involved in the community, visit close friends or attend different events. This will improve the appetite and general well being of the elderly.

Reflection

Now that we have completed this unit dealing with nutrition during the adult years, take some time to reflect on what you have studied thus far.

Reflect on the following questions and share your thoughts in the writing space provided.

1. How do you feel about growing old?
2. What are some of the practices you can put in place to reduce the effects of aging on your body?
3. Do you agree that proper nutrition can improve the quality of life for the elderly?

Unit Summary

Summary

In this unit you learned about nutrition during the adult years, including the essential nutrients, their functions and food sources. The physiological changes of aging were also looked at according to the different systems of the body. These changes along with psychological, economic and social factors could adversely impact the nutritional status of the elderly. Therefore, in an effort to manage these changes and certain nutrition-related diseases, guidelines were given. Factors to assist you in planning balanced meals for adults and the elderly, in order to promote general good health, were also examined.

Assignment

Assignment

Read the case study below and complete the following assignment. You are required to meet with your tutor and submit your response to this assignment for comments. Your response should be written in about 500 words.

Case Study

Mr. William is aged 85 and lives in a home for the aged. His family seldom comes to visit him, and most of his close friends have died. He often feels lonely and depressed. Mr. William experiences poor appetite due to depression and his ill-fitting dentures. He is underweight and contracts the common cold regularly. Mr. William prefers to stay in his room instead of participating in any activities.

As a nutrition consultant you are asked to advise Mr. Williams caregivers on guidelines to improve his nutritional status. Include guidelines to ensure that Mr. Williams gets the required energy and nutrients he needs to improve his appetite and to encourage him to participate in different activities at the elderly home he resides.

Assessment

Assessment

Read and answer the following assessment questions. You are required to meet with your tutor and submit your responses to this assessment for comments.

1. Explain the importance of the following nutrients in the diet of

the elderly:

- Protein
- Calcium
- Iron

2. How can proper nutrition manage the following nutrition-related diseases?

- Osteoporosis
- Diabetes mellitus type II
- Iron-deficiency anemia

3. Mrs. Clarke is 70 years old and lives alone. She experiences poor nutrition due to the limited money she has to spend on food.

- State three services Mrs. Clarke can access to assist her in improving her nutritional status.
- Plan a day's menu for breakfast, lunch and dinner suitable for Mrs.Clarke.

Contents

Unit 7

Principles of Heat Transfer

Introduction

Some foods can be eaten raw and others must be cooked in order to make them safe and palatable. The application of heat to food is called cooking and there are several reasons and methods of and for cooking food. Cooking food causes it to go through several changes both physical and chemical so that it looks completely different from raw food and these changes are permanent. Can you identify any of these changes? Well if you can, that is great but if you cannot, do not be worried. Together we will discover the wonderful world of cooking and you will marvel at lessons that are provided for you. So let us put on our lab coats and let us take a trip so that we will explore the underlying principles of heat transfer in food.

Upon completion of this unit you will be able to:

Outcomes

- *Explain* the principle of cooking.
- *Describe* how heat is transferred to food.
- *Explain* the methods of cooking food.
- *Explain* the effect of heat on food nutrients.

How long?

You will need to devote fifteen (15) hours to work on this unit. Ten (10) hours for formal study and 5 hours of self-study and completing assessments/assignments.

This Unit is Comprised of Four Sessions

Session 7.1 The Principles of Cooking Food

Session 7.2 Dry Methods of cooking

Session 7.3 Moist Methods of Cooking.

Session 7.4 Cooking with Fat and Microwave Cooking

Terminology

Conduction:	Transfer of heat by direct contact from the source of the heat or the flame.
Convection:	The transfer of heat through a liquid or a gas.
Radiation:	The transfer of heat into food by rays.
Microwaves:	a short electromagnetic wave (longer than infrared but shorter than radio waves); used for radar and microwave ovens and for transmitting telephone, facsimile, video and data.
Caramelization:	This occurs when sugar is heated to a temperature of 300 F or higher, causing them to turn brown, as the sugar is heated volatile chemicals a released producing the characteristic caramel flavour.
Denature:	A process in which protein looses their structure due to the addition of other substances such as salt, heat.

Dextrinization: The application of dry heat to starch causing it to break down into dextrin.

Gelatinization: The mixing of starch grains with liquid and is heated causing the starch grains to swell and burst.

Session 7.1 The Principles of Cooking

Introduction

Some food requires cooking in order to make them safe and have a better colour, flavour, texture and nutritive value than when eaten raw. It is important for us to understand the methods in which heat is transferred to food and select them appropriately. The size, thickness and type of food being cooked dictates the selection of cooking methods which use dry heat, moist heat, and hot oil.

Outcomes

Upon completion of this unit you will be able to:

Explain the reasons for cooking food.

Differentiate between the methods of transfer.

Describe the methods of heat transfer.

How long?

You will need 2 ½ hours of formal study and 1 ½ hours of self-study to complete this session.

Terminology

Bacteria : These are microscopic, single-celled organisms that come in a variety of shapes. Bacteria can be found in various places such air, food, water, soils and plants etc.

Toxins: These are organic poisons. They are so called because they are produced by living cells and organisms which are capable of producing disease when introduced to body tissues.

This is the instance where food either contains

Food contamination:	bacteria or toxic substances or where foreign substances or objects have been introduces to the food rendering it spoiled, tainted and inedible.
Oxidation :	The process whereby oxygen combines with food and decreases the quality of the food by making it rancid.
Conduction:	This is the transfer of heat through solid material or liquids by the collision of friction of the atoms and molecules they contain.
Convection:	This is the transfer of heat through liquids and gases which expand a rise as they are heated and contract and drop as they are cooled.
Radiation:	This form of heat transfer occurs when electromagnetic waves such as those from microwaves or heat rays (infra-red rays) travel through space. When those rays come into contact with an object the waves transfer their heat to the object e.g. meat patties in the microwaves.

7.1-1 Reasons for Cooking Food

Now you are ready to take that first step into the world of cooking food. Ah, but before getting to the heart of the matter we must explore the principles of cooking food. These will help you understand the how and why of cooking food. Some foods such as lettuce, tomatoes, mangoes, oranges, watercress and other can be eaten raw or uncooked but then there are those such as beef, goat, chicken, rice, cassava, and eddoes that must undergo some type of heat application or cooking. If this is not done then we are endangering our lives and we will not enjoy the ultimate taste of the food. Together we will find out the reasons for this. The application of heat to food alters or changes the chemical and physical structure of food so that it does not look similar to its raw state and we will also explore why this is so. So now let us gather our lab coats and begin the exploration into the wonderful world of cooking.

Why Food Is Cooked

Figure 1 Why cook food?
Image: graur codrin / FreeDigitalPhotos.net

- ***To makes food safe to eat and preserve it from decay***: Food is made unsafe by *bacteria.* They are so small that they cannot be seen with the naked eye. In addition to bacteria, food may contain unsafe agents such as chemicals such as insecticide or fertilizers. Meat for example may hold or harbour bacteria. Cooking kills them and makes the meat safe for eating.
- ***To destroy natural toxins (poisons):*** Some foods such as red beans (kidney beans), ackee, cassava, bamboo shoots, zucchini, potatoes, etc contain natural toxins. In order to make these foods safe they must be cooked sufficiently to destroy their natural toxins. Some toxins are destroyed by the application of heat for at least 15 minutes e.g. in the cooking of beans such as red beans, and in some cases peeling of the food destroys their toxin. If these foods (named above) are not thoroughly cooked then you will experience discomfort ranging from vomiting to stomach cramps.

Cassava
Figure 2.
Image: DEU.TT

Red Beans
Image: nuchylee/
FreeDigitalPhotos.net

To make food easier to eat and digest: Foods such as meat and raw rice or cassava, etc are difficult to eat and digest. Cooking softens the tissues found in meat. If they are uncooked and you bite into a piece of beef or chicken what would happen? It would be chewy and the taste would be horrible! Simply you would have to tear or rip it as a lion would do with meat captured in the wild. In order for meat to be digested the gastric juice produced in the digestive tract must act upon it and this is easier done on cooked meats. Also the uncooked starch grains are difficult to digest and cooking foods such as rice, cassava, etc, will cause the starch grains to swell, burst open and gelatinize thus softening the cellulose. This will make these types of food more receptive to the actions of the digestive juices enabling digestion and swallowing.

Figure 2 Uncooked Beef
Image: FreeDigitalPhotos.net

Figure 3 Cooked Beef
Image: Worakit Sirijinda / FreeDigitalPhotos.net

Can you see the difference in the beef?

- ***To improve the keeping quality of food****:* Bacteria which is present in food is destroyed on the application of heat in the cooking process. This helps the food to keep longer thus delaying the process of spoiling. Fish and meat in their raw or uncooked condition if left on the counter top without being cooked, will spoil faster than fish that has been cooked. It will give off a foul scent that will alert you to its state of decomposition.
- To improve the flavour of food – The flavour of certain foods is enhanced or improved once they are cooked.

Reflection

Here are some examples of foods. Think about them uncooked. Have you ever tried to taste; uncooked bread dough, meat, rice, potato? How was it?

- The flavour and texture of these foods are changed and enhanced when cooked.On the opposite side of the coin if we apply heat to most fresh fruits such as watermelon, guava ripe pawpaw the opposite will result. The application of heat would destroy the true flavour of these fruits.
- ***To make food attractive and appetizing****:* Always remember that you eat with your eyes first and then your teeth. If the food to be eaten does not look appealing to you, then you most likely will not want it to go into your mouth. So we must first make the food look attractive before we eat it. Have you ever smelt the aroma of mangoes being curried or bread baking in the oven? Have you noticed what happens to your mouth? If you said your mouth

increase the production of saliva that is the answer that I am looking for. Once you smell the aroma of food cooking the digestive organs in your body begins to secrete or ooze out digestive juices because they are stimulated in anticipation of eating the food.

- ***To reduce bulk****:* Some foods such as leafy vegetables look plentiful when they are chopped or cut for cooking. For example dasheen leaves or patchoi when uncooked will fill a saucepan but when water is added and it is placed on heat the quantity is reduced. Thus the bulk of the food is reduced to increase the amount of the food item eaten.

Reading

Caribbean Home Economics in Action II by Caribbean Association of Home Economists

Food & Nutrition by Anita Tull.

Read the chapters in the books above about cooking food.

Answer the questions that follow in the space provided.

Did you read or learn about any other reasons for cooking food that was not listed above? Write your answer below.

Activity

List at least five (5) reasons for cooking food based on what you've just covered. For each reason explain why this is important.

1.

2.

3.

4.

5.

Here's another activity for you to do this should be fun.

Food Dectective.

You will need the following resources;

- 1bundle of dasheen leaves or spinach (cut)
- 1 saucepan and wooden spoon
- ¼ cup water

Method

- Weigh the cut vegetables and place into saucepan with boiling water
- Apply heat for twenty minutes, stir occasionally
- Observe and state the appearance of the cooked vegetable
- Record what you have noted and explain the reason (s)
- For the result see the end of the unit for the answers.

Observations (write them in this box)

Come on you're progressing nicely!!! So let's continue with the lesson.

Note it! / Warning

Cooking makes food safe for eating and enables it to be kept longer.

Food is also rendered soft because it is easier to chew, swallow and digest.

7.1-2 Methods of Heat Transfer.

Here are a few points you should note about how heat moves through food.

Note it! / Warning

Heat always moves from a warmer place to a cooler place.

Hot objects in a cooler room will cool to room temperature.

Cold objects in a warmer room will heat up to room temperature.

Together we are about to explore the physics of cooking. Yes that's right I said the physics of cooking. There are underlying principles of physics at work when we cook food. So we must know the why and how of cooking.

So let us get started. Have you ever thought about how heat is transferred or moves through the food to become heated and eventually cooked? Which

method of heat transfer is occurring at a particular point in the cooking process? Food is cooked by the application of *heat energy*. Three methods are involved in the transfer of heat to food and they are

Conduction

Conduction is the transfer of heat via direct contact with the source of heat. Why is understanding conduction important? Think about a metal or wooden spoon, pot handles. Metals are good conductors of heat and metal saucepans and cake tins are excellent conductors.

The burner is the source of heat and on placing the saucepan on that source, the heat travels from the heat source or the warmer object to the cooler source or object and in this instance this would be the saucepan. The saucepan will then get hot and in turn the heat of the saucepan will travel from the warmer source into the cooler source which is the food or liquid in the saucepan.

Saucepan handles should be made of wood or heavy duty which are insulators or poor conductors of heat and will prevent them from becoming hot and burning your hands. Also wooden spoons, heavy duty plastic spoons or metal spoons with plastic handles should be used and not metal spoons during the cooking process because of the aforementioned.

Figure 4 Conduction
Image: Michelle Meiklejohn / FreeDigitalPhotos.net

Convection

This is the transfer of heat through a liquid or gas. When the gas or liquid is heated they expand. This causes their volume to increase but the mass of the gas or liquid remains the same so that they do not get heavier causing its density or thickness to decrease.

The *convection currents move* or circulate from the heat source to the top of the oven. The same principle occurs in the oven, when it is lit. In most gas and electric ovens heat causes the hot air to circulate in the oven via *convection currents.* The oven will therefore have different heat zones – the middle shelf will correspond to the thermostat setting, the top shelf will be hotter than the middle shelf and the bottom shelf will be cooler that the middle shelf. Therefore you will be able to cook different items requiring slightly different cooking temperatures at the same time.

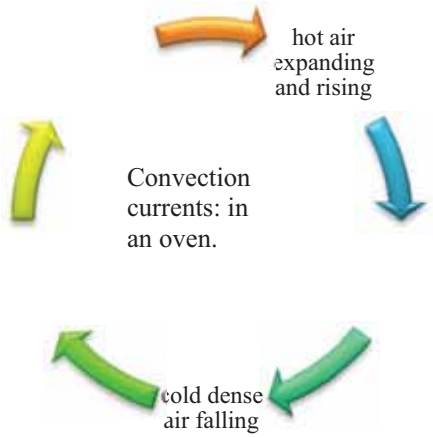


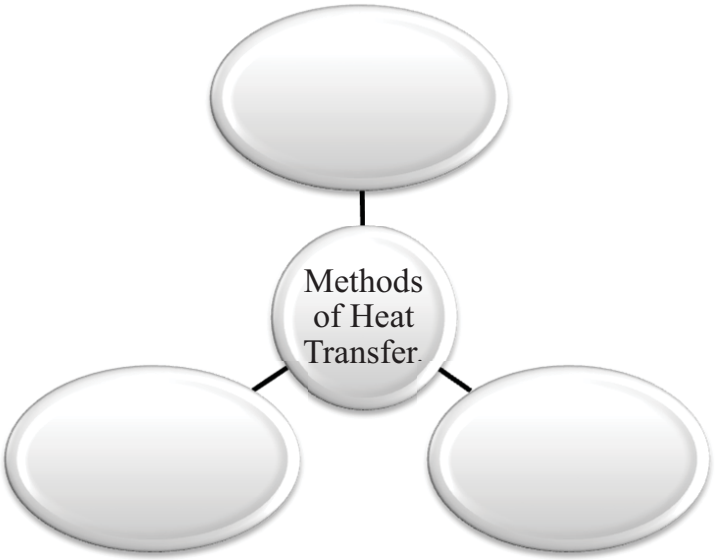
Figure 5 Convection Currents in an Oven.

Radiation

Radiation occurs when heat energy passes from one point to another without the aid or use of a medium. For example if you place a grape or a sliced green mango or a container filled with water into the sunlight, eventually the water will become hot and the fruits will get dry. This happens because the rays of the sun fall directly onto the food or liquid without the aid or help of a medium it passes through a space or vacuum. Heat rays are called infra-red rays and when they come into direct contact with an object some of the rays are absorbed by the food and felt as heat and this cooks the food. Grilling, roasting food on a spit or rotisserie and microwave ovens all uses radiation to cook food.

Figure 6
Image: graur razvan ionut / FreeDigitalPhotos.net

Activity



1. In the diagram above in the provided spaces list the names of the three methods of heat transfer

2. For each description of heat transfer given in the table write the method of heat transfer taking place.

Description	Heat Transfer Method
1. Roasting of a suckling pig on a spit (open flame).	
2. Cooking food on the top shelf of the oven and keeping food warm on the lower shelf.	
3.Steaming rice or vegetables	
4.The handle of saucepan become hot to the touch	
5.Boiling an egg	
6.Grilling a pork chop	
7.The metal pot spoon gets hot as	

Description	Heat Transfer Method
the sauce is stirred	
8. Deep fried chicken is cooked by the transfer of heat via?	

How did you do? Here are the answers, check back, what did you write. Never mind if you didn't get them all.

Feedback

Description	Heat Transfer Method
1. Roasting of a suckling pig on a spit (open flame).	Radiation
2. Cooking food on the top shelf of the oven and keeping food warm on the lower shelf.	Convection
3.Steaming rice or vegetables	Convection
4.The handle of saucepan become hot to the touch	Conduction
5.Boiling an egg	Conduction, Convection
6.Grilling a pork chop	Conduction, Radiation
7.The metal pot spoon gets hot as the sauce is stirred	Conduction
8. Deep fried chicken is cooked by the transfer of heat via?	Convection, Conduction

Session Summary

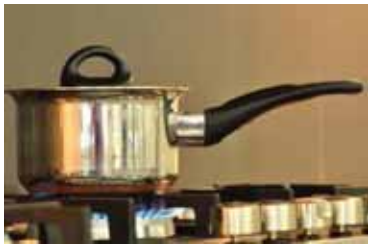
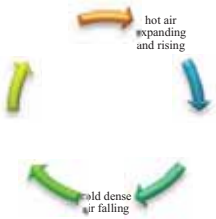
Summary

In this session you learned about the basic principles that govern the cooking of food i.e. why is food cooked? And how is the heat transferred to cook the food.

#	Food is cooked for the following reasons;	☑
1	It is safer to eat when cooked and preserved from decay.	❑
2	The food actually becomes easier to ea and digest	❑
3	The food lasts longer.	❑
4	The flavor of the food is improved.	❑
5	Food becomes more attractive and appetizing	❑
6	It reduces bulk e.g. green leafy vegetables	❑

How is Heat Transferred

First you should note that heat always moves from a warmer to a cooler place. There are three methods of heat transfer.

Conduction Conduction is the transfer of heat via direct contact with the source of heat. Why is understanding conduction important? Think about a metal or wooden spoon, pot handles. Metals are good conductors of heat and metal saucepans and cake tins are excellent conductors.	 Image: Michelle Meiklejohn / FreeDigitalPhotos.net
Convection This is the transfer of heat through a liquid or gas. When the gas or liquid is heated they expand. This causes their volume to increase but the mass of the gas or liquid remains the same so that they do not get heavier causing its density or thickness to decrease.	

Radiation Radiation occurs when heat energy passes from one point to another without the aid or use of a medium.	 Image: graur razvan ionut / FreeDigitalPhotos.net.

Assessment

Assessment

Fill in the blanks in the following statements;

1. Hot liquids have become hot by _____ _____. These liquids should be stirred using a _____ spoon and not a _____ spoon.
2. _____ _____ is based on the principle that _____air rises and that _____air _____.
3. _____ waves travel through _____..
4. The hottest part of an oven is the _____, foods are cooked and get their golden brown colour. The coolest part of an oven is _____shelf; you can use the part keep foods warm or cook them gently.

I cook foods to make them (write any five reasons in the spaces below)

1. _____
2. _____
3. _____
4. _____

5.

Session 7.2 Dry methods of Cooking.

Introduction

That cup of tea, coffee or cocoa that you had for breakfast or that grilled chicken, fried breadfruit or dhalpuri (roti/flatbread) you ate for lunch was cooked using one or several cooking methods. It is important that we develop an understanding of these methods of cooking so that we will be able to make informed choices on what method is more suited or applicable for the type of food we want to prepare.

In order to obtain nourishment from certain foods we must cook them. Cooking is the application of heat via several media, inclusive of hot oil and dry or moist heat. The application of heat causes the physical and chemical alteration of food which is permanent. Together we will take an in-depth look at various cooking methods.

Outcomes

Upon completion of this session you will be able to:

- *Differentiate* between the different categories of cooking methods.
- *Describe* the different dry methods of cooking.
- *Distinguish* among the various dry methods of cooking.
- *Choose the* most suitable dry method for cooking various foods.
- *Explain* the importance of a marinade.

How long?

You will need 2 ½ hours of formal study and 1 ½ hours of self-study to complete this session.

Smoke Point: This is the point at which cooking fat or oil begins

Terminology		
		to breakdown into its constituent glycerol and fatty acids, producing a bluish smoke.
	Flash Point:	This is the point at tiny wisps of fire begin to leap from the surface of hot oil. A blue haze is seen and the oil ignites momentarily but does not continue to burn.
	Thermostat:	A liquid-filled temperature-sensing bulb senses and maintains the internal oven temperature by cycling heat on and off.
	Basting:	A technique of brushing, spooning or pouring liquids over food, usually meat and poultry, as it cooks.
	Marinade:	A savoury usually acidic sauce in which meat, fish, poultry, vegetables or fruit is soaked to enrich its flavor or to tenderize it before cooking.

7.2-1 Classification of Cooking Methods

As in the previous lesson we stated that food changes in its appearance and structure or becomes cooked when heat is applied to it and these changes are permanent. Heat can be applied to food using several or various media namely dry heat, moist heat, hot oil or fat. Let us see if we can differentiate between them.

Activity

Do you know the cooking methods?

For the list of dishes provided below can you list the cooking methods?

Write the method of cooking next to the dish.

Dish	Method of Cooking
1.Chocolate Cake	
2.Soused Chicken Feet	
3.Stuffed eggs	

Dish	Method of Cooking
4.Chow Mein	
5.Fried rice	
6.Chicken kebabs	
7.Doughnuts	
8.Burgers	
9.Curried Chicken	
10. Red Bean Chilli	

Figure 7

Feedback

So your responses should have looked like the completed table below.
How did you do?

Dish	Method of cooking
1.Chocolate Cake	baking
2.Soused Chicken Feet	boiling
3.Stuffed eggs	boiling
4.Chow Mein	Sautéing
5.Fried rice	Stir frying
6.Chicken kebabs	grilling
7.Doughnuts	Frying
8.Burgers	Grilling/bar-b-que
9.Curried Chicken	Stewing
10. Red Bean Chilli	Boiling.

Of course we see that there are several different methods of cooking. Another thing is that these same foods could have been cooked using a different method.

Now can you group or categorize the different cooking methods. Place similar methods together. How would you determine the similarities?

Classification of Cooking Methods

- **Dry cooking methods** utilize dry heat to cook food or we can say it refers to cooking food without adding moisture or liquid. These methods of cooking usually involves high temperatures, this means that the temperature ranges from 300°F/150°C or hotter. Dry heat means that food is cooked by the heat from an oven, grill or from electromagnetic waves.

Figure 8
Image: federico stevanin / FreeDigitalPhotos.net

Figure 9
Image: graur razvan ionut / FreeDigitalPhotos.net

- **Moist method** means that food is cooked either by placing it directly into boiling liquid or by cooking in the steam that rises from boiling liquid. The liquid can be water or its steam, wine or stock. Foods cooked by this method usually have no bite or crisp texture and they will feel soft in your mouth. Cooking using moist methods, especially steaming is relatively healthier because the caloric value of the food is maintained once you do not add fat is item being prepared.

Figure 10 Boiling.
By jonl (Flickr) [CC-BY-SA-2.0 (www.creativecommons.org/licenses/by-sa/2.0)], via Wikimedia Commons

Figure 11.Indirect Steaming
By Sameboat (Own work) [Public domain], via Wikimedia Commons

- **Cooking in Hot Fat** allows you to cook food by frying food in hot oil or fat. Frying is a quick method of cooking and it is very popular because the food is cooked in a short time and the fat gives the food a lovely flavour. Fried food absorbs the oil in which it is cooked and as you learnt in a previous lesson this will increase your energy content or will give you more calories. Therefore you should limit the amount of frying to avoid the effects of too much fat in your diet.

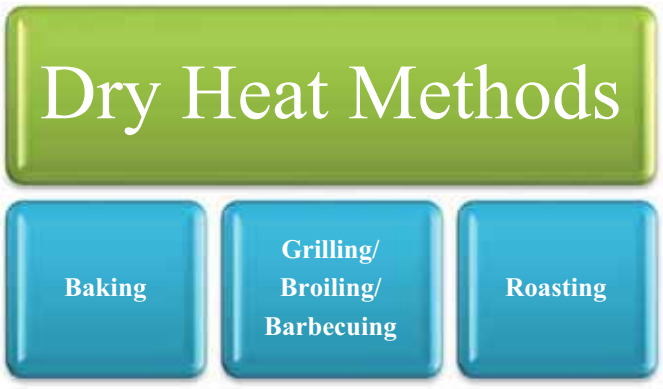
Figure 12 Deep Frying
By Photo taken by Muu-karhu (Own work) [GFDL (www.gnu.org/copyleft/fdl.html), CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0/) or CC-BY-SA-2.0 www.creativecommons.org/licenses/by-sa/2.0)], via Wikimedia Commons

Note it! / Warning

Food can be cooked using **moist heat, dry heat or hot fat or the use of electromagnetic waves**. Some methods of cooking are healthier than others. Healthy methods of cooking use little or no oil and the loss of nutrients in to cooking water is minimized.

7.2-2 Dry Cooking Methods

As you learnt previously, cooking by dry heat means that food is cooked by the heat from an oven, grill or microwave which causes food to vibrate. The dry heat is transferred to food using convection and conduction currents radiated heat and electromagnetic waves. It is important to know how these cooking methods are used and the impact they have on food.



7.2-3 Baking and Roasting

We'll start by exploring baking and roasting. Though these two terms are often used interchangeably they are indeed different. Take a look at the table below and you'll see. r.

Method of Cooking	Precautions
Baking is a method of cooking that uses dry heat that is transferred to the food via convection and radiation in an oven without the addition of fat. Even though it is a slow method of cooking it is a healthy method of cooking. Why do you think it is? **Suitable foods**; Flour products e.g. cakes, pastries, breads. Fish, meat, poultry, vegetables Desserts e.g. puddings and soufflés.	Foods may dry out and baking uses a lot of fuel. How do we overcome this? -preheat the oven for 10 minutes especially for baked goods -Check for correct oven temperature and cooking time. -Position shelf before beginning to bake; remember hot metals expand -Cook several items at once for better use of fuel; timing dishes and efficient use of oven shelving is crucial.
Roasting: Long ago roasting was done over an open fire whereby the food which most times was meat was placed on a spit over the fire. Today roasting can be done in an oven whereby vegetables or meat is basted with fat to prevent them from drying out and to enhance their colour and flavour. **Suitable foods**; joints of meat (pork, lamb, beef) e.g. leg, shoulder. Vegetables; potatoes. (tomatoes, eggplant, garlic and onions are also roasted)	A juicy, moist and succulent piece of meat is the desired end result of roasting. How do we ensure this? -Observe the appropriate cooking time i.e. 15 minutes for per pounds. -Start the roast in a hot oven 425^{o}F/220^{o}C to seal in the juices (what do you think is happening here?) and then lower to 325^{o}F-350^{o}F/160-180^{o}C for the remainder of cooking time -very important is frequently basting to improve flavor and keep moist.

Figure 13

The Oven

Figure 14 an Oven. Notice how the oven is used to cook an entire meal?
By Joseph Zollo from Marietta, GA, United States of America (Flickr) [CC-BY-2.0 (www.creativecommons.org/licenses/by/2.0)], via Wikimedia Commons
http://upload.wikimedia.org/wikipedia/commons/6/66/Thanksgiving_oven.jpg

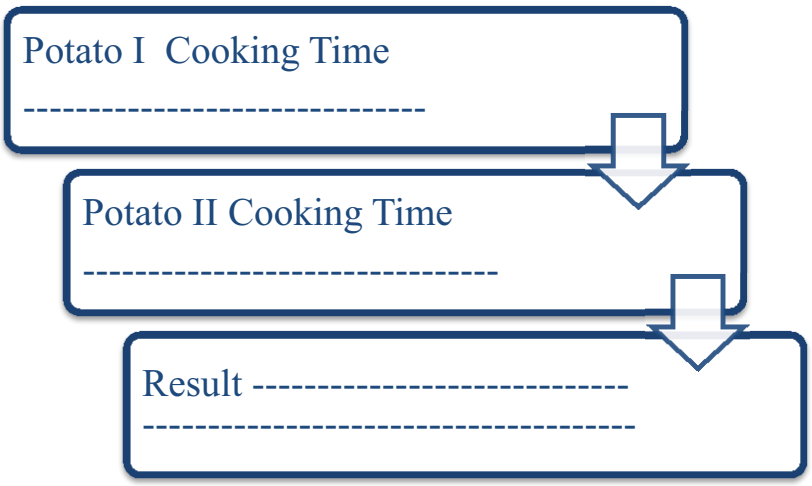
Oven temperature is controlled by the thermostat which is a metal device controlling the flow of gas or heat to the oven. Ovens should be preheated for at least 10 minutes before placing items to be baked. This will allow for the required temperature to be reached and is especially important for bread, cakes and pastries whose raising agent need heat to work properly.

Baking uses heat radiated or given out from the hot metal lining of the oven and by convection currents set up in the hot air. The hot air rises from the source of the heat. The heating of these gases cause them to become less dense or thinner and this allows them to rise. The hot air in the oven rises and therefore the top oven shelf is usually the hottest, the middle and lower shelves are cooler than the top shelf. The exception to this is if the oven is a fan oven where the temperature is even throughout

Figure 15 Gyro Roasted Pieces of Meat on a Vertical Spit
Yannis Samatas. Original uploader was Yannis2810 at en.wikipedia

Activity

Collect two potatoes and place one into a pot of boiling water and the other onto a baking sheet and then into a pre-heated oven 350 ◦F.
Record below the time the potatoes were placed into each cooking media and record the time the cooking is completed or when the potato softens.
State the cooking method which took longer to soften the potato.



Feedback

From the above experiment you would have identified that it took a longer time to cook or soften the potato by baking. Although baking is a slow method of cooking, the size of the oven makes it is ideally suited for cooking a large quantity of food. This makes it an economical method of cooking by reducing the amount of fuel used because all the shelves in the oven can be utilized as they hold and cook food in a timelier manner.

7.2-4 Grilling and Broiling or Barbecuing

Grilling and broiling while both dry heat methods the source of heat differs; with grilling the heat source is below the food; broiling the heat source is from above the food. Grilling is often presented as a healthy alternative to cooking with oil, although the fat and juices lost by grilling can contribute to drier food.

Figure 16 An Assortment of Foods Being Grilled
By AMAPO (Own work) [CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0) or GFDL (www.gnu.org/copyleft/fdl.html)], via Wikimedia Commons
http://commons.wikimedia.org/wiki/File:Laredo_Grill.jpg

Here's what occurs when we grill or broil food. The high temperature seals the surface or the top of the food quickly and this causes moisture, nutrients, and flavour of the food to be retained and not loss.

What foods are suitable to be grilled or broiled? Since the food being grilled should not be more than one to one and half inches (1-1 ½") thick, to allow heat to penetrate to the inside and allows for cooking. What kinds of foods fall into this category? Make a list in the spaces below.

Feedback

Did you list foods such as;

- thin tender cuts of meat e.g. steaks, chops, burger patties, sausages, ribs e.g. baby back ribs.

-poultry breasts.

-fish fillet and cutlets, also shrimp

-vegetables, meat and vegetable kebabs, fruit slices e.g. pineapples.

Perfect Grilling

Grilling has become the cooking method of choice since less fat is used and you get lovely flavor. How do you ensure that you do it right?

- First thing is the marinating of the food

What is a marinade? This is a liquid used to soak or marinate the meat or foods to be grilled in. It imparts flavor to the food. The marinade should contain oil, acid, and herbs. The longer the food is immersed in the marinade the more flavourful it will be when cooked.

Figure 11 A Marinade- Notice the Spice Herbs and Liquid.
I, Gerard cohen [GFDL (www.gnu.org/copyleft/fdl.html), CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0/) or CC-BY-SA-2.5-2.0-1.0 (www.creativecommons.org/licenses/by-sa/2.5-2.0-1.0)], via Wikimedia Commons http://commons.wikimedia.org/wiki/File:ADHOCMarinade.JPG

- Then ensure the grill is preheated to the appropriate grill temperature; the technique for checking your grill's temperature is simple. Carefully place the palm of your hand at the level your cooking food will be and count until your hand gets so hot you ***have*** to move it away.

Very Hot.....1 to 2 seconds

Hot.....2 to 3 seconds

Medium-Hot...3 to 4 seconds

Medium.....4 to 5 seconds

Medium-Low...5 to 6 seconds

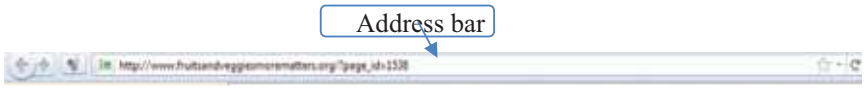
Low.....6 to 7 seconds

- Oil the food, not the grill. Oil burns away at high temperatures so it is pointless to oil the cooking grate.
- You should only turn an item once, which means cooking one side, turning it to finish the cooking, and then taking it off the grill. Avoid prodding the food forks as this releases the juices.

Group activity

Follow the links below to get some more information on the different types of marinades used in grilling.

N.B. Type the URL information (accurately) below into your browser's address bar



http://www.webcookingclasses.com/does-your-grilling-marinade-have-these-3-simple-elements/cooking-classes/

http://allrecipes.com/HowTo/grilling-101-marinades-brines-and-rubs/detail.aspx

http://simplyrecipes.com/recipes/grill/

- There should be three persons in a group.
- Decide who is going to look at which site.
- Discuss amongst yourself the answers to the following questions.

- 1. What are the essential ingredients in a marinade? Give examples of the various types of these ingredients.
- 2. Take a look at the grilling recipes on the web pages, what are some of the ingredients used in the marinade? Did you see any ingredient that you don't normally associate with cooking meat e.g. spice.
- Feel free to try any one of the recipes. When you see you group discuss what you did and how the food tasted?

Barbecuing

Barbecuing is similar to grilling and broiling in that it also uses an open flame to cook. But what defines *barbecue* is the use of wood or coals to produce the flame. What kind of heat transfer do you think is utilized in barbecuing?

Figure 12 Barbecue Pit, Notice the Charcoals?
I, Yoggysot [CC-BY-SA-2.5 (www.creativecommons.org/licenses/by-sa/2.5) or CC-BY-SA-2.5 (www.creativecommons.org/licenses/by-sa/2.5)], via Wikimedia Commons
http://commons.wikimedia.org/wiki/File:Barbecue_griglia.jpg

So after all is said what are the advantages of grilling/broiling or barbecuing and of course the disadvantages too.

Advantages	Disadvantages
It is a quick method of cooking and it can be used to make time saving meals and snacks.	Careful timing of the food being grilled is required this will prevent overcooking and toughening of the food.
It is a healthier method of cooking because fat from meat is drained away.	Cuts of meat should be tender and this would require that you buy expensive cuts of meat or the meat

Advantages	Disadvantages
	will have to be par boiled before grilling

Figure 13 Advantages and Disadvantages of Grilling

Session Summary

Summary

In this session you learn about the classification of the various methods of cooking and about the various dry methods of cooking that you can use.

You learnt that these dry methods are generally considered healthy because of the small to non-existent amount of fat that is used to cook. You learnt as well that in order for the foods to cook properly there are some guidelines that you should observe.

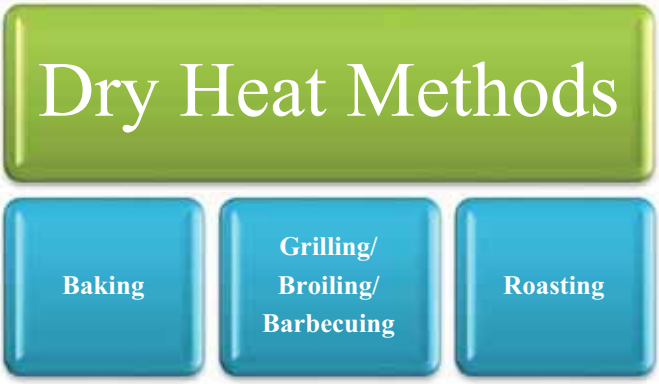
Classification of Methods

Dry Methods utilize dry heat to cook food or we can say it refers to cooking food without adding moisture or liquid. These methods of cooking usually involves high temperatures, this means that the temperature ranges from 300°F/150°C or hotter. They are baking, roasting, grilling/broiling/barbecuing.

Moist methods means that food is cooked either by placing it directly into boiling liquid or by cooking in the steam that rises from boiling liquid. The liquid can be water or its steam, wine or stock.

Frying allows you to cook food by frying it in hot oil or fat. Frying is a quick method of cooking and it is very popular because the food is cooked in a short time and the fat gives the food a lovely flavour.

You also learnt that the dry methods of cooking are:



Baking/Roasting

Method of Cooking	Precautions
Baking is a method of cooking that uses dry heat that is transferred to the food via convection and radiation in an oven without the addition of fat. Even though it is a slow method of cooking it is a healthy method of cooking. Why do you think it is? **Suitable foods**; Flour products e.g. cakes, pastries, breads. Fish, meat, poultry, vegetables Desserts e.g. puddings and soufflés.	Foods may dry out and baking uses a lot of fuel. How do we overcome this? -preheat the oven for 10 minutes especially for baked goods -Check for correct oven temperature and cooking time. -Position shelf before beginning to bake; remember hot metals expand -Cook several items at once for better use of fuel; timing dishes and efficient use of oven shelving is crucial.
Roasting; long ago roasting was done over an open fire whereby the food which most times was meat was placed on a spit over the fire. Today roasting can be done in an oven whereby vegetables or meat is basted with fat to prevent them from drying out and to enhance their colour and flavour. **Suitable foods**; joints of meat (pork, lamb, beef) e.g. leg, shoulder. Vegetables; potatoes. (tomatoes, eggplant, garlic and onions are also roasted)	A juicy, moist and succulent piece of meat is the desired end result of roasting. How do we ensure this? -Observe the appropriate cooking time i.e. 15 minutes for per pounds. -Start the roast in a hot oven 425°F/220°C to seal in the juices (what do you think is happening here?) and then lower to 325°F-350°F/160-180°C for the remainder of cooking time -very important is frequently basting to improve flavor and keep moist.

Grilling/Broiling

You also learnt that grilling and broiling while both dry heat methods the source of heat differs; with grilling the heat source is below the food; broiling the heat source is from above the food. Grilling is often presented as a healthy

alternative to cooking with oil, although the fat and juices lost by grilling can contribute to drier food

Suitable Foods for Grilling/Broiling Include:

- - thin tender cuts of meat e.g. steaks, chops, burger patties, sausages, ribs e.g. baby back ribs.
- -poultry breasts.
- -fish fillet and cutlets, also shrimp.

-vegetables, meat and vegetable kebabs, fruit slices e.g. pineapples

There were several advantages and disadvantages to grilling;

Advantages	Disadvantages
It is a quick method of cooking and it can be used to make time saving meals and snacks.	Careful timing of the food being grilled is required this will prevent overcooking and toughening of the food.
It is a healthier method of cooking because fat from meat is drained away.	Cuts of meat should be tender and this would require that you buy expensive cuts of meat or the meat will have to be par boiled before grilling

Barbecuing

Barbecuing is similar to grilling and broiling in that it also uses an open flame to cook. But what defines *barbecue* is the use of wood or coals to produce the flame.

Assessment

Assessment

So you've learnt all about the dry methods of cooking! Now let's see if you can choose the appropriate dry method **(baking, roast, grilling, broiling, and barbecuing)** for the foods that are listed below.

1. Stuffed potatoes_____

2. Chicken tenders_____
3. Fish fillets_____
4. Leg of lamb_____
5. Pork chops_____
6. Broccoli and cauliflower florets_____
7. Meat balls_____
8. Pineapple slices_____
9. Donuts_____
10. Crème Caramel_____

A marinade is a very important part of grilling? Why is it important?

_____

_____

_____

Session 7.3 Moist Methods of Cooking

Introduction

Moist cooking methods use water or liquid as their source of heat. Cooking using moist heat means that food is cooked in liquids such as water, steam, stock, fruit juice, milk or wine. Food is either cooked directly or indirectly in the water or liquid. Water can pass heat quickly or slowly to food using conduction and convection currents. The low temperature lengthens the cooking time. The end result will be a food that has a soft texture.

We will now look at the following cooking methods which use moist heat to cook food.

Outcomes

Describe the various moist methods of cooking.

List the foods that are suitable to be cooked by the different methods.

Distinguish between the different moist methods.

Describe the principle underlying pressure cookery.

State the precautions to observe when using the pressure cooker.;

How long?

You will need 2 ½ hours of formal study and 1 ½ hours of self study to complete this session.

Terminology

Simmering :	A moist method of cooking where food is cooked in hot liquids kept at or just below the boiling point of water (which is 100°C or 212°F).
Leaching:	The extraction or removal of nutrients from foods which dissolve in the cooking liquid when food is cooked by moist methods such as boiling, etc.
Bouquet garni:	A mixture of herbs tied together with, celery, chive stalks or cooking twin or enclosed in a cheesecloth that is used to flavor stews, soups or broths.
Mirepoix:	A French term, it is a mixture of onions, carrots, and herbs sautéed in fat that is used to season soups, stews and sauces as well as a bed on which to braise various meats of fish.
Steaming:	A moist method of cooking that uses the steam form boiling water to cook food.

7.3-1 Boiling and Stewing

What are the moist methods we traditionally use in the kitchen? Take a look at the diagram below at those methods we'll explore in this session.

Method of cooking	Advantages	Disadvantages
Boiling is a quick and efficient method of cooking food and you must completely submerge or cover it in the liquid. In this cooking method food is cooked in water at its boiling point (100◦C). At this temperature you will see that the water is bubbling very quickly or vigorously and it converts or changes into steam through evaporation. **Foods suitable for boiling;** -Most vegetables, -Tough muscular cuts of meat e.g. pig's feet, beef clod, etc, -Cereal, pasta, rice, eggs,	-Boiling is an excellent cooking method to soften tough cuts of meat as it causes the hydrogen bonds of the meats' fibrous tissues to break up. -Food does not burn and it is a fairly quick way of cooking.	-If foods are overcooked they disintegrates -Since the cooking water is thrown away any nutrients that leach into the water is lost -Food cooked this way may lack flavor and colour.
Stewing is a long slow moist method of cooking food in a covered vessel. You can stew food in a covered saucepan on top of the cooker or in a covered casserole dish in the oven. In stewing the food is cooked below the boiling point. Did you know that	-it tenderizes tough cuts of meat and so it an economical way of cooking. -since the cooking liquid is served with the food, nutrient	-Since it is a long slow method it is not an efficient use of fuel. There is no variation in texture or consistency in a meal prepared by stewing.

Method of cooking	Advantages	Disadvantages
currying and stewing are one and the same method of cooking? **Food suitable for stewing;** -tough muscular cuts of meat e.g. beef clod, lamb breast, oxtail, poultry, -Peas and beans -Fruit	loss is minimized. -An entire meal can be prepared in one pot.	

Figure 14 Boiling and Stewing

Boiling can you see the bubbles?

Image: Simone Reid-Foster

Stewing: are there any bubbles?

Attribution: FiveRings at en.wikipedia

Note it! / Warning

Did you ever hear that a stew boiled is a stew spoiled? What does that mean? During the stewing process you will use a **low temperature** and the moist heat softens the connective tissue and changes it to gelatine. This will separate the meat fibres, making it tender. If the temperature is too high the meat will fall apart and the liquid will evaporate so that the food may stick to the saucepan or casserole and burn, and I know that we do not want that to happen The meat being stewed is usually cut up in order to expose a greater surface area to the liquid.

Activity

Ok all this talk about stewing has got to have made you hungry. Let's try a simple Stewed Chicken and Boiled White Rice. You can do this at home. Prepare a mini portfolio of what you did and the results. Of course you're going to eat it! Here's what you'll need:

- A folder (plain or patterned)
- A few sheets of lined paper to record what you did and your answers.
- The recipe; which you can access by copying the following URL into your ddress bar: http:s//caribbeanpot.com/tag/caribbean-stew-chicken/ Ultimate Trinbagoian Stew Chicken.
- Use the ingredients and utensils described in this recipe.
- Complete the following:
- Write the steps for the dish in your own words.
- What was the finished chicken tender or rubbery?
- Was the completed chicken caramel in colour or lighter on darker in colour?
- How were the flavour and the taste of the chicken? Circle all that apply; flavourful, bland, sweet, and bitter.
- What other ingredients can be added to this dish? List two.

Feedback

So how was it? Great I am sure!

Now if your Stewed chicken dish was tender, caramel in colour and flavourful you were on the right track. For some of you this may have been a first try. Try it again if you had some problems it takes some practice to get it perfect.

You can also add any peas or bean and vegetables to your dish.

7.3-2 Steaming and Poaching

I am steaming mad! What comes to mind when someone says that to you? You see smoke right? While the person is definitely not on fire, the smoke you imagine has something to do with the level of anger expressed by the person. What then is steaming as it relates to cooking? Steaming is cooking food in the steam that rises from boiling water. The food does not come into direct contact with the water.

Food is either cooked by **direct contact** with the steam or by **indirect contact** such as in a bowl. The steam first heats the container in which the food is placed and then this heat is transferred into the food cooking it slowly.

Suitable foods for steaming include fish, chicken, vegetables, and various types of puddings.

Steaming Methods

There are several methods of steaming food and together we will explore them.

- **Plate Method**: Food is placed between two plates or between a plate and a saucepan cover that is put on top of a saucepan with boiling water. This method can be used to cook two or more foods together. For example fish cutlets or steaks can be placed between the plates and potatoes, cassava, etc or eggs can be boiled in the water.
- **Saucepan method**: This is suitable for puddings and cakes. The food is placed into a basin or bowl and then covered with a waterproof lid or wrapping to prevent condensation of the water onto the food. The bowl or basin is then placed on top of a trivet placed into the saucepan.

Figure 15 Saucepan Method of Steaming
By Steamingtechniques.jpg: KVDP derivative work: Beao (Steamingtechniques.jpg) [Public domain], via Wikimedia Commons
http://commons.wikimedia.org/wiki/File:Can-in-can_steaming.svg

- **Tiered Steamer**: This can be used for cooking a whole meal. Each tier or steps of the steamer consist of perforated wholes or vent pipes may be located on the side of each tier. This will allow for the steam to rise to each level and cook the food that is on them. On one tier you may place green vegetables and in the other meat or fish and a starchy vegetable could be put into the boiling water.

Figure 16 Types of Steamers; Double Tiered, Bamboo Steamer
Gveret Tered (talk | contribs): http://upload.wikimedia.org/wikipedia/commons/4/4b/Steamers.jpg

- **Electric Steamer:** This uses the same principle as a tiered steamer but it is fuelled by electricity. Water is placed into the base of the steamer and the steam rises through the perforated tiers. The electric steamer has a timer which has to be set and will indicate the end of the cooking time.

Figure 17 An Electric Steamer
English Wikipedia user KVDP [GFDL (www.gnu.org/copyleft/fdl.html) or CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0/)], via Wikimedia Commons
http://commons.wikimedia.org/wiki/File:Steam_cooker.JPG

Here are some points that you should remember when steaming food.

- Cover food with a waterproof lid or wrapping to prevent condensation of water vapour or having the food such as puddings or cakes being soaked by the cooled steamed which changes into water.
- Have a supply of boiled water in a kettle to replenish the water that has evaporated in the saucepan.
- Place marbles into the water so they will bounce around the saucepan when the water evaporates this will let you know when replenishing of water is required.
- Allow water to boil before placing food into the steamer this will ensure that a steady flow of steam is produced.
- Step back when removing the lid of the steamer to prevent scalding.

The good and bad about steaming!

Honestly if healthy eating is of great concern to you, then steaming makes it all the more easy. Read on in the table below for some more information about the pros and cons about steaming.

Advantages of Steaming	Disadvantages of Steaming
Since the food is not being immersed or placed into the water there is less loss of nutrient and flavour in the food.	The disadvantage of steaming is that it is a long method of cooking and vitamin C in food may be destroyed. .
You will also be able to digest the food easier and this makes it ideal to serve to individuals who are elderly, invalids or convalescents because the texture of the food will be light.	Your kitchen may become filled with moisture and needs to be well ventilated.
Steaming requires little attention but it will take a longer time to cook the food. Several foods may be steamed together or steamed and boiled which will reduce the amount of fuel being used.	

Figure 18 Advantages and Disadvantages of steaming

Let’s discuss Poaching.

Poaching

Since this is also a moist method of cooking, what do you think distinguishes it from steaming or stewing? Poaching means "to cook an item by submerging it in a liquid that is just barely simmering." When you poach foods there is a rolling boil. Poaching, compared to boiling, is a much gentler technique. The temperature of the poaching liquid should be between 170 and 180 degrees and the surface of the liquid should be just "shivering". This temperature is very important because boiling liquid toughens meat and fish, and can make fragile products like eggs and certain delicate fish disintegrate.

Suitable foods for poaching are delicate food such as fish, eggs, and fruit.

Unlike boiling or steaming, the liquid used in poaching must be flavourful in order to impart flavour to the food being cooked. The liquid is called the 'court bouillon' and consists of an acid e.g. wine, lemon juice or stock and aromatics e.g. bouquet garni or mirepoix.

Eggs are generally poached in water and vinegar. Why do you think this is so?

Figure 19 Poaching Chicken
Poaching chicken. Photo courtesy of Stu Spivack
Source: http://flickr.com/photos/stuart_spivack/43533962/

We've got a few other moist methods to explore before we come to the end of this session. So hang in there!

7.3-3 Combination Methods of Cooking

Braising

Why is braising considered a combination method of cooking? Braising is defined as a stewing and roasting. It's kind of like stewing in the oven.

Braising is the technique of cooking large cuts of meat, poultry, or vegetables in enough flavoured liquid to partially cover over a very low heat. The food may be lightly browned before the liquid is added (this makes for a brown braise; the food is not browned for a white braise), and a *mirepoix* of roughly cut vegetables is often included for flavouring. The pot is tightly covered so that the food cooks slowly in the liquid and steam until very tender. The resulting braising liquid is exceptionally flavoursome and is served as a sauce, either as it is or reduced. Stewing is much the same as braising except that the food is cut into even pieces, may or may not be browned, and is cooked in enough liquid to be covered.

Braising is a good choice of cooking method for cuts of meat that are tougher or from older animals. The connective tissues that are more prevalent in cuts like this, and which can make meats tough and chewy when improperly cooked, are

slowly dissolved through long, slow application of moist heat. So you end up with a tender piece of meat.

Figure 20 Braising
Photo: Mogens Engelund (Own work) [CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0)], via Wikimedia Commons
http://commons.wikimedia.org/wiki/File:Ossobuco.jpg

Figure 21.Dutch Oven Used in Braising.
FiveRings at en.wikipedia [GFDL (www.gnu.org/copyleft/fdl.html), CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0/) or CC-BY-SA-2.5-2.0-1.0 (www.creativecommons.org/licenses/by-sa/2.5-2.0-1.0)], from Wikimedia Commons

7.3-4 Conservative

Do you know that cooking food kills them? Did you also know that the longer we cook food makes them even ‘deader’? How can this happen? Particularly in the case of fruits and more so vegetables the closer they are to the raw stage when eaten, the better, since more of the nutrients (especially the water soluble ones-see the micronutrients unit) are preserved and available to the body for use. So what then is the conservative method of cooking? It is a method of cooking where a minimum amount of water is used to cook vegetables. Very little salt is used and the pot remains covered while the vegetables are cooked for a very short time. Vegetables cooked this way should still have a crunch when bitten into.

Can you think of other cooking methods that also preserve nutrients?

7.3-5 Pressure Cooking

Figure 22
See Page for Author [GFDL (www.gnu.org/copyleft/fdl.html) or CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0/)], via Wikimedia Commons http://commons.wikimedia.org/wiki/File:Pressure_cooker.jpg

Pressure cooking is a moist method of cooking food at temperatures higher than 100◦C, which as I am sure you remember is above the boiling temperature of water. This is achieved through the use of a pressure cooker. A pressure cooker is a tightly sealed saucepan which has an escape vent onto which a weight is placed, this builds up the pressure inside of the pressure cooker. The steam that is built up inside of the pressure cooker is allowed to escape at a controlled rate. The pressure and temperature builds up to the required level and the steam is forced through food so that it cooks very quickly. Together we will now look at the structure of a pressure cooker.

Structure of a Pressure Cooker

The main parts of a pressure cooker are:-

- **Locking lids**
- **Rubber gaskets**
- **Safety valve**
- **Control valve**
- **Trivet**
- **Metal storage container**

Points to Remember when Using a Pressure Cooker –
Here are some handy points you should bear in mind when using a pressure cooker.

Activity

The temperature is rising!

Investigation 1

You will be provided with the following food item: - oxtail. You are required to cook the item using both stewing and pressure cooking methods and they must be timed individually.

Questions for you to answer:

1. Which cooking method took the shortest time.
2. What has accounted for the shortened cooking time.

Write your answer here:

Session Summary

Summary

In this session you learned about the various moist methods of cooking.

Here's what you learnt:

- The moist methods of cooking use liquid either water, or stock to cook food.
- There are several moist methods and foods that are cooked using those methods:

Method and Description	Suitable Foods
Boiling: food is cooked in water at 100^0C.	Vegetables, muscular cuts of meat e.g. cow's feet, cereal, pasta, eggs, dried peas.
Steaming: food is cooked in the steam produced by the boiling water. The food may be cooked using the plate or saucepan method.	Fish, chicken, vegetables and various types of puddings.
Stewing: food is cooked in flavoured liquid just below boiling point.	Tough cuts of meat, poultry, fruit.
Poaching: food is gently cooked in flavoured liquid that is simmering. The food is submerged in the liquid.	Eggs, fish, fruit e.g. pears.

Braising: a combination moist method of cooking. It is mixture of roasting and stewing.	Tough older or large cuts of meat e.g. leg of lamb, brisket.
Pressure cooking: the is cooking of food in steam under pressure	Tough cuts of meat, dried peas and beans e.g. channa/chick peas, black eye peas
Conservative cooking: food particularly vegetables are cooked in a small amount of water, in a covered pot for a very short time.	Vegetables.

Assessment

Assessment

How well do you remember? Answer the following questions about moist methods of cooking.

1. Why is it important to make use of the liquid used for boiling vegetables and other foods such as poultry?

_____

_____

_____

_____

2. Describe the moist method of cooking that can help diminish nutrient loss.

_____

3. Which moist method of cooking you would choose to prepare Oxtail? Explain why you chose the method you did

Session 7.4 Cooking with Fat and Microwave Cooking

Introduction

We will now look at cooking food using hot fat. The use of hot fat or oil to cook food is called frying. Fat is able to cook food at a much higher temperature than water making it a quick method of cooking. The fat is usually heated between temperatures of 180◦C and 205◦C. Frying is a suitable method for cooking small pieces of food and it requires little preparation, all you need is a frying pan and hot oil or fat. The nutrient content of the food being fried is not lost because the hot fat seals the surface of the food thus preventing the juices from escaping. However the food does absorb some of the fat and this raises the energy value of the food. Have you ever observed fried food? I am sure you would say that

cooking by this method makes the food look very attractive and the flavour of the food is also well developed.

When you fry food you need to give it constant and careful attention because it has to be turned over many times. This will ensure even cooking and prevent burning of the food. You have to make sure that the fat is at the correct temperature so that it does not absorb the fat and become too soggy. Some people may find eating fried food difficult because they may not be able to digest the fat. Therefore we can say that the food is indigestible or it sits in the stomach for a long period of time.

Outcomes

Describe the various methods of frying.

Choose the most suitable method for frying various foods.

Explain the health concerns that may arise by regular consumption of fried foods.

Observe the rules for deep frying food.

Explain why it is important to coat foods before frying.

Explain how various types of heat affects different types of foods.

How long?

You will need 2 ½ hours of formal study and 1 ½ hours of self-study to complete this session.

Terminology

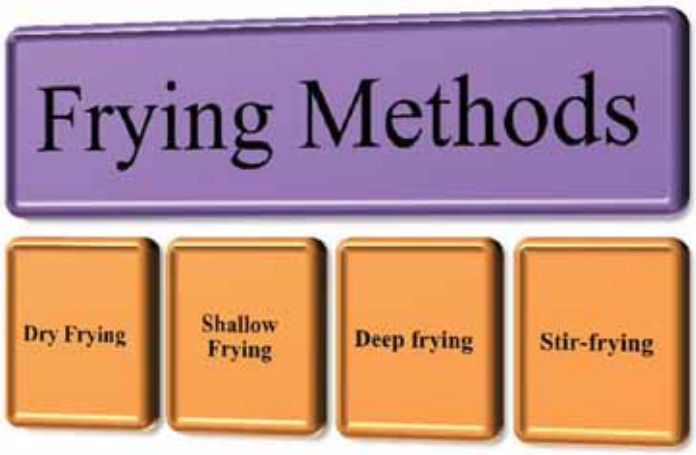
Coagulation: The transformation of protein by heat or the addition of chemicals into a semisolid or solid mass.

Smoke point: This is the point at which cooking fat or oil begins to breakdown into its constituent glycerol and fatty acids, producing a bluish smoke.

Flash point: This is the point at tiny wisps of fire begin to leap from the surface of hot oil. A blue haze is seen and the oil ignites momentarily but does not continue to burn.

Frying:	The cooking of food through the medium of hot fat.
Dry frying:	Frying food in its own fat, no additional fat is added.
Stir frying:	Cooking food very quickly over high heat in an oiled skillet.

7.4-1 Frying Methods



Fats used for frying

Caution! Frying may be hazardous to your health!

Note it! / Warning

7.4-2 Dry Frying

When walking barefoot along the sand on a very hot day, have you ever felt the blistering heat of the sand scorching the soles of your feet? You actually feel the heat or the burning sensation of the sand and you do your best to either jump in the water or get into the shade. Well the effect of the heat on your feet soles can be likened to dry frying.

Some foods such as bacon and sausages can be fried without adding oil. If you look at bacon you will see the pink meat and the white or cream part is fat. The fat in sausages cannot be seen so easily, none the less it is there.

Figure 23 Fried Without Added Oil
By Rene Ehrhardt [CC-BY-2.0 (www.creativecommons.org/licenses/by/2.0)], via Wikimedia Commons. http://commons.wikimedia.org/wiki/File:Pan_frying_sausages.jpg

Activity

Try it! You will need to get a packet of bacon, an 8"or 10"skillet, a spatula, a plate to serve up the finished product.

How do you do it?

- Preheat the skillet; place your hand above it to check that it's hot. Should take 10 seconds.
- Place the strip of bacon into it and you will see fat oozing out of it. The bacon will be quickly cooked without you having to add any cooking oil or fat. Therefore we can say that dry frying is the frying of food in its own fat, no additional fat is required.

7.4-3 Shallow Frying

In the process of shallow frying, the food is cooked in hot fat that covers the bottom of the frying pan. This should remind you of the shoreline at the beach, when you allow only the scorched feet to touch the water's edge. The same happens in the frying pan during the frying process. The food is placed into a frying pan to just cover the base or bottom of the frying pan. As the frying continues the food has to be turned over and over to ensure that it gets cooked on all sides and to prevent burning. Fish, chicken, cutlets, and eggs can be cooked using shallow frying.

Figure 24 Shallow Fried Chicken
Image: topstep07 / FreeDigitalPhotos.net

Do you notice the amount of oil or fat that is used?

7.4-4 Deep Frying

In this type of frying a large quantity of fat is used so that the food being fried is totally submerged or covered with oil. This method is just like the deep area of the sea, the area reserved for swimmers. Deep fat frying is suitable for foods such as chicken parts, fish, plantain and potato chips or french fries, cassava, accra, doughnuts, etc. If you have visited a fast food restaurant you would see the cooks placing french fries into a basket which is then lowered into hot oil so that the entire food is covered.

Figure 25 Deep Fat Frying
By Cyn0matic (Own work) [CC0 (creativecommons.org/publicdomain/zero/1.0/deed.en)], via Wikimedia Commons. http://commons.wikimedia.org/wiki/File:EmpanadaFry.jpg

In the picture above do you notice the type of spoon used? Why do you think this spoon is used? What about the basket the food is in, why is it necessary? Jot your answers down in the spaces provided.

7.4-5 Stir –Frying

In this method food is cooked in a little hot fat in a frying pan or wok. The ingredients are stirred until they are cooked and a small amount of water is added to help the cooking process. Vegetables, shrimps, thin slice of meat, and fish can be stir fried.

Figure 26 Stir Fried Vegetables
http://creativecommons.org/publicdomain/mark/1.0/deed.en

Did you observe the amount of oil used to stir fry these vegetables? The amount of oil used is barely noticeable right?

Now that you have learnt about the methods of frying, we shall now look at the preparation that some foods should undergo before frying.

Activity

Your teacher will provide you with two pieces of chicken. Cover one piece with the flour provided and then place both pieces into the hot frying pan and note what happens.

Did you notice juice or liquid running out of one of the meats and which one?

Feedback

If your answer is yes and you said the uncovered one, I will concur or agree. Yes the uncovered one had its juices running out of it because it had no coating, unlike the other one. Some foods need to be coated or covered before they are fried.

There are Several Benefits for Coating Food:-

a prevent them absorbing the fat
b prevent them sticking to the pan
c prevent them breaking up
d seal in food juices and prevent them from escaping
e makes some foods more attractive

There are Several Types of Coating for Foods Which Include:

- batters
- egg and breadcrumbs
- milk and seasoned flour
- seasoned flour
- cornmeal

7.4-6 Rules for Frying

Before you begin to fry food there are some rules that you need to adhere to in order to be successful when frying. Please read and always bear them in mind. You must:-

#	Checklist	☑
1	Use clean fat or oil – oil that looks cloudy contains impurities that could interfere with the flavour of the food	❑
2	Use a dry, strong frying pan – if wet it will cause the oil to spit and strong pans can withstand the high temperature without burning the food will absorb the fat and a greasy end product will result.	❑
3	Test oil for readiness by placing a piece of bread in the fat if it becomes brown in 30 seconds it is ready. If it sinks the fat is not ready however if it turns brown within a few seconds it is ready to be used or if you observe a faint blue haze rising from the fat.	❑
4	Do not fry too many pieces of food at once – this will lower the temperature of the fat and the food will absorb the fat.	❑

#	Checklist	☑
5	Never throw food into the frying pan – place gently into the hot fat the fat will splash and burn you.	❑
6	Turn food with a spatula or fish slice – do not use a knife that will pierce the food and cause the juices to flow out into the oil.	❑
	Dry wet food to ensure the oil does not spit.	
	Drain food on absorbent paper or brown paper to remove the excess oil.	
	Keep heat low enough to ensure that food is cooked inside and not burnt on the outside.	

- Try the activity below, see how you do.

Activity

1. To obtain the fried drumsticks below, you will have to coat the food. List suitable coatings that can be used.
2. Give two reasons for coating food.
3. Give three reasons for coating food before frying.

Note it! / Warning

Frying is a quick method of cooking using hot fat. There is little loss of nutrients but the caloric value of food is increased because the food absorbs the fat in which it is cooked, the exception to this is dry frying. Hot oil should be used for frying and a dry frying pan should be used to prevent burning.

7.4-7 Microwave Cooking

Microwave cooking is different from the other methods of cooking that we previously looked at. In microwave cooking the application of heat is different. The previous methods of cooking apply heat from the outside of the food which then moves or travels into the inner portion of the food. However in microwave cooking heat is generated or started inside of the food and moves or migrates outward.

Figure 27 A Microwave Oven
By Wrightmt (Own work) [Public domain], via Wikimedia Commons.
http://commons.wikimedia.org/wiki/File:Microwave_oven_flashon.jpg

How does the microwave cook food?

A microwave oven produces electromagnetic waves or microwaves which penetrates food agitating or shaking up the molecules in the food thereby producing heat which moves from the inside out.

Benefits of Cooking in the Microwave

The food cooked in the microwave heats up quickly, this in turn decreases your fuel bill, preparation time and wastage because food is only heated as required. The short cooking time reduces the amount of heat generated and this in turn reduces or lessens the destruction of nutrients thereby making foods cooked by this method more wholesome and nutritious.

In order to be cooked quickly food must have a thickness between 2 ½ to 3 inches but smaller pieces of food will be quickly cooked. For this reason

microwaves are an essential part of canteens, snack bars and hospitals. The microwave oven does not heat up but only the food heats up. This will prevent your kitchen from becoming uncomfortable and it is safer for elderly or disabled people to use.

Food can also be served in the same dish in which it is cooked, suitable containers are oven proof glass, china, paper, ceramics and some plastic containers. Ensure that you read the underside of the container to see if it is microwave safe. You should never use metal foil dishes and dishes with metal trim in a microwave oven because metal will reflect the microwaves back to the magnetron and cause arcing. This may cause permanent damage to the oven. The magnetron is the valve that generates the microwaves. Foods cooked in a microwave oven do not become crisp or brown and in addition to this they may not develop the characteristic flavour, colour or texture.

Now let's move on and discuss how heat affects the food we eat.

7.4-8 How Does Different Types of Heat Affect the Food We Eat

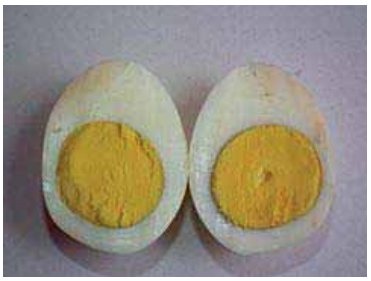
What's up with these changes!!!

As you previously learnt in this unit, when heat is applied to food it undergoes both physical and chemical changes. Now, together we are going to take a more in depth look at these changes. Heat used to cook food can be either dry or moist and for this lesson you can expand moist heat to include hot fat or oil. Once any type of heat is applied to food the changes would be permanent. Together we will do some investigative work; so I hope you did not take off your lab coat. You will have to do some practical work to better understand this lesson. I am sure that you are up to the challenge to investigate these changes and that you are familiar with all of them.

7.4-9 Effects of Heat on Food from Animals

Foods from animal sources - that are rich in the nutrient protein such as meat, fish, and eggs undergo physical changes when they are cooked by heat. The nutritive value of these foods are minimally affected. To help you better understand these changes we will use an egg.

A. Uncooked Egg
http://commons.wikimedia.org/wiki/File:Raw_egg.jpg



B. Cooked Egg
By Ramesh NG (Flickr: Boiled Egg - Crossection) [CC-BY-SA-2.0 (www.creativecommons.org/licenses/by-sa/2.0)], via Wikimedia Commons

Figure 28 Heat and Eggs

Activity

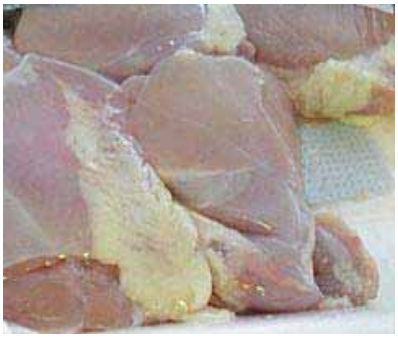
Crack an egg onto a plate and you will notice that it has two distinctive parts, the yellow colour egg yolk and the clear egg white. Place some of the egg white into a test tube containing water. Look at the colour, it's clear and you can see through it. Apply heat to the test tube and note the changes.

The clear colour changes into a white cloudy mass or it has become opaque. This change is referred to as **coagulation** or setting. Heat causes the protein to coagulate or harden causing the protein to change from a clear colour into a solid opaque or white mass. If more heat is applied the white mass will further harden becoming tougher and it will shrink in size. Therefore all protein food coagulates once heat is applied to it.

Heat and Animal Muscle Fibres

In meat the muscle fibres (actin and myosin) change colour. Once heat is applied the connective tissue becomes shorter and thicker and the meat shrinks in size, similar to what happened to the egg white. The heat changes collagen into gelatine allowing the meat fibres to loosen and become tender. Have you read or heard of gelatine? If you said yes, that's excellent if your response was no – then I think you may want to change your answer when you continue reading. Ever heard of a product called 'Jello', yes the same sweet item that is mixed with hot water and is liquid at room temperature but sets or forms a gel when chilled. That item contains gelatine which is a setting medium. If you place cooked meat in the refrigerator overnight, and you look at the liquid that surrounds it you would see that it is set or it has a gel. That is because gelatine has been extracted from the bones and connective tissue of meat. The same happens in fish, however fish has less connective tissue than meat making its flesh tenderer and if cooked for a long time it will fall apart as flakes. The colour of meat and fish

will also change from red to brown or to a creamy colour depending on the cooking method.



A.Uncooked Chicken
By gran (self) [GFDL (www.gnu.org/copyleft/fdl.html) or CC-BY-3.0 (www.creativecommons.org/licenses/by/3.0)], via Wikimedia Commons

B.Cooked Chicken
Image: nuchylee / FreeDigitalPhotos.net

Figure 29 Compare Uncooked and Cooked Chicken

What do you observe about the raw chicken and the cooked chicken?

What about dairy products?

Activity

Pour some milk into a saucepan and apply heat to it. You will notice that the milk will coagulate or set and if cooking continues it forms a 'skin' on the surface or top. Feel the skin, you will see that it floats on the surface and it feels thick, sometimes this skin can be seen when you overheat milk when mixing cocoa or chocolate beverages for breakfast.

Cheese on the other hand will coagulate quickly and you will notice fat coming out. If you pull it, you will note its rubbery texture and if cooking continues it becomes crisp and very difficult to digest. I am sure that you have seen this happen at some point in time when you have made a macaroni pie or a grilled cheese sandwich we can say that is overcooked or as we say burnt.

Heat and Nutritive Value

The nutritive value of protein is not affected by dry heat. However if foods such as meat or fish are exposed for a long time to very high temperatures as in roasting or grilling, some amino acids may be destroyed and the proteins, collagen and elastin, coagulate and they become hard and are less digestible. This happens especially on the surface or the outside of meat. A crisp cover or coating forms and it is difficult to bite and chew and even digest.

Note it! / Warning

The application of heat to causes coagulation of protein, turning it solid. Overcooking causes protein to toughen. Cheap cuts of meat should be cooked using moist heat because they cause the tough collagen and elastin to soften.

7.4-10 Effects of Heat on Cereals and Starches

Cereals and starches are important staples in our diet. Examples of these are vegetables, legumes, pasta, and rice and they are cooked to reduce their bulk and to make digestible the starch present in these foods. These foods have the nutrient carbohydrates as their main nutrient content which is available to the body in the form of roughage and starch.

Moist Heat and Cereals and Starches

Cooking will soften the cell walls of vegetables and fruits. In vegetables the cell walls are broken, thus making them more digestible. However fruit will disintegrate or mash up when overcooked. Fruits with pectin content become soluble becoming soft and thick roughage. You will also notice that the starch grains swell and this is because they absorb water making them soft and eventually they will burst releasing their starch content. Observe the cooking water for rice or cassava, at first the water is clear, you can see through it but eventually it will become cloudy. This is because as we said earlier the starch grains burst and release the starch into the cooking water. If you feel the grain of rice or piece of cassava they are no longer hard, they will become soft but did you take a look at the colour of the food? Did it remain the same colour or size as you began with? I am sure that your answer will be no. Some foods will also increase in size or bulk because they absorb water.

A. Uncooked Rice
Image: Ambro / FreeDigitalPhotos.net

B. Cooked Rice
By Sakurai Midori (Own work) [Public domain], via Wikimedia Commons.

Figure 30 Raw vs Cooked Rice

Dry Heat and Cereals and Starches

If dry heat is applied to breads or pastry or cake or similar items made from starch the surface changes colour to a golden brown because the starch has been changed into dextrin a sugar this process is called **dextrinization**. If you toast a slice of white bread you will see that the colour has changed from white to golden brown which is the dextrin. Further heating will cause the starch to darken and eventually turn black or chars (the residue made mostly of carbon).

Sugar on the other hand will dissolve in water and will turn into a syrup which you can use to sweeten your fruit juice or drinks. If you continue to heat the syrup, the water evaporates and the sugar caramelises. When sugar caramelises it changes colour from the white or golden brown colour into a deep brown colour. To better understand this process, place a tablespoon of sugar into a heavy saucepan and put it onto the heat. You will see that the sugar grains melt and become a thick liquid then the colour changes to a golden brown colour to a deeper brown colour. If heat is continued the colour becomes richer and darker. I am sure that you have seen this when you or your parent browns chicken for stewing or last Christmas when fruit cakes were made. Yes, caramel is what is used to colour your Christmas fruit cakes. The nutritive value of carbohydrates is negligibly or insignificantly impacted by heat

A. Bread Dough
By Kurt Nordstrom from Ponder, TX, USA (Ball o' Dough Uploaded by sevela.p) [CC-BY-2.0 (www.creativecommons.org/licenses/by/2.0)], via Wikimedia Commons

B. Freshly Baked Bread
By David Sinden (w:Image:French bread, photo.jpg) [GFDL (www.gnu.org/copyleft/fdl.html)], via Wikimedia Commons

Figure 31 Raw vs Cooked Bread Dough

7.4-11 Effects of Heat on Vegetables – Green Leafy and Legumes

Vegetables and legumes form an important part of our diet. They are colourful and very attractive and are rich in vitamins, minerals as well as carbohydrates in the form of roughage. Some of them can be eaten raw whereas others have to be cooked to ensure that they are made palatable. We will now look at the affect heat has on these foods.

Leafy vegetables such as dasheen bush, spinach, and patchoi contain cellulose turn limp when heated in water. The fibre in the leaves and stems absorb water and soften. Now you will roughly chop a few patchoi or dasheen leaves and place them into a saucepan with some water. Observe the quantity of leaves placed into the saucepan and cook for 10 minutes then examine same. Does the quantity of leaves look the same as when you started? I am sure you will say no, what happened to it? Well the fibres in the leaves and stalk absorbed water and became limp and have been reduced. Or the bulk of the food has been reduced so that you can eat more of it.

When we use moist cooking methods, the water soluble vitamins - vitamin B complex and vitamin C are greatly affected because they are unstable. The following occurs when legumes and green leafy vegetables are cooked using moist cooking methods.

- Leaching – this is the diffusion of vitamins into the cooking liquid especially during boiling. If plenty of water is used more vitamins will diffuse out of the food into the cooking liquid. Some minerals are also affected in this way.

- Oxidation – this is the destruction of vitamin C by heat in the presence of oxygen which is present in the air. you will observe this if an apple or

banana are cut and left exposed or open to the atmosphere. They soon become discoloured or brown in colour.

- Oxidation by enzymes (oxidases) – the presence of oxygen in water allows the destruction of vitamin C by oxidases. This effect can be reduced by putting vegetables into boiling water which inactivates the oxidases instead of placing them into cold water and then allowing it to boil.
- Prolonged cooking and keeping vegetables hot causes heat destruction of vitamin C and thiamine. To avoid this, green vegetable should be cooked just before their use.
- Preparation for cooking – when you slice, shred or chop vegetables the surface area of the food increases the surface area of the food exposing the food to greater loss of water soluble vitamins through leaching and this releases more oxidase enzymes. To prevent or reduce the loss of these important vitamins you should use a sharp knife, and cut or tear roughly and quickly just before cooking.
- Do not add sodium bicarbonate to improve the colour of vegetables or to shorten the cooking time of legumes. Sodium bicarbonate destroys the vitamin C and thiamine content of these foods.
- Eat vegetables immediately after cooking

Note it! / Warning

High heat and some methods of food preparation destroy vitamin B and vitamin C. Appropriate action should be taken to reduce such losses.

7.4-12 Effects of Heat on Fats and Oils

Frying is a quick method of cooking food using hot fat or oil and it increases the caloric value of food.

Rancidity and the Quality of Fat

The type and quantity of fat or oil used to cook food impact the end result of the item being prepared. Let us now venture into the how it impacts on these food items. Heat, light and exposure to oxygen all promote the oxidation of cooking oils and fats, resulting in its rancidity.

Rancidity is the off flavour and odour that food develops because its fat is broken down or decomposes into its component parts of fatty acids and glycerol. This impacts the nutritive value and keeping qualities of fat. You must never heat fat past its **smoke point.**

The smoke point of a fat is that temperature at which fat molecules split up and this reduces the keeping quality of the fat. If heating continues the fat breaks down further and an unpleasant smelling smoke emanates and the resulting substance can be harmful to your body.

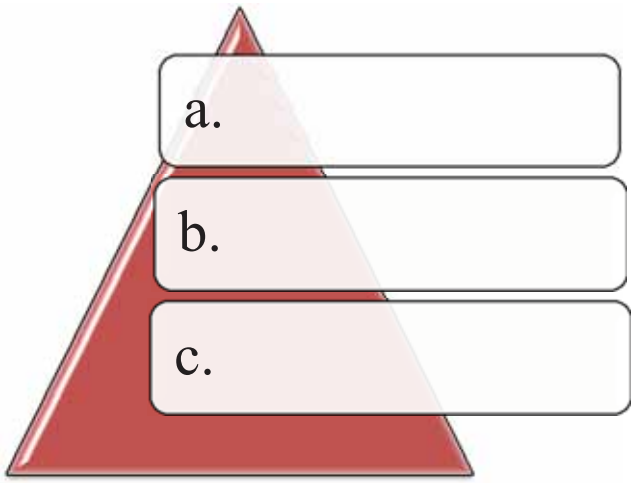
Solid fat such as margarine, butter, shortening all become liquid just like oil when heated. As you continue to apply heat the oil becomes thinner and thinner and it will bubble. At very high temperatures the fat separates into its constituents or parts – namely fatty acids and glycerol and you will see a blue haze is given off. It will then smoke and very soon after it will ignite or catch a fire and burn quickly (**flash point**).

What to do if fat ignites?

If a fire should start, do not panic just cover the flames with a pot cover and it will be extinguished because the supply of oxygen has been cut off.

Activity

1. List three ways you can reduce the loss of vitamin C during the preparation or cooking of leafy vegetables.



2. Define the Term Dextrinization.

Unit Summary

Summary

We have now come to the end on this unit on the principles of heat transfer. Heat is transferred from a heat source to food via conduction, convection and radiation. Food can be cooked using dry or moist heat and hot oil. Once heat is applied to food its structure changes both physically and chemically. The main reasons for cooking food are to destroy micro-organisms, make it palatable and to increase its storage life. We must be ever mindful to keep the integrity of its nutrient content intact and use suitable cooking methods. It is important to ensure that the heat being used must first be hot enough to reduce nutrient loss, especially the water soluble vitamins and to ensure thorough cooking of food. Completing this unit will act as a foundation to the other units you will have to pursue and it will also guide you in selecting appropriate cooking methods and suitable menu selection when planning the diet for yourself and your family.

Assessment

Assessment

True or False statements

This unit contains ten statements. State if each statement is true (T) or False (F) by writing the corresponding letter in the space provided.

1. Food being steamed comes into direct contact with water _____
2. Metal containers can be used in microwaves _____
3. Grilling is a quick method of cooking food _____
4. Moist heat causes the loss of vitamin C in food _____
5. Food is cooked to increase its storage life _____
6. Sodium bicarbonate added to vegetables improves colour only _____
7. Collagen and elastin are soluble proteins in meat _____
8. Fish contains the same amount of connective tissue as meat _____
9. Boiling, frying and baking used dry heat _____
10. Applying heat to sugar causes caramelization ____

Assignment

Assignment

As a food tester, you have been asked to explore the following.

1. How heat passes through and cooks the following foods:

a) Deep fat fried fish

b) A cake baked in the oven

2 Describe three methods of steaming food.

3 List the benefits of steaming

Outcomes : At the end of this assessment students will be able to:-

1. Identify the heat transfer methods in deep fat frying and baking
2. Explain with the aid of diagrams the methods of heat transfer involved in cooking the listed foods
3. Definition of steaming
4. Describe three steaming methods
5. Explore the benefits of steaming

Evaluation: Your teacher will provide you with the necessary feedback as it relates to this Assessment on this unit on 'Heat Transfer'.

Identification of heat transfer methods - deep fat frying and baking	10%
Use of diagrams to show heat flow	20%
Definition of steaming	10%
Describe and explain three steaming methods	30%
Discuss benefits of steaming	30%

Contents

Unit 8

Diet and Health

Introduction

In the Caribbean the time has come for us to stop and reflect on what we eat and drink. Over the years our diet continually changed to suit our ever changing lifestyles. However the question arises, have these changes been beneficial to us or have they impacted negatively on our health?

This unit will help you understand the importance of consuming a balanced diet, how this impacts on the development and maintenance of good health as well as the positive impact this has on your nutritional status. Each session will explore the factors that impact upon our food choices, diet modification for improved health and well being, and the role of dietary fibre in promoting good health.

Together we will explore the guidelines we should follow to meet the nutritional needs of vegetarians and convalescents. Our diet plays an important role for the survival and fortitude of the peoples of the Caribbean; we have to make the connection that 'we are what we eat'.

Outcomes

Upon completion of this unit you will be able to:

- *Explain* the importance of a balanced diet.
- *Explain* the impact of food choices on health.
- *Describe* the underlying benefits of diet modification.
- *Justify* the nutritional requirements of vegetarians and convalescents.

How long?

You will need to devote fifteen (15) hours to work on this unit. Ten (10) hours for formal study and 5 hours of self-study and completing assessments/assignments.

This Unit is Comprised of Five Sessions

Session 8.1 Balanced Diet

Session 8.2 Food choices

Session 8.3 Nutritional Status

Session 8.4 Diet Modification

Session 8.5 Nutritional requirements for Special Groups

Terminology

Arteries:	Small muscular elastic tubes or vessels that carry oxygenated blood from the heart to all parts of the body.
Cholesterol:	This is a waxy fat like substance that is made in the body by the liver. It is also found in some foods. It is necessary for the manufacture of cell membranes and hormones.
Nutrients:	These are chemical substances found in food.
Macronutrients:	Nutrients required by the body in large amounts, carbohydrates, fats, protein.
Micronutrients:	Nutrients required by the body in small amounts – example Vitamins and Minerals.
High Density Lipoprotein:	A type of cholesterol 'good guys' that clean your arteries by carrying away excess cholesterol.
Low Density Lipoprotein:	A type of cholesterol 'bad guys' which over time can clog the arteries with plaque.
Nutritional status:	An individuals' personal health condition which reflects their need for nutrients and their use of them.
Balanced diet	Diet made up of the six food groups and supplies the six main nutrients in the proportions the body requires.

Session 8.1 Balanced Diet

Introduction

It is important that we do a balancing act when it comes to our diet. This ensures that our body is getting the right nutrients in the correct proportions so as to ensure the maintenance of good health and well being.

Outcomes

Upon completion of this session you will be able to:

Explain the functions of a balance diet.

Examine the causes of an unbalanced diet.

State he guidelines to follow when balancing energy.

How long?

You will need to devote 2 hours of formal study and 1 hour of self-study to complete this session.

Terminology

Special Diet:	A modified diet prescribed by a doctor or nutritionist.
Dieting:	The practice of ingesting food in a regulated fashion to maintain or control weight.
Nutrition:	The study of food and its function in the body.
Overweight:	Having more body fat than is what is considered healthy for a given height.
Energy:	The capacity of the physical system or the body to do work.
Deficiency Diseases:	Disease caused by dietary deficiency of specific nutrients.
Adipose Tissue:	A type of connective tissue that contains stored cellular fat.
Food Groups:	A food group consists of foods that are similar based on their type e.g. vegetables or fruit and that these foods all have similar nutrients.

8.1-1 Balancing your Diet

The food we choose to eat and drink daily is called our diet. It encompasses everything you eat from breakfast, snack time, supper and dinner. Every piece of food that you eat and drink constitutes your diet. This should not and must not be confused with the term special diets.

Note it! / Warning

A special diet is one that individuals are placed on by their physicians or dietician for health or medical reasons.

What does consuming a balanced diet do for you?

Sometimes you may hear someone say that they are dieting because they may want to lose weight or because of a medical condition. Therefore the term diet should not be confused with the term special diet.

As you learnt in the previous unit, nutrition helps you to understand the sources and functions of nutrients in the body. Eating foods from the six food groups or having a balanced diet will help your body to:

- Supply energy so that you are able to perform all types of activities; both involuntary and voluntary. Involuntary activities include the beating of your heart, breathing or voluntary activities include walking, running, and writing.
- Support growth and maintenance of the body so that you will grow to your full potential or if you fall and get a cut or have surgery your wound or cut will heal.
- Function properly so that all your organs and other parts of your body will do their work efficiently, for example, you can see in dim light and you could remove waste such as urine from the body via the kidneys.

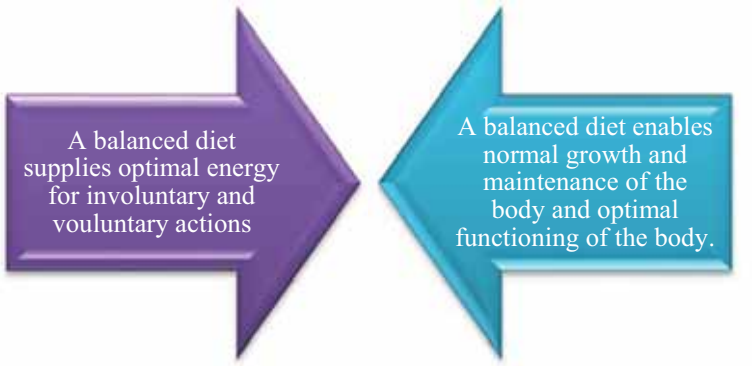


Figure 1 Benefits of Consuming a Balanced Diet.
Image: Gail Samaroo

What causes us to consume an unbalanced diet?

The opposite is true for an unbalanced diet, where some nutrients will be lacking or are in excess. An unbalanced diet could result from:-

- Economic Constraints: You may have limited finances or money so that you are eating poorly or eating foods with little or no nutritional value in order to fend off hunger.

- Poor Eating Habits: You maybe overeating or overindulging in foods with similar nutrient content such as fats so that you are gaining weight thinking that you are healthy or well nourished. When in fact you are not and are becoming overweight with a false sense of being healthy. Or you are under eating, not eating the correct amount of food that your body requires and therefore are becoming thin or underweight.

- Not Following Nutrition Guidelines: You are eating too much or too little with little or no variety of foods from the six food groups, thus limiting your supply of nutrients that your body requires.

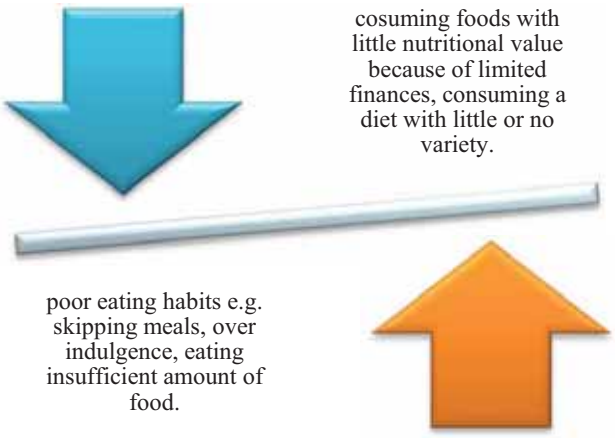


Figure 2 What Causes an Unbalanced Diet?
Image: Gail Samaroo

The ultimate goal of all diets is to be balanced. Therefore the food you eat or your input must be equal to what your body uses up i.e. your energy to do your activities both voluntary and involuntary which is called your output.

Figure 3 Result of a Balanced Diet
Image: Gail Samaroo

This can be achieved by eating a variety of food, in moderation that is reducing the quantity or amount of a given food and balancing your energy intake. However if your input is more or greater than your output you will gain weight and if this continues over a prolonged period of time you can suffer from various lifestyle diseases. The opposite is true; if your input is less than your output and you live a very active lifestyle then you will lose weight. It is possible that this could result in you suffering from various deficiency diseases.

Remember in order to balance your diet you must:

#	What I Must do to Balance my Diet	☑
1	Eat a variety of food from the four foundation food groups (see unit 1).	❑
2	Eat moderately in other words observe serving sizes (see unit 5)	❑

Activity

In the photograph below the boy is overweight. One reason for this is his diet. In the spaces provided below list three steps he should take to balance his diet which will eventually impact his weight.

Figure 4 An Obese Child
http://fatpeoplefail.com/wp-content/uploads/2009/03/fat-boy-eating.jpg

1.

2.

3.

Feedback

How did you do? Check the answers to the first assessment here. If you missed an answer just go back and read the information then attempt to answer the question again.

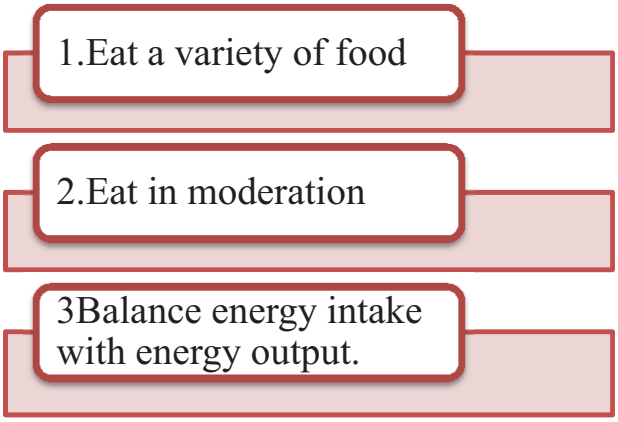


Image: Gail Samaroo

8.1-2 Guidelines for Balancing our Diets.

Remember our input (what we eat or energy supplied) should be equal to our output (what we do or energy used). If your energy intake is greater than your output you run the risk of becoming overweight. The excess energy is converted into fat and stored as energy reserve under your skin in your adipose tissue. You should therefore try to balance your caloric or energy intake based on your individual energy needs or requirements or lifestyles

What should we remember when balancing our diets?

Factor	Explanation
Age	Young children are very active when compared to their body size and they need more nutrients than adults, especially nutrients for growth and repair and less nutrients that supply energy than adults require. Therefore you should provide young children and all family members with a diet that is compatible to their needs.
Gender	Males due to their more muscular build than females need more energy. They tend to do more physical activities than females therefore more energy is required for the performance of activities and for their body mass.

Factor	Explanation
Size	Tall persons need more food than short people because they have a larger frame or body structure. That means that their bones or body frame needs to be appropriately covered with muscles and tissue. Eating foods that supply the body with nutrients for growth and repair in addition to supplying of energy is important
Level of activity	An active lifestyle that entails both physical and mental labour such as a construction worker needs more energy than those persons who are moderately active or inactive such as a secretary or teacher. If your diet contains a reduced amount of energy giving foods for example foods rich in the nutrient fat, then your reserves of energy will be used for the activities that you have to perform. The reverse is true, if your diet contains a larger amount of energy giving foods and your level of activity is limited or non-existent then the extra energy will be stored as fat and you will eventually become overweight. 'Exercise and balance your diet.'

Figure 5 Factors to be Considered when Balancing the Diet

Balancing the diet so we consume a nutritious diet is important, another important reason has to do with balancing or managing our weight. Take a look at the diagram below to get a better idea.

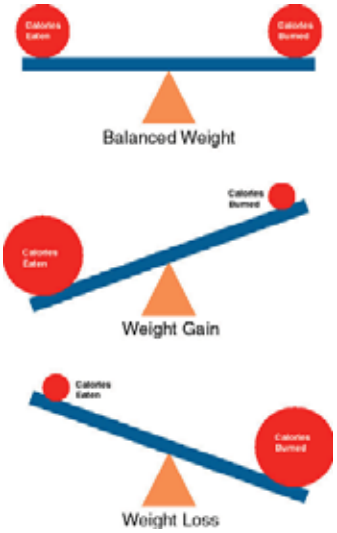


Figure 6 Energy or Calorie Input and Output
http://www.medical-weight-loss-guide.com/image-files/calorie-balance.jpg

Which foods containing macronutrients supply our bodies with energy? Here are a few examples; fatty meats, cakes, cassava, rice, roti, bread, lamb, butter etc.

Reflection

The foods we eat are placed into food groups which are derived from their nutrient content. Can you name the food groups to which each of the macro nutrients identified above belong?

If you said staples, fats and oils and foods from animals you are correct.

The nutrient fat contains twice the amount of calories than protein and carbohydrates.

Session Summary

Summary

In this session you learnt a well balanced diet is one that contains all the nutrients the body requires in the correct proportion, that is, in the correct proportion for the weight and needs of the individual.

A balanced diet will provide your body with protein, fats, carbohydrates, water, essential vitamins and minerals. The best way to ensure a healthy diet is to eat a variety of food from the six food groups which includes staples, food from animals, coloured vegetables, legumes, fruits and fats. An unbalanced diet will fail to provide you with all the essential nutrients and deficiency disease may result.

Session 8.2 Food Choices

Introduction

All through our lives we have to make choices but the choices that we make with regard to the foods we consume are very important. It is important to make wise choices in the selection of foods that we eat because it impacts directly on our overall health and well being.

Upon completion of this unit you will be able to:

Outcomes

- *State* the factors that influence food choices.
- *Explain* the impact of food choices on the diet.

How long?

You will need 2 hours of formal study and 1 hour of self-study to complete this session.

Terminology

Food Stuff:	Material of plant or animal origin that consists of nutrients.
Meal Planning:	a grouping of foods that are listed to be served at meals.
Vegetarian:	An individual who does not consume the flesh of animals or their by- products.
Lifestyle:	A style of living that reflects the individual's values and attitudes.

8.2-1 Factors that Influence Food Choices

Have you ever thought about why you eat certain foods and not others?

Well let's see if we can find out the reason. Some of them I am sure you already know. There are several factors that influence your choice of food and they include (see diagram on the next page):

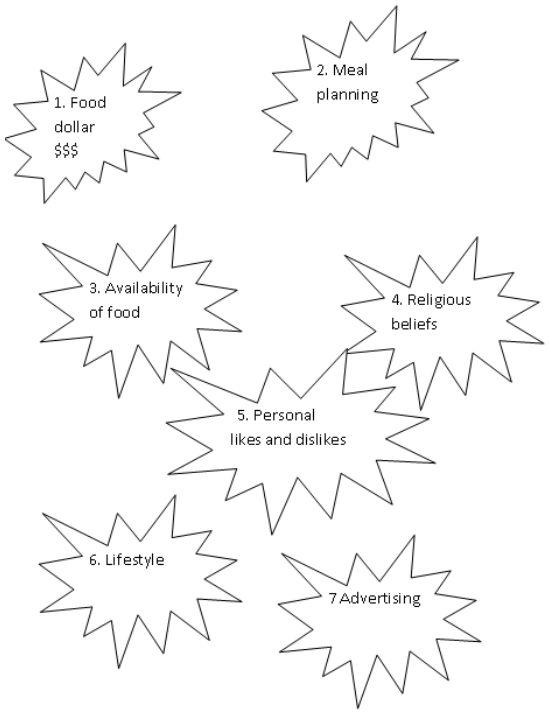


Figure 7 Why do we eat the foods we eat?
Image : Gail Samaroo

Activity

Why do we eat the foods we eat? Write your answers in the spaces provided. List at least five reasons.

1. _____

2. _____

3. _____

4. _____

5. _____

Feedback

Here are the reasons why we eat the foods we eat.

#	Checklist	☑
1	Food dollar	❑
2	The meals planned	❑
3	The food available	❑
4	Our religious beliefs	❑
5	Our personal likes and dislikes	❑
6	Advertising	❑
7.	Our lifestyle	

8.2-2 How do these factors affect our food choices?

Yes the factors listed in the previous lesson determine your choice of food. So now let's see exactly how these factors affect your food choices:

- **The Food Dollar**: Is your income allowing you to purchase your required foodstuff so that the quality and quantity of food meets your nutritional needs? When you shop for foodstuff the amount of money you have and your ability to meet the cost of the item plays a significant role in determining whether you can buy the foodstuff or how much of that foodstuff you can actually buy. In this case you have to determine your needs and wants and most times due to your limited finances you may have no other choice but to leave the foodstuff with the vendor.

- **Meal Planning**: Your meals should be planned before shopping for food to ensure that good or balanced nutrition is obtained. You should plan your meals monthly as this would ensure variety of food so that you are eating foods from the six food groups. Meal planning also provides you with the

ability to make changes to meet your needs and saves you time in the actual preparation and service of meals.

- **Availability of Different Foods**: Purchasing foods when they are in season which is called 'seasonal food' will reduce your food bill because foods are cheaper when they are in season. Also the increased production of food and its distribution will reduce food cost thus providing you with the ability to add variety to your diet.

- **Religious Beliefs**: Some religions prohibit their followers from eating certain foods. For example, Seventh Day Adventists and Muslims do not eat pork. Hindus do not eat beef. Therefore if you are a practising believer in any religious faith you may choose to follow their teachings which would restrict your eating of various foods.

- **Personal Likes and Dislikes**: Sometimes you would not eat certain foods such as vegetables or certain types fish or meat because you dislike their taste or appearance and they are not your favourite or liked foods. You automatically would avoid purchasing, cooking or eating them.

- **Advertising:** Television, print and radio advertising can persuade you to buy different brands and types of food. The advertisement plays on your mind and makes you want to eat or try the food item because of its appearance and the constant replay of the item via the media. Even the attractive packaging of food products makes them appealing to you and they act like a magnet drawing you to them. Eventually you will want to taste and buy the food product.

- **Lifestyle:** The time you have allocated to the buying, preparing and eating of food may be limited. You may live a fast paced active lifestyle and purchase fast food, or use more convenience foods than fresh foods because your time for the preparation of meals is limited or your level of skill may be limited.

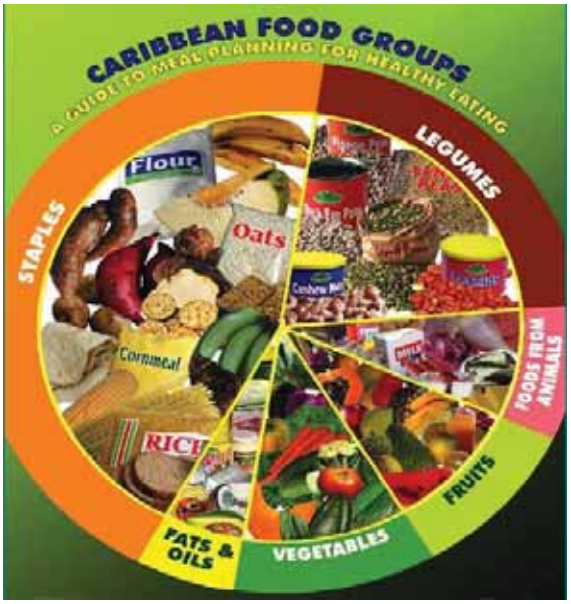


Figure 8 The Caribbean's Six Food Groups Help us Make Wise Choices

Session Summary

Summary

In this session you learnt when selecting food for your family several factors must be considered. They include the amount of money that is available-this should encompass the cost for food and the fuel required to cook the meals. The religious beliefs, some religions do not allow for the consumption of meat and others specify the types of meat which are not to be eaten. The types of meals you are planning for breakfast, lunch, supper, dinner, tea and snacks. The personal likes and dislikes of those who will be eating the meal in addition to dietary restrictions such as salt, gluten free, sugar, and the like. The impact that advertising has on individuals, how this affects food consumption patterns, lifestyles-active or sedentary, and the availability of food whether it is in season or not.

Session 8.3 Nutritional Status

Introduction

Nutritional status is your personal health condition which reflects your need for nutrients and how your body uses these nutrients. The nutrients found in food

perform various functions in your body. When you eat foods that contain nutrients in the correct proportion that your body requires your nutritional status or state of health will be good. However, if your body is not getting the correct amount of nutrients or if your body is deprived or deficient of vital nutrients then your nutritional status will be poor and you will become susceptible or at risk for disease or conditions that compromise your health.

Upon completion of this unit you will be able to:

Outcomes

- *Explain* the term nutritional status.
- *Explain* the factors that determine the nutritional status of individuals.
- *Describe* the methods of measuring nutritional status.
- *Calculate* the body mass index.

How long?

You will need 2 hours of formal study and 1 hour of self-study to complete this session.

Terminology

Recommended Daily Allowance:	The amount of selected nutrients considered adequate to meet the nutrition needs of healthy people.
Body Mass Index (BMI):	This is a measurement of the amount of body fatness of a person. It is used as an indicator for weight categories that may pose health concerns. It is calculated using height and weight.

8.3-1 The Importance of Nutritional Status

Nutritional status is your personal health condition which reflects your need for nutrients and how your body uses these nutrients.

Nutritional status is determined by the Recommended Dietary Allowance or RDA.

This is also referred to as Recommended Daily Allowance and is defined as "the average daily dietary intake level that is sufficient to meet the nutrient requirements of nearly all healthy individuals".

It represents the establishment of a nutritional norm for planning and assessing dietary intake, and is the level of intake of essential nutrients that are considered to be adequate to meet the known needs of practically all healthy people. RDAs are different for children, adults, males and females.

The Dietary Reference Intakes (DRIs) are a set of nutrient reference values. They are used to help people select healthful diets, set national nutrition policy, and establish safe upper limits of intake which together impacts our nutritional status.

The nutritional status of an individual, community or country is determined by the following factors:

- **Lifestyle**: Making unwise food choices can lead you to a diet that is lacking in essential nutrients that could result in you being at risk for diseases related to poor nutrition. For example, if your diet is lacking or deficient in the nutrient iron then the deficiency disease anaemia may result especially if you are a girl or woman who is menstruating. In addition to this if you overindulge in foods with a high caloric value and not exercise then you will become overweight or fat.
- **Knowledge**: If you are uninformed or do not know about the proper selection, preparation, service and storage of food then the nutrient content you should obtain from food can be reduced. For example fresh vegetables contain the water soluble vitamin called ascorbic acid or Vitamin C. If during preparation you peel and then wash the vegetable, the Vitamin C found in the vegetable would dissolve out of it. This is because once the inner surface of the vegetable has been exposed and then washed, vitamins C would dissolve out of the vegetable.
- **Production/Availability**: Certain foods maybe unavailable due to import restrictions, natural disasters such as draught, and limited food production. In severe cases such as a natural disaster like the earthquake that rained destruction on Haiti, the majority of Haitians are not getting adequate quantities of food because the level of availability has been reduced due to the mass destruction of infrastructure and crops in addition to people being killed and livelihoods being lost.
- **Storage/Transportation**: Limited or no transport for carrying food produce to remote areas will leave you without food or make some foods too expensive to be included in your diet. In addition to this inadequate storage of food such as lack of cold storage or chilling facilities will cause food spoilage before it is distributed to you the consumer. Therefore it is important to have chilling rooms or houses and delivery vans with adjustable refrigeration to transport food to various parts of the country especially to remote or countryside areas to ensure that the nutritional value of food is not destroyed by extreme temperatures.

Figure 9 Nutritional Status Shows the Direct Link Between Diet and the Impact on our Body.
Image: Ambro / FreeDigitalPhotos.net

8.3-2 Measuring Nutritional Status

How do we measure nutritional status?

Nutritional status is measured using the following methods either each one on its own or a combination of methods.

- **Dietary Analysis**: This is carried out by calculating the nutrient content of your diet. This is done by listing the foods you have eaten over a period of several days together with your dietary habits, for example, how much water you drink every day in addition to listing the snacks (fruit or potato chips) that you eat daily.
- **Measuring Your Body**: Measurement may include your weight, height, and skin thickness. This will provide you with some information about your protein and energy intake. The Body Mass Index or BMI is an example of a suitable method that is used to determine your body's fat content. It provides you with information as to whether you are overweight or within a good weight range for your height and age. For example, if a teenage girl is not overweight her BMI should be approximately 18.

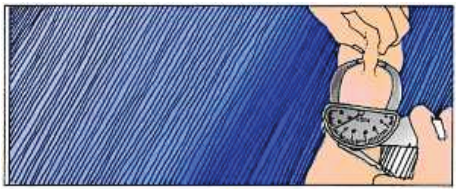


Figure 10 Measuring Skin Fold Thickness
http://apjcn.nhri.org.tw/server/info/books-phds/books/foodfacts/images/figures/fig16-17.jpg

Figure 11 Taking Weight Measurements for BMI
Image courtesy: CDC/ Dr. David Sencer

- **Physical Examination**: Some physical signs indicate possible nutritional deficiencies or excesses. By looking at or inspecting parts of your body such as your hair, skin, and tongue you can indicate if you are experiencing good and poor nutrition. For example, if your tongue, gums and mouth are pink or you are a good height and weight for your age or you have clear eyes then you are exhibiting or showing signs of good nutrition. However if the opposite is true of you then you are showing signs of poor nutrition.

- **Laboratory Assessment**: Blood and urine samples are used to measure the levels of glucose, fats and minerals in your body. In recent times the Caribbean has seen increases in the number of people with diabetes, high cholesterol, heart disease and obesity. On most visits to your physician or doctor, you would see him or her taking and testing samples of your urine. If your tested sample indicates high levels of glucose or blood sugar and you are suspected of being diabetic then you are sent to the laboratory for further testing to confirm the suspicion.

Note it! / Warning

The Body Mass Index (BMI) tells you how your weight relates to your your height and it tells us if you are overweight, underweight or at your correct weight.

8.3-3 Body Mass Index

In session 6.3-2 on measuring the nutritional status, you learnt that the Body Mass Index or BMI is one method that is used to indicate your weight as it relates to your height. The BMI is an estimate of body fat. It tells you if you are at a healthy weight, overweight or underweight for your height. It informs you of the relationship between your height (cm) and your weight (kg). When you eat too many foods rich in fats, carbohydrates and protein, an excess of calories occurs. This will cause you to become overweight or obese. Measuring your BMI will help you to monitor your nutritional status as it relates to your weight or size

A calorie is a unit of energy. It is used as a measure of the amount of energy a particular food provides to the body. The calorie is a very small measure of energy

so the food calorie (kilocalorie, kcal), 1000 calories, is more often used and is what is used on food labels when showing the calorific value of a food item.

How do you calculate your BMI?

Your BMI is calculated by dividing your weight by the square root of your height.

$$\text{BMI} = \frac{\text{weight (kg)}}{\text{height (m)} \times \text{height (m)}}$$

To calculate your BMI , just follow these simple steps below: -

a. Take your weight in kilograms
b. Measure your height in centimetres
c. Find the square of your height or multiply your height by itself
d. Divide your weight by your multiplied height.

In the figure below the table provided that will help you make sense of the results from your calculations. In the left column are BMI readings and the right columns indicates what the readings stand for or represent or mean.

BMI	Weight Category
Less than 20	**Underweight**
20-25	**Healthy weight**
25-30	**Mildly overweight**
30 and above	**Very overweight**

Figure 12 BMI categories

Activity

Try your hand at calculating your BMI. Follow the steps then do the calculation. You might need a friend to help you.

1. Stand on the scale provided and weigh yourself.

2. Measure your height in centimeters. Remember to square your height!
3. Write down the BMI formula.
4. Look at the BMI categories in the table above (fig.12). Which BMI category did you fall into?
5. If you fell above or below the 'healthy weight' category, state one thing you can do to correct this.

Feedback

So here's the BMI formula;

$$\text{BMI} = \frac{\text{weight (kg)}}{\text{height (m) x height (m)}}$$

How did you do?

Certainly you can improve your dietary intake to correct this problem.

Eat a more balanced diet and of course engage in some exercise to help you burn unused calories.

Session Summary

Summary

In this session you learnt that eating habits influence your nutritional status because it is related to how healthy you are since your diet impacts your health. Consuming a balanced diet with regular exercise will help you to maintain good health. If you eat a balanced diet your body will be provided with the nutrients required for growth and maintenance, for protection against disease and for the proper functioning of the various body processes. Excess calories or a deficiency in any nutrient will prevent your body from functioning properly and this will impact negatively on the quality of life that you would enjoy. It is therefore important that you keep track of you nutritional status by monitoring your Body Mass Index regularly.

Session 8.4 Diet Modification

Introduction

Sometimes our diet may contain certain foods that may not be beneficial to us. It will take some will power to modify your diet but when compared to the benefits, we will understand the necessity of reducing the sugar, sodium and fat contents of our diets.

Upon completion of this session you will be able to:

Outcomes

Explain the effects of high salt, sugar and fat diets on our body.

State the guidelines for reducing excess body weight, salt and sugar in the diet.

Explain the importance of dietary fibre.

How long?

You will need 2 hours of formal study and 1 hour of self-study to complete this session.

Terminology

Hypertension :	This refers to the disease that describes higher than normal blood pressure known as high blood pressure.
Blood Pressure:	a measure of the force of blood against the wall of your arteries as the heart pumps blood through the body.
Heart Disease :	Narrowing of the small blood vessels that supply oxygen to the heart.
Stroke :	A stroke or "brain attack" occurs when a blood clot blocks an artery or a blood vessel breaks, interrupting blood flow to an area of the brain. When either of these things happens, brain cells begin to die and brain damage occurs.
Oedema :	Retention of water in the body causing swelling of leg or ankles.
Glycemic index:	This is a measure or ranking of the effect of foods on their potential to raise blood sugar levels.
Glucose :	This is the simplest form of carbohydrate; it is used as energy by the body.
Diabetes:	This is a chronic lifelong disease marked by high levels of sugar in the blood.

Insulin:	This is a hormone made by the pancreas that regulates the level of blood sugar.
Calorie:	It is a unit of energy. It is used as a measure of the amount of energy a particular food provides to the body. The calorie is a very small measure of energy so the food calorie (kilocalorie, kcal), 1000 calories, is more often used and is what is used on food labels when showing the calorific value of a food item.
Cholesterol:	This is a waxy fat like substance that is made in the body by the liver. It is also found in some foods. It is necessary for the manufacture of cell membranes and hormones.
Dietary Fibre:	This is the portion of plants and fruits that are undigested by enzymes in the body.

8.4-1 Salt the Good and the Bad

I am sure that you love the taste of salt in your diet. Have you ever considered eating a green mango or cucumber pickles that contained no salt? No, I'm sure you are saying it just would not taste the same: "salt please", must be running through your mind. Well let's see if there are any benefits to having salt in your diet. Should you use as much as you want or should salt be limited? Let's see!

Note it! / Warning

The salt we eat is called sodium chloride and it is the sodium which you need to regulate your blood pressure and blood volume.

It also plays an important role in making your muscles and nerves function properly. As you learnt previously, sodium is found naturally in most foods and in table salt therefore we should limit our intake of table salt. The dietary reference intake or DRI for salt is between 920- 2300mg, approximately 1 teaspoon. That is the amount of salt that is required daily. However many individuals regularly surpass the daily requirement

You may ask is there such a thing as too much salt?

Yes there is such a thing as too much salt and there are several risks in eating a high salt diet. You need sodium for blood to circulate around your body and for your heart to pump blood with a certain amount of force, that force is called blood pressure. However, high intake of sodium which is a constituent of salt causes your

blood pressure to get too high. A high sodium diet has been medically related to Hypertension (high blood pressure). It occurs when your blood pressure rises beyond acceptable levels and remains consistently high. In high blood pressure, blood puts greater pressure on the blood vessels or arteries as it flows through, causing the heart to work harder. Sometimes it is referred to as the 'silent killer', because most people do not realise that their pressure is high until it is too late. High blood pressure is a risk factor for heart disease because your heart has to work harder to push blood around the body, putting a strain on your arteries.

What could be the result if you continue eating a high salt diet? If you continue to have a diet which is high in salt without monitoring your blood pressure, the following medical conditions could result with deadly consequences of:-

- stroke
- heart failure
- kidney diseases
- oedema(the retention of water in your body which can lead to the swelling of the ankles and weight gain)

Therefore it is important that you reduce the amount of salt in your diet.

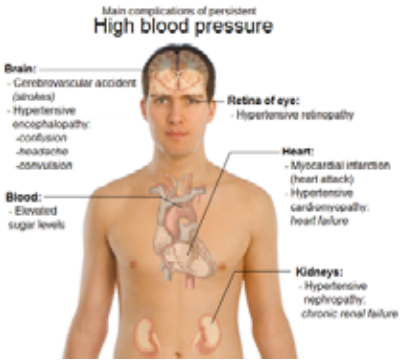


Figure 13Effects High Salt Diet.
By Mikael Häggström (All used images are in public domain.) [Public domain], via Wikimedia Commons

8.4-2 Normal Blood Pressure

You may ask what normal blood pressure is. Well it varies according to your physical condition. Blood pressure is measured using an instrument called a sphygmomanometer.

Figure 14 Sphygmomanometer, Measuring Blood Pressure
Image: Ambro / FreeDigitalPhotos.net

I am sure that you have seen it when you visited your medical practitioner or health care provider. The sphygmomanometer carries two readings, namely the:-

- Systolic pressure which is the top number and it indicates the pumping force of the heart.
- Diastolic pressure indicates the relaxing or the resting of the heart between beats and is the bottom number.
- These numbers are written for example 110/80. Below in Figure 11 a table is provided for you and it indicates the upper limits of normal blood pressure for young people. Can young people suffer from high blood pressure? The answer is yes! The number of young people becoming ill with high blood pressure is increasing and there are several reasons which we shall examine as we continue with this lesson.
- Your teacher will provide and demonstrate to you the sphygmomanometer. Please use it and read the blood pressure of your friends. You can also ask the Health Centre nurse to demonstrate to you the use of the sphygmomanometer and to take your blood pressure reading is used

Age	Systolic (pumping force)	Diastolic (resting of heart)
Child 3-5 years	116	76
Child 6-9 years	122	78
Child 10-12 years	126	82
Child 13-15 years	136	86

Age	Systolic (pumping force)	Diastolic (resting of heart)
Adult (optimal)	Less than 120	Less than 80
Adult (20-40 years)	Less than 130	Less than 85
Adult (high to normal)	130-139	85-89
Mild hypertension	140-159	90-99
Moderate hypertension	160-179	100-109
Severe hypertension	180 +	110 +

Figure 15 Blood Pressure Reading Chart

Note it! / Warning

If the resting pressure remains high (above 90 -99) after several measurements this is an indication that a person has high blood pressure.

Who are the people most likely to suffer from hypertension?

Several people in society are more likely to suffer from high blood pressure or hypertension. These people will suffer from hypertension because of their lifestyles and some hereditary or inheritance factors namely if they are:-

- Over 40 years
- Members of a family whose relatives have high blood pressure
- Of African descent
- Obese
- Smokers

- Under constant stress
- Heavy drinkers of alcohol

Does your lifestyle or hereditary factors cause you to fall into any of the above categories? If your answer is yes, then you MUST seriously rethink your diet and lifestyle and make the necessary adjustments before it is too late.

8.4-3 Modifying Salt in the Diet

What can you do to lower salt in the diet:-

You may say that you cannot do without salt, since it makes food taste good, however I have listed just for you some simple steps for you to follow and that will help you reduce the level of salt in your diet. The following guidelines are given to you to help you make the necessary adjustments so that the level of salt would be reduced in your diet.

- Gradually begin to reduce the salt content when cooking – instead of using one teaspoon use a half teaspoon instead.
- Use herbs and spices such as celery, garlic, etc instead of salt to flavour your food.

Figure 16 Use Herbs Instead of Salt
Image: Paul / FreeDigitalPhotos.net

Figure 17 Spices

Image: Michelle Meiklejohn / FreeDigitalPhotos.net

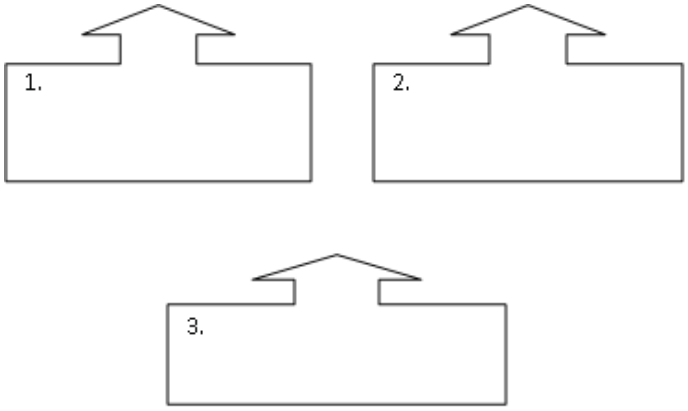
- Eat fresh fruits and vegetables, such as mangoes, oranges, carrots, and the like.

Figure 188 Mangoes
Image: Arvind Balaraman / FreeDigitalPhotos.net

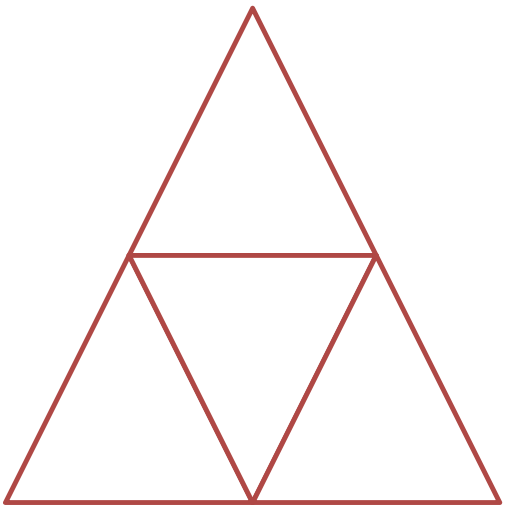
- Reduce your intake of baking soda, baking powder, so cut back on the amount of bakes, cakes, biscuits, etc that you eat.
- Reduce cured meats such as ham, bacon, salted fish, pigtail, etc.
- Reduce the use of processed or canned foods such as corn beef, canned sardines, corn, peas and carrots, etc.
- Reduce the amount of processed snacks such as potato chips, corn curls, salted peanuts, etc.
- Read the nutrition labels on convenience foods and avoid foods that uses the word sodium on the package. This indicates the presence of sodium chloride or salt.

Activity

As we recap this lesson on salt modification in each arrow provided below name a disease that is associated with an increased level of salt.



In the pyramid below write the names of four foods that would help you reduce the level of salt in your diet.



Feedback

How did you do? Check your answers with those given below.

Diseases associated with high blood pressure:

Stroke

Heart failure

Kidney disease

Foods to reduce salt content;

Herbs e.g. celery, garlic, onions

Fresh fruit and vegetables e.g. mangoes and oranges etc.

8.4-4 Sugar: The Sweet Life

As you learnt previously in the lesson on macronutrients, sugar is the simplest form of carbohydrates. It is present naturally in foods that you eat such as fruits, vegetables, milk and in household sugar which is obtained by processing sugarcane or beet. You use processed or refined sugar to sweeten your beverages and when you make various items such as jams, cakes, biscuits and desserts. Once sugar is eaten , it is digested or broken down into glucose (blood sugar) and is transported to all body cells to give you energy.

How would you know if food contains sugar and how much sugar is good for you?

In order to find out the amount of sugar food contains you will have to know the Glycemic Index (GI) of food.

The GI measures how quickly carbohydrate foods turn into glucose in the bloodstream after digestion and absorption. A number is given to food based on how quickly it turns into blood glucose (blood sugar).

Foods with a low GI indicate that carbohydrates break down slowly into glucose and there is a gradual release of glucose into your blood stream. Your blood glucose response is slower and steadier and more sustained. Low GI foods include soya beans, lettuce, whole grain spaghetti, oatmeal, grapefruit and ground provision.

Foods that break down quickly into glucose after digestion will have a high GI. That means glucose quickly enters your blood stream and remains high. This will stimulate your pancreas to release insulin which should reduce glucose levels. The changing of blood sugar levels in the body is not healthy because it places additional stress on the body cells and organs. Some examples of these foods with high GI are watermelon, white bread, cornflakes, sugar and white rice.

What are the effects of high sugar levels in the body?

When you eat foods that contain sugar, the sugar raises your blood sugar (glucose) levels after digestion and absorption. This causes the pancreas, which is a gland in

your body to release the hormone insulin. Insulin acts like a key to help the body cells unlock and use energy from the blood sugar.

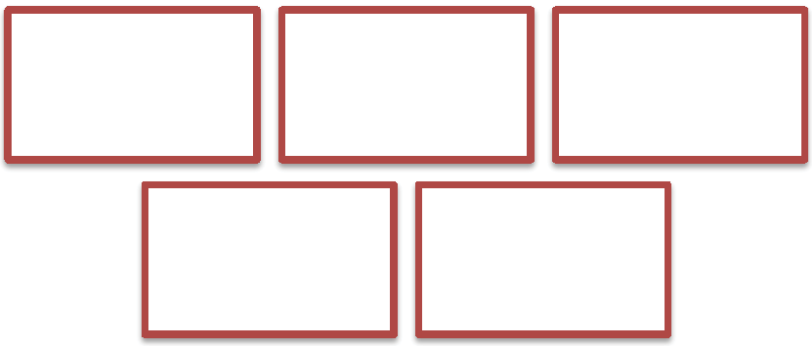
However if the levels of glucose are consistently high due to you eating too much carbohydrate foods your pancreas has to work overtime to produce more insulin. This will cause the:-

- Pancreas to wear out and it will eventually stop producing insulin and the level of glucose will remain high and diabetes will result.
- Lens of the eye or retina will get damaged which could lead to blindness.
- Kidneys to work overtime. Kidneys filter unwanted material from the blood and their blood vessels may become damaged causing kidney disease or kidney failure.
- Immune system to become weak thus making it easier for you to contract the common cold, cancer, etc because the level of white blood cells activity which is needed to fight off disease is reduced.
- Body to gain weight (obesity) because fat will be allowed to be stored as you eat foods too high in sugar.
- Teeth to form dental caries (tooth decay) when combined with poor dental hygiene.

Figure 19 Decaying Tooth
I, ISebestyen [GFDL (www.gnu.org/copyleft/fdl.html), CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0/) or CC-BY-SA-2.5-2.0-1.0 (www.creativecommons.org/licenses/by-sa/2.5-2.0-1.0)], via Wikimedia Commons

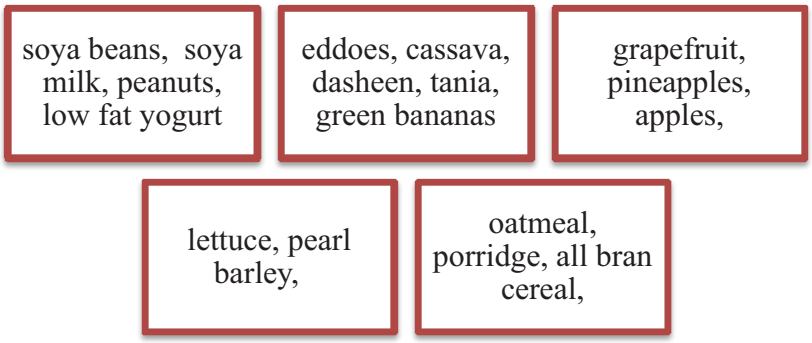
Activity

You are working as a trainee dietician with the North General Hospital and you have been asked to speak to a group of patients who have been identified as having high blood glucose levels. You have spoken to them about eating foods with a low glycemic level. In the spaces provided below list five foods that have low glycemic levels that would be good to include in their diet:



Feedback

Here are the answers how did you do this time? If you missed one then go back and re read the information.



8.4-5 Let's Look at Diabetes

After you eat food, it is digested and changed into glucose which is your body's source of energy. I am sure that you have been to the gas station with some member of your family or in a taxi and the driver had the car filled up with gasoline because the car needed to go a long distance. The same is true of your body. You eat food so that you will get energy to perform all the functions or tasks assigned to you. Even to breathe for your lungs to take in oxygen and to exhale, energy is required. In order for you to be able to read, think, talk, even during

sleep, yes energy is required. Glucose is your body's energy supply but in order for you to use it or access it the hormone insulin is needed.

The hormone insulin is released by your pancreas, an organ in your body. The insulin acts like a key which opens the door for your body cells to take in and use the glucose thus reducing the level of blood sugar. Therefore you are able to perform all bodily activities both voluntarily and involuntarily. However, when there is insufficient insulin or if the pancreas is not releasing the insulin then diabetes mellitus, hyperglycaemia or 'sugar' occurs. That means that there is a high level of glucose in your blood. This happens when the body either:

- Does not produce enough insulin.
- Produces no insulin at all.
- Does not respond properly, through the body cells, to the insulin produced by the pancreas.

The level of glucose accumulates or builds up in the blood and it will spill into the urine because the body cells are unable to get and use the glucose. Body cells are therefore being deprived of energy and are crying out for it.

Note it! / Warning

A prolonged period of high blood glucose can cause damage to the following parts of the body, namely the;

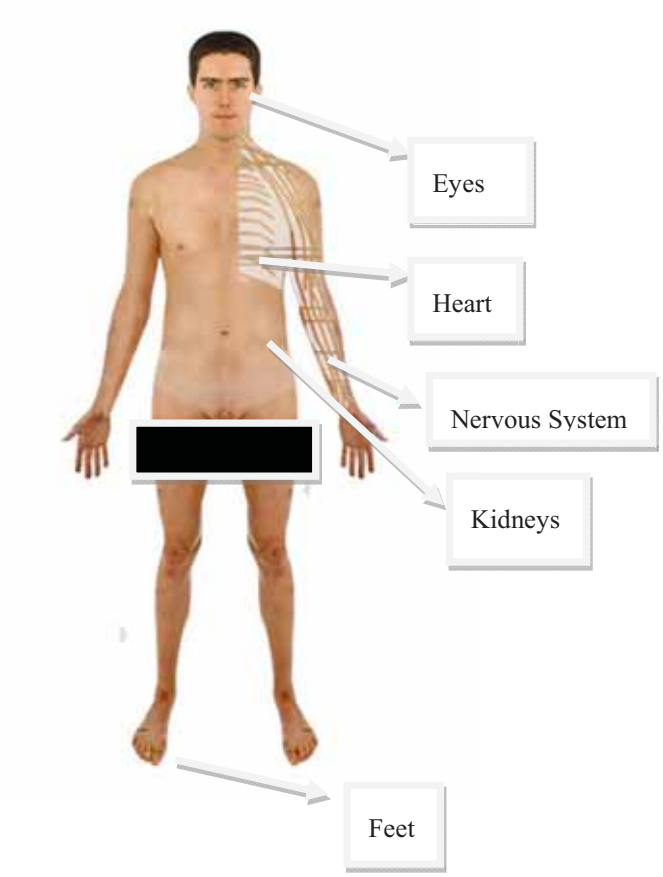


Figure 20 the Impact of High Blood Sugar on the Body
http://upload.wikimedia.org//wikipedia/commons/b/b8/Human_anatomy.jpg

Types of Diabetes

There are three types of diabetes:

- Diabetes Type 1 occurs when the pancreas does not produce insulin at all.
- Diabetes Type 2 occurs when the pancreas does not produce enough insulin or your insulin is not working properly.
- Gestational Diabetes: Women develop diabetes just during their pregnancy and it disappears after the birth of the child. Babies born to mothers with this condition are usually large in weight. Gestational diabetes disappears after the birth of the baby but the chance of the mother developing diabetes later on in life is greatly increased.

Signs of Diabetes

If a person is suffering from diabetes they would exhibit or show the following signs:-

- Passing urine frequently.
- Becoming very thirsty and drinking a lot of water.
- Becoming weak and tiring easily because parts of your body is not getting enough energy.
- Rapid weight loss.
- Experiencing prickling and tingling in your skin.
- Having blurred vision.

8.4-6 Who's at Risk for Developing Diabetes

Anyone is at risk of developing diabetes especially if you are:-

- Related to a person with diabetes.
- Overweight
- Under stress – stress can cause ineffective use of insulin.
- Do not exercise - Type 2diabetes is more common among inactive people.
- Ageing – Type 2 usually develops later in life.
- Pregnant with a large baby.

What foods should be included in your diet to control or reduce the risk of developing diabetes?

The following guidelines should be followed in your diet:

- Reduce sugars in diet by reducing those spoonfuls of sugar in your beverages, cakes, icing, confectionery, desserts, etc
- Reduce white flour, white rice, white pasta, processed cereals, corn, potatoes
- Reduce alcoholic beverages such as beer, rum, etc
- Eat whole wheat flour, bread, cereals, oats

- Eat vegetables and fruits especially -carili, broccoli, cabbage, lettuce, legumes, onions, garlic, tomatoes, parsley, apples, tamarind, grapefruit, yogurt, ground nuts, jambul fruit, ground provision, mangoes, oranges, pineapples
- Use the following cooking methods: steaming, baking, grilling, microwave cooking

Figure 21
Image: happykanppy / FreeDigitalPhotos.net

Activity

Diabetes challenge; which of the following are symptoms of diabetes.
Draw a line from each symptom to the word diabetes.

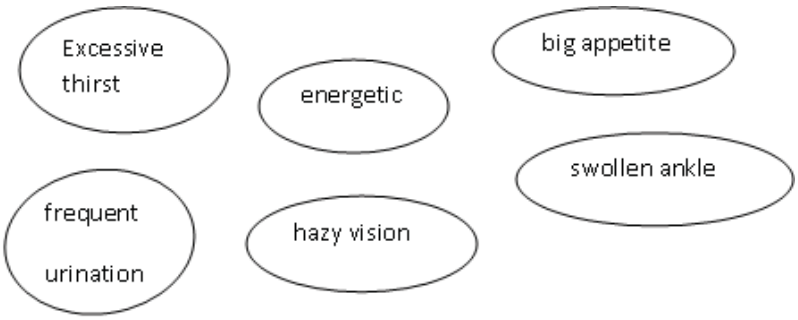


Figure 22

Diabetes

Feedback

This was easy! Did you get them right?

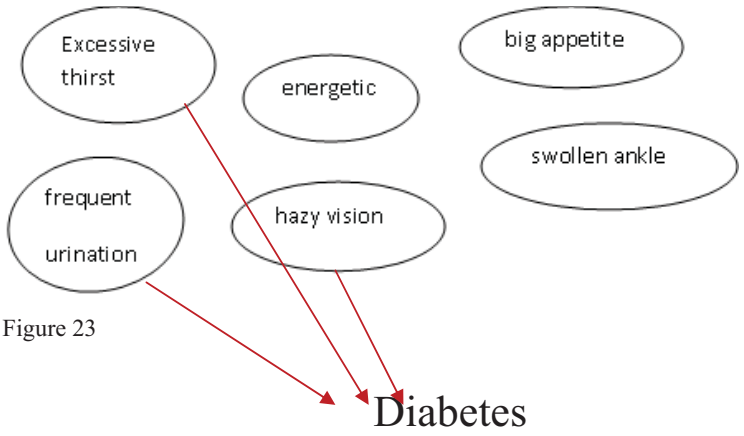


Figure 23

Note it! / Warning

The hormone insulin secreted by the pancreas helps body cells use glucose to produce energy. Diabetes develops when the level of glucose in the blood is high. This happens when your body either does not produce enough insulin, produces no insulin at all or the body cells do not respond properly to the insulin produced by the pancreas.

Reading

For additional information please read

'Nutrition Made Simple': Versada Campbell and Dinesh Sinha '

Follow the link below to get some more information .**N.B. Type the URL information (accurately) below into your browser's address bar:**http://southbeachdiet.com

8.4.7 Fat: Is it Good or Bad?

Fat supplies your body with the most concentrated source of energy. As you learnt in an earlier unit on macronutrients, 1 gram of fat supplies your body with 9

calories that's more than twice the amount of calories as protein and carbohydrates. Proteins and carbohydrates both contain 4 calories each. This is important to know if you want to find out the energy value of foods in your diet.

Once you know the weight of the energy-giving nutrients you can multiply that value by the caloric value to get the total amount of calories in any food. Let see how to calculate the calories in an 8 ounces (oz) (250) ml glass of whole milk. Assume that whole (full cream) milk contains:

8 grams protein

8 grams fat

12 grams carbohydrates

Activity

Calorie Count

Using the macronutrient content stated above for 8 ounces or 250 ml of milk, calculate the total caloric value of the milk.

Remember that protein and carbohydrates each contain 4 calories and fat contains 9 calories respectively. In order to find the total caloric content of a 250 ml glass of milk you will have to multiply each macronutrient by its respective caloric value and then add together the three values to find the total caloric value of the glass of milk. Review unit 2 to help you along. One calculation is done for you as a guide, please complete the remainder.

8 grams protein = 8 x 4 =32 calories

8 grams fat = 8 x ? = ? calories

12 grams carbohydrates = 12 x ? = ? calories

The total number of calories in an 8oz or 250 (ml) glass of milk is

32 + ? +? = ? calories.

Check the answer below.

Feedback

Here are the answers for the calorie count activity. How did you do? Did you remember the number of calories each gram of protein, carbohydrate and fat contain?

8 grams protein = 8 x 4 =32 calories

8 grams fat = 8 x 9 = 72 calories

12 grams carbohydrates = 12 x 4 = 48 calories

The total number of calories in an 8oz or 250 (ml) glass of milk is

32 + 72 +42 = 152 calories

Energy the Real Deal

Energy is the ability to do work and we need food energy to perform such work. When the foods you eat interact with oxygen that energy given off is in the form of heat. The energy or calories contained in this food is the total of the calories in the energy giving nutrients -carbohydrates, protein and fats. As a result, foods containing the same amount of fat as the protein or carbohydrates will provide twice the energy or calories.

If you eat foods that are **energy-dense,** that is, foods that have many calories in a small amount such as fats, sugars, honey, syrup, etc and very little other nutrients, then your diet may not meet all of your body's nutritional needs.

The extra calories provided by energy-dense foods will give you extra calories which could lead to weight gain. This will happen especially if your energy input is less than your energy output, remember we covered this earlier?

The amount of energy your body requires depends on what is required for its vital process such as breathing, heartbeat, and blood circulation when you are resting.

This basic need for energy is called Basal Metabolic Rate or (BMR). The basic body processes uses up to two-thirds of your total energy needs, therefore if you are physically active your body will require more energy.

Everyone has different energy needs and this is dependent on the following factors:

- body size and composition
- gender
- age
- the environment
- physiological state
- personal lifestyle of the individual

As mentioned earlier in this lesson, the nutrient fat supplies twice the amount of calories than the other energy producing nutrients. You therefore need to pay attention to the types of foods eaten which supply the nutrient fat to your body which will eventually turn into energy upon digestion.

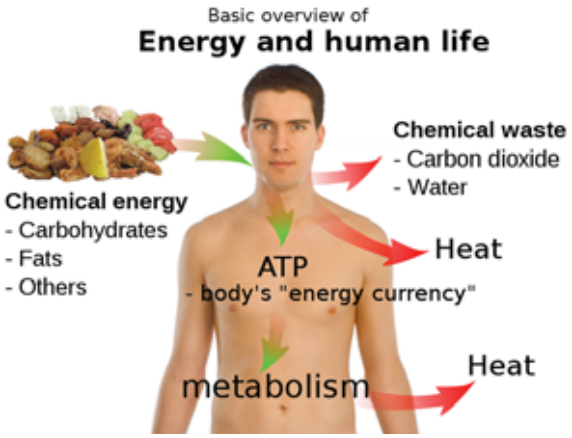


Figure 24 Energy Cycle in the Human Body
http://upload.wikimedia.org/wikipedia/commons/thumb/4/4c/Energy_and_life.svg/746px-Energy_and_life.svg.png

8.4.8 Fats the Good the Bad and the Ugly

Fats are essentially a combination of fatty acids. They supply your body with energy and also essential fatty acids that your body needs for growth which your body can not make. As you learnt previously in the unit on macronutrients, fats are made up of fatty acids that are made up of different lengths of carbon chains and they are classified into the following groups or types of fat which are listed below.

Fats are Placed into the Following Groups

- Saturated fats: They tend to increase your blood cholesterol and LDL. They are found in red meat and dairy products such as ghee, ice-cream, butter, shortening, sausage, cheese, biscuits, cream, pies, pastry, eggs, coconut oil, palm oil, cooking butter, etc.

Figure 25 Cheese and Pastries Full of Saturated Fats
Image: Grant Cochrane / FreeDigitalPhotos.net
Image: Grant Cochrane / FreeDigitalPhotos.net

- Monosaturated Fats: (MUFA) They lower your overall LDL cholesterol (the bad cholesterol) and raises your HDL (the good cholesterol). In addition to this they are useful in reducing body fat and are found in plant foods especially almond, walnuts, avocado (zaboca) canola oil and olive oil.

Figure 26 Olive Oil One Source of Monounsaturated Fats
Image: m_bartosch / FreeDigitalPhotos.net

- Polyunsaturated fats: They help you reduce the level of cholesterol in your blood and increase your body's HDLs. They also provide your body with essential fatty acids that your body can not make for itself. They are present in fish such as salmon, herring and fish oil, corn oil, soya bean oil, sunflower oils and in omega oils.

Figure 27 Salmon One Source of Polyunsaturated Fats
Image: lobster20 / FreeDigitalPhotos.net

- Trans fats: They are formed when liquid vegetable oils are solidified in the presence of hydrogen so that they are solid or semisolid at room temperature. They improve the texture, flavour and shelf life of processed foods and are used in the production of some fast foods. Some examples are hard stick margarine and vegetable shortening, microwave popcorn

and commercially packaged foods. It is therefore important to read the labels on food packages.

What of cholesterol?

We briefly discussed cholesterol earlier on. Cholesterol cannot dissolve in the blood. It has to be transported to and from the cells by carriers called lipoproteins. Low-density lipoprotein, or LDL, is known as "bad" cholesterol. High-density lipoprotein, or HDL, is known as "good" cholesterol. These two types of lipids, along with triglycerides and Lp(a) cholesterol, make up your total cholesterol count, which can be determined through a blood test.

LDL (Bad) Cholesterol

A high LDL count occurs when too much LDL (bad) cholesterol circulates in the blood; it can slowly build up in the inner walls of the arteries that feed the heart and brain. Together with other substances, it can form plaque, a thick, hard deposit that can narrow the arteries and make them less flexible. This condition is known as arthrosclerosis. If a clot forms and blocks a narrowed artery a heart attack or stroke can result.

HDL (Good) Cholesterol

About one-fourth to one-third of blood cholesterol is carried by high-density lipoprotein (HDL). HDL cholesterol is known as "good" cholesterol, because high levels of HDL seem to protect against heart attack. Low levels of HDL (less than 40 mg/dL) also increase the risk of heart disease. Medical experts think that HDL tends to carry cholesterol away from the arteries and back to the liver, where it's passed from the body. Some experts believe that HDL removes excess cholesterol from arterial plaque, slowing its build up. Fish, especially fatty fish such as salmon and mackerel, are a good source of omega-3 fatty acids. Omega-3s reduce triglycerides, which in turn leads to higher HDL levels. Other good sources of omega-3s include nuts, soy and green leafy vegetables

Triglycerides

Triglycerides are the chemical form in which most fat exists in food as well as in the body. They're also present in blood plasma and in association with cholesterol, form the plasma lipids. Triglycerides in plasma are derived from fats eaten in foods or made in the body from other energy sources like carbohydrates. Calories ingested in a meal and not used immediately by tissues are converted to triglycerides and transported to fat cells to be stored. Hormones regulate the release of triglycerides from fat tissue so they meet the body's needs for energy between meals. Elevated triglycerides can be due to overweight/obesity, physical inactivity, cigarette smoking, excess alcohol consumption and a diet very high in carbohydrates (60 percent of total calories or more). People with high triglycerides often have a high total cholesterol level, including a high LDL (bad) level and a low HDL (good) level. Many people with heart disease and/or diabetes also have high triglyceride levels.

Lp(a) Cholesterol

Lp(a) is a genetic variation of LDL (bad) cholesterol. A high level of Lp(a) is a significant risk factor for the premature development of fatty deposits in arteries.

Lp(a) isn't fully understood, but it may interact with substances found in artery walls and contribute to the build up of fatty deposits.

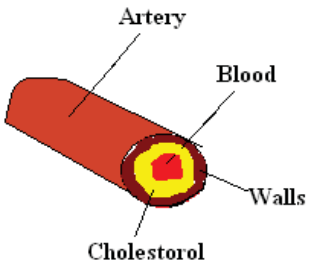


Figure 28 Cholesterol Build up in our Blood Vessels
http://upload.wikimedia.org/wikimedia/en-labs/e/e4/Arteries_2_Ch.PNG

Now that we've discussed cholesterol, let's now link it to the development of heart disease.

8.4-9 Heart Disease

Causes of Heart Disease

Heart disease refers to conditions relating to your heart and blood vessels. It is a reduction of blood flow through your coronary arteries which supply blood to your heart muscle. This happens because cholesterol and other fatty substances line the walls of the arteries, causing the diameter of the arteries to become smaller. These substances harden over a period of time causing restriction of the circulation of your blood and making blood pressure rise.

Factors Contributing to Heart Disease

The following factors contribute to heart disease. In the Caribbean it is more common in people over 50 years and people of East Indian origin, in addition to:-

- Eating too much foods from animal sources and other sources such as margarine
- High amounts of LDL
- Lack of exercise
- High stress levels
- High alcohol consumption

- Obesity
- Heredity - people with a family history of heart disease

Figure 29 Foods to Avoid
Image: graur razvan ionut / FreeDigitalPhotos.net

Warning Signs and Symptoms of Heart Disease

Pay attention to the following signs for heart disease; they could save your life

- Dull, squeezing or pressing pain in your chest
- Pain spreading down to your arm, jaw and neck
- Weakness, bad feeling, sweating, shortness of breath
- Tingling feeling that runs down the left arm

Foods to Include in your Diet to Ward off Heart Disease

The following foods should be included in your diet to help lower your risk of heart disease:- Eat foods rich in HDL such as

- Fish
- Ground provision eg. cassava, eddoes, dasheen, yam, etc
- Legumes eg. peas, beans, bodi, channa, etc
- Whole grain cereal
- Fruits and dark green leafy vegetables

Figure 3019 One of the Kinds of Food to Include.
Image: winnond / FreeDigitalPhotos.net

Note it! / Warning

Note use boiling, steaming, grilling, microwaving as alternative cooking methods instead of frying.

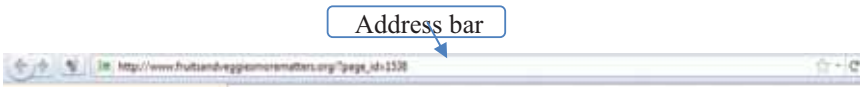
Reading

For additional information please read

Food Home and Society by Deirdre Madden

Caribbean Home Economics in Action Books 2 and 3

Follow the link below to get some more information .**N.B. Type the URL information (accurately) below into your browser's address bar:**
http://www.healthcastle.com/



8.4-10 Dietary Fibre

What is dietary fibre?

Dietary fibre is a polysaccharide that is made up of cellulose, pectin and lignin. It forms the structural framework of plants and is found in the skin, stems, seeds, leaves and roots of plant food. Dietary fibre cannot be broken down by your digestive system.

Where does the fibre go and what does it do?

Your digestive juices cannot work on dietary fibre and break it down for use by the body. Dietary fibre once ingested passes through the digestive system undigested and into the large intestines. In the large intestine the dietary fibre acts like a sponge and absorbs large amounts of water. This makes the waste or undigested food in the bowel soft and bulky. The bulk waste stretches the walls of the

intestines, stimulating muscular activity, due to the formation of faeces or stool which is then forced out of the body.

Types of Dietary Fibre

Dietary fibre is classed into two main groups:-

- **Soluble dietary fibre**: Is a little harder to visualize and it also is known by another word which is mucilage. One of the many compounds that are included in this category of dietary fibre is a group of chemicals that we know as pectin, which is the clear, gelatin-like compounds that make fruit jams and jellies semi-solid. It is characterized by its slimy consistency and this property accounts for the slippery texture that you find in many of your foods that are high in soluble fibre, such as that found in oats and barley, in addition to gum that dissolves and thickens in water to from gels. Good sources of soluble dietary fibre are legumes, oats, barley, citrus fruits, guava, pawpaw, apples, carrots, okras, cabbage, ground provision, christophene and broccoli.

Figure 31 Beans on Source of Soluble Fibre
Image: Paul / FreeDigitalPhotos.net

Soluble fibre has been found to thicken the contents of your intestines, thus slowing down the formation and release of nasty toxins. It can also play a role in the prevention of heart disease and Type 2 Diabetes. It is also responsible for absorbing some of the cholesterol and sugar in the foods you eat, and allows them to be excreted rather than absorbed in your blood streams.

- **Insoluble Fibre** - This type of fibre is the one that you would be familiar with. It is the "roughage" and "bulk" that we refer to when we think of dietary fibre. It is the best known type of fibre and it is called ‘Cellulose’. In addition to this being a primary component of plant foods that you eat, it adds bulk to the contents of your intestines and helps to move the by-products of digestion rapidly through your digestive tracts. This is beneficial to you because some of these by-products can be very toxic, and the faster your body can be rid of them, the better for you. When you have a diet that is high in insoluble fibre, this also helps to reduce the incidence of constipation, which is one of the conditions that can contribute to us getting diverticular disease.

Diverticular Disease is the painful distended or bloated pockets of the intestines whereby it loses it natural shape because of the passage of hard stool or faeces (residue from food).

Insoluble fibre is found in stems, leaves, bran of cereals, skins of fruit and vegetables and seeds. Good sources of insoluble fibre are whole wheat bread, unrefined cornmeal, cassava, dried coconut.

Figure 32 Whole Grain Bread a Source of Insoluble Fibre
Image: Grant Cochrane / FreeDigitalPhotos.net

Figure 33 How many sources of dietary fibre can you identify?
http://upload.wikimedia.org/wikipedia/commons/3/3d/Fruit,_Vegetables_and_Grain_NCI_Visuals_Online.jpg

What's the importance of dietary fibre to you?

Dietary fibre is the residue or waste material from plant food that remains in the intestines after the other part of eaten food has been digested and the nutrients are sent throughout the body.

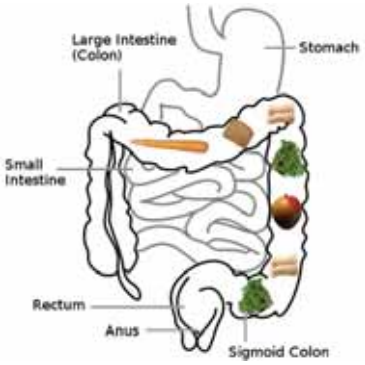


Figure 204 Dietary Fibre in your Large Intestine.
Image: DEU

Dietary Fibre Helps your Body:-

- Get rid of toxins (poisons) via the removal of solid waste (faeces).
- Promote defecation thereby preventing constipation, varicose veins, hernias which are caused by constant removal of hard faeces.
- Lower blood cholesterol by raising the level of HDL which protects against heart disease.
- Lower blood pressure.
- Reduce the risk of diabetes, disease of the colon such as diverticulitis and cancer of the colon.
- Slow the emptying of the stomach thus making you feel full.

Note it! / Warning

A high fibre diet is associated with reduced risk of diseases of the colon such as diverticulitis (painful distended pockets formed in the walls of the intestines), colon cancer, heart disease and diabetes.

Activity

Fibre Rocks

1. Place the following foods into soluble fibre or insoluble fibre groups.

carrots	coconut	cabbage
eddoes	lettuce	celery
mango	banana	broccoli

2. Name three diseases that eating dietary fibre helps you to fend off

1. ----------. 2. ---------- 3. ----------

Feedback

The Foods which contain soluble fibre are; carrots, eddoes, mango, cabbage, broccoli.

The foods which contain insoluble fibre are; coconut, lettuce, celery.

Three diseases that eating consumption of dietary fibre helps to fend off are; diverticulitis, hypertension and cancer of the colon

So how did you do? Remember if you missed an answer, read the material over again. This helps you to remember.

Note it! / Warning

Include foods rich in monounsaturated and polyunsaturated fats moderately in your diet. Reduce your intake of foods high in saturated fats and try to stop eating Trans -fat foods. Each gram of fat contains 9 calories. Read nutrition labels on food products for trans-fat, even though the product may say 0% trans-fat, it may contain 0.05% Trans fat. Saturated fats and Trans fat increase your cholesterol levels and your risk of developing heart disease.

Session Summary

In this session you learnt that in order to experience good health you must practise healthy eating. Eating too many sweets can lead to tooth decay, a reduced immune system and in extreme cases the development of diabetes. Salt is added to many foods to make them taste better but at what cost. Too much salt can result in the silent killer hypertension or

Summary

high blood pressure taking hold and destroying your life.

Heart disease has been linked with eating fatty foods. A high percentage of individuals have been plagued with this disease, so you must cut down on practices such as spreading butter or margarine onto foods eaten and on the whole reduce your total caloric intake.

Dietary fibre should become a major part of our diet and this can be achieved through eating foods such as unpolished cereals, fruits and vegetables inclusive of salads so as to prevent constipation and cancer of the colon. Make smart choices when it comes to your diet like eating more bread, cereal and starchy foods; cut down on fat especially saturated fat from animal food; eat less sugary food, eat less salty food and drink an increased amount of water.

Session 8.5 Nutritional Requirements for Special Groups.

Introduction

In this session we will pay particular attention to the nutritional needs of vegetarians and convalescents. These two groups may have difficulty getting their nutritional status met in family's meal planning exercises. It will serve us in good stead to note the differences in each type of vegetarian and the guidelines to adhere to ensure that their nutritional needs are met.

Upon completion of this session you will be able to:

Outcomes

- *Differentiate* between types of vegetarians.
- *State* the nutritional requirements of vegetarians.
- *Describe* guidelines for planning vegetarian meals.

How long?

You will need to devote 2 hours of formal study and 1 hour of self study to complete this session.

Terminology

Vegan:	A strict vegetarian who does not eat any form of animal flesh or their by products.
Lacto-ovo vegetarian:	This type of vegetarian will consume eggs, milk and cheese but does not eat the flesh of the animal.
Lacto vegetarian:	This type of vegetarian consumes milk and milk products but does not consume eggs.
Convalescent :	This is an individual recovering from an illness

8.5-1 Do you fit the vegetarian bill?

Vegetarians are people who do not eat the flesh of animals or the products of animal. This is usually because of religious beliefs, humane or aesthetic reasons. Based on the forgoing definition would you call yourself a vegetarian? Maybe not that type of vegetarian? Read further and see if you are indeed a veggie or a meatie!

There are several groups of vegetarians, namely:-

- **Vegans or Strict Vegetarians** are people who do not eat any animal flesh and eat only plant or vegetable foods. Their diet contains whole grain cereals, ground provision, legumes, nuts and nut-like seeds, fruits and green vegetables.
- **Lacto Vegetarians** are people who include milk or milk products such as butter and cheese in their diets, in addition to whole grain cereals, ground provision, legumes, nuts and nut-like seeds, fruits and green vegetables. They exclude meat, poultry, fish, other sea foods and eggs from their diet.
- **Lacto-Ovo Vegetarian** are people who include milk and milk products and eggs in their diets but not the flesh of animals or fish. In addition to this they will consume whole grain cereals, ground provision, legumes, nuts and nut-like seeds, fruits and green vegetables.

8.5-2 Planning the Vegetarian Diet

Vegetarians require the same nutrients as non vegetarians. However the vegetarian needs to pay attention to their supply of the following nutrients when planning their meals to supply their diet with the following nutrients:

- Protein – this nutrient would be obtained from – legumes especially soya beans or soya products-TVP (contains HBVP protein), cereals, nuts.

Figure 35 Soy Milk Good Source of Protein for Vegetarians
Image: winnond / FreeDigitalPhotos.net

Figure 36 Assorted Nuts and Excellent Source of Protiens for Vegetarians
Image: Maggie Smith / FreeDigitalPhotos.net

- Vitamin A is found in dark green leafy and yellow vegetables and fruits such as tomatoes, pumpkin, carrots, pawpaw, mangoes, peewah, etc

Figure 37 Paw Paw (papaya) an Excellent Source of Vitamin A
Image: kongsky / FreeDigitalPhotos.net

- Calcium – can be provided by legumes, cereals, nuts, fruits, fortified soya milk, tofu However some calcium may be unavailable to the body because of the presence of phytic acid (see unit 4) which prevents the body from absorbing and using calcium.

- Vitamin B12 – vegetarians especially vegans do not get enough of this vitamin, which is essential for the formation of red blood cells. This will have to supplemented by purchasing from the pharmacy.

- Iron- would be supplied by dark green leafy vegetables such as dasheen bush, spinach, and legumes. Fresh fruits and green vegetables are a must because they will help the body with vitamins to absorb and use iron and to fight off various diseases and for general good health.

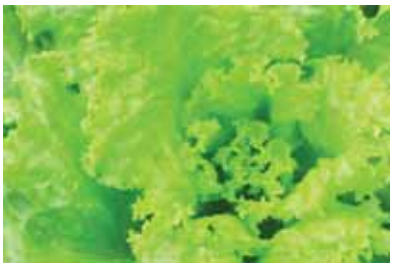


Figure 38 Good Source of Iron
Image: lobster20 / FreeDigitalPhotos.net

Figure 39 an Assortment of Vegetables
http://upload.wikimedia.org/wikipedia/commons/thumb/4/4e/Vegetarian_diet.jpg/396px-Vegetarian_diet.jpgrce:

Here are Some Sample Menus for Vegetarians

Sample Vegan Breakfast Menu

Watermelon Slices

Wholegrain Cereal/Soya Milk

Lentil Patty

Whole grain Deli Buns

Hot Chocolate

Sample Lacto Ovo Vegetarian Dinner Menu

Stewed Soya Chunks

Macaroni Pie

Lettuce / Tomato Salad

::::::::::::::::::::::::::::::::::

Coconut Ice cream

Activity

Now you try planning a lunch menu for lacto-ovo vegetarian. It's not difficult to do. Write your answer in the box below.

Protein food:_____

Cooked Starchy dish:_____

Raw Vegetable:_____

****

Dessert:_____

Feedback

How did you do?

Did you include a suitable protein dish? Remember no meat now! But you could have used eggs, milk and cheese in your dish.

Did you try to include food stuff rich in iron, vitamin A and Calcium?

Note it! / Warning

Remember a vegetarian diet

- supplies HDL to control blood cholesterol levels
- provides dietary fibre which promotes free bowel movement
- provides unsaturated fats which raise the body's HDL and fights off heart disease
- retains mineral
- lowers death rate from cancer, heart disease, stroke and high blood pressure.

8.5-3 Convalescents

A convalescent is a person who is recovering from an infection, illness, accident or surgery. Their diet should supply foods rich in protein, minerals, vitamins especially vitamin C (see unit 4). and energy These nutrients are important because they repair damage to tissues and help the body to fight off diseases and speed up the recovery process in addition to strengthening the body.

At this stage of illness, the patient's appetite is most likely better and he/she would be better able to feed themselves at the table instead of in bed.

When planning meals for the convalescent remember to:

- Include foods rich in protein – such as meat, fish, eggs, cheese, etc to repair body tissue
- Give foods rich in iron to replace the loss in blood – such as dasheen leaves, legumes, spinach, etc
- Supply calcium rich foods to heal broken bones eg, milk, cheese, etc
- Include foods rich in vitamin C and vitamin D – they help the body absorb iron and calcium respectively
- Ensure that foods which are easy to digest and are low in fat are included in their diet
- Ensure a good supply of water, fruits and green vegetables daily

- Avoid serving left over foods for fear of contamination
- Pay attention to hygiene to avoid the spread of disease onto food
- Try to prepare foods that the convalescent likes but only within the confines of a balanced diet
- Limit foods that are high in fat. uUe only foods that supply unsaturated fatty acids. Avoid rich pastries and biscuits
- Reduce spiced or strongly flavoured foods
- Avoid rich pastries and biscuits

Figure 4021 Recuperating from Illness
Image: Sura Nualpradid / FreeDigitalPhotos.net

Activity

The Vegetarian Challenge

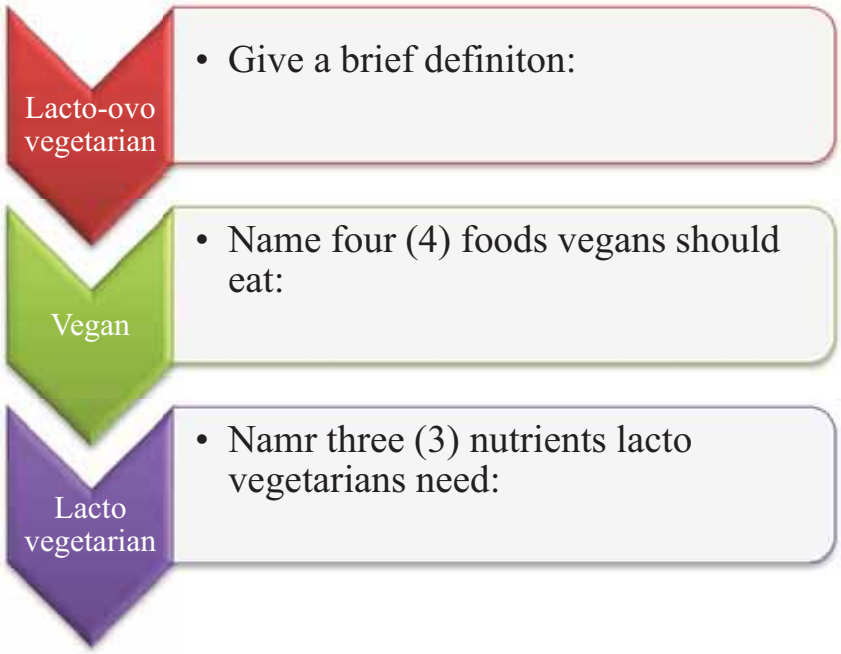


Image: Gail Samaroo

Feedback

How did you do in the vegetarian challenge? Let's see. Check the answers below.

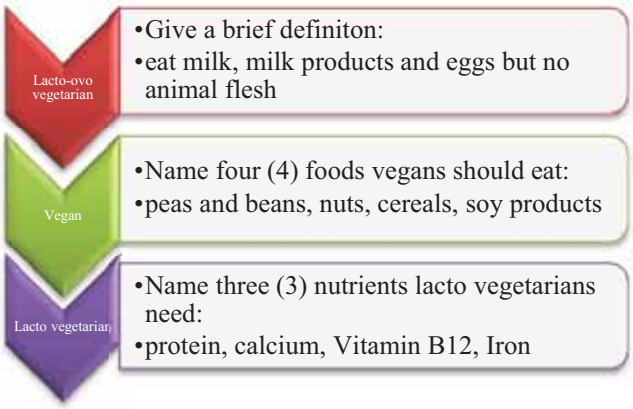


Image: Gail Samaroo

Session Summary

Summary

In this session you learnt that a vegetarian is an individual who does not consume the flesh or by-products of animals. There are several different types of vegetarians and they are classified according to their consumption patterns.

The main source of protein for vegetarians is legumes especially soya beans which has been processed into soya products. Vegetarians have to be mindful of their supply of the mineral iron and Vitamin B12 and Vitamin B6 since their nutritional supply may be limited.

Convalescents are individuals that are recovering from illness, they are on the road to recovery and their diet should reflect nutrients that will help them heal and get back on their feet. However nutrients such as fat should be reduced or limited because you do not want to increase their caloric intake which could result in them becoming overweight because of their reduced level of activity or the reduced energy needs.

Unit Summary

Summary

We have now come to the end on this unit on diet and health. Together we have learnt that a balanced diet should contain foods from the six food groups to supply nutrients for all bodily activities. It is important to balance energy intake with energy output. Age, gender, size and level of activity determine your energy needs. Our food choices will determine the types and quantities of food we use in our diet which in turn inform our nutritional status.

The BMI is one method that is used to indicate your weight as it relates to your height. It is an estimate of body fat and tells us if we have a healthy weight, are overweight or underweight for our height.

It is important to modify our salt, sugar and fat intake and increase our dietary fibre so as to avoid lifestyle diseases such as hypertension, diabetes, heart disease in addition to colon cancer and diverticulitis.This can be done by reducing our intake of salt, sugar and saturated and trans fats which would increase our blood cholesterol and LDL; and eating a high fibre diet.

We need to put into practice counting the caloric content of foods in our diet in addition to exercise in order to fight off obesity. The vitamins and minerals that we eat are important to help us fight off diseases such as the common cold, anaemia and others. Therefore we must know what will happen to our bodies if we eat too little or too much.

The diets for convalescents and vegetarians should be given special attention because they form an integral part of our families. The nutrient content of their food should be appropriate to enable convalescents to recover fully from their health situations and vegetarians to be healthy.

Completing this unit will act as a foundation to the other units you will have to pursue in order to successfully complete this course of study and it will also guide you in making wise food choices when planning the diet for yourself and your family.

Assignment

Assignment

Complete the following exercise. Rate your diet.

Your friend bought the following for lunch:

Barbeque Pigtail

French Fries

Potato Salad

Soft Drink

Ice Cream

1. What's wrong with this meal?

2. Make the appropriate changes or substitutions to the meal above.

3. Identify the dangers of consuming meals like the one above for a prolonged period.

4. List four (4) factors that contribute to heart disease.

1.

2.

3.

4.

List four (4) foods/dishes that are suitable for the diet of an individual who has developed.

a. Diabetes

1.

2.

3.

4.

b. Hypertension

1.

2.

3.

4.

c. Heart Disease

1.

2.

3.

4.

Answers to Assessment

Answers to Assessment

Here are the answers to the assignment you just completed.

1. Diet Flaws

   Diet has too much:-

   Salt - Pigtail

   Fat – French Fries. Mayonnaise and Ice-cream

   Sugar – Soft drink and Ice –cream

   No Fresh fruit and vegetable

   Too much fat – French Fries

2. Suggested diet changes

   Barbeque Chicken or Fish or Legumes (vegetarian)

   Baked Potatoes or Pasta Salad or Rice dish or Provision

3. Diet Dangers:-

   Diabetes

   Hypertension

   Heart disease

4. Factors contributing to heart disease:-

   Eating too much foods from animal sources and margarine

   Lack of exercise

   High stress levels

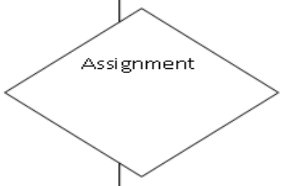
   High alcohol consumption

   Obesity

   Heredity – people with a family history of heart disease

5. Suggested foods to prevent diabetes, hypertension and heart disease

   Fresh fruits and vegetables, herbs, nuts, canola, olive, omega, corn oil, avocado, fish, yeast, yogurt, whole wheat flour, pasta



Contents

Unit 9

Meal Planning

Introduction

Have you ever wondered what you were going to have for breakfast, lunch or dinner? Sometimes you may take time to decide, or may get puzzled over what to eat, however, this can be avoided if we take time to plan our meals. Meal planning will help you include a variety of foods in your diet and therefore eat balanced meals. Meal planning also helps you allocate your money on food wisely and save time during meal preparation.

The preceding units gave you a foundation on which this unit can be built. The preceding units were designed to give you a sound knowledge of the nutrients and their functions and inform you of the nutritive value of different foods. Now that you have completed those units successfully, you are ready to look at what is involved in meal planning.

You should find this unit on meal planning interesting. This unit will provide information and guidelines that cover the nutritional aspects and other considerations necessary for successful meal planning. You will also learn to plan daily meals according to different formats, such as the planning of packed meals. This unit ends with the service of food- a component that will provide you with knowledge of table setting and the types of meal service.

Upon completion of this unit you will be able to:

Outcomes

- *Explain* the nutritional guidelines used for meal planning.
- *Explain* the factors aside from nutrition that impact meal planning.
- *Plan* menus for different occasions.
- *Write* menus using different formats.
- *Evaluate* the various types of food service.

How Long?

You will need to devote fifteen (15) hours to study this unit. Eight (8) hours of formal study and seven (7) hours of self-study.

This Unit is Comprised of Four Sessions

Session 9.1 Guidelines for Meal Planning

Session 9.2 Types of Meals

Session 9.3 Meal Planning

Session 9.4 Meal Service

Terminology

Breakfast: This is the first meal of the day, usually eaten in the morning. It breaks the fast of the night.

Lunch: This is a light meal eaten at midday.

Dinner: This is the main meal of the day, it may be eaten in the evening or at midday.

Supper: This is a light evening meal. It is usually the last meal consumed before going to bed

Meal: This is the food served and eaten at any one of the customary times or occasions for taking food throughout the day.

Menu: This is a list of dishes that may be served at a meal. The dishes are normally listed in the order that they are served.

Course: This is a dish or group of dishes that are components of a menu and are served at a meal. A meal may be comprised of one or more courses e.g. appetizer, main course and dessert.

Session 9.1 Guidelines for Meal Planning

Introduction

What is the aim of having a meal? You will agree that the main purpose of having a meal is to supply part of your daily nutritional requirements. As a result, it is important to give thought to meal planning. Therefore, there are important guidelines to follow that assist you in meal planning.

This lesson will deal with nutritional guidelines and other considerations in meal planning. These guidelines are necessary to ensure meals planned are well- balanced and nutritious.

Outcomes

Upon completion of this lesson you will be able to:

Explain the nutritional guidelines used for meal planning;

Explain what other factors aside from nutrition impact meal planning.

9.1-1 Nutritional Guidelines

When planning meals, it is important to consider some nutritional guidelines. Below, we've discussed nine (9) nutritional guidelines to help you plan properly for nutritious food.

1. A Variety of Foods

Each food provides your body with a main nutrient. You should choose foods from the six food groups e.g. staples: rice, corn, wheat flour, plantain, breadfruit, yam, sweet potato, cassava and dasheen.

2. Multi-Mix Principle

Sometimes you may not be able to choose foods from all six (6) food groups. This may be due to a limitation of food, money, facilities and time. In such cases, the multi-mix principle is helpful. This principle relates to the manner in which foods from the food groups are combined to plan and prepare nutritious meals.

In Unit 1 - *Nutritive Value of Food*, you learned about the four (4) food groups referred to as the 'Foundation Food Groups.' Can you remember the names of these four food groups? The names of these four groups are: staples, foods from animals, legumes and vegetables. If you know how to apply the multi-mix principle, you can plan and prepare nutritious meals using these four food groups. When applying the multi-mix principle in meal planning, you have to select the staple food first. You may choose either a cereal (i.e. rice, corn, or wheat flour) a starchy fruit (i.e. breadfruit, plantain or green banana) or a starchy root (i.e yam, cassava or dasheen.) The number of foods added to the staple determines the type of mix combination. The more foods you combine from different food groups the more nourishing the meal will be.

What is the main reason for eating a meal? The main reason for eating a meal is to provide your body with the necessary nutrients for it to function properly.

There are three (3) types of multi-mix meals- the *two-mix, three-mix* and the *four-mix* combination meals. When you are planning a *two-mix* meal, you have to pay attention to certain facts. You must know which food groups you can combine with your selected staple to make the meal nourishing. If you are not selecting a food from an animal, (such as fish, cheese, egg or chicken,) you must select a cereal, such as rice, corn or wheat flour, as your staple food. Additionally, it is best to combine a cereal, that belongs to the staples food group, with a legume. You may be wondering why this is necessary. Foods from animals provide your body with complete proteins. Foods from a vegetable source provide your body with incomplete proteins. These proteins are referred to as incomplete because they lack one or more of the essential amino acids. Incomplete proteins are mainly found in legumes and cereals. When these foods are combined, their amino acids complement each other. This means that the amino acids lacking in the cereal is supplied by the amino acids in the legumes.

Examples of Different Types of Multi-Mix Meals

Examples of *A Two-Mix* Meal

A *two-mix* meal may include:

- Staple (cereal) and legume e.g. rice and split peas
- Staple (cereal) and a food from animals e.g. bread and cheese
- Staple (starchy fruit/root) and a food from animals e.g. cassava and meat or breadfruit and chicken

Activity

Now let's see if you can write three (3) examples of *two-mix* meals in the spaces provided below.

1. _____

_____

2. _____

_____

3. _____

_____

Examples of *Three-Mix* Meals

A *three-mix* meal may include:

- A staple, a food from animals and vegetable e.g. dasheen, chicken and patchoi
- A staple, a food from animals and legume e.g. sweet potato, fish and pigeon peas
- A staple i.e. cereal, legumes, and vegetables e.g. rice, chickpeas and pumpkin

Activity

Now let's see if you can write three (3) examples of *three-mix* meals in the spaces provided below.

1. _____

_____

_____

2. _____

_____

_____

3. _____

_____

_____

Examples of *Four-Mix* Meals

A *four-mix* meal may include:

- A staple, a food from animals, legumes and vegetables e. g. plantain, turkey, kidney bean and spinach

Or e.g. potato, lamb, black eyed beans and tomato

Or e. g. bread, milk, chickpeas and pumpkin

Activity

Now let's see if you can write three (3) examples of *four-mix* meals.

1. _____

_____

2. _____

_____

3. _____

_____

3. Reduce Sugar Content

In meal planning, you should pay attention to the sugar content of foods. Include naturally sweet foods without adding refined sugar to them. Examples of naturally sweet foods include fruit salads and fruit juices. It is important to reduce the amount of sweet food items on the menu. If you have to include a sweet food item in the meal, consider reduced-sugar products, such as jams, ice creams, cakes, cookies and fruit drinks. These reduced- sugar products can be prepared by reducing the sugar normally added in their preparation.

4. Reduce Fat Content

During meal planning you should include the use of low-fat products. These include low-fat milk, low-fat yogurt, low-fat margarine, low-fat sandwich spreads and low-fat mayonnaise. Include more poultry and white fish, rather than red meats, in meals. Examples of poultry include: chicken, duck, goose and turkey. Some examples of white fish include: cod, halibut, sole and red snapper. You should also consider the use of cooking methods that do not require the added fats. Examples of these cooking methods include: baking, grilling, boiling and steaming. For example, you can include baked potatoes instead of fried potato chips or perhaps grilled chicken instead of fried chicken. You also need to pay attention to foods with a high hidden fat content. Examples of these food items include: pastries, cakes and sausages, all of which you should avoid including regularly in planned meals.

5. Reduce Salt Content

Plan meals with a reduced amount of foods packed in brines such as canned peas, canned vegetables, pickled olives and cucumbers, salted fish, sausages and cheese. These foods are processed with a high percentage of salt. In meal planning include the use of primarly fresh or frozen foods.

Activity

Let's see if you can give two (2) points you would consider to reduce:

1. Sugars in meal planning

2. Fats in meal planning

3. Salts in meal planning

6. Include Adequate Dietary Fiber

You should always plan meals to include wholegrain cereals, such as cornmeal, oatmeal, and whole wheat. You should also include legumes, such as dried peas and beans as well as fresh fruits and vegetables. These foods are rich sources of dietary fiber, which is important for proper bowel movement.

7. Include Iron and Vitamin C Rich Foods.

Iron is a very important mineral in the diet. Include foods rich in iron when planning meals. Iron rich foods include: liver, watercress, spinach, cocoa and pulses. It is also necessary for a source of vitamin C to be consumed together with the iron-rich food. Some sources of vitamin C include: pineapple, West Indian cherries, guava and oranges. Vitamin C enables the absorption of iron from a meal.

8. Reduce Alcohol Content

For some occasions you may consider consuming alcohol beverages. As a meal planner, the use of alcohol reduced beverages or non-alcoholic beverages should be considered.

9. Serving Sizes

As a meal planner you should not confuse the terms 'serving sizes' and 'portion sizes.' A 'serving size' is a unit of measure that indicates the recommended amount of a certain food. Whereas, a 'portion size' refers to the amount of food you choose to eat at a given time. Further, a 'portion size' of a food might be more or less than the serving size for that particular food.

'Serving sizes' are determined according to the type of food. The 'serving sizes' of bulk foods, such as cereals, legumes, flour and salad oils are measured in units such as cups, tablespoons, teaspoons or fluid ounces. Foods that are divided up to be served, i.e. pizza, cake and pie, have 'serving sizes' in terms of a fraction of the product, e.g.1/4 of a pizza. Foods that come in discrete units, such as bread and cookies, have 'serving sizes' that are given as '2 slices of bread' or '1 cookie.'

As a meal planner, you should consider the 'serving sizes' of the various foods to be served. In the Table below, there are some examples of foods and their 'serving sizes.' The illustrations and pictures of the various 'serving sizes' of food give you a clear idea of what the 'serving sizes' look like. Knowledge of the 'serving sizes' of different foods is important especially when planning meals for special groups of people, such as individuals with diabetics and/or obese individuals.

Food	Serving Sizes of Uncooked Food	Serving Sizes of Cooked Food	Illustrations of One Serving Size	Pictures of Foods in One Serving Size
STAPLES Cereals: rice, oats, flour, cornmeal	1 oz	½ cup		
Bread		1 Slice		
Starchy Roots: cassava, yam, sweet potato, potato	4 oz	½ cup		
Starchy Fruit: plantain, green banana	4 oz	½ cup		
FOOD FROM ANIMALS Egg	2			
Cheese	1 ½ oz			
Liquid Milk	1 cup			
Fresh fish/chicken, lean meat		3 oz		
LEGUMES Split peas, kidney beans, lentils	1 oz	½ cup		

VEGETABLES Bodi, cucumber, carrot, eggplant	4 oz	½ cup		
Green Salad	8 oz	1 cup		
FRUITS Orange, mango	1 medium size			
Watermelon (cubed)	½ cup			
Cherries	12			
Ripe Banana	1 small size			
Fruit Juice	½ cup			
FATS AND OILS Margarine	1 tsp			
Peanut Butter	1 tsp			
Salad Dressing	1 Tbsp			
Bacon	1 slice			

Figure 1

The above nutritional guidelines serve as a tool for you as a meal planner to plan nutritious and well-balanced meals.

Activity

You are a nutritionist and members of your community have asked you to advise them on nutritional guidelines for meal planning. Outline and explain the meal planning guidelines to be distributed on a brochure throughout your community.

Share your comments in the space provided below.

Can you think of any other nutritional guideline(s) not mentioned in the above text? Write them in the box provided below.

Note it!

Note that a variety of foods from the six food groups should be considered when planning meals. This is important to ensure that the planned meals are nutritious and well-balanced.

9.1-2 Other Factors to Consider in Meal Planning

Other than the food groups and the multi-mix principle, there are other considerations to take into account when planning meals. These considerations include:

1. Individual needs of your family members
2. Food selection
3. Religious customs and traditions
4. Food preferences of individuals
5. Capabilities of the cook
6. Resources available
7. Low budget concerns

1. Individual Needs

Think about the different people who make up your family. Your father, mother, brother(s), sister(s) and grandparent(s) may compose your family. These members' needs depend on their age, sex, occupation and health condition. The daily requirements of the necessary nutrients should be met by the planned meals.

The needs of a toddler are different to those of your grandparents. A teenage girl's needs are different to those of a teenage boy. A manual worker may require more energy-rich foods than an office worker. Also, special food requirements may be necessary for a sick person in your family.

2. Food Selection

Other considerations regarding food selection include:

- Foods in season
- A variety of foods
- Leftovers

Have you ever seen vegetables and fruits in abundance in the market or food mart? Vendors usually sell them very cheap in an effort to get them off their hands. When choosing foods for your meals, consider those that are in season. This practice has economic value for you.

A variety of foods included in a meal adds nutritive value, and adds different colours, textures, flavours as well as improves foods appearance. Could you imagine eating a meal with all the foods being the same colour, texture and/or flavour. A meal of this nature would not stimulate your appetite. A meal with foods reflecting colours such as yellow, red, orange, green, and white is much more appealing. Foods of different textures and flavours should also be considered.

After meals, there might be leftovers. As much as possible you should think of creative ways of including these in other meals. Leftover meat or fish can be minced or flaked and added to pies or casseroles. Leftover legumes and starchy foods can be added to one pot meals. Further, stale bread and cakes can be prepared into desserts.

3. Religious Customs and Traditions

The culture of a family may be influenced by its religious customs and traditions. These customs and traditions impact the choice of dishes served at a meal. In the Caribbean, there are three major religions; Christians, Hindus and Muslims. Each religion has a period where their followers do not partake in the consumption of certain foods. Some Christians do not eat meat during the period of lent. Hindus do not eat beef because they believe the cow is a sacred animal, and the Muslims do not include pork in their meals because they consider the pig to be unclean. The different religious festivals also influence the different foods the religious followers include in their meals. For example, at Christmas certain food items are prepared i.e. hams, pastelles and fruit cakes. The Hindus, for their religious festival Divali,,may serve curried channa and potato, bodi, pumpkin and mango or pommecythere with roti. They do not include meat in this meal. Further, in celebration of their religious festival Eid, the Muslims serve sawine, which is a vermicelli dessert.

4. Preferences of Individuals

Which foods do you prefer? Do you prefer meat over vegetables? Most people have their food preferences. These preferences may be due to their likes or dislikes, for example some people may prefer sweet foods over spicy foods, while other people may prefer some foods over others due to vegetarianism, medical reasons or food allergies. Strict vegetarians do not include foods from animals in their diet. There are other types of vegetarians who may include certain foods from animals, such as milk and its products, eggs and/or fish. Some people may prefer foods that enhance their health. For example, some people may choose chicken over shrimp because shrimp makes them ill. As a meal planner you should consider the preferences of others to avoid food waste.

5. Capabilities of the Cook

The capabilities of the person preparing the meals determines the meals planned. A skilled cook could prepare elaborate meals and perform different cooking techniques. A skilled cook may prepare dishes that involve a number of skills. A skilled cook is likely to prepare dishes such as, stuffed chicken breast rolls cheese rice ring, spinach timbales with a white sauce or walnut chiffon cake, The preparation of these dishes involves a number of skills and techniques. An unskilled cook is more likely to prepare simple dishes such as, chicken and vegetable soup, tuna and Rice casserole and/or fried chicken and potato fries. These dishes do not require much skill to be prepared. Therefore, as a meal planner, you have to know the capabilities of the person who is be preparing the meal. This is important in the selection of dishes for a meal.

6. Resources Available

The availability of resources, such as money, time, equipment and facilities, influence the type of meals planned. Also, you should spend the money available for food wisely. Check food cupboards and the refrigerator and make a grocery list of the foods needed. Compare prices and read the food labels carefully before buying foods.

The time available to prepare a meal influences whether a one pot meal or a meal including a variety of dishes is planned. Time also influences the manner in which the meal will be served.

The type of equipment and facilities available also influence the amount of work and energy involved when preparing meals. The use of labour saving equipment assists in the quick preparation of meals.

7. Low Budget Concerns

Do you go to the grocery store or market? What do you think of the food prices? Do you agree that food prices are on the rise? Tough financial times have led people to seek ways of reducing their expenditures. One of the ways to reduce expenditures is by considering low-budget meals. As a meal planner, you should keep in mind the low-budget concerns of individuals. Plan meals by including foods you already have readily available. You should be able to substitute expensive foods with cheap foods. For example, you can substitute meat with peas and beans. You can also plan meals to include cheaper cuts of

meat or poultry such as: beef or pork ribs or chicken wings. When meal planning, combine cereals and legumes together for the best nutritive value from both foods. You can also consider using homemade products such as bread and cakes in the planned meals. Using leftover food to create a new dish is also another way of reducing the food bill.

Activity

One of your friends does not understand the factors to consider when planning meals. Arrange a meeting place and explain these factors to your friend. Write what you are going to say in the space given below.

Session Summary

Summary

In this unit you learned nutritional guidelines for meal planning. These guidelines included:

- Choosing foods from the six food groups.
- Applying the multi-mix principle to meal planning.
- Reducing the sugar, salt and fat content of food in meals.
- Considering recommended 'serving sizes' of different foods.

You also learned about other factors to consider in meal planning. These guidelines included:

- Considering individual needs.
- Paying attention to the religious customs, traditions, and food

preferences of individuals.

- Knowing the capabilities of the cook.
- Using the available resources.
- Addressing low budget concerns of individuals.

Session 9.2 Types of Meals

Introduction

What are the different meals you eat daily? Your daily meals are most likely influenced by your family's schedule. As such, the meals eaten daily vary from family to family. Most people follow the 'three meals a day' routine. Some may have breakfast, lunch and dinner. Others may choose to have breakfast, dinner and supper. You may choose to consume light, medium or heavy versions of these meals depending on your individual needs. Sometimes it may be necessary to pack your meals to take to work or school. Packed meals are also considered for outings such as a picnic. Whether you are eating your meals at home, at school or outdoors, they should be well planned to ensure they supply your daily nutrient requirements.

Upon completion of this unit you will be able to:

Outcomes

- *Describe* the different types of daily meals.
- *Choose* suitable foods for each of your daily meals.
- *Plan* packed meals for various occasions.

9.2-1 Daily Meals

Breakfast

To begin your day, you need to supply your body with the necessary nutrients. Breakfast should provide one third of the day's nutritive needs. The amount of breakfast consumed by an individual depends on their individual requirements. Look at the figure below for breakfast examples that vary depending on the needs of the person served. It is substantial for you to have the energy to perform your daily tasks. Breakfast should supply your body with protein, carbohydrates, fat, vitamins and minerals. There are also specific foods associated with breakfast. Breakfast foods may consist of a fruit, cereal,

protein, breadstuff and a beverage. Also, breakfast foods are usually easily prepared, eaten and digested. Look at the Table below to check out the suggested foods for breakfast menus. Further, breakfast could also include: pineapple slices, oatmeal porridge, scrambled eggs, bread slices and hot cocoa.

BREAKFAST MENUS

Chilled Orange Juice

Bread Slice with Shredded Cheese

Hot Tea

(Light breakfast)

Cubed Pawpaw

Fried Sausages

Whole Wheat Muffins

Hot Cocoa

(Medium breakfast)

Chilled Mango Slices

Cream of Wheat Porridge

Fried Fish in Tomato Sauce

Boiled Dasheen Slices

(Heavy breakfast)

Suitable foods to be served at breakfast may include:

Dishes/Items Served at Breakfast	Suitable Foods
Fruits	Pineapple, mango, papaya, West Indian cherry, citrus fruit e.g. oranges. Serve fruit, whole or diced.

Dishes/Items Served at Breakfast	Suitable Foods
Cereal	Oats (oatmeal), cornmeal, cream of wheat or ready to eat packaged cereal served with milk.
Protein Dish	Eggs (fried, scrambled boiled) cheese, fish, sardines, canned tuna, shark cutlets and liver.
Breadstuff	Sliced bread (white or whole wheat,) bakes, roti (type of flatbread), or crackers. Other starchy roots may substitute bread e.g. cassava, breadfruit etc.
Beverage	Hot or cold beverages.

Figure 2

Lunch/Supper

Lunch is the meal that is eaten at midday. Supper is similar to lunch, however it is eaten in the evening. Lunch is regarded as a main meal of the day. Therefore, you should plan it accordingly, ensuring that one third of the required daily nutrients are met. A lunch menu is comprised of a protein dish, starchy food and vegetables (raw or cooked). Examples of dishes served for lunch include; grilled fish, breadfruit au gratin and steamed spinach. Supper may consist of a one dish meal, e.g. split pea soup, a sandwich, (i.e. egg sandwich) or a chicken casserole. Supper menus are composed of the some types of food as lunch. Both lunch and supper should be smaller than the dinner meal.

Dinner

Dinner may be eaten at midday or in the evening. Dinner is the heaviest meal of the day. Dinner may be an elaborate meal that requires more resources for its preparation. It is suggested that you plan the dinner menu first. The lunch and supper menus are then planned to ensure the daily nutrient requirements are met. A dinner menu comprises a protein dish, starchy food and vegetables. Figure 3 shows the sequence of food items in lunch/supper and dinner menus.

Sequence of Meal	Examples of Dishes

Sequence of Meal	Examples of Dishes
Protein Foods	Foods from animals, e.g. eggs, cheese, meat and fish. Legumes e.g. dried peas, beans and nuts.
Starchy Foods	Cereals e.g. rice, cornmeal, pasta. Staples e.g. starchy roots and vegetables, yams, cassava, breadfruit and dasheen.
Vegetables (raw/cooked)	Carrots, pumpkin, spinach, tomatoes, cucumber and lettuce.

Figure 3

Activity

In the space provided, describe the following daily meals: breakfast, lunch, dinner, and supper.

Breakfast

Lunch

Dinner

Supper

In the table below, using a tick, indicate the foods that are suitable for the meals indentified.

Dishes	Breakfast	Lunch	Dinner
Stewed Beef			
Lentil Loaf			

Scrambled Eggs			
Boiled sliced Dasheen			
Coconut Bakes			
Pineapple Slices			
Fried Rice			

Figure 4

Activity

Identify the meals you consume daily and record the foods you eat at each meal for one week. Compare the foods recorded with the suggested foods for the different meals given in the above text.

9.2-2 Packed Meals

Have you ever carried a lunch kit to school? It is most likely that you did in preschool. Your kit likely contained all that you needed to eat and drink while you were away from home. Packed meals are often necessary for individuals

going to school, work or on an outdoor event such as a field trip or picnic. Packed meals should contribute to the daily nutrient requirements of the persons eating these meals. Therefore, packed meals should be nutritious, contain a variety of foods and be attractive. For this reason, it is important to ask:

1. Who would be eating the meal?
2. The available facilities for eating this meal.
3. The available packaging containers and carriers.

The following list of rules for packed meals should be considered:

1. A packed meal should supply one third of a person's daily nutrient requirements.
2. Foods should include a variety of colours (red, green, orange/yellow, white and blue/purple,), textures (hard, soft, smooth, chewy, crisp and crunchy) and slices, chunks, segments, shreds and strips.
3. The food should be easy to carry and convenient to eat.
4. Foods should be packed attractively in small portions; especially for preschoolers.
5. Include fruits and vegetables in packed meals.
6. Avoid including high fat content foods in packed meals.
7. Include beverages such as fruit juices, milk drinks and soups. Avoid carbonated drinks as they are high in sugar content.

Suggested foods for packed meals include:

Sandwiches, pies or rolls - filled with egg, cheese, fish or meat.

One dish items – soups, pelau and casseroles e.g. lasagne.

Salads – carrot sticks, tossed salad.

Pastries – meat pies, chicken rolls, fish and vegetable flans.

Fresh whole fruits – oranges, pawpaw, pineapples.

Desserts – cakes, biscuits, cookies, doughnuts, pone, sweet bread.

Has your packed lunch ever been crushed? This was probably due to poor packing. Proper packing of meals is important. The use of suitable wrapping

materials, containers and carriers are greatly needed. Examine the table below for suitable wrapping materials and containers to be used for packing meals.

Food Items	Packing Materials and Containers
Sandwiches, cakes, roti, pastries	Plastic wrap, wax paper, plastic bags and plastic containers.
Casseroles, pelau, potato salad	Plastic containers, light weight stainless steel containers with lids.
Beverages	Plastic bottles, flask vacuum.
Soups	Flask vacuum.

Lunch Kits and Bags

Figure 5

Lunch kits and bags should be sturdy and durable. They are usually made from plastic, vinyl, aluminium or tin. Lunch kits and bags should be lightweight, easy to clean, easy to carry and look neat when packed.

Food Containers

Food can be placed in sturdy plastic containers or in stainless steel containers with lids. Choose plastic food containers that do not retain food odours and tastes after use. Food container lids must fit securely on containers to prevent

food spillage. You can also select food containers of different sizes with varried compartments to pack your food accordingly.

Figure 6

Vacuum flasks are designed to keep the desired temperatures of foods. Vacuum flasks can be used to keep soups, tea and other hot beverages hot. They can also be used to keep cold beverages such as fruit juices and milk drinks cold. Vacuum flasks are normally made of stainless steel and plastic materials. You should choose vacuum flasks that are durable and easy to clean. They should also be able to seal properly to prevent spillage.

Plastic Bottles

Plastic bottles are used to pack water, fruit juices and other drinks when leaving home. Suitable bottles should be made of sturdy, durable plastic, be lightweight and easy to carry. The covers of these plastic bottles should also fit securely to avoid any spillage. Plastic bottles suitable for packing beverages are available in an assortment of colours and sizes.

Wrapping Materials

Figure 7

Wrapping materials are materials used to wrap food instead of using a food container. These wrapping materials include plastic wrap, wax paper, paper bags and aluminium foil. Plastic wrap can be used to wrap moist foods such as shepherd's pie or salads. Wax paper and paper bags can be used to wrap items such as sandwiches, cakes, pastry pies and other dry food items. Aluminium foil can be used to wrap foods, such as roasted chicken, macaroni pie, cheese sandwiches, pizza, cakes and biscuits. As a meal planner, it is important to use each wrapping material appropriately.

Activity

Indicate, by ticking the box provided, "True" or "False" to the following statements below.

1. A packed meal should be just as nutritious as an ordinary meal.

   True ☐ or False ☐

2. Packed meals should not have variety because they would be bulky.

   True ☐ or False ☐

3. Food packed for a preschooler should be in small portions.

   True ☐ or False ☐

4. Avoid using plastic bowls when packing soup for lunch.

   True ☐ or False ☐

5. Sandwiches, casseroles, fruits and salads are all suggested food items for packed meals.

   True ☐ or False ☐

Plan a packed meal for yourself to carry to school. Pay attention to the nutritional guidelines emphasized in the lesson as well as the information on a proper packed meal. Write your meal in the space below.

Session Summary

Summary

- In this unit you learned that daily meals served include : breakfast, lunch, dinner and supper.
- There are suitable foods served at each meal.
- There are guidelines to follow when planning packed meals.
- There are suitable foods for packed meals.
- There are appropriate food containers and wrapping materials to be used for packed meals.

Session 9.3.Menu Planning

Introduction

Congratulations! You have completed two lessons in this unit. Using the knowledge you have gained in lessons one and two, you are now ready to plan menus for different meals. This section will help you develop further skills in menu planning. Soon you will be able to show your creativity in combining dishes to be served at different meals.

Have you ever gone out for dinner at a restaurant? If you have, you were most likely given a card with a list of dishes served. You were either asked to select the dishes of your choice from the list provided or told those were the set dishes to be served. This list represents the menu for the particular meal.

Upon completion of this unit you will be able to:

Outcomes

- *Explain* what is meant by the term menu.
- *Describe* the different styles of menus at restaurants.
- *Write* different formats of menus usually provided at restaurants.

9.3-1 Menu Writing

A menu is the suitable combination or list of dishes, written in a particular order, to be served at a meal. There are two styles of menus: the à la carte menu and the table d'hôte menu.

A la Carte Menu

The à la carte menu has each food item and beverage on the menu priced separately. Food choices can be made from the food grouping on the menu. The food items may be listed as appetizers, soups, salads, entrees, starchy foods, vegetables, desserts and beverages. This style of menu offers you the flexibility to choose and pay for the food items you want for your meal.

Table d'Hôte Menu

The table d'hote menu provides a complete meal for a set price. Stewed Lamb Ribs, Steamed Breadfruit in Coconut Milk and Callaloo is an example of a table d'hôte menu. The foods on this type of menu style are cooked according to order. The cutlery is usually set on the table according to the courses on the menu. This type of menu is common at fast food restaurants. All the food items on this type of menu are served to you and offer you no selections.

Activity

Please write down the two (2) types of menu styles and their descriptions in the space provided below.

The following points will assist you in writing a menu.

Good Nutrition:

When writing a menu, you should pay attention to proper nutrition. In doing so, you should know to whom the menu will be served, thus their religion, food preferences, customs and health concerns should be considered. With these in mind, you should plan the menu using the food groups as a guide.

Variety:

How would you like to have a meal lacking variety? You need to plan a menu that would appeal to ones appetite. There should be variety of colour, shapes, sizes, textures, cooking methods and temperatures.

The natural colour of foods should be used to create an advantage. Also, shapes and sizes add appeal to a menu; therefore a menu should be planned with various shapes and sizes of food in mind. Knowing foods and their textures is also important when selecting dishes for a menu. Further, a variety of cooking methods add interest to the menu, yet depends on the selected foods and their suitable cooking methods. The serving temperature of the foods should also be considered. Protein, carbohydrate and vegetables dishes are normally served hot. Salads and fruits are served cold. Appetizers and beverages may be served hot or cold according to the meal or occasion.

Indication of Preparation Method:

When writing a menu state the preparation method indicating how each food item will be cooked or prepared. Examples indicating how dishes were prepared ar include: Grilled Chicken Breasts, Steamed Carrots and Broccoli, Fried Rice and Tossed Salad. This information assists the person reading the menu to make the right choices according to their needs and concerns.

Correct Sequence:

Each dish on the menu should be written in the order it will be served. Also, each dish along with its accompaniments should be written on a separate line.

The appetizer is listed first. In a meal that includes dessert the beverage is written last.

Specific Names of the Dish:

When you are writing a menu, it is important to write the specific names of dishes. Specific names inform the person reading the menu in order to make the right choices according to their needs and concerns. Examples of how to write the specific names of dishes include Fish Cakes with Lemon Sauce, Cassava Au Gratin, Cole Slaw and Orange Soufflé.

Capital Letter:

The first letter of the name of each dish on the menu should be written in capital letters e.g. Grilled Chicken with Barbeque Sauce. Take some time to look at the examples of two menus in Figures 9 and 10. Pay attention to the sequence in which the dishes are written.

Note it!

You should remember that a menu is a list of dishes to be served at a particular meal. It should not show quantities of food.

Activity

Answer the following questions in the spaces provided below.

1. What is a menu?

2. What are the two (2) styles of menus normally used in restaurant meal service?

3. List six (6) factors to consider when planning a menu.

1.

2

3.

4

5

6.

4. Why is it important to include variety in a menu?

5. Arrange to meet two (2) other students in your class and carry out the following activities:

a. Visit a restaurant and discuss the difference between an a la carte menu and table d'hôte menu with the supervisor in charge. Make a journal entry on what you have learned from the discussion.
b. Design two (2) menu cards showing:
- An à la carte menu.
- A table d'hôte menu.

Place your journal entry and your menu cards in your portfolio.

9.3-2 Menu Formats

Menus may be comprised of one course or more than one course. Regardless of the number of courses in a meal, when writing a menu it should follow a particular format.

What is a course? A course represents a complete part of a meal; it may consist of one dish or a group of dishes. The appropriate dishes should be written according to the order of their service during the meal. As previously stated, menus may be comprised of one or more courses. Figure 12 shows a three-course menu. These three courses include an appetizer, main course and dessert; each written in the order they are to be served and with each dish on a new line.

Beverages do not represent a course on a menu. For this reason they are written at the end of the menu.

Let's begin by looking at a one course or main course menu.

The One-Course or Main Course Menu:

The main course is centred around the protein dish; also referred to as the main dish. The carbohydrate dish and vegetable dish are selected to complement the protein dish. Also, the vegetable may be raw or cooked. Look at Figure 9.

One-Course Menu Format

Protein Dish/Main Dish

Cooked Starch

Vegetable Dish

(Raw or cooked)

Example of a One-Course Menu

Fried Fish Fillet with Lemon Sauce

Cornmeal Dumplings

Callaloo

Figure 9

Activity

Now, it's your turn to write a one-course menu. Pay attention to the guidelines suggested throughout this unit regarding the proper format, balance and capitalization required on a menu. Use the space below to write your one course menu.

Appetizers:

Appetizers form the first course of a meal served at the table. They are intended as the introduction to a meal. Appetizers are foods prepared to stimulate the palate and awaken the digestive system. Appetizers are savoury, tasty foods served hot or cold, positioned first on a menu and often come in small portion sizes. Examples of appetizers include: soups i.e. French Onion Soup, stuffed eggs i.e. Devilled Eggs, fruit cocktails i.e. Fresh Pineapple Cocktails, seafood cocktails, i.e. Lobster Tail Cocktails and stuffed vegetables.

Have you ever heard the term "hors d'oeuvre" pronounced "or – dur – erve?" Sometimes people use the terms appetizers and hors d'oeuvres interchangeably. However, they are not the same. An appetizer represents the first course of a meal and is intended to stimulate the appetite. While an hors d'oeuvre is served separately from the meal or before a meal. Hors d'oeuvres are served at cocktail parties and are not intended to stimulate the appetite.

Desserts:

Desserts represent the sweet or final course of a meal. Desserts are sweet food items used to close the appetite. Desserts are served at the end of the meal and as such, are written last on menus. Additionally, they may be served hot or cold depending on the type of dessert. Examples of hot desserts include: Steamed Chocolate Pudding, Lemon Meringue Pie, and Hot Orange Soufflé. Examples of cold desserts include Fresh Fruit Trifle, Baked Custard, Cherry Cheese Cake and Coconut Ice Cream.

Now let's look at a two-course menu.

A two-course menu may offer an appetizer and the main course. Look at Figure 10 for an example. Another two-course meal may offer a main course and dessert. Look at Figure 11.

Two-Course Menu Format

Appetizer

Main Course

Example of a Two-Course Menu

Stuffed Eggs

****

Fried Fish Fillet with Lemon Sauce

Cornmeal Dumplings

Callalooo

Figure 10

Two-Course Menu Format

Main Course

Dessert

Example of a Two-Course Menu

Fried Fish Fillet with Lemon Sauce

Cornmeal Dumplings

Callaloo

Pineapple Upside Down Cake

Figure 11

Activity

Let's see if you can write two-course menu on your own. Just follow the format and the guidelines given in the examples above. Remember you can have a two-course menu either with an appetizer and a main course or the main course and dessert. Write your menu in the spaces below.

Three-Course Menu Format

Let's have a look at the three-course menu format. Look at Figure 12 and note the different courses that make up a three-course menu. The three-course menu includes an appetizer, a main course and a dessert.

Three-Course Menu Format
Appetizer
Main course
Dessert

Example of a Three-Course Menu
Devilled Eggs
*****
Fried Fish with Lemon Sauce
Cornmeal Dumplings
Callaloo

****

Pineapple Upside Down Cake

Figure 12

Activity

Now, can you write a three-course menu on your own? Just follow the format and the guidelines given in the example above. Remember a three-course menu includes an appetizer, a main course and a dessert.

Write a three-course menu in the space provided below:

In menu planning, you should aim to develop the skill of combining two or more foods into one dish. This is useful when you have very little time for food preparation. Packed meals may also require this skill. These combinations are usually seen in one dish meals, sandwiches and variations to basic recipes of dishes.

Example of a Combined One-Course Menu

Pelau

Mixed Vegetable Salad

In the example above, the protein food (chicken) is combined with the carbohydrate food (rice). The salad is then added to maintain balance in the menu.

Activity

Answer all of the following questions.

1. Menus may be written for more than one course. What is meant by a course?
2. What are the dishes that compose the main course of a menu?
3. What is the format for a three-course menu?
4. Write two (2) examples of a two-course menu format.
5. Write a three-course menu using dishes of your choice- (pay attention to the considerations given in this lesson.)

i) The graduating class committee of your school is responsible for planning a menu for the formal graduation ball. As a member of this committee:

6. List the factors you will consider before planning the menu.

Plan a three-course menu suitable for this occasion.

Write your comments in the following box.

Session Summary

Summary

- In this unit you learned that there are two styles of menus, the a la carte menu and the table d'hôte menu. The a la carte menu has its food items separately priced, while the table d'hôte menu has its complete meal for a set price.
- Proper menu writing involves paying attention to good nutrition, and including a variety of foods, specific names of dishes, correct sequencing of dishes as well as capitalizing the first letter of each dish on the menu.
- A menu can be comprised of one or more courses. A course represents a complete part of a meal.
- A one-course or main course menu includes a protein dish, a carbohydrate/starchy dish and a raw or cooked vegetable dish.
- An appetizer is the first part of the meal and is intended to stimulate the appetite.
- A dessert is the sweet or final course of the meal and is intended to close the appetite.
- A two-course menu may include either the appetizer and the main course or the main course and the dessert.
- A three-course menu includes the appetizer, the main course and the dessert.

Session 9.4 Meal Service

Introduction

Have you ever gone to dinner at a restaurant? If you have, I hope that the experience was a good one. Was the table properly set? Did a waiter serve your table? As seen in the previous three lessons, meal planning involves a lot of time and energy. It is therefore important, that the meal is served in an environment that encourages enjoyment and relaxation. The preparation of the serving area, table setting and the serving of the meal should be of the highest standard. In this lesson you will learn information on proper table setting and different types of meal services

Upon completion of this unit you will be able to:

Outcomes

- *Set* tables appropriately for various meal menus.
- *Describe* the service of food for various occasions.
- *Arrange* a tray for tray service.

9.4-1 Table Setting

Figure 13

Table setting forms an integral part of the service of a meal. Walking into a serving area should give you a feeling of warmth and welcome. Each person eating the meal should have a cover or place setting. This is the space that occupies all the crockery, cutlery, glassware and napkin for one person.

The following points should be observed during table setting.

Room Preparation:

1. Make sure that the room is clean and well ventilated.
2. Arrange and clean table and chairs in a manner to provide comfort for all persons eating the meal.
3. Use chairs of a suitable height for sitting at the table.
4. The lighting in the serving area should be gentle enough for the food to be seen.

Tablecloths and Table Mats:

1. Tablecloth should be appropriate for the occasion.

2. Tablecloths or table mats can be made from fabric such as linen, cotton and spun polyester. Tablecloths and table mats should be kept clean and wrinkle free.

3. The tablecloth should be a sufficient length to cover the table. It should hang about 20-25cm over the table edge.

4. Table mats should be able to hold all the table items with 5cm of space left around the items.

5. The tablecloth should match or contrast harmoniously with your colour scheme.

Table Napkin:

1. Table napkin and tablecloth should match and made of the same fabric i.e. Exampl linen, cotton or spun polyester.

2. The table napkin may be folded simply or in a fancy manner according to the occasion.

3. The folded napkin may be placed either:

    - On the left of the fork
    - On the turned up plate
    - In the empty glass.

Centre Pieces

1. The centrepiece should be low enough to allow persons eating at the table to see each other.

2. A flower centrepiece should be of a mild fragrance, so as not to interfere with the odours of the food.

3. Flowers used as a centrepiece should not go limp or close up.

4. Fruits or vegetables used as a centrepiece should be fresh and blemish free.

5. Crystal pieces may be used for a formal setting. These should have a clean and sparkling appearance.

Glassware:

Figure 14

Figure 15

1. Glassware is used to refer to the wide range of glass containers used for drinking.

2. Glassware can be divided into four (4) categories:

    - Everyday Glassware –includes glasses used to serve water, milk and juice.

    - Barware Glassware –includes beer mugs and pitchers.

    - Stemware Glassware - this type of glassware sits on a base. Stemware includes cocktail glasses wine glasses, sherbet glasses, chalices and goblets.

    - Crystal Glassware – includes the elegant forms of glassware, such as flutes and carafes.

Chinaware:

Figure 16

Chinaware refers to dishware made of high quality porcelain. Chinaware is used as serving and eating dishes. Chinaware includes tea cups and saucers, luncheon plates, serving dishes and sauce bowls.

Cutlery:

Figure 17

Cutlery is defined as tableware implement for serving, cutting and eating food. Cutlery includes knives, forks and spoons. Cutlery has to be appropriate for eating the different courses of the meal. For example, a soup spoon should be used for eating a soup as the appetizer, a luncheon knife and fork should be used for eating the main course and a dessert spoon should be used to eat the dessert.

Note it!

Glassware, chinaware and cutlery used for a table setting should be free of finger marks and lint from towels used to clean them.

Covers:

Figure 18

A cover in table setting is the entire place setting for one person. Each cover has a plate in the centre and cutlery arranged around the cover in the order it is used.

Guidelines for Setting Covers:

1. Use glassware, chinaware and cutlery of appropriate sizes depending on the meal served. Dinner sets are larger than those for lunch.

2. Place plate, bowl and spoon turned upward to the centre of the cover about 2.5cm from the edge of the table.

3. Set knives and spoons on the right of the plate with the sharp edge towards the plate.

4. Set forks to be used with knives left of the plate with the prongs turned upward.

5. Set forks to be used alone on the right of the plate.

6. Other cutlery will be placed according to the menu. The first course cutlery should be place furthest from the plate. Cutlery for the last course (dessert) is placed nearest the plate. Look at Figures 19 and 20.

7. Set the glasses and cups with a saucer at the tips of the knives.

8. Place coasters under glasses containing the beverages.

9. Always set the table for the right-handed person.

10. Serving dishes should be large enough to avoid food spillage.

11. Serving spoons should be placed on the right of the dish.

12. Hot dishes should be placed on hot mats.

Figure19: A Breakfast Cover

Figure 20

Activity

(a) Illustrate the table setting for the following three-course menu.

Chicken Consommé

Grilled Chicken
Buttered Yam Balls
Tossed Salad

Baked Custard

(b) Illustrate the table setting for the following breakfast menu.

Chilled Mango Slices
Oatmeal Porridge
Fried Sausages
Coconut Bake Wedges
Hot Chocolate milk

9.4-2 Types of Meal Services

Have you ever been to a restaurant and experienced having a waiter serve you your meal? Or did you have to serve yourself? Let's have a look at the different types of meal services. Meal service may be either an informal or formal service. The formal type of meal service is elaborate and is served by a waiter. The informal type of meal service is simple and served by the hostess or by family member(s).

Informal Meal Service

Family Meal Service:

The entire meal is placed on the table. Each family member serves himself or herself. A family member also serves dessert.

Compromise Service:

The main course is served by the hostess at the table. The other foods are placed in portions in the kitchen and then served.

English Service:

Food is served by the hostess and other members. The meat is carved and served by the hostess. The meal is served one course at a time. Dishes are removed from the table before another course is served.

American/Table/Plate Service:

This is a simple service. Food is prepared, plated in the kitchen and then served to the table.

Self-Service:

Customer places and picks up orders. This type of service is most seen in fast food operations.

Buffet Service:

Have you ever been served food at a buffet service? Do you know what is meant by the term buffet service? A buffet service is a self-service serving style where guests serve themselves. This type of food service may be simple or elaborate depending on the occasion. The buffet service is preferred for serving large numbers of people. A buffet service is suitable for breakfasts, brunches, luncheons and parties. The main dish (the protein dish) is sometimes served to the guests , but usually the guests serve themselves the entire meal. The hostess sets the table to ensure ease and order.

Types of Buffet Service:

1. Sit -Down Buffet Service – at this type of buffet service the appetizers, dessert and tea or coffee are served to the table. The guests serve themselves the main course and return to the table to have their meals. This type of buffet service requires table setting and staff to clear the dirty dishes immediately after the guests are finished eating. Waiters serve wines, coffee and tea to the guests at the tables. The sit-down buffet service is suitable for a formal meal in a relaxed atmosphere.

2. Stand-Up or Fork Buffet Service – at this type of buffet service the guests serve themselves and eat while standing. This type of buffet service is less formal and ideal for parties. Foods served should be eaten easily with a fork while the guests are standing. Suitable foods for this type of buffet service include: boneless chicken dishes, fish fillet dishes, rice or pasta dishes and salads.

3. Display or Finger Buffet Service – this is an economical and informal type of buffet service. The guests are allowed to go to the buffet at different times to select their food according to the courses. Tableware, cutlery napkins are collected at the buffet. The guests eat their food at a table and staff is required to clear the tables. Finger foods are suitable for this type of buffet service. These buffet services include finger foods such as:

sandwiches, pastry items – tartlets, rolls, quiches, cakes – and slices or squares of fruit.

Activity

Let's see how much you understand from the material that we just covered.

We have just covered the three (3) types of buffet services. The type of buffet service determines the type of food items that are served.

You were asked to suggest five (5) suitable food items to be served at:

1. A Stand-Up/Fork Buffet Service

2. A Display or Finger Buffet Service

Guidelines for Buffet Service Layout:

In order for the guests to be served with ease, the layout of the buffet is very important. Have you ever attended an event where the traffic flow to be served is at a standstill? This could be very frustrating especially if you are hungry. So let's look at some guidelines to follow when setting up a buffet service.

1. Arrange the table according to the size of the room, the number of persons to be served, the type of foods to be served and the number of courses to be served. For a large number of people, set up two (2) buffet stations if the room can support the traffic flow.

2. Arrange for easy access and service of food. Dishes that tend to be more difficult to handle should be placed at front where the guests would be better able to serve themselves.

3. Plates must be placed first for guests to pick up. Hot plates must be placed near the hot food. If a soup is served, soup plates must be near the soup. The same goes for dessert, the dessert plates must be near the desserts.

4. The foods to be served must be put in the order by which they are eaten. For example the appetizer (e. g. soup) will be first, followed by the main course (the protein dishes, starchy dishes and the cooked or raw vegetables) followed by the dessert.

5. Cutlery (e.g. knives, forks and spoons) may be wrapped up in a napkin or plainly set upon the table at which the guests will be eating their meals.

6. Each dish served at the buffet must have its own set of service cutlery.

7. The centrepiece used should reflect the theme of the occasion. A floral arrangement, a carving of ice or fruits/vegetables are often used as centrepieces for a buffet service.

Tray Service:

Tray service is suitable and convenient to serve tea or coffee to a small gathering, the elderly or the sick.

The following are points to consider for tray service:

1. Use a suitable sized tray to hold all that is necessary for service.

2. Use a clean wrinkle free tray cloth.

3. Choose matching china and cutlery.

4. Use containers of a size in proportion to the space.

5. Arrange serving dishes in a manner ready for use. For example, a tea pot and milk jug are placed on the right-hand side. Look at Figure 21- a tray service for tea.

6. Include a small decoration.

7. Ensure the cleanliness of all items used.

Figure 21: Tray Service for Tea

Formal Meal Service

Russian/Continental Service:

In the Russian service style, food is prepared in the kitchen, plated at the table by the waiter and then given to the guest. The Russian service involves the courses of a meal to be brought to the table sequentially. The food is served using a fork or a spoon in the right hand, while holding the dish in the left hand.

French Service:

Food is partly prepared in the kitchen although it is finished and plated at the table. The waiter usually has a cart that carries different foods for the guests to decide on their choice. Sometimes entire dishes are prepared in front of the guests. These dishes may include an entire meal, appetizers or desserts.

The Russian service and French service are usually seen at fine dining establishments.

General Rules for Formal Type Meal Service:

(1) Serve the hot food hot on a warm plate.

(2) Serve the cold food cold on a chilled plate.

(3) Serve the bread in small pieces on a plate.

(4) Place the cold food on the table just before the meal is served.

(5) Announce the meal when everything is ready.

(6) Arrange the food near the person responsible for serving food.

(7) Fill the cups and glasses up to three quarters with beverage

Activity

Matching item

Match the words in the right hand column correctly to statements on the left. Write the 'correct matching' in the space provided

Meal Service	Correct Matching	Incorrect Matching
Plate Service		The main course is served by the hostess.
French Service		Food and dishes are arranged on the table.
English Service		Food is prepared and plated in the kitchen.
Russian Service		The entire meal is placed on the table.
Family Service		Food is prepared in the kitchen and plated at the table
Compromise Service		The meat is carved and served by the hostess.
Buffet Service		Food is partly prepared in the kitchen and finished at the table.

Figure 22

Session Summary

Summary

- In this unit you learned
- Table setting forms an integral part of the service of a meal.
- The room should be prepared in a manner for the comfort of all

individuals eating the meal.

- The tablecloths, mats and napkins should be appropriate for the occasion.
- The centrepiece, used as part of table setting, should be low enough to allow the individuals eating at the table to see each other.
- The glassware, chinaware and cutlery should be free of finger marks and lint.
- A cover in table setting is the entire place setting for one person.
- Meal service may be either informal or formal.
- There are three types buffet services – sit-down buffet service, stand-up buffet service and finger buffet service.
- Formal meal service includes: Russian/continental meal service and French meal service.

Discussion

Mealtime is supposed to be enjoyed. However, sometimes things may go wrong and cause the guests to become dissatisfied. Identify five (5) occurrences that could lead to dissatisfaction at mealtime. Discuss these in your study centre with the tutor as well as with fellow learners. Comment as to how to avoid dissatisfaction at mealtimes through proper meal planning.

Reflection

Reflect on what you have learned in this unit. Share how you will implement this information in the planning and service of your family meals.

Unit Summary

Summary

In this unit you learned:

- A variety of foods are essential for a well-balanced diet.
- The individual needs of the person eating the meal

should be met by their daily meals.

- Substitute expensive foods for cheap foods for low-budget meals.
- Breakfast may include a fruit, cereal, protein food, breadstuff and a beverage.
- The main course includes a protein-rich food, a carbohydrate-rich food and vegetable dish.
- Packed meals should supply one-third of a person's daily needs.
- A menu is a list of dishes to be served at a particular meal.
- Each dish on the menu should be written in the order it will be served.
- There are two styles of menus – the à la carte menu and the table d'hôte menu.
- A three-course menu is comprised of an appetizer, a main course and a dessert.
- A two-course menu is comprised of the main course and the appetizer or dessert.
- Table setting forms an integral part of meal service and should be appropriate for the occasion.
- A cover is the space that occupies all the crockery, cutlery, glassware and napkin for one person.
- Meal service may be classed into informal and formal services.
- An informal meal service is simple and served by the hostess or family member.
- A formal meal service is elaborate and served by a waiter.

Assignment

Assignment

Your parents are celebrating their 25th wedding anniversary. You have invited their close friends to have dinner. Plan an appropriate three-course menu.

- Include a cake suitable for dessert.
- Illustrate a cover suitable for the menu.

Indicate how you would serve the meal and why.

Contents

Unit 10

Hygiene and Safety during Food Preparation

Introduction

Hygiene and safe preparation and service of food are of vital importance in the prevention of food borne illnesses.

The development and continual practice of high standards of food hygiene once reinforced will be demonstrated in your performance at home as well as in the food service arena.

You will learn in this unit what causes food to spoil, how these factors contribute to the development of food borne illnesses and how to control these factors for the safe preparation and service of food.

In addition you will understand the benefit of having access to a first aid kit. The procedures necessary to prevent common accidents in the home and how to render first aid to a sick or injured person before professional help can be obtained.

Outcomes

Upon completion of this unit you will be able to:

- *Identify* the causes of food decay and spoilage.
- *Describe* the factors that contribute to food contamination and food borne illnesses
- *Outline* the factors of hygiene and safety to be considered when purchasing wholesome foods.
- *State* methods of preventing common accidents in the kitchen.
- *Explain* what is first aid?
- *Describe* the administration of first aid treatment for various conditions.

How long?

You will need to devote fifteen (15) hours to work on this unit. Ten (10) hours for formal study and 5 hours of self-study.

Terminology

Budding: Asexual reproduction in living organisms where new individuals are developed in the form of buds from the mature organisms.

Enzymes: Organic catalyst produced by living cells which changes rate of a reaction.

Oxidation: A chemical reaction which usually involves the addition of oxygen.

Spores: A microorganism in a dormant state which is activated by the appropriate environmental conditions.

Respiration: A metabolic process which allows cells to consume oxygen and give off carbon dioxide and continues after harvest time.

Evaporation: The removal of water by it changing into a gas from a liquid after the application of heat.

This Unit is Comprised of Five Sessions.

Session 10.1 Causes of Food Spoilage

Session 10.2 Factors that Contribute to Food Contamination

Session 10.3 Hygiene Practices during Food Preparation

Session 10.4 Accident Prevention

Session 10.5 Administering First Aid

Session 10.1 Causes of Food Spoilage

Introduction

Have you ever wondered what causes foods like vegetables to change from brightly colourful vegetables to dull lifeless ones; or meats from a bright red

colour to grey discoloured piece of meat; or what causes us to feel sick after having tainted a meal? This lesson will help you clear up some of these concerns. Food spoilage is the deterioration of foods due to natural decay or the contamination via the transmission of micro-organisms. Food spoilage begins almost immediately after foods have been harvested, gathered or slaughtered. Also, the entrance of bacteria and viruses into our bodies lead to several food borne illnesses and in more serious circumstances, death.

Outcomes

Explain the occurrence of natural decay.

Identify the various micro-organisms responsible for the deterioration of the quality of our food.

Explain the detrimental effects of microorganisms on the quality of the foods we eat and in the transmission of food borne illnesses.

Explain what is a food borne illness;

Discuss how to avoid contracting a food borne illness.

How long?

You will need 2 hours of formal study and 1 hour of self-study to complete this session.

Terminology

Rancidity: Caused by a biochemical reaction between fats and oxygen, rancidity is the chemical degradation of fats and oils which produces undesirable flavours and odours.

Enzymes: Organic catalyst produced by living cells which changes rate of a reaction.

10.1-1 Natural Decay

Remember looking at a carrot that has been in the refrigerator for a long period of time? Or what about a piece of cheese that has a cracked surface and looks dull and dry? The conditions described above are as a result of natural decay. Two factors are responsible for the occurrence of natural decay in food;

- The loss of moisture
- The action of enzymes.

Figure 1 Wilted, Shrivelled Celery and Sweet Pepper Slice
Image: Simone Reid-Foster.

Enzymes play a significant role in the decay of food. Enzymes are naturally present in the foods we eat and make significant changes to the quality of our food. Both factors mentioned above affect the quality and appearance of the food we eat. Firstly, we'll discuss how moisture loss affects the quality of our food.

Moisture Loss:

Loss of moisture is most noticeable in fruits and vegetables, however, it can occur in meat, fish and cheese as well. Moisture loss in fruit and vegetables may occur because of **respiration** (loss of moisture through leaves and skin).

What happens in the case of meat, fish or cheese? Moisture loss is then due to **evaporation** (loss of moisture from the surface of food items). In vegetables this results in dryness of the skin and softening of the produce which leads to a very undesirable product. Signs of decay are most often seen in the discolouration of the skin and softening of the product.

Fruits and vegetables rely on moisture from the soil to preserve them. This is done through the movement of water to the plant tissues via transpiration. However, when removed from this environment proper storage is very important to prolong the right texture for consumption. Look at the table below and observe the difference between fruit and vegetables that have been affected by moisture loss.

Now is a good time to go to your refrigerator and see how your fruits or vegetables stack up with the descriptions below!

Good Quality	Poor Quality
Skin- smooth and firm	**Wrinkled and leathery**
Crisp eg. Green leafy vegetables	**Wilted**
Body- crisp and tender	**Limp**
Plump and juicy fruit	**Pithy**

Figure 2 Quality of Fruits and Vegetables due to Moisture Loss:

Activity

How does you green grocer stack up?

While going through this list try to come up with some examples of your own and add to the list. You will have to go through your local mini mart and observe the characteristics of various fruits and vegetables so as to make your own comparisons.

Write a brief report of your experience in the space below.

Figure 3 Decaying Tomato
Image: Robert Cochrane / FreeDigitalPhotos.net

On the other hand, meat, fish and cheese loose moisture by evaporation. Water is lost from the skin or surface of these foods which result in discolouration. This changes the quality of the product.

In both instances what we notice is that a loss of moisture to these products has significant disadvantages. For example, the quality of the food product changes that is to say you will notice a dull appearance, texture change, and skin discolouration.

Enzymatic Action:

Another cause of food decay is a result of enzymes. Let us first talk about enzymes.

An enzyme is a catalyst which speeds up a reaction. It is an organic catalyst, naturally present in both plant and animal cells that changes the rate of a reaction without being used up in the reaction or it being changed.

Enzymes become activated after harvesting or slaughtering of animals, once activated the enzymes speed up the process of decay by breaking down the tissues and the structure of the product which in turn alters the texture of foods e.g.

Enzymatic Action Can Take the Form of:

- Oxidation,
- Browning
- Ripening.

Let us look at each one in greater detail; we'll start with oxidation.

Oxidation

Oxidation takes place due to fruits and vegetables exposure to air, heat, light and metals e.g. copper and iron. This process can be minimized by the addition of anti-oxidants.

An antioxidant is a substance that slows or prevents oxidation reaction e.g. citric acid.

Some foods which are affected by this are fats and fatty foods e.g. pork and fish.

Have you ever left butter over a long period and realized there is an off odour, well this is a result of oxidation. This off flavour is called rancidity which occurs because the presence of the enzyme lipase in fats breaks down the fats to give off free fatty acids, this result both in an off odour and unpleasant taste. Oxidation causes the breakdown of vitamins mainly the water soluble vitamins (vit.C, thiamine).

Browning

Next we have browning, you should be familiar with this type of enzyme action since you have seen what happens to a sliced apple or a banana left exposed on the countertop. Soon after there is a brown colour developing on the surface? This is due to enzymes present in these foods. This also happens with potatoes, they have the same effect of the enzyme action observed as in the fruits mentioned above.

Figure 4 Apple Slice Exposed to the Air.
Image: Simone Reid-Foster

Activity

Browning activity; try it!

Try peeling a banana cut it in half leave one half exposed to the atmosphere for 10 minutes; rub the other half with some lime juice. After the time has elapsed what did you notice?

Feedback

What did you notice? One half of the banana should have turned brown and the other half should have retained its colour. Can you guess which one? The half that was rubbed with some lime juice of course!

Ripening

Finally, we have ripening of fruits and maturing of vegetables, you may have observed that a fruit or vegetable picked under ripe exhibit certain colours and textures (e.g. Let us visualize a green banana; green colour skin, firm texture but after some time has passed you will realize the colour of the skin changes from green to yellow and eventually brown.). You will also notice there is a change in the texture of the fruit from a firm texture to a tender one. If you have tasted the green banana the starchy taste present in the unripe fruit is replaced with a sweet taste. What's responsible for this change? This change is due to the conversion of the starch as a result of the enzymes in the fruit into sugar giving you the sweet pleasant taste. Enzymes are also responsible for the other changes which occurred.

Figure 5 Overripe Bananas
By Obsidi♠nSoul (Own work) [Public domain], via Wikimedia Commons

The diagram below illustrates the actions of enzymes on foods; **oxidation** which is due to rancidity; colour discoloration as a result of **browning** and a change in texture due to **ripening** of vegetables and fruits.

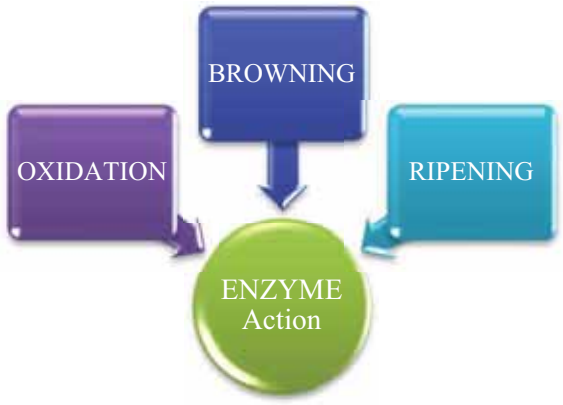


Figure 6 Enzyme Actions
Image: Simone Reid-Foster

Activity

Answer the following questions about what you've just learnt. See if you understand!

1. What results in natural decay?

2. What three (3) factors are due to enzyme actions?

1. _____

2. _____

3. _____

3. Explain briefly these terms as they relate to food decay:

- Enzymes
- Respiration
- Evaporation

Enzymes: _____

_____

Respiration: _____

_____

Evaporation _____

_____

Feedback

How did you do? If you had a few problems, go over the material again and then attempt the questions.

10.1-2 Bacteria

Bacteria are the main threat to food safety. The reason being they enjoy the same things we as humans like, for example food, moisture and the right temperature. They are also very dangerous because given the right conditions they multiply rapidly and can be harmful to your health causing food poisoning.

Bacteria are single celled, living microscopic organisms which replicate rapidly under suitable conditions. These conditions are moisture, proper temperature and food supply .Some bacteria are able to grow in an oxygenated environment called

aerobic bacteria and non-oxygenated environment called anaerobic bacteria. They are transmitted to our food via water, human beings, animals and insects.

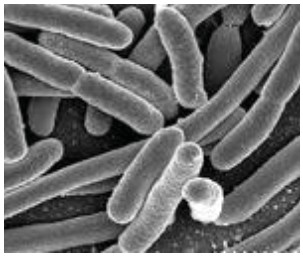


Figure 7 Microscope View of Bacteria
Anlace at the English Wikipedia
http://en.wikipedia.org/wiki/Image:Bacteriarazorback.jpg

Certain species can cause food spoilage, fermentation and food-borne illness. Micro-organisms cannot be detected by smell, taste or appearance. That is to say you cannot use your senses to detect the presence of bacteria in foods, therefore, we have to take the necessary precautionary measures to ensure that bacteria growth is minimal.

There is a lot of talk about bacteria growth and the effects on the body, but how this happens. First, we will remember that a microorganism is a single cell microbe which begins to reproduce by dividing into two and eventually into millions in a space of six to twelve hours if the conditions are right.

What about temperature? There is a danger zone for rapid multiplication of bacteria and these temperatures are **60˚F-125˚F (15.6˚C-51.7˚C).**

Why do you think this temperature range in the multiplication of bacteria is important?

Figure 8 Germs that May Infect our Food.
By Gaspirtz (Own work) [CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0)], via Wikimedia Commons
http://commons.wikimedia.org/wiki/File:Couple_of_Bacteria.jpg

Also, to note some bacteria are beneficial in food manufacturing. They are used in the preparation of various cheeses, making pickles and yogurt.

Food Borne Illness

What's that? No it doesn't mean that your food carries a disease but actually the food can make you sick if it's been infected by harmful germs and you eat it!!

How does the food become infected? Think about it. Improperly handled or stored raw or cooked food, and of course sick people who prepare food!

Everyone's at risk of contracting a food borne illness. However there are some groups who are more susceptible. Who would they be?

- Babies and young children
- Pregnant women
- Elderly people
- People who may already have diseases that threaten their immune system e.g. those who have cancer HIV etc.

  If you were to get food poisoning? What do you think your symptoms would be? Have you ever had food poisoning? What happened? Write it down in the spaces below.

Your symptoms should have included; stomach ache, fever, cold sweats, nausea, vomiting, and don't forget diarrhea!

So what do these bacteria look like? Read on below.

Classification of Bacteria Shapes:

i **Spherical bacteria (round)**- cocci; eg. Streptococci which cause scarlet fever and tonsillitis; Diplococcic cause pneumonia; Staphylococci cause boils, septic wounds and food poisoning.

ii **Rod shaped bacteria**- bacilli- such diseases as diphtheria, tuberculosis and food poisoning; Clostridia- food poisoning

iii **Spiral shaped bacteria**- cholera, syphilis and infectious jaundice.

Bacilli Cocci Spirilli

Figure 9:Simplified Bacterial Forms
By Mariana ruiz LadyofHats (did it myself) [Public domain], via Wikimedia Commons
http://commons.wikimedia.org/wiki/File:Bacteria_morphologic_forms_simplified.svg

10.1-3 Moulds

Have you ever seen a slice of bread covered with something that looks like a blue carpet? Or a piece of cheese covered with blue or white fuzziness? This is what mould looks like. What is mould? It is a class of fungi which is slightly visible to the naked eye. They may be found growing on food items such as bread, fruit and cheese under warm and moist conditions. Moulds growing on food for long period of time can produce a substance called mycotoxin (toxins produced by moulds which are harmful to our bodies) which affects the organs of the body and causes food borne illnesses.

Figure 10 Mouldy Bread

Unlike bacteria that are single celled, moulds are made of many cells which make it possible to see with the naked eye. They reproduce by means of what is called sporulation where spores are released and carried by air to food products where they germinate and produce new ones.

Moulds can grow in reduced water conditions, both high salt and sugar content. Moulds favour a wide range of food products such as acidic foods (eg. citrus fruits), neutral foods (eg. bread), and sweet foods (eg. jams).

Figure 5 Mould Growing on Christophene
Image: Simone Reid-Foster

Note it! / Warning

A point to note that a small amount of mould on foods is harmless and can be easily removed and eaten, however, moulds covering a large surface area would have an effect on both the flavor and taste and should be discarded.

Prevention of Mould Growth

1. Cool, dry storage – Because moulds favour moisture elimination of such will hinder mould growth. Foods that have gone through a process of dehydration would prevent mould growth.

2. Heating to destroy moulds and spores – Mould can be removed by boiling, however, spores are not that easily removed and may require extreme temperature to be destroyed.

3. Acidic conditions

10.1-4 Yeast

Yeasts are not only associated with bread making but also wine making. They are in fact microscopic single celled fungi, the largest of all microorganisms which can be found in the air and soil and on the surface of fruits. Some yeast are highly tolerable in conditions such as high acid, salt and sugar concentrations and in some cases some can even grow in the presence of oxygen.

Yeast cells reproduce by budding which requires a supply of water, warmth and food (sugar or starch).

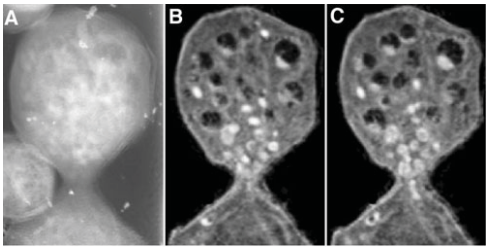


Figure 12 Budding Yeast
http://commons.wikimedia.org/wiki/File:Budding_yeast_tomography.jpg

Yeast spoils foods by producing unwanted fermentation by converting the sugars in foods into carbon dioxide and alcohol.

Activity

Yeast has many beneficial uses in food production. Do a little research and find out what food products use yeast in their manufacture. You may be surprised. Write your response below.

Feedback

Yeast are also beneficial in the making of wines, vinegar, beer, bread making etc. Did you have other items that use yeast?

What are the conditions that make the growth of yeast possible? Conditions for the growth of yeast:

1. Warmth (yeast is killed at high temperatures (140˚F)
2. Water (moisture)
3. Food (sugar)

We've come to the end of this session. Let's recap

Session Summary

Summary

In this unit you learned all about the microorganisms that might inhabit our food. The table below gives you a brief recap of those microorganisms.

Micro-organisms	Bacteria	Moulds	Yeast
Reproduction	From single celled to a colony; Asexual reproduction	through spores in the presence of air	Budding
Environment	Oxygen availability, pH Moisture; hot and cold temperature	Warm, moist conditions	Water, warmth and food (sugar)
Foods	Meats, poultry, dairy products	Bread, cheese and fruits	Fruits
Effects on the body	Diarrhea, vomiting, abdominal pains	Little effect in small amounts, toxic in large amounts	Little effect; may cause unwanted fermentation

Food spoilage is almost instant after harvesting, gathering and slaughtering. Natural decay is a result of loss of moisture and enzyme action. Enzyme action brings about oxidation, browning and ripening. Both moisture loss and enzyme action have an effect on the quality of products.

Another factor which caused food spoilage is the presence of microorganisms. There are three forms of microorganisms. Bacteria are the smallest of the microbes. Moulds and yeast are the largest of the three microorganisms. Bacteria multiply rapidly through asexual reproduction under suitable conditions to cause food contamination while moulds and yeast have an effect on bread and fruits respectively.

Assignment

Assignment

Research the numerous food borne illnesses that occur as a result of bacteria multiplication.

Your recommended Food and Nutrition text should be helpful.

Draw up a table using the following headings:

- Microorganism
- Symptoms
- Sources
- Groups of persons most at risk

Session 10.2 Food Contamination

Introduction

Some factors that may cause contamination to foods are microbial growth, ways of handling foods when receiving and storage. A food handler needs to be aware of the probability of entry of bacteria and their growth rate and how to control these situations so that food prepared and eventually served are safe to consume. This lesson will explore these situations.

Upon completion of this unit you will be able to:

- *Identify* the importance of a food handler in the prevention of food contamination and contracting food borne illnesses.
- *Describe* ways by which the growth of microorganisms can be

Outcomes

controlled.

- *Explain* the importance of proper food storage.

How long?

You will need 2 hours of formal study and 1 hour of self-study to complete this session.

Terminology

Food Handler:	A person involve in the production of food.
Microorganisms:	Single celled organisms which can be only seen under a microscope.
Cross contamination:	Food contamination from another source, e.g. People, equipment and other foods.
Pasteurization:	This is a process of heating a food, usually liquid, to a specific temperature for a definite length of time, and then cooling it immediately.
Sterilization:	This is the application of heat, pressure, filtration, irradiation to eliminate or kill any microorganism present on a surface, or in a liquid.
Danger zone:	This is the temperature range within which food borne bacteria can multiply 40°F (4.4°C) and 140°F (60°C).

10.2-1 Food Handling

A food handler has the responsibility to ensure that microbial loads are at a minimal level to provide safe food at high quality to the consumer. Microbial destruction can be achieved either by heat or by chemicals. The most common method is the thermal method (heat) followed by good sanitation practices to prevent microbes from multiplying in foods.

Figure 13 Preparing Meat
Image: savit keawtavee / FreeDigitalPhotos.net

What's wrong in this picture? Can you tell? Look at the picture above to help you.

Figure 14 Salad Preparation
Image: Dino De Luca / FreeDigitalPhotos.net

Remember that microorganisms are single celled organisms responsible for food spoilage and may cause food poisoning in large amounts. Bacteria can contaminate foods via person to person, infected animals and unsanitary equipment. Microorganisms can be found anywhere; on your kitchen countertops, utensils, appliances etc. and as food handlers we have a duty to control or eliminate microbial growth. Let us look at two heat treatments of destroying microbes.

1. Pasteurization- heating to a specific temperature for a specific time to kill most pathogens. All milk for example must be pasteurized to ensure that milk ingested for consumption have a low microbe level to avoid any form of contamination from the animal (cow) to humans.

Figure 15 Milk Undergoing Pasteurization
By James.folsom at en.wikipedia [Public domain], from Wikimedia Commons
http://commons.wikimedia.org/wiki/File:Milk_Vat.jpg

2. Sterilization- heat to a specific temperature for a specific time to kill most heat resistant spore forming organisms. Spores are more difficult to rid of as a result they require a higher temperature to be killed.

Food handling is very important as it ensures food safety. Whenever foods are handled their safety is either preserved or compromised therefore it is the duty of the food handler to exercise good safety practices.

10.2-2 Receiving

Every one of us has a responsibility to our guests or families for the products we use for consumption, whether as a food handler, a restaurant owner or even a house administrator. There are some basic precautions we need to be aware of when purchasing foods and by observing these measures we can avoid some of the problems that we encounter, for example deteriorating products, expired products or food supplies delivered or sold in unsanitary conditions. Let us spend some time on a few observations you should be aware of.

1. Always take a minute to check out the conditions of the delivery trucks. Are they clean and free from filth and pests and are different food items kept separate during transport?

2. Check the temperature of the truck or grocery chiller, temperature always plays an important part with food items.
3. Check the temperature of the product upon receipt. It is your decision whether you should accept or deny any products that are questionable. Different products require certain temperatures to ensure the best quality eg. Meats and poultry should be in a cold environment when transporting from one place to another.
4. Always check expiration date before accepting the delivery. The expiry date would determine the length of your product's shelf life.

Activity

Let's go shopping! How can you ensure you choose right for food safety at the grocery store?

Here's a list of grocery store items that you are going to shop for, place them in order; from the first item you'd pick up to the last item before you go to the check out/ cashier in the next column.

Should the cashier observe any food safety precautions when packing up your items? How can she do this?

Here's the list:

Shopping List	Shopping List in the Correct Order.
Canned Tuna	
Ready to cook chicken wings	
Macaroni	
Bleach	
Laundry detergent	
Frozen cassava	
Ice cream	
Eggs	
Dish washing liquid	
Assorted ground provisions	
Chopped Dasheen bush	
Canned fruit cocktail	
Carrots	
Fish and meat	

Figure 16 Shopping List

Feedback

So let's see how you did.

Shopping List	Shopping List in the Correct Order.
Canned Tuna	1. Canned tuna, macaroni and canned fruit cocktail.
Ready to cook chicken wings	Assorted ground provision, carrots, chopped dasheen bush.
Macaroni	Eggs

Bleach	Frozen cassava, Ice cream fish and meat in separate bags.
Laundry detergent	Ready to cook chicken.
Frozen cassava	Bleach, .laundry detergent and dish washing liquid.
Ice cream	
Eggs	
Dish washing liquid	
Assorted ground provisions	
Chopped Dasheen bush	
Canned fruit cocktail	
Carrots	
Fish and meat	

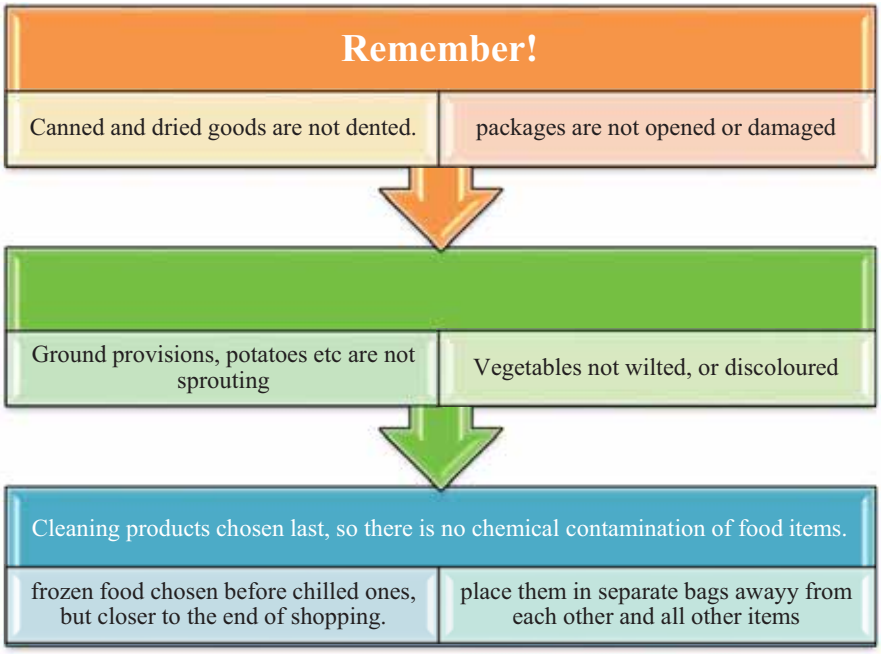


Image: Simone Reid-Foster

10.2-3 Storage

Before we go into some factors affecting storage of food let us take a minute and reflect on some concerns of your own. Place yourself in your own kitchen area and observe how certain foods are stored in the refrigerator, freezer, pantry area or racks.

Storage plays an important part in the preservation of food items and as a result adequate storage is imperative for dry goods, refrigerated and frozen foods. The goods received should be placed in storerooms, chillers and freezers. Whatever the storage always have in mind the areas should be well ventilated, free from rodents and insects and the appropriate temperature for the particular product .This should apply to both restaurant owners and family members.

Dry goods, for example (peas, beans, rice etc.), should be stored in well ventilated and cool areas. Meats, poultry, fish in cold storage, not overcrowded to prevent proper air circulation. Fruits and vegetables should be stored either in the refrigerator or in a rack where it is cool. Let us now look at some factors to ensure proper storage and the best quality for our products.

Figure 17 Storage for Goods such as Flour, Rice etc.
Image: FreeDigitalPhotos.net

1. Never leave food sitting on the dock or in a holding area for any extended time period. Remember that time is a factor for microbial growth.

2. Secure proper storage as soon as the products are received, this is to maintain the quality of the products.

3. Always keep storage areas clean and organized, good sanitation is the key to healthy practices.

4. Storage areas should be free from cardboard boxes containers and any other objects that may provide a breeding ground for insects and rodents which have the tendencies to transmit diseases.

Refrigerating and Freezing There are two ways of storing foods. These foods can either be in the raw state or cooked foods. You will remember that foods stored in the freezer stop microbial growth since this temperature is not ideal for the multiplication of microorganisms.

Temperature is the most important factor for deterring the growth of bacteria. As we mentioned before some bacteria are able to survive in high temperatures above 140˚F, whereas in other instances some are able to withstand lower temperatures that are below 20˚F.

If you have to store cooked foods the temperature of the food needs to be cooled down below 41˚ F (5˚ C).

Let's come up with some ways to bring foods down to safe temperatures. What about some of these ways that are mentioned below.

1. Using blast chillers and walk-in coolers, this will definitely cool your food quickly (commercial setting).

2. Transferring the product into a shallow pan or even in smaller containers. Spreading your food thinly to allow air to circulate and to separate in smaller containers would both speed up the cooling process.

3. Placing the container of hot food into an ice water bath and stirring frequently, this brings down the temperature of the food quickly and allows cooling to take place.

4. Using cooling paddles for rapidly reducing the temperatures of liquid contents, this helps circulate the air into the food thereby increasing the cooling process.

5. Spreading certain food products that are highly contaminable in a thin layer in a shallow pan to speed up the cooling process. For example pastry cream because of the milk and egg content.

Now we have an understanding of what temperatures to store cooked foods. Let us now look at some ways foods can be thawed out for reuse. If we store foods we need to have an idea how to thaw out these foods to be used for consumption.

1. Don't ever thaw foods at room temperature because with cooked foods it is very easy for bacteria to be activated and multiply at this temperature; a temperature they favor.

2. Always thaw gradually in the refrigerator.

3. Place wrapped food in a container under cool running water in a sink.

4. The water temperature should not be more than 70˚ F (21˚ C).

5. The microwave provides an easy and fast way of thawing foods, however, foods thaw by this method should be eaten soon after as they cool down quickly when left sitting. This can encourage bacteria growth.

Activity

Okay so you just came in from the grocery store with your purchases. Now it's time to pack them away. In the kitchen you have cold storage i.e. refrigerator and freezer, pantry and other cupboards. Where do you think is most appropriate to store the items that you bought? Write your answer in the column next to the food stuff.

Shopping List	Shopping List in Correct Order.
Canned Tuna	
Ready to cook chicken wings	

Shopping List	Shopping List in Correct Order.
Macaroni	
Bleach	
Laundry detergent	
Frozen cassava	
Ice cream	
Eggs	
Dish washing liquid	
Assorted ground provisions	
Chopped Dasheen bush	
Canned fruit cocktail	
Carrots	

Shopping List	Shopping List in Correct Order.
Fish and meat	

Figure 18 Shopping for Storage

Feedback

How did you do? Let's see if you packed away your food stuff with food safety in mind?

Shopping List	Shopping List in Correct Order.
Canned Tuna	Cupboards if unopened. Refrigerate any leftovers and consume as directed
Ready to cook chicken wings	On shelf in refrigerator is it is to be used within three (3) days
Macaroni	In canisters designated for storage, avoid mixing old stock with new stock.
Bleach	In a separate cupboard, away from foodstuff.
Laundry detergent	In a separate cupboard, away from foodstuff.
Frozen cassava	Freezer, separate from meat and poultry.
Ice cream	Freezer.
Eggs	On refrigerator shelf in original carton. Door not appropriate, not cold enough.
Dish washing liquid	In a separate cupboard, away from foodstuff.

Assorted ground provisions	Vegetable crisper, away from meat and poultry.
Chopped Dasheen bush	Vegetable crisper away from meat and poultry.
Canned fruit cocktail	Cupboards if unopened. Refrigerate any leftovers and consume as directed.
Carrots	In vegetable crisper in refrigerator, away from meat and poultry.
Fish and meat	Freezer if not being used right away. If purchased frozen, don't allow to thaw and then refreeze, bacteria can multiply that way.

Serving hot foods to our guests and families at the correct temperature is paramount.

Meats, poultry, fish, vegetables, peas and beans should all be served hot while our salads, mayonnaise based products and cold desserts should be served cold.

1. Serve hot foods as soon as it is cooked e.g. fish and seafood to avoid contamination.
2. Keep it simmering if to be used later, this is to ensure that proper temperature is maintained.
3. Avoid the food temperature danger zone (40 to 140˚ F or 5˚to 57˚ C). This is a good time to remind ourselves that these temperatures are the breeding ground for rapid bacteria growth.
4. Food held for service must be kept at135˚ F (57˚ C) or above to minimize or stop the growth of bacteria.
5. Check holding food on a regular basis using a thermometer, this is important to maintain the right temperature throughout food service.
6. Transportation of foods should be held at the same temperatures; therefore food warmers should be available to maintain temperature.
7. Serve food in small batches so as to use up quickly.
8. Never add fresh product to old batches, this may cause cross contamination as temperatures may vary.

We have digested quite a lot but always remember good safety rules to ensure our guests and our love ones are well taken care.

Session Summary

Summary

In this unit you learned that microorganisms are single celled organisms responsible for food spoilage and may cause food poisoning in large amounts. Food handling is very important as it ensures food safety. Check the temperature of the product upon receipt. Different products require certain temperatures to ensure the best quality.

Storage plays an important part in the preservation of food items and as a result adequate storage is imperative for dry goods, refrigerated and frozen foods. Refrigerating and freezing foods are two ways of storing foods. These foods can either be in the raw state or cooked. If you have to store cooked foods the temperature of the foods need to be cooled down below 41˚ F (5˚ C).

Don't ever thaw foods at room temperature because with cooked foods it is very easy for bacteria to be activated and multiply at room temperatures, a temperature they favor.

Hot foods should be served at the correct temperature. Avoid the food temperature danger zone (41 to 135˚ F or 5˚to 57˚ C). Check holding food on a regular basis using a thermometer, this is important to maintain the right temperature throughout food service.

Assessment

Assessment

Answer the questions below in the spaces provided.

1. List any two factors that need to be considered when storing foods.

2. Who is a food handler?

Session 10.3 Hygiene Practices during Food Preparation

Introduction

Do you know that one of the most important reasons for transmission of diseases is from improper handling of foods? Therefore, it is the responsibility of every food handler to observe proper hygiene practices and make these a part of their lives. Having a healthy positive attitude and practicing high standards of hygiene would both contribute to the benefit of customers, employees, employers and also your household.

Upon completion of this unit you will be able to:

- *Define* the term hygiene.
- *Explain* the guidelines for practicing good hygiene.

Outcomes

- *Recognize* the importance of good hygiene.
- *Accurately* perform the hand washing routine.
- Prevent cross contamination in food
- *Distinguish* between cleaning and sanitizing.

How long?

You will need 2 hours of formal study and 1 hours of self-study to complete this session.

Terminology

Hygiene:	Sanitary practices and cleanliness that serve to promote or preserve good health.
Communicable disease:	A disease that can be easily transmitted from person to person.
Infection:	Affect with some sort of disease that can be passed on.
Food borne illness:	Diseases caused by harmful bacteria carried either in water or food.
Germs:	Harmful bacteria entered foods via humans, animals or other sources.
Cleaning:	This activity removes dirt.
Sanitizing:	This activity removes germs and bacteria.

10.3-1 Personal Hygiene

Personal hygiene is very important to prevent the spread of diseases .We must first examine ourselves to see if we are practicing proper hygiene to eliminate the possibility of contributing to the spread of diseases from person to person. Food borne diseases are transmitted by food workers if proper hygiene is not practiced.

Figure 19 Hand Washing

Author Lars Klintwall Malmqvist (Larsklintwallmalmqvist) http://upload.wikimedia.org/wikipedia/commons/thumb/1/1b/OCD_handwash.jpg/220px-OCD_handwash.jpg

Figure 20 Deodorant
Image: Ambro / FreeDigitalPhotos.net

Figure 21 Head Covered
Image: africa / FreeDigitalPhotos.net

Go through this list carefully and really apply it to your daily activities especially when dealing with foods.

1. Do not work with food if you have any communicable disease or infection .This can be transmitted to customers and leads to the spread of diseases.

2. Bathe or shower daily. This ensures that the food handler is free from germs and micro-organisms.

3. Both uniforms and aprons should be spotlessly clean and preferably white as dirt and soils can be easily detected.
4. A hat or hairnet should be worn at all times to keep hair neat and tidy to avoid hair from entering foods.
5. Keep moustache and beard trimmed and clean or completely removed if necessary. If facial hair is to be worn use a beard guard.
6. Always wash hands before handling food and after using the toilet, we want to continue to maintain a clean environment.
7. Ensure that cuts and sores are covered with waterproof dressings and they do not come in direct contact with food items. Use finger gloves.
8. Do not smoke in a room where food is being prepared.
9. Never cough or sneeze over food; use a tissue and remove from the food site.
10. Avoid using bare hands to handle foods, always use disposable gloves.

Reflection

Think about it, how would you feel about eating at an establishment whose workers don't practice good personal hygiene?

Activity

Hand Washing!

It is not as simple as applying soap and water. The aim is to remove the germs thoroughly. How long does it take you to sing the 'Happy Birthday song? As long as it takes you to wash your hands!!

So go to your sink and follow the steps outlined. Read them through first, and then do it. Have a partner tick it off on the check list as you progress. When you're done observe your partner.

#	Checklist	☑
1	Wet hands and wrists with warm, running water.	❑
2	Apply enough liquid soap to get a healthy lather.	❑
3	Rub hands vigorously together and scrub wrists.	❑
4	Scrub palm to palm, between fingers, thumbs, and wrists for at least 15-20 seconds.	❑
5	Clean under fingernails, with a clean nail brush. Rinse brush and replace.	❑
6	Rinse hands with warm running water, let water run DOWN off your wrists.	❑
7.	Dry hands with clean disposable (paper) towel. Use towel to turn off the faucet.	

Now that you're done washing your hands! Make a list of at least seven (7) instances when you should wash your hands.

1. _____

2. _____

3. _____

4.

5.

6.

7.

How did you do?

Feedback

Here are the times when your should was your hands:

1.After using the bathroom

2.After touching animals

3. before and after preparing food.

4. immediately after handling raw meat, fish and poultry

5. After blowing your nose.

6. After coughing or sneezing into your hands.

7. Before and after treating wounds or cuts.

8. After handling garbage.

9. Before eating.

10.3-2 Kitchen Hygiene

Kitchen hygiene is just as important as personal hygiene and for this reason it should be strictly adhered to. This is the surroundings where food is prepared and served. Some factors to note that will help you along your way are;

1. Work tables, surfaces, ranges and floors should be clean and sanitized regularly. Cleaning is to remove dirt and pieces of food items while sanitizing is to kill bacteria. This is very important.

2. Keep utensils clean and well stored away from rodents as they urinate and drop their filth wherever they pass. These cause diseases to be transmitted to humans which can be detrimental to our health.

3. Wipe up spills as they occur to prevent severe falls or burns if carrying a hot item.

4. Do not allow pets in the surrounding as they can be a means of transmitting several diseases.
5. Rinse out dish cloth (a favourite spot for bacterial growth) and dry. Immerse in bleach regularly, especially when need to be reuse. Gentle reminder moisture is another factor for bacterial growth.
6. Prepare raw and cooked foods in separate areas cutting boards to avoid cross contamination, especially meats, poultry and seafood.
7. Ensure waste food is disposed of properly. Always keep the lid on the dustbin and wash your hands after putting waste in it. Try not to forget this one.
8. Meats, poultry and fish should be thoroughly thawed out before cooking.
9. Dish cloths should never be used to wipe floors; this is for your counter tops use a mop with a mop bucket.

Activity

What do you know about cross contamination? How do you prevent it?

State whether the following statements are true or false by writing 'T' next to those that are true and 'F' next to those that are false.

1. After feeding your dog, you should wash your hands before you eat to get rid of the dog scent from your hands _____

2. You should not buy cracked eggs because bacteria may have passed from through the crack to the eggs _____

3. .When you make a stir fry of vegetables and chicken you should have two chopping boards the juices form the raw meat can pass bacteria to the vegetables _____.

4. You should was the outside of a mango before biting into it so you don' get that bitter taste from skin _____

5. Meat you intend to use three days from today should be stored on the top shelf of the refrigerator _____

Feedback

Cross contamination is serious business! How many did you get?

Check these answers with yours: 1. F; 2. T; 3. T; 4. F; 5. F.

10.3-3 Waste Disposal

1. Garbage must be taken out regularly to avoid insects, maggots and rodents. Again these conditions provide a breeding ground and nutrients for them to strive.

2. Dustbins should be placed away from the kitchen where food is being prepared in a cool and shaded position.

Figure 22 Covered Bins away from Food Preparation Area
Image: Matt Banks / FreeDigitalPhotos.net

3. Clean and disinfect bins regularly and always allow drying, again constantly reminding yourselves that moisture together with food particles provide proper conditions for microbial growth.

4. Do not allow waste pipe to become clogged and stagnated to harbor insects or rodents.

5. Nappy pails should not be placed close to or in the kitchen, keep far away from the kitchen area

HACCP

HACCP, what's that? Let's take a brief look at this hygiene concept in food preparation.

HACCP-(Hazard Analysis and Critical Control Points), this is a preventative system used to ensure safety within a food establishment.

There are Seven Basic Steps

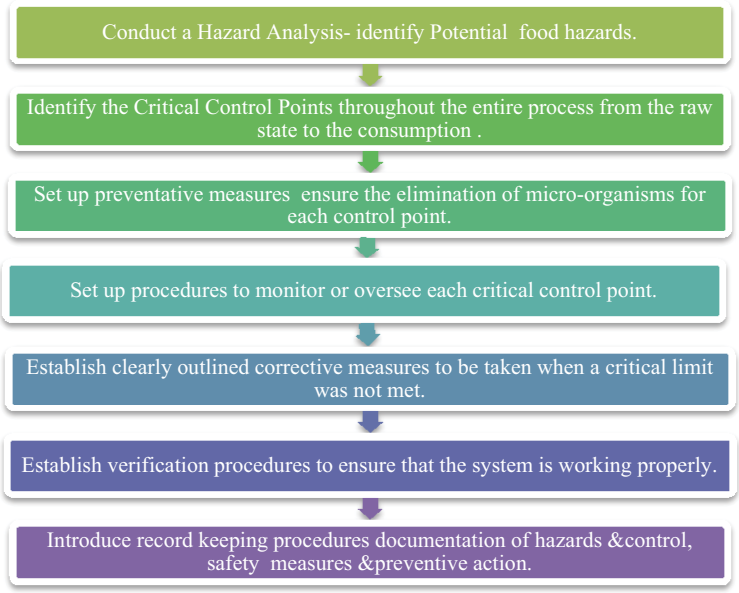


Image: Simone Reid-Foster

Session Summary

Summary

In this unit you learned food borne diseases are transmitted by food workers if proper hygiene is not practiced. Do not work with food if you have any communicable disease or infection .This can be transmitted to customers and leads to the spread of diseases. Ensure that the food handler is free from micro-organisms.

Work tables, surfaces, ranges and floors should be clean and sanitized regularly. Cleaning is to remove dirt and pieces of food items while sanitizing is done to kill bacteria. Rinse out a dish cloth and allow it to dry. Prepare raw and cooked foods in separate areas, use cutting boards to avoid cross contamination, especially meats, poultry and seafoods. Ensure waste food is disposed of properly.

Dustbins should be placed away from the kitchen where food is being prepared in a cool and shaded position. Clean and disinfect bins regularly and always allow to dry.

HACCP-(Hazard Analysis and Critical Control Points), this is a preventative system used to ensure safety within a food establishment.

Assessment

Assessment

Now that you've completed this session let's see what you've learnt.

Outline to the cafeteria manager and staff at your school how they can improve the establishment appearance in terms of personal hygiene and kitchen hygiene, in light of complaints that have been received.

Session 10.4 Causes and Prevention of Accidents

Introduction

Accidents in the home and particularly in the kitchen are common place. As part of this course practical sessions will be conducted in the food laboratory at schools. It is important that you are aware and inculcate the appropriate safety habits to prevent injury to yourself and others. Accidents occur without any warning; therefore, you need to be aware of the possibilities and how to prevent them from occurring. This lesson will help you to do this.

Outcomes

Upon completion of this unit you will be able to:

- *Explain* the causes of accidents in the kitchen.
- *Identify* the safety practices for food preparation and service.
- *Describe* how each different type of accident can be prevented.
- *Describe* the safety precautions with various small equipment and tools.
- *Describe* the accurate use of the fire extinguishers.

How long?

You will need 2 hours of formal study and 1 hour of self-study to complete this session.

Terminology

Insecticide: Poisonous substances for killing insects.

Accident: An unfortunate incident that happens unexpectedly and unintentionally, typically resulting in damage or injury.

Flammable : A substance or material that is capable of igniting or burning easily.

10.4-1 Accidents in the Kitchen

The one place you can find a number of accidents occurring is in the kitchen, as a result, persons working in the kitchen should follow certain rules. Having an instructor or a lab assistant would avoid or minimize the number of accidents from occurring.

Here are some possible accidents which can occur in the kitchen and being aware of these accidents we can minimize the possibility.

1. Hot Pots and Pans: Handles of hot pots should be turned on the inside to avoid burns.

2. Electrical Equipment: Should be placed in a safe place free from moisture when not in use. Electrical cords must be placed out of the reach of children.

3. Kitchen Floors: Floors should be free from grease and moisture which lead to falls. Kitchen knives; knives should be stacked away when not in use and should be held in a vertical position when moving around in the kitchen.

4. Insecticides and other Dangerous Liquids: Poisonous substances should be carefully labeled to avoid ingesting as sometimes this may lead serious health risks.

5. Flammable Clothing: Avoid wearing flammable clothes when in the kitchen.

10.5-2 Prevention of Accidents

As a food and nutrition student it is important to note that there are a number of possible accidents which occur in the kitchen and as a result you also need to be aware of the prevention measures. Having this understanding would avoid any discomfort not only to the food handler but also to your classmates and team workers.

Hot Cooking Utensils (Pots and Pans)

Some cooking utensils you may be familiar. These are sauce pans, stock pots, frying pans and others that as providers you would use in the kitchen. However, great care must be taken when moving around the kitchen with hot items to prevent scalds and burns which could be very severe and may lead to permanent scars.

Reflection

Can you think for a moment what some of the possible causes of accidents that occur during food preparation in the kitchen lab are?

Let us take for example steaming a pot of rice and your pot handle is placed towards the outside of the burner and someone hurriedly passes and bounces the handle and the pot topples over. What do you think will be the outcome? The hot contents would spill out onto the person and cause severe burns. This and many more accidents can be avoided if we pay attention to the necessary preventative measures. Let us look at some others and try to minimize the occurrences of accidents in the food laboratory.

Pots and Pans

a. Always hold hot utensils with a pot holder or mitten. Why shouldn't we use a kitchen towel?

b. Announce loudly to your classmates or team members when moving around the kitchen with hot utensils.

c. Never place hot pots close to the edge of your worktables or handles jutting out to cause accidents. Remember the incident in the above scenario.

d. Always allow the remains of hot liquids especially hot oil to cool before adding tap water. Hot oil can cause severe burns.

e. Avoid opening the lids of hot liquids to allow steam to go directly by your face or hands to be scorch.

f. Never leave hot pots and pans on the floor. Floors were designed to walk on and not to leave objects whether pots or pans to allow someone to trip on.

Reflection

After you've read the statements above. Can you appreciate the danger of carelessness in the food laboratory?

Kitchen Knives

Kitchen knives should be kept sharp at all times to make it possible to efficiently execute various tasks. However, if not used properly you can receive serious bodily harm, especially on the hands. Some measures to avoid harm to the body are as follows:

.1. Always cut in a heel and toe manner with your fingers tucked in away from the knife to avoid cuts.

Figure 23 What could possibly happen here?
Image: Ambro / FreeDigitalPhotos.net

.2. When moving around in the kitchens with a knife always hold in a vertical position with the point facing downwards.

.3. Knives should never be placed in the kitchen sinks but place on the sideboards or wash after used.

.4. Store away knives properly and out of the reach of children. Knives should be stored in a drawer specifically for the various knives used in the kitchen.

.5. When cutting items with a knife on a board always make sure that the board is sturdy. Placed a wet cloth to prevent the board from moving around while you cut.

ELECTRICAL APPLIANCES AND EQUIPMENT:

When operating an electrical appliance always remember to avoid allowing your equipment to come in contact with water either by wet hands or in a wet environment.

Some precautionary measures:

a. Never come in direct contact with wet hands or stand on a wet floor when operating an electrical appliance.

b. Always read the manufacturer's manual carefully and follow the instructions.

c. Never attempt to touch exposed or frayed wires from your electrical appliances but seek the service of a reputable electrician.

d. Never immerse electrical appliances in water while still in used or plugged in.

e. Never leave your electrical appliances unattended or in the presence of unsupervised children.

Kitchen Floors

A number of accidents occur in the kitchen due to wet floors, oil spills or loose flooring. These accidents lead to broken bones, fractures and head injuries. Let us list some preventative measures to avoid unnecessary accidents. Some of these measures you may be already aware of, others may be new to you.

1. Take time to wipe away any form of spillage from floors. This should be done immediately and the remaining students and teacher should be informed.

2. One point to note when removing grease from floors is to apply salt to the greased areas. The salt absorbs the grease making it easy to clean.

3. Ensure all floor coverings are laid down flat on the floor to avoid someone tripping and damaging parts of his/her body.

4. Floor coverings should be in light colours to allow all objects, fruit and vegetable peels and spills to be visible.

5. Mats and tiles placed on the kitchen floors are to be of a non skid material to prevent someone from slipping and falling.

6. Proper footwear with grids is important to avoid skidding.

Activity

Let us go through this kitchen and identify the number of possible causes of accidents.

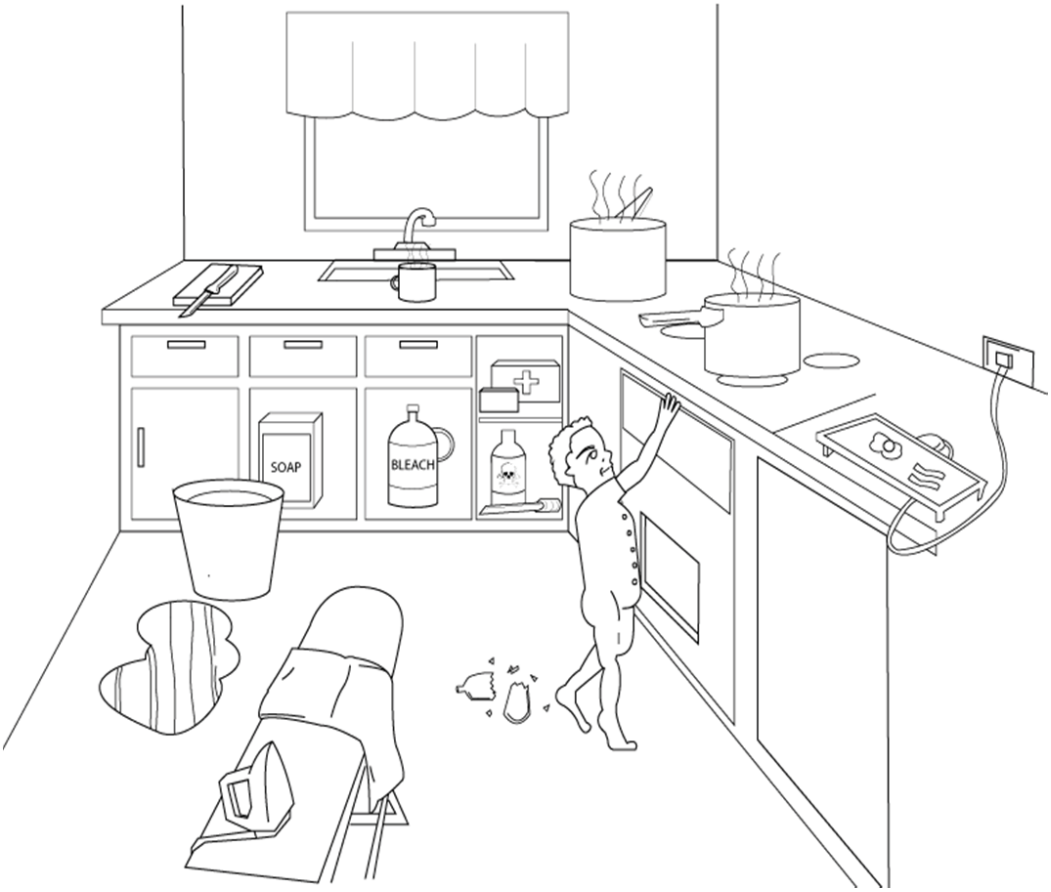


Figure 24 Image: DEU

How many did you come up with?

Feedback

Breakages

If a glass bottle or a ceramic plate breaks in the kitchen, how do you go about cleaning the area? Well, if you thought about using wet newspaper print to remove the splinters after the large pieces have been removed you are absolutely correct, and if you thought about wrapping the broken pieces in news print before discarding you are also correct. The latter would prevent someone from getting cut when throwing out the garbage.

Two other points to consider are; avoid using chipped glassware and plates as they harbor bacteria, and, splinters could be ingested. Always place breakable wares within easy reach to avoid overstretching and breakage.

Ranges

Let us spend some time on one of the most important large equipment used in the kitchen and that is a cooking range (stove).

1. Wipe up spills as soon as they occur.
2. Stoves or any cooking ranges should be placed on a sturdy and level base.
3. Avoid leaving partially lit matches close to the range.
4. Do not leave pot holders or towels close to open flames or anywhere on top of the range.
5. Always remember to turn off gas supplies or unplug electrical equipment when not in use.
6. Avoid placing pot handles close to an open flame as the handles become too hot to remove the pot from off the stove.

Curtains or Fabric Material

If any form of fabric is to be used in a kitchen area the fabric that the curtain is made from must be inflammable. Also, fabric placed in the kitchen must be far away from stoves or anything that carries an open flame.

Curtains should be short in length and transparent enough to allow adequate natural light to enter the kitchen.

Other Safety Measures

- Uniform should be non-flammable, to avoid getting your clothes caught in a fire.
- All poisonous substances must be properly stored away and labelled.
- Wear comfortable footwear and preferably of leather material.

- A fire extinguisher should be available at all times in the kitchen.

Session Summary

Summary

In this unit you learned a number of accidents occur in the kitchen. The kitchen has been the place for accidents and as a result persons working in the kitchen should follow certain rules. For example, handles of hot pots should be turned on the inside to avoid burns. Floors should be free from grease and moisture which lead to falls. Avoid wearing flammable clothes when in the kitchen.

There are ways to prevent accidents from occurring in the kitchen such as never place hot pots close to the edge of your worktables or handles jutting out to cause accidents. Hot oil can cause severe burns. Knives should never be placed in the kitchen sinks but place on the sideboards or wash after being used.

A number of accidents occur in the kitchen due to wet floors, oil spills or loose flooring. Therefore kitchen safety rules should be taken seriously.

Assessment

Assessment

Using the diagram in the activity above outline step by step how you would go about correcting all the possible accidents you have identified in the picture.

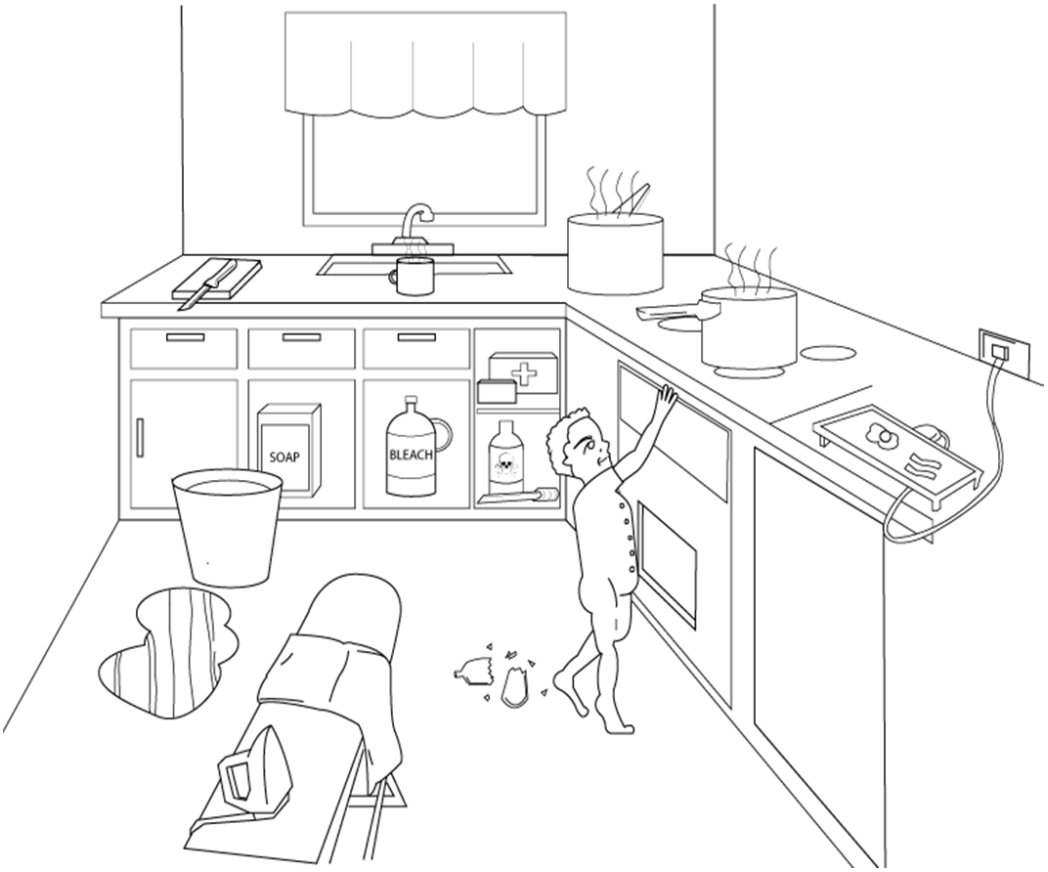


Figure 25 Image : DEU

Session 10.5 Administering First Aid

Introduction

First aid is the accepted principle of medical/emergency care rendered to a sick/injured person before professional help can be obtained, using whatever materials are at hand.

The aims of first aid are to preserve life; to promote recovery and to prevent the condition from becoming worse.

Outcomes

- *Identify* the responsibility of the first aider.
- *List* the items in a first aid kit.
- *Explain* the importance of each item in the first aid kit.
- *Apply* the necessary treatment for the various conditions that may arise.

How long?

You will need 2 hours of formal study and 1 hour of self-study to complete this session.

Terminology

First aid kit:	It is a collection of supplies and equipment for use of giving first aid.
First aid	The provision of immediate care to a victim with an injury or illness, usually effected by a lay person, and performed within a limited skill range.
Sign:	Something you see or determine using the relevant senses.
Symptom:	Something unseen, based on information concerning feelings given by the patient.
Shock:	The unavailability of oxygenated blood to the vital organs.
Wounds:	Any break or cut on the body that allows blood to escape.
Fracture:	This may be a break or crack along a bone.
Sprain:	Either the overstretching or tearing of ligaments when a joint exhaust the normal range of motion.

10.5-1 The Responsibilities of the First Aider

Figure 26
Image: Ambro / FreeDigitalPhotos.net

1. Be calm and take charge, the reason being is that you are acting as a temporary medical attendant and as a result you must be able to take control of the situation until professional help comes about.
2. Assess the situation.
3. Identify the illness or injury and proceed to offer assistance.
4. Give immediate adequate and appropriate treatment to the patient to alleviate any discomfort.
5. Transport the patient to a safe place where it is comfortable.

10.5-2 First Aid Kit

Figure 27 The First Aid Kit
Image: renjith krishnan / FreeDigitalPhotos.net

A first aid kit should always be kept in the home to treat both minor and more serious injuries. First aid boxes must be both easily identifiable and accessible in the work area. A first aid box should be placed in the hands of a very responsible person .This person needs to check supplies regularly and refilled when necessary and it should always be clean and waterproof in order to keep the contents safe and aseptic. A first aid kit should be placed in all working establishment and

homes in the event of an emergency or injury, temporary relief or help can be ministered to the injured person.

ITEMS	USES
Elastic bandages	Sprains and pressure bandage
Gauze roller bandages	Absorbent, breathable and elastic
Soap	Clean superficial wounds
Antiseptic (wipes or spray)	Reduced the risk of infection in abrasion or around wounds
Triangular bandages	Used as slings and tie splints
Antiseptic (wipes or spray)	Reduced the risk of infection in abrasion or around wounds
Burn dressing	To cool burn areas
Gloves (disposable)	To prevent contamination
Goggles	To protect your eyes
Surgical mask	To reduce possibility of airborne infection transmission
Alcohol pads	For sterilizing equipment or unbroken skin
Alcohol rub	Sanitize hands
Thermometer	Check body temperature
Emergency blanket	
Aspirin	For chest pains
Paracetamol (painkillers)	For pain
Anti-inflammatory painkillers (Ibuprofen)	To treat sprains and strains
Codeine	As painkillers and anti-diarrheal
Saline	Cleaning wounds or for washing foreign particles from eyes
Shears	For cutting clothing

Figure 28 items in the first aid kit

OTHER ITEMS:

1. Safety pins

2. Tweezers
3. Scissor
4. Apron

10.5-3 First Aid Treatment for Various Treatments

Wounds:

A wound is a break or cut on the tissues of the body that allows blood to escape internally/externally or both and which may allow germs to enter the body.

Figure 29 A laceration to the leg. Is this an open or closed wound?

http://en.wikipedia.org/wiki/Wound

There are two classifications of wounds; open or closed

1. Open wounds- these are wounds caused by sharp, jagged edge objects or where tissues are removed. e.g. Abrasion, incision, laceration and avulsion, puncture and gun shot.

2. Closed –These are injuries caused by a blunt instrument e.g. stone.

External Injury

1. Apply direct pressure on the wound either using your fingers or the palm of your hand, this control bleeding and prevent the loss of too much of blood, or,

2. Indirect pressure is also used to control bleeding by applying pressure on a pulse site between the wound and the heart.
3. Elevate or raise the injured part above the level of the patient's heart, again this helps to control bleeding.
4. Bandage wound, this will help to stop the bleeding. apply a sterile dressing over the pad and bandage firmly in place
5. Treat for shock, this occurs if the heart is affected, loss of too much blood or rupture of blood vessels which may all contribute in preventing oxygenated blood reaching the vital organs.

Burns/Scalds:

Burns are injuries to the body due to contact with hot objects, open flames, boiling liquids, chemicals, electricity/lightening and radiation.

Figure 30 2nd Degree Burn on the Hand

http://en.wikipedia.org/wiki/Burn

Classification of burns are done according to the depth of tissue affected and they are divided into three categories:

- 1st degree burns- these burns involve only the epidermal (superficial) layer of the skin, the outer layer.

Characteristics- redness, swelling and tenderness.

- 2nd degree burns/ partial thickness- these burns involve the epidermis and some of the dermis, both the outer and middle layers.

Characteristics- the skin is mottled (blotches) white to red, is often blistered and very painful.

- 3rd degree burns- extend through all layers of the skin and may involve other structures. The worst of all three.

Characteristics- skin is dry, leathery and often either white or charred .Area may become numbed.

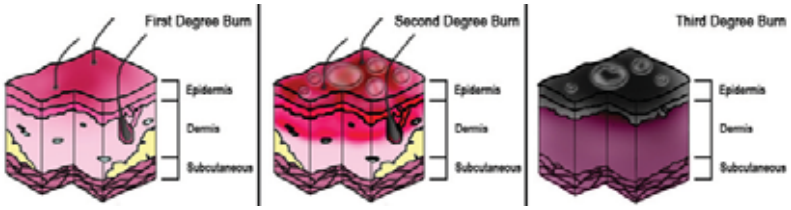


Figure 31 Burn Degree Diagram
By Persian Poet Gal at en.wikipedia [GFDL (www.gnu.org/copyleft/fdl.html) or CC-BY-3.0 (www.creativecommons.org/licenses/by/3.0)], from Wikimedia Commons
http://commons.wikimedia.org/wiki/File:Burn_Degree_Diagram.png

Treatment of Burns:

1. Cool burn by pouring cold liquid on the burn for at least ten (10) minutes. Make the patient comfortable and look for signs for any difficulty in breathing.

2. Remove any constrictions such as jewellery and clothing from the area before it begins to show signs of swelling. However, do not attempt to remove clothing that sticks to the affected areas.

3. Cover the burn and surrounding area with a sterile dressing which must be clean, non-fluffy material.

4. Treat for shock to avoid further complications such as a heart attack.

5. Seek medical attention if necessary.

Note it! / Warning

Remember to constantly reassure the patient, we want to be sure that the patient is comfortable at all times.

Do not apply butter, gel or flour on burns as these things trap the heat which damage the epidermal layer and cause more damage.

If someone's clothing is on fire apply these simple rules; stop where you are, drop to the ground and roll around on the ground until the flames are smothered**.**

Fractures

A fracture is a break or crack along the bone and can be classified as either open or closed fractures.

Figure 32 Internal and external views of an arm with a compound fracture, both before and after surgery
Sjbrown at en.wikipedia

Open fracture- bone is exposed at the surface where the fracture occurs and the patient is likely to suffer bleeding and shock.

Closed fracture- this is the opposite to open fracture where the skin is not broken, however, the ends of the bone may damage nearby tissues and blood vessels which may cause internal bleeding.

How can you identify a fracture? This can be done by signs and symptoms such as pain, swelling, immobility, discolouration, protruding bone, disability and deformity.

Whenever a fracture occurs immobilize the fracture site by elevating the patient until medical attention arrives.

Sprain

A sprain is the overstretching or tearing of ligaments. This occurs when a person's joint moves beyond its normal range or motion.

Figure 33 Mild 2nd Degree Sprain, Rotated Inwards.
http://en.wikipedia.org/wiki/File:Sprained_foot.jpg

Some signs and symptoms to detect sprains are pain, swelling, disability, discolouration, tenderness and deformity.

A sprain is treated by applying the R.I.C.E principle and this is as follows:

R- Rest the injured part

I-Ice is applied to the injured site.

C- Compression bandage for support

E- Elevate the injured part

Electric Shock

Figure 34 Danger Electric Shock

Three simple procedures:

1. Do not touch the patient until the power supply is turned off.
2. If for some reason the power supply cannot be turned off use a non-conductive material (e.g. wood) to help remove the patient.
3. Finally, the first aider checks the patient to notice any signs of breathing if not resuscitation is applied.

Choking

Choking occurs when a foreign object or food particle blocks the air passage.

Treatments:

1. Apply a series of sharp blows
2. Use tour finger to assist in removing the object

3. Small children should be turned in an upside-down position and hit on the back.

4. Apply the Heimlich manoeuvre; the first aider stands behind the patient with his/her arms wrapped around the waist. Use your fist to press a series of approximately five quick inward and upward thrusts.

Figure 35 Abdominal Thrusts (Heimlich Manoeuvre)
Author: Amanda M. Woodhead
http://en.wikipedia.org/wiki/File:Abdominal_thrusts3.jpg

C.P.R. (Cardio Pulmonary Resuscitation)

These initials stand for Cardio Pulmonary Resuscitation. It is an emergency procedure used to restore breathing when a person's breathing and heartbeat has stopped. It is a combination of rescue breathing (mouth-to-mouth resuscitation) and chest compressions.

How to perform C.P.R?

- **CHECK** the victim, if the person is not responsive and not breathing or not breathing normally. Call the emergency number and return to the victim.
- **PUMP:** If the victim is still not breathing normally, coughing or moving, begin chest compressions. Push down on the center of the chest 2 inches 30 times. Pump hard and fast at the rate of at least 100/minute, faster than once per second.
- **BLOW**: Tilt the head back and lift the chin. Pinch nose and cover the mouth with yours and blow until you see the chest rise. Give 2 breaths. Each breath should take 1 second.
- Continue with 30 pumps and 2 breaths until help arrives.

Note it! / Warning

ISO-International Organization for Standardization sets a standard to have all first aid kit to have a green background with a white cross. This allows the kit to be easily recognizable to people requiring first aid treatment.

Session Summary

Summary

In this unit you learned the responsibilities of the first aider are to apply medical treatment to the injured until professional help arrives and to keep the patient comfortable. A first aid kit should be available at the work place and your home to treat injuries when they occur.

There are certain treatments to be applied for different injuries such as; wounds, burns, fractures and sprains. As a first aider you should be aware of the relevant treatments.

Finally, a first aider must be able to identify and detect the injury and administer the appropriate treatment to the injured part, for example, whether it is an open or closed wound, 1st, 2nd, or 3rd degree burns, a shock, an open or closed fracture, a sprain, an electric shock or someone choking.

Assessment

Assessment

Review lesson five (5) by answering the following questions:

1. What treatment should be applied to the following injuries?

    a. An open wound

b. 3rd degree burn

c. A closed fracture

d. An electrical shock

e. Someone choking

Unit Summary

Summary

In this unit you learned about food safety, hygiene and how to administer first aid.

Two factors are responsible for the occurrence of natural decay in food;

- The loss of moisture

Loss of moisture is most noticeable in fruits and vegetables; however, it can occur in meat, fish and cheese as well. Moisture loss in fruit and vegetables may occur because of respiration (loss moisture through leaves and skin). In the case of meat, fish or cheese moisture loss is then due to evaporation (loss of moisture from the surface of food items). In vegetables this results to dryness of skin and softening of the produce which leads to a very undesirable product. Signs of decay are most often seen in the discolouration of the skin and softening of the product

- The action of enzymes.

Enzymatic action can take the form of:

- Oxidation,

Oxidation takes place due to fruits and vegetables exposure to air, heat, light and metals e.g. copper and iron. This process can be minimized by the addition of anti-oxidants.

- Browning

The brown colour that develops on the exposed surface of foods such as apples, bananas and potatoes. This is due to enzymes present in these foods.

- Ripening

This is the change in the texture of the fruit from a firm texture to a tender one. This change is due to the conversion of the starch as a result of the enzymes in the fruit into sugar giving you the sweet pleasant taste. Enzymes are also responsible for the other changes which occurred.

Factors that Contribute to Food Contamination and Food Borne Illness

Food can make you sick if it's been infected by harmful germs and you eat it!!

How does the food become infected? If it is improperly handled or stored raw or cooked food, and of course sick people who prepare food!

The microorganisms responsible for food spoilage and contamination are:

- Bacteria; single celled, living microscopic organisms which replicate rapidly under suitable conditions. These conditions are moisture, proper temperature and food supply.

- Mould; a class of fungi which is slightly visible to the naked eye. They may be found growing on food items such as bread, fruit and cheese under warm and moist conditions. Moulds growing on food for long period of time can produce a substance called mycotoxin (toxins produced by moulds which are harmful to our bodies) which affects the organs of the body and caused food borne illness.

- Yeast; microscopic single celled fungi, the largest of all microorganisms which can be found in the air and soil and on the surface of fruits. Some yeast are highly tolerable in conditions such as high acid, salt and sugar concentrations and in some cases some can

A food handler has the responsibility to ensure that microbial loads are at a minimal level to provide safe food at high quality to the consumer. There are some basic precautions we need to be aware of when purchasing foods and by observing these measures we can avoid some of the problems that we encounter, for example deteriorating products, expired products or food supplies delivered or sold in unsanitary conditions. Let us spend some time on a few observations you should be aware of.

Storage plays an important part in the preservation of food items and as a result adequate storage is imperative for dry goods, refrigerated and frozen foods. The goods received should be placed in store rooms, chillers and freezers. Whatever

the storage always have in mind the areas should be well ventilated, free from rodents and insects and the appropriate temperature for the particular product

If you have to store cooked foods the temperature of the foods need to be cooled down below 41˚ F (5˚ C).Hot foods should be served at the correct temperature. Avoid the food temperature danger zone (41 to 135˚ F or 5˚to 57˚ C). Check holding food on a regular basis using a thermometer, this is important to maintain the right temperature throughout food service.

Another important aspect of food safety is the application of proper personal hygiene techniques e.g.

1. Bathe or shower daily. This ensures that the food handler is free from germs and micro-organisms.

2. Ensure that both uniforms and aprons should be spotlessly clean and preferably white as dirt and soils can be easily detected.

3. A hat or hairnet should be worn at all times to keep hair neat and

4. Keep moustache and beard trimmed and clean or completely removed if necessary. If facial hair is to be worn use a beard guard.

5. Always wash hands before handling food and after using the toilet, we want to continue to maintain a clean environment.

6. Ensure that cuts and sores are covered with waterproof dressings and they do not come in direct contact with food items. Use finger gloves.

7. Do not smoke in a room where food is being prepared

8. Never cough or sneeze over food; use a tissue and remove from the food site.

9. Avoid using hands to handle foods, always use disposable

Kitchen hygiene is very crucial to food safety. It goes hand in hand with good personal hygiene practices. Ensure that;

1. Work tables, surfaces, ranges and floors should be clean and sanitized regularly. Remember that Cleaning is to remove dirt and pieces of food items while sanitizing is to kill bacteria.

2. Utensils are kept clean and well stored away from rodents as they urinate and drop their filth wherever they pass. These cause diseases to be transmitted to humans which can be detrimental to our health.

3. Spills are wiped as they occur to prevent severe falls or burns if carrying a hot item.

4. Pets are not allowed in the surrounding as they can be a means of transmitting several diseases.

5. The dish cloth is properly rinsed out (this is a favourite spot for bacterial growth) and dried. Immerse in bleach regularly, especially when need to be reuse. Gentle reminder moisture is another factor for bacterial growth.

6. Raw foods are prepared separately from cooked foods, using separate cutting boards to avoid cross contamination, especially meats, poultry and seafood.

7. Waste is disposed of properly. Always keep the lid on the dustbin and wash your hands after putting waste in it. Try not to forget this one.

8. Meats, poultry and fish should be thoroughly thawed out before cooking.

9. Dish cloths should never be used to wipe floors; this is for your counter tops use a mop with a mop bucket.

10. Garbage is taken out regularly to avoid insects, maggots and rodents. Again these conditions provide a breeding ground and nutrients for them to strive.

11. Dustbins are placed away from the kitchen where food is being prepared in a cool and shaded position.

12. Bins are cleaned and disinfected regularly allowing them to dry thoroughly, since moisture together with food particles provide proper conditions for microbial growth.

An accident is an unfortunate incident that happens unexpectedly and unintentionally, typically resulting in damage or injury. Possible accidents include with hot pots and pans, spillage of liquids and other food stuff, improperly laid floor coverings, improper handling of electrical appliances, improper use, cleaning and storage of knives. Prevention of accidents in the kitchen requires vigilance. While accident prevention is important, knowledge of how to deal with accidents that do occur is also very important. This is why first aid knowledge is very important.

First aid is the provision of immediate care to a victim with an injury or illness, usually performed by a lay person, and performed within a limited skill range. First aid is normally performed until the injury or illness is satisfactorily dealt with (such as in the case of small cuts, minor bruises, and blisters) or until the next level of care, such as a paramedic or doctor, arrives. Some general first aid tips include;

1. Be calm and take charge, the reason being you are acting as a temporary medical attendant and as a result you must be able to take control of the situation until professional help comes about.

2. Assess the situation, which is to check to see what might be the problem.

3. Diagnose/identify the illness or injury and proceed to offer assistance.

4. Give immediate adequate and appropriate treatment to the patient to alleviate any discomfort.

5. Transport the patient to a safe place where it is comfortable.

Unit Assessment

Assessment

We've now come to the end of this unit on hygiene. Answer the questions that follow and see how well you understood what you learnt.

Circle the BEST answer in the following questions.

1. Mary contracted food poisoning, which of the following symptoms do you expect she'll express?

a) Dizziness and fainting

b) Fever and headaches

c) Stomach pains and diarrhea

d) Headaches and cramps

2. For lunch today you want to prepare Stewed Beef. You need to thaw the beef quickly, which is the safest way?

a) Place on the counter in a bowl

b) Run some cold water on it, while in a sealed plastic bag

c) Place it in sunny area on the counter

d) Run some hot water on it, while in a sealed plastic bag

3. Steamed fish steaks would become unsafe to consume due to the presence of;

a) yeast budding

b) mould growth

c) bacterial growth

d) Oxidation

4. You can prevent the development of food borne diseases if adopted which of the following practices:

i) Proper food storage

ii) Healthier cooking methods

iii) Waste Dsiposal

iv) Personal hygiene

a) I and II

b) II and III

c) I, III, and IV

d) II, III and IV

5. How can babies avoid contracting gastro-enteritis?

a) The availability of better trained doctors

b) Choosing to breast feed over bottle feed

c) Sterilizing of their bottles

d) Giving them herbs and cod liver oil

6. Which of the following foods **CANNOT** be considered a 'high risk' food?

a) Baked muffins

b) Chilled fish fillets

c) Frozen chicken drumsticks

d) Rice salad

7. The person or group of persons MOST at risk for developing food borne illnesses are

a) Pregnant women

b) Young babies

c) Persons with HIV or cancer

d) All of the above

8. Homemade sanitizing solution is made using;

a) 5militres of bleach and 1 liter of water

b) 5 milliliters of bleach and 750 milliliters if water

c) 5 milliliters of bleach, 750 milliliters of water and 2 teaspoons of dishwashing liquid

d) 5 milliliters of bleach, 1 liter of water and 2 teaspoons of dishwashing liquid

9 The maximum amount of time that food should safely in the danger zone is

a) one hour

b) two hours

c) three hours

d) four hours

10. The temperature range in the danger zone is

a) 4-60^{o}C

b) 18-0^{o}C

c) 0-40^{o}C

d) 60-80^{o}C

State whether the following statements are True or False; write 'T' next to those responses that are true and 'F; next to those responses that are false.

1. Cleaning supplies like bleach etc should be purchased first at the supermarket so that don't contaminate food items _____
2. Frozen foods should be purchased last at the grocery store_____
3. Yogurt purchased on the expiry date is safer to eat than potatoes that have sprouted _____
4. You should wash your hands for at least ten (10) seconds_____
5. First aid assistance should only be given be competent medical personnel _____
6. You should cool a burn by pouring melted butter on it_____
7. The Heimlich manoeuvre involves the first aider standing behind the patient with his/her arms wrapped around the waist _____

8. You should wash your hands when you begin to prepare food _____

9. Meat that is going to be cooked soon is stored at the bottom of the refrigerator because the bottom of the refrigerator is the coldest part of the refrigerator_____

10. Cracked eggs are a source of food contamination _____

Answer All of the Following Questions

1. List five items that you'd find in the first aid kit. State the use of each item named.

1. _____

2. _____

3. _____

4. _____

5. _____

2. Outline five ways in which food handlers can prevent food contamination as they purchase, store and prepare food.

_____

_____

_____

_____

_____

_____

3. Explain the difference between cleaning and sanitizing as you prepare your kitchen counter tops for use.

4. Explain how the following accidents could have been avoided;

   a) A pot of steaming hot rice was knocked off the counter.

   b) While washing the dishes you got cut with a dirty knife

   c) The curtain hanging from the window above the stove caught on fire.

d) Your baby brother ingested a poisonous liquid stored in the kitchen cupboard.

Now check back in the unit for the answers to these questions.

Contents

Unit 11

Purchasing Various Foods

Introduction

In previous units, we examined the essential nutrients, their importance to our bodies and their food sources. We also looked at meal planning and showed that there is a relationship between balanced meals and good health. We need to have wholesome foods to prepare these balanced meals. How do we get food to prepare for our meals? We can produce them. But can we produce all the foods we need? No we cannot. So how can we get the foods we need to prepare our meals? Yes, you are right, we can purchase them.

Where do you purchase foods to prepare your meals? Do you know how to select wholesome foods? Good success in food preparation starts with the purchasing of wholesome foods. This requires that you should know the physical characteristics of foods as they relate to their purchase. When you visit the market, grocery, food mart or supermarket, there are a variety of foods available. The purchasing of wholesome foods influences the quality of a meal.

In units 9 and 10 you learnt how to be a responsible consumer and how to spend your money wisely. Unit 11 will take you a step further. You will get information on the factors influencing food purchasing; the forms in which foods are sold; the physical characteristics of various foods; points to consider when selecting foods for purchase; and how to store the foods that were purchased. This unit is designed to equip you to be a responsible consumer.

Upon completion of this unit you will be able to:

Outcomes

- *Identify* the different forms in which foods are sold.
- *Select* wholesome foods for purchase.
- *Purchase* food and get value for your money.
- *Store* foods appropriately for future use.

How long?

You need to devote approximately fifteen hours to complete this unit.
Nine hours of formal study and six hours of self-study

This Unit is Comprised of Five Sessions.

Session 11.1 Getting Ready to Purchase Food

Session 11.2 Purchasing Staples, Legumes and Nuts

Session 11.3 Purchasing Meat, Fish and Poultry

Session 11.4 Purchasing Milk, Cheese and Eggs

Session 11.5 Purchasing Fruit and Vegetables

Session 11.1 Getting Ready to Purchase Foods

Introduction

Have you ever paid attention to the different forms in which food is sold? Can you identify the different types of food packaging? What factors influence the food purchase of your family? What points do you consider before purchasing foods? This session will inform you of the different forms in which food is sold. It will also provide information on the different types of food packaging. This session will show the factors which influence food purchasing. General guidelines on food purchasing will also be given. The information in this session will serve to equip you to make better choices when purchasing food.

Outcomes

Upon completion of the session you will be able to:

Identify the various forms in which food is sold.

State suitable food packaging for different foods.

Determine the factors that influence food purchasing.

Identify foods for purchase adhering to certain important guidelines.

How long?

In order to complete this session, you need to schedule 2 hours formal study time. You are also required to allocate 1 hour self-study time to review concepts and complete activities/assessments.

Terminology

Dehydration:	Dehydration is the process of removing water from a substance.
Enzymes:	Enzymes are proteins that accelerate a chemical reaction without altering the nature of the reaction.
Microorganisms:	Microorganisms are living organisms, such as bacteria, fungi and viruses, too small to be seen with naked eye visible under a microscope.
Thaw:	Thaw is to change from a frozen solid to a liquid by gradual warming.
Vegetarianism:	Vegetarianism is the practice of consuming a diet composed primarily of vegetables, cereals, legumes, nuts and fruits with or without eggs and dairy products.
Yield:	Yield is the number of servings obtained from a given amount of food.

11.1-1 Forms and Packaging of Foods

What are the forms in which foods are sold? In a large supermarket, you will get a very good view of the different forms foods are sold. Have you ever visited a large supermarket? If you did you would have seen the wide variety of fresh, frozen, dried, canned and bottled foods. How do you decide which form of food to buy? This will depend on the purpose of the food purchase; the required convenience; and the available food storage facilities.

Now let's examine each form in which food is sold!

The various forms in which foods are sold are as follows:

The table below shows the advantages and disadvantages of the various forms of food.

Food Form	Advantages	Disadvantages
Fresh foods	▪ Contain most of their nutrients. ▪ Have better taste and texture than the other forms of foods. ▪ More attractive in appearance.	▪ Nutritive value declines after a few days in storage. ▪ Decay within a short period. ▪ Require longer preparation time.
Frozen foods	▪ More economical than fresh foods. ▪ Requires less preparation time. ▪ Produce less wastage	▪ May lose their shape and texture. ▪ Nutrients are lost during thawing.
Canned and bottled foods	▪ More economical than fresh foods. ▪ Produces no wastage. ▪ Easily stored. ▪ Have a longer shelf life.	▪ Nutrients are lost during heat processing. ▪ Salt and sugar are added. ▪ Taste and texture of food changes.
Dried foods	▪ Require little storage space. ▪ Stored for long periods. ▪ Not bulky in weight.	Loses their natural texture and colour.

Figure 1 Various Forms of Food Purchased

Fresh Foods

Fresh foods are unprocessed foods which contain most of their nutrients. They are perishable and therefore have a limited shelf life. These foods should be stored for a short period in a cool place such as a refrigerator and used as soon as possible. Long storage periods cause fresh food to deteriorate and reduce their nutritive value. Examples of fresh foods are vegetables, fruits, meat, fish, eggs, and milk.

Frozen Foods

Frozen foods are kept at a low temperature of 0º F or lower in a freezer. Freezing stops the action of enzymes and microorganisms present in the foods. Frozen foods do not deteriorate for long periods, once they are kept at the correct temperature. Examples of frozen foods are frozen meats, fish, poultry, mixed vegetables, corn and cassava.

Canned and Bottled Foods

There are a variety of canned and bottled foods to be purchased. Canned and bottled foods were subjected to high temperatures to destroy the microorganisms and enzymes present in the foods. The sealing of the cans and bottles prevent contamination during storage. Canned and

bottled foods are usually soft in texture and often require no cooking. These foods should be stored in a cool, dry place.

Dried Foods

All fresh foods contain a large percentage of water. The water in food contributes to its deterioration. Microorganisms depend on water for their growth and reproduction. Dried foods were exposed to a process referred to as dehydration. This process involves the removal of water from the foods. Dried foods should be stored in a cool dry place. These foods are lightweight, require little storage space and can be stored for long periods.

Food Packaging

Foods in whatever form are packaged in a manner to maintain their quality. Packaging also serves to display the food to appeal to the consumer. The food packaging informs the consumer on the nutritive value of the food. Figure 11.1.1 and table 11.1.2 shows the different types of food packaging.

Figure 2 (11.1.1 Different types of food packaging)
Image: DEU

Food packaging	Food examples
Plastic bags	Fresh vegetables, frozen meat, frozen fish, bread, dried peas and beans, powdered milk.
Plastic tubs	Fruits, margarine, yoghurt.
Plastic bottles	Cooking oil, mayonnaise, liquid milk.
Plastic trays	Fresh and frozen meat cuts, poultry and fish cuts, pre-cut vegetables.
Aluminum cans	Corned beef, sardines, vegetables,

Food packaging	Food examples
	soups, peas, beans, condensed milk.
Cardboard carton	Liquid milk, fruit juices.
Glass bottles and jars	Fruit juices and fruit drinks, jams, pickles.
Paper wrapping and bags	Wheat flour, corn meal.

Figure 3 Types of Food Packaging

Activity

Now that you have learnt about the various forms in which foods are sold and their packaging set aside some time to do the following activity.

Visit a supermarket or grocery and record the forms in which the following foods are sold:

- Meats
- Fish
- Corn
- Tomato
- Cheese
- Milk
- Flour
- Peas

Feedback

Comment on the packaging used for each food stated. Record your responses in writing space provided.

11.1-2 Making a Decision to Purchase Food

What influences your food purchase? There are certain factors that influence a person's food purchase. These factors determine the amount, the types and the variety of foods purchased. The factors that determine food purchasing include: income; food availability; personal preferences; nutrition education and advertisements. Now let's look at each of these factors in greater detail and see their influence on our food purchases.

Income

The income of consumers influences the types, amount and variety of foods that they purchase. Consumers may be either of a high income, middle income or low income level. Consumers of high income can afford to purchase a wide variety of foods. Consumers of a low income level have limited income. They are unable to purchase expensive foodstuff, such as meat, fish, milk, fruits and vegetables. These foods may be seldom included in their daily diets. Consumers who have a limited budget may tend to purchase cheaper foods to provide the necessary nutrients in their diet. For instance, they may tend to purchase cheaper cuts of meats and more cereals and legumes to meet their nutritional needs.

Food Availability

What foods are available for sale in the vicinity where you live? Is there a grocery or supermarket close to your home? How far is the market from where you live? The availability of food determines the food purchases of consumers. When a wide variety of foods are available, the consumer can compare products and prices and make the best choice for purchase. Limited food choices may cause consumers to purchase the same types of foods when making their purchases. In some food stores imported foods and locally grown foods are sold. The consumer is given

the option to purchase either imported foods or locally grown foods. The foods in season at the particular time of the year also determine the availability of foods for purchase.

Personal Preferences

Which foods do you prefer? Do you prefer carrots over pumpkin? Most people have their food preferences. These preferences may be due to their likes or dislikes, e.g. people may prefer chicken over beef. Others may prefer foods over other foods due to vegetarianism, medical reasons or food allergies. Strict vegetarian do not include food from animals in their diet. There are other types of vegetarian who may include certain foods from animals, such as milk and its products, eggs or fish. This depends on their preferences. Some people may prefer foods that would enhance their health. For example, some people may choose fish over milk because milk makes them ill.

Nutrition Education

Did you know that education should bring about positive change to the life style of a person? Nutrition education increases knowledge of the nutritive value of foods. This knowledge causes some consumers to purchase foods that would promote their general health and wellness. Nutrition education also equips the consumer to be able to read and interpret food labels and make informed choices.

Advertisements

Why do manufacturers advertise their products? Do some of these advertisements mislead consumers? Manufacturers advertise their food products to promote their sale. Food advertisements tend to persuade consumers to purchase the advertised food. Most advertised foods tend to contain high, fat, sodium and sugar. Some food advertisements mislead consumers about the food products. This results in consumer dissatisfaction.

General Guidelines for Purchasing Food

Before we look at what points to consider when purchasing certain foods, let's examine some important guidelines for food purchasing.

1. Make a shopping list

Have you ever gone to the grocer and forgot what you came to purchase? A shopping list is a helpful tool to ensure that you purchase the foods you need. Check the food cupboards, refrigerator and freezer for the foods you have in stock before making your shopping list. It is useful to plan your meals for the week and develop your shopping list from your plan. Consumers should be guided by their shopping lists to avoid wastage of money and food.

2. Shop Economically

Don't you like to save money when shopping? One way to do this is by using clip and save coupons. Manufacturers often use these coupons to promote the sale of their food products. Clip coupons can save you money on food items that you normally purchase. However consumers should practice comparing prices of comparable food products. Have you ever seen pre-cut vegetables being sold in the supermarket? I'm sure you did. You can save money by purchasing whole vegetables instead of those that were pre-cut. It is better to cut your vegetables just before you are ready to cook them.

3. Examine Products with Red Stickers Carefully

Have you ever seen food with labels such as "buy one, get one free" or "discounted food products"? As a consumer, you should read these labels carefully. Check for relabeling and repackaging of food products. Foods sold in this manner are to be consumed immediately and not for prolonged storage.

4. Check Food Label Dates

Do you know what the different dates mean on the different food packaging? Food poisoning may be associated with eating expired food items. Symptoms of food poisoning are diarrhea, abdominal cramping, and vomiting. It is therefore important for consumers to know what the different dates mean to make informed choices. The table below provides information on the different dates placed on food packaging and their meanings.

Types of Food Label Dates	Meanings
Best if used by; Better if used before; Best by or Best before	▪ These dates are advisory. ▪ The food freshness and flavour may be lost after these dates. ▪ These dates do not guarantee product safety. ▪ These dates must appear on pre-packaged foods that will keep fresh for three months or less.
Use by	▪ Food will be no longer safe to consumer after the specified date. ▪ Food has to be stored correctly. ▪ This date is used on highly perishable foods. ▪ Food should not be purchased beyond the use by date.
Sell by or	▪ Guides retailers on how long the product should be displayed.

Types of Food Label Dates	Meanings
Display until	▪ Product should be bought before the sell by date.
Expires on	▪ Food product has to be consumed before the expiry date. ▪ Food should be discarded if this date has passed. ▪ Food consumed after expiry date poses a health risk

Figure 4 Dates Found on Food Labels

5. Consider Food Yield

The yield of foods is important for adequate servings for daily meals. The quality and condition of the food purchased affect its yield. Consider the peeling waste when purchasing fresh vegetables. In the case of meat purchase consumer should consider the fat trimming and bone. Consider also the yield of a particular food in different forms. For instance, consider the yield of canned peas compared to the same weight of dried peas.

6. Read Food Labels Carefully

It is not a good practice to purchase foods without having any information about the food. Find out the nutritional value of the food. Check whether the ingredients are natural or synthetic. Check whether food was semi or fully produced. Reading the food labels gives consumers information to decide whether or not they should purchase the food product.

7. Inspect Cans and Jars Carefully

Have you ever seen dented cans of food in the supermarket? Do not purchase cans that are dented, bulging or rusty. Food content of such cans should not be consumed because of the growth of bacteria - Clostridium botulinum. A toxin produced by Clostridium botulinum is the danger concern of canned and bottled foods.

Note it! / Warning

- Never purchase nor use food from cans that are leaking, bulging, rusting or badly dented.
- Do not purchase food in jars that are cracked or have loose or bulging lids.

8. Check Food Packaging Carefully

Food packaging protects food from being contaminated with germs. It also helps to increase the shelf life of the food product. Will you purchase a food product with its packaging torn? Consumers should ensure that the food packaging is intact and not tampered with.

9. Ensure Correct Temperature for Refrigerated Foods

Do you know the purpose for keeping foods in a refrigerator? Refrigerated foods are kept at a temperature between 33 and 38º F. The growth of microorganisms in refrigerated foods is slowed down. Do not purchase foods stored at higher temperatures that cause microorganisms to grow quickly.

10. Ensure Correct Temperature for Frozen Foods

Do you know the temperature at which frozen foods are kept in the supermarket? Frozen foods stored at 0º F or below remain safe for consumption. Once frozen foods are stored correctly, their colour, texture, nutritional value and taste will be retained. Do not purchase foods which have been thawed. Examine frozen packaging for ice crystal formation. This is an indication that the food has been thawed and refrozen. This affects the food quality and makes the food unsafe for consumption.

Note it! / Warning

Why food becomes unsafe for consumption after it has been thawed and refrozen?

Frozen foods are stored at a temperature below that at which microorganisms can grow. The growth of microorganisms is merely stopped during the freezing process. When frozen foods are thawed the microorganisms will begin to grow again. The danger concern is that the food can spoil before it is refrozen. If this food is eaten it can be a source for food poisoning. Do you know that severe cases of food poisoning can be fatal?

Activity

Fill in the Blank Activity

A basic understanding of what the food label dates mean can help you to select wholesome foods. Indicate the correct food label date in column A that apply to the relevant statement in column B. Number one was done as an example for you.

Column A Food label dates	Column B Relevant statements
1. Expiry date	Food should be discarded if this date has passed.
2.	The food freshness and flavor may be lost after this date.
3.	This date indicates how long the food product should be displayed.
4.	This date must appear on pre-packaged foods that will keep fresh for three month or less.
5.	Food will no longer be safe to consume after the specified date.

Figure 5

Feedback

You can check your answers to the activity below.

1. Expiry date
2. Best before date
3. Sell by date
4. Best before date
5. Use by date

Were you able to complete activity 11.1-2 correctly? Well congratulations! If you were unable to complete it correctly, review the relevant part of the session and try again.

Session Summary

Summary

In this session you learned that food is available in fresh, frozen, canned and dried forms for purchase. Foods for purchase are suitably packaged to maintain their quality. The food packaging also provides information about the food product. Food purchases are influenced by consumers' income, their preferences, food availability, nutrition education, and advertisements. Consumers can follow certain important guidelines to ensure the foods they select for purchase are of a high quality.

Assessment

Assessment

Now that you have completed this session, let's see if you can answer the following correctly.

You are required to answer all of the following questions. Write your responses in the space provided.

1. What are the various forms in which food is sold?

2. State the suitable food packaging for the following list of foods.

Foods	Suitable food packaging
Fresh fish cuts	
Wheat flour	
Fresh carrot	
Corned beef	
Fruit juices	
Yoghurt	

Figure 6

3. What are five factors that influence consumers to purchase different types of food?

4. What are five general guidelines consumers can adhere to when purchasing food?

Now that you have completed assessment 11.1, you can check the answers for it below.

Answers to Assessment

1. Various forms in which food is sold are:

- Fresh food
- Frozen food
- Canned food
- Dried Food

2. Suitable food packaging for the following foods are:

- Fresh fish -plastic trays
- Wheat flour -paper bags
- Fresh carrots -plastic bag

- Corned beef -aluminium cans
- Fruit juices -glass bottle or carton
- Yoghurt -plastic tub

3. The following are five factors that influence consumers to purchase different types of food:

- Income
- Food availability
- Personal preferences
- Nutrition education
- Advertisements

4. General guidelines that consumers can adhere to when purchasing wholesome food are:

- Make a shopping list.
- Shop economically by making use of clip coupons and comparing prices.
- Examine product with red sticker carefully.
- Check food label dates e.g. “best before” date or “use by” date.
- Consider food yield.
- Read food labels carefully.
- Inspect food cans and jars carefully.
- Check food packaging carefully.
- Ensure correct temperature for refrigerated foods.
- Ensure correct temperature for frozen foods.

Were you able to answer all the questions correctly? Well congratulations! If you were unable to answer all the questions correctly, review the session and try again.

Session11.2 Purchasing Staples, Legumes and Nuts

Introduction

Do you remember what staples are? Can you think of some examples of staple foods? What about legumes? Do you know what they are? Do you know what to look for when purchasing these foods? If you are not

sure of what to look for when purchasing these foods, do not worry. The information in this session will be beneficial to you in this respect.

Outcomes

Upon completion of this session you will be able to:

Outline the different forms in which cereals are sold.

State points to consider when purchasing staple foods.

State points to consider when purchasing legumes and nuts.

Explain how to store staples, legumes and nuts correctly at home.

How long?

You will need 2 hours of formal study and 1 hour of self study to complete this session.

Terminology

Cereal:	Cereals are edible grains obtained from cultivated grasses.
Dietary fibre:	Dietary fibre refers to the cell walls of plants which cannot be digested by the body. It is found in cereals, fruits and vegetables.
Legumes	Legumes is the term used to describe dried peas, beans and lentils as a group.
Nuts:	Nuts are fruits consisting of usually a single edible seed enclosed in a hard shell.
Staples:	Staples refer to foods that made up the bulk of the diet and mainly supply energy and nutrient needs. Examples of staples are cereals and other starchy foods.
Pasta:	Pasta refers to the various shapes made from unleavened dough. The dough is made of wheat flour, water and sometimes eggs. Examples of pasta are macaroni, shells, spaghetti and vermicelli.

11.2-1 Staples Purchase

Staple foods are regularly consumed in large quantities as they often make up the bulk of the diet. They serve as a major source of energy and nutrients. Staple foods can be further grouped into cereals and starchy fruits roots, and tubers. The structures of the foods in these two groups are different. So we are going to examine how to purchase cereals and starchy fruits roots, and tubers separately.

Purchasing Cereals

Do you know what cereals are? What are some examples of cereals? Cereals are edible grains obtained from cultivated grasses. The main cereals are wheat, corn, rice, barley, rye and oats.

The structure of different cereal grains is similar. Cereal grains have three distinct parts: the pericarp, the endosperm and the germ.

When you visit the supermarket what are the different forms in which cereals are sold? Cereals are available in different forms for purchase:

- As a grain – e.g. rice, corn kernels, and barley
- As flour – which can be used for bread, pasta, porridge and dumpling
- As breakfast cereals – grains are processed to manufacture ready-to eat or instant breakfast products. Figure 4 provides more information on the various forms in which cereals are sold.

Cereals	Forms sold in
Wheat	Wheat is ground into different types of flour and used to make bread and pasta. Also sold as cracked wheat, ready-to-eat breakfast cereal in the form of flakes, shreds, granules and puffs.
Corn	Corn is sold fresh, frozen, canned and dried in a meal form. Also sold as ready-to-eat breakfast cereal in the form of flakes and puffs.
Barley	The husk is removal from the whole grain and is sold as pearl barley. Barley grains are also ground into flour. Also sold as ready-to-eat breakfast cereal in the form of granules.
Rice	Rice is sold without its husk as brown rice, and milled and polished as white rice. It is

Cereals	Forms sold in
	also ground into flour. Also sold as ready-to-eat breakfast cereal in the form of flakes and puffs.
Rye	Rye is ground into flour. It is also sold in the form of crisp bread.
Oats	Oats are rolled coarse, medium and fine oat meals. Also sold as ready-to-eat breakfast cereal –oat puffs and instant mixed cereals.

Figure 7 Forms in Which Cereals are Sold

Now that we have looked at the various forms in which cereals are available for purchase, let's see what we should pay attention to when purchasing them!

Points to Consider when Purchasing Cereal Foods

- Read labels on packaging carefully for the best before date, the product nutritional content and storage.
- Buy whole grain cereal to benefit from their essential nutrients and dietary fibre. Examples cracked wheat, cornmeal, oatmeal and brown rice.
- When purchasing ready-to-eat breakfast cereals look for those with at least 3 grams of dietary fibre per ½ cup serving.
- Cereals should be free from weevils, dirt and mould.
- Compare the cost of ready to eat cereals with the cost of other forms of cereals.
- Pay attention to the hidden sugars. Some ready-to-eat cereal may contain a mixture of sugars – e. g. cane sugar, corn syrup and honey. Buy those cereals with 5 grams of sugar per ½ cup serving or less.
- Check packaging to ensure it is secure and not tampered with.

Storage of Cereals

- Store dried cereal in a sealed glass or plastic container, cool, dry place. If cereals are exposed to damp air they take up moisture and go mouldy.
- Never store dried cereals in refrigerator as moisture and odours from other food can be easily absorbed.
- Wrap and secure cereal packaging properly to avoid insect infestation.
- Opened packages should be placed in zip lock bags before storing in a cool, dry place.

Activity

You are required to set some time aside and go to the supermarket in order to complete this activity.

The following table shows a list of cereals and an example of a form in which they are sold. You are asked to visit the supermarket and record two (2) other forms in which each of the listed cereals are sold. Number one was done as an example for you to follow.

Cereals	Examples of the Forms Sold in
1. Wheat	Pasta, wheat biscuits and cream of wheat.
2. Oats	Oats puffs,
3. Rye	Rye flour,
4. Barley	Pearl barley,
5. Corn	Corn flakes,
6. Rice	Brown rice,

Figure 8

Feedback

Did you see a variety of cereals when you visited the supermarket? I'm sure you did. The following is a list of possible responses for each cereal listed. If the responses listed below differ from those you have recorded, consider them as additional information.

1. Wheat biscuit, cereal of wheat
2. Oats flour, rolled oats groats
3. Rye flakes, rye bread
4. Barley grits, quick barley
5. Corn grits, corn bran
6. Rice puffs, rice krispies

Cereals are not the only staple food you may have to purchase. Let's see how to purchase another set of staple foods: starchy fruits, roots and tubers.

Purchasing Starchy Fruits, Roots and Tubers

Do you know what starchy fruits, roots, and tubers are? Do you know how to go about purchasing these foods? Before we look at how to purchase these foods, let's look at how we can identify these foods.

Let's first look at starchy fruits.

Starchy fruits are fruits high in starch and have to be cooked first before being consumed. Examples of starchy fruits are breadfruit, green bananas, plantains and breadnut.

What about starchy roots and tubers?

Starchy roots and tubers are modified, thickened root or stem which generally develop underground and are used for food. Starchy roots and tubers include: starchy root, tuber and corm crops. Can you distinguish between these crops? It is useful for you to be able to tell the difference between these crops. You will certainly be a better shopper.

Let's take some time to see what is unique about these crops.

Starchy Root cCops

Starchy root crops are plants with edible modified roots which are tuberous, fleshy storage organs. Examples of starchy root crops are arrowroot, cassava and sweet potato.

Starchy Tuber Crops

Starchy tuber crops are swollen, fleshly underground stem of plant bearing buds (eyes) from which new plant shoots arise. Examples of starchy tuber crops are yam, cush-cush and Irish potato.

Starchy Corm Crops

Starchy corm crops are short, vertical, swollen underground plant stems that serve as storage organs. Examples of corm crops are dasheen, eddoes and tannia.

Activity

In order to be a good shopper, you should be able to identify different types of foods. This activity is designed to see if you can outline two examples of foods in the following categories. You can write your responses in the space provided.

1. starchy fruits

Examples:

2. starchy root crop

Examples:

3. starch tuber crop

Examples:

4. starchy corm crops

Examples:

Feedback

Once you have completed activity you can check the correct responses listed below.

1. Breadfruit, green banana, plantain, breadnut.
2. Sweet potatoes, cassava, arrowroot
3. Yam, cush-cush, Irish potatoes
4. Dasheen, tannia, eddoes

Were you able to complete activity 11.2-2 successfully? If you did congratulations! If not, review the relevant part of this session and try again.

Points to Consider when Purchasing Starchy Fruits, Roots and Tubers

Let's now look at what to pay attention to when buying starchy fruits, roots and tubers.

Starchy fruits, roots and tubers may be sold either fresh, frozen, dried or flour form.

When buying starchy fruits, roots, and tubers consider the following:

Fresh

- Buy starchy fruits that are heavy for their size and not over-ripe. Pay attention to the colour of breadfruit, green banana and plantain. In the case of breadfruit and green banana select those light green in colour without brown spots on them. Brown spots indicate ripening has started to take place.
- Buy ripe plantain without black spots on the skin.
- Buy starchy roots and tubers that feel heavy for their size. They should have neither bruises nor soft spots which may lead to spoilage. They should also show no sign of sprouting. This might be evident in the case of Irish potato, yam, and cush-cush.

Frozen

- Buy frozen starchy foods, such as breadfruit, cassava dasheen and sweet potato, that are kept at a temperature of 0º F or below in a properly labelled and sealed package.

Dried Chips and Flour

- Check to ensure that package is sealed securely.
- There should be no insect holes on package.

Storage of Starchy Fruits, Roots and Tubers

How to store these foods until you are ready to use them?

Fresh

- Store foods such as breadfruit, green banana, Irish potato, yam, dasheen and sweet potato in a dark, cool, dry place to prevent them from becoming mouldy. This type of storage is especially important to prevent tubers, such as Irish potato and yam, from sprouting. Storing Irish potato in a place with light causes it to become green.

Frozen

- Store frozen starchy foods such as breadfruit, cassava, dasheen and sweet potato in the freezing compartment or freezer. Frozen foods should be kept at 0º F or below. Food should be properly wrapped and labelled.

Dried Chips and Flour

- Store dried chips and flour of these starchy foods in a cool, dry and clean place.

Activity

This activity is designed to see if you can select good quality staples for purchase. You are given a list of staples you may have to purchase. Each staple food is described briefly. You are required to circle the phrase that describes the staple food you will select for purchase. Number one is done as an example for you to follow.

1. Breadfruit

(a) that has a nice green colour.

or

(b) with some brown spots.

2. Ripe Plantain

(a) with some black spots.

or

(b) without black spots.

3. Sweet Potato

(a) with one bruise.

or

(b) without any bruises.

4. Yam

(a) with signs of sprouting.

or

(b) with no sign of sprouting.

5. **Frozen Cassava**

(a) kept at a temperature of 0º F or lower.

or

(b) kept at temperature of 33º to 38º F.

6. Dried Chips and Flour Packages

(a) show evidence of insect holes.

or

(b) show no evidence of insect holes.

Feedback

Once you have completed the activity, you can check the correct responses listed below. You should have circled the following responses in completing activity. Let's see how you did.

1. **Breadfruit**

- that has a nice green colour.

2. **Ripe Plantain**

- without black spots.

3. **Sweet Potato**

- without any bruises.

4. **Yam**

- with no sign of sprouting.

5. **Frozen Cassava**

- kept at a temperature of 0º F or lower.

6. **Dried Chips and Flour Packages**

- show no evidence of insect holes.

Were you able to complete activity 11.2-3 successfully? If you did congratulations! If not, review the relevant part of this session and try again.

11.2-2 Legumes and Nut Purchases

Legume is the term used to describe dried peas, beans and lentils as a group. Examples of legumes are black-eye beans, pigeon peas, split peas, channa, kidney beans and lentils. A nut is a fruit consisting of usually a single edible seed enclosed in a hard shell. Nuts include walnut, pecan, almond, cashew and hazel. Legumes and nuts are inexpensive sources of protein which can be consumed with cereals. They also add bulk to our diet in the form of dietary fibre. Legumes are sold in two forms: dried and canned.

Do you know what to look for when purchasing legumes and nuts? If you are not sure, we are going to deal with some points to consider when purchasing these foods. You'll see how simple it is to purchase legumes and nuts, once you know what to look for.

Points to Consider when Purchasing Legumes and Nuts

- Buy from food stores where there is a fast turnover to avoid buying legumes and nuts that aren't fresh.
- Avoid buying packages with large amounts of cracked and wrinkled legumes. Legumes should be smooth in appearance and not shrivelled. Shrivelled legumes are usually old and do not cook well.
- When buying canned legumes choose cans that are not dented or bulging in anyway.
- Compare yield and cost of dried legumes with that of canned legumes.
- Consider the high salt content and preservatives in canned legumes.
- Buy legumes and nuts that are not infested with weevils.
- Buy nuts with a fresh looking appearance and have no unpleasant or rancid odour.
- When buying nuts in shells purchase those with no cracks or insect holes. If nuts in shell are shaken there should be no rattling sound.

Once you have purchased good quality legumes and nuts, you need to know how to maintain their freshness and quality until used in food preparation.

Storage of Legumes and Nuts

- Store legumes and nuts in a sealed glass or plastic container and keep in a cool, dry place.
- Ensure packaging is secure to avoid insect infestation.
- Opened legumes and nut packages should be placed in zip lock bags and store in a cool, dry place.

Activity

You are going shopping for food and on your shopping list are: dried kidney beans; canned pigeon peas and walnuts. What points will you consider when selecting each food for purchase? Write your responses in the space provided.

1. Dried kidney beans

2. Canned pigeon peas

3. Walnuts

Feedback

Once you have completed activity 11.2-4, you can check the correct responses listed below. Let's see how you did.

1. Dried kidney beans

- Beans should have a fresh looking appearance.
- Beans should have a smooth appearance and not shrivelled.
- Package should not have a large amount of cracked or wrinkled beans.

2. Canned pigeon peas

- Do not buy cans that are dented or bulging.
- Compare the yield and price of canned pigeon peas with those of dried pigeon peas.
- Consider salt content in the canned pigeon peas.

3. Walnuts

- Walnuts should have a fresh looking appearance
- There should be not unpleasant or rancid odour.
- The nuts shells should have no cracks or insect holes.
- There should be no rattling sound when nuts shells are shaken.

Were you able to complete activity 11.2-4 successfully? If you did, congratulations! If not, review the relevant part of this session and try again.

Session Summary

Summary

In this session you learned that the cereals wheat, corn, barley, rice, and oats, are sold in different forms. These cereals are sold either as a grain, flour or ready-to-eat breakfast cereals. Consumers should purchase whole grain cereals to benefit from their essential nutrients and dietary fibre. They should read the labels carefully before purchasing ready-to eat cereals. When purchasing starchy fruits, avoid those with brown spots, which indicates ripening. Starchy roots and tubers should be free from bruises, soft spots and sprouts. Legumes should not be cracked, wrinkled or shriveled in appearance. Nuts should have a fresh looking appearance and with no rancid odour. The nuts shells should have no cracks or insect holes. Staples, legumes and nuts should be stored in cool, dry place to maintain their freshness.

Assessment

Assessment

Now that you have completed this session, let's see if you can answer the following questions correctly.

You are required to answer all of the following questions. Write your responses in the space provided.

a State two (2) points to consider when purchasing the following foods:

1. Ready-to-eat breakfast cereals

2. Fresh yam

3. Green banana

4. Frozen cassava

b Explain briefly how the following foods should be stored to ensure their freshness and good quality are maintained.

1. Corn meal

2. Sweet potato

3. Dried lentils

Now that you have completed the assessment , you can check the answers for it below.

Answers to Assessment

a State points to consider when purchasing the following foods:

1. Ready-to-eat breakfast cereals

- Consider ready-to-eat breakfast cereals with at least 3 grams of dietary fibre per ½ cup serving.
- Compare the cost of ready-to-eat breakfast cereals with that of other forms of cereals.
- Pay attention to the sugar content in ready-to-eat breakfast cereals.

2. Fresh yam

- Should be heavy for its size.
- Should be without bruises and soft spots.
- Should show no sign of sprouting.

3. Green bananas

- Should be heavy for their size.
- Should have a nice green colour.
- Should be without brown spots.

4. Frozen dasheen

- Purchase frozen dasheen kept at a temperature of 0º F or lower.
- Frozen dasheen should be in a package sealed properly and labelled.

b Explain briefly how to store the following foods to maintain their freshness and good quality.

1. Cornmeal

- Store cornmeal in a secure glass or plastic container in a cool, dry place. Ensure that cornmeal package is wrapped securely to avoid insect infestation.

2. Sweet potato

- Store sweet potato in a dark, cool, dry place to prevent it from becoming mouldy.

3. Dried lentils

- Store dried lentils in a secure glass or plastic container and keep in a cool, dry place. If package was opened secure it properly in a zip lock bag to avoid insect infestation.

Were you able to complete assessment 11.2 successfully? If you did congratulations! If not, review this session and try the assessment again.

Session 11.3 Purchasing Meat, Poultry and Fish

Introduction

Do you enjoy eating meat as part of your meal? Or do you prefer fish? Your satisfaction of either a meat or fish dish begins by choosing wholesome meat or fish of good quality. Meat, poultry and fish are highly perishable foods. We need to handle these foods correctly to ensure they are safe for consumption. Meat, poultry and fish add variety to a meal and can be prepared in various ways. These foods can be purchased fresh, frozen or canned.

Outcomes

Upon completion of this session you will be able to:

State the types of meat, poultry and fish available for sold.

Describe the structure of meat, poultry and fish.

Identify the various cuts of meat, poultry and fish.

identify wholesome, meat, poultry and fish of a good quality for purchase.

Explain how to store meat, poultry and fish appropriately after purchase.

How long?

In order to complete this session, you need to schedule 2 hours formal study time. You are also required to allocate 1 hour self study time to review concepts and complete activities/assessments.

Terminology

Crustacean: Crustacean has a segmented body covered with external skeleton and paired jointed limbs.

Meat: Meat is the dressed flesh obtained from cows, lamb, sheep or pigs.

Poultry:	Poultry is the term used for domestic birds, such as chickens, turkeys, ducks or reared for meat and eggs.
Primal cuts:	Primal cuts refer to the major cuts in which the carcass of the lamb, sheep, cow or pig is separated.
Molluscs:	Mollusc is a group of shellfish. The fish in this group has a soft body usually enclosed in a hard shell. Examples oysters, clams, mussels and scallops.

13.3-1 Meat and Poultry Purchase

Do you know the difference between the terms meat and poultry? Some people may think that there is no difference between the two terms. However, it will be useful to you to know the difference between meat and poultry. Let's examine the two terms by defining them.

Meat is the dressed flesh obtained from cows, sheep, or pigs.

Poultry is the term used for domestic fowls such as chickens, turkeys, ducks or geese reared for their meat and eggs.

Meat

Activity

Do you know the names of the different meats obtained from the following animals?

Complete the following table by naming the meats obtained from the various animals. Number one is done as an example for you to follow.

Flesh from a:	Names of meat
1. Mature cow	Beef
2. Calf (young cow)	
3. Lamb	
4. Sheep	

Flesh from a:	Names of meat
5. Pig	

Figure 9

Feedback

Now that you have completed the activity, check the correct answers stated below to see how well you did.

1. Beef
2. Veal
3. Lamb
4. Mutton
5. Pork

How did you do? If you answered all correctly, congratulations! If not I'm sure that you made a good attempt to answer all correctly. So let's go over it again.

Types of Meat

The main meats eaten are:

- Beef obtained from mature cattle.
- Veal obtained from cattle under one year old.
- Mutton obtained from sheep.
- Lamb obtained from lambs.
- Pork obtained from pigs.

Let's now look at the structure of meat

Structure of Meat

When we refer to meat we usually mean lean meat that is the flesh of the animals mentioned above.

Lean meat is muscle tissue made up of tiny thread-like fibres which are held together by connective tissue to form bundles. The muscle fibres contain meat juices and protein, and fat cells between them.

Connective tissue is made up of two proteins which are insoluble in water. They are: collagen and elastin.

- Collagen is the tissue itself, which is converted by moist heat into a soluble protein called gelatine.
- Elastin makes up the wall of the muscle fibres.

What determines the tenderness of meat? The answer to this question is important when purchasing meat.

The following explanation gives the answer.

Note it! / Warning

The tenderness of meat depends on:

- the size of the muscle fibres;
- the amount of connective tissue;
- the amount of cartilage;
- the amount of fat.

Older animals have long, thick muscle fibres with a lot of connective tissue. By contrast younger animals have finer, smaller muscle fibres with a little connective tissue.

Muscles, such as the neck and leg that are worked a lot tend to be tough.

Why is it necessary for you to know about the structure of meat and its tenderness?

This information will assist you in understanding why certain cuts of meat are tender, while others are tough.

It's time for us to look at the different cuts of meat. Beef, lamb and pork are divided into large sections called primal cuts. These primal cuts are then further cut into individual steaks and other retail cuts.

We are now going to look at the beef cuts, lamb cuts and pork cuts.

Meat Cuts

Beef Cuts

The following diagram in figure 13.3.1 shows the beef primal cuts.

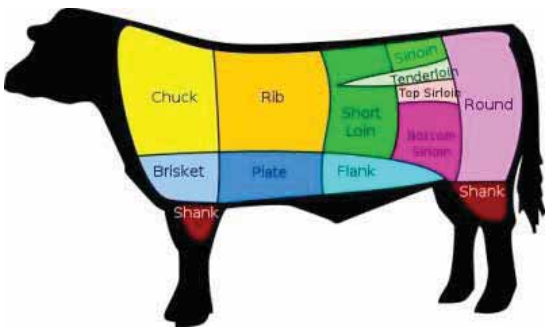


Figure 10 Beef Primal Cuts
Source: http://0.tqn.com/d/culinaryarts/1/0/S/H/-/-/beefcuts400.jpg
About.com/Wikimedia Commons/Danilo Alfaro

Primal Cuts	Uses
Beef Chuck ▪ Most economical cuts. ▪ Tough due to a lot of connective tissues. ▪ Has a balance of meat and fat. ▪ Has a strong flavour.	▪ Cut into chuck steak and clod steak for grilling. ▪ Cut into chuck roast and clod roast for braising or stewing as a pot roast. ▪ Boneless chucks are made into ground beef.
Beef Rib ▪ Finest cut. ▪ Very juicy and has superb flavour.	▪ Cut into short rib steak, rib eye steak, prime rib roast and standing rib roast for grilling.
Beef Brisket ▪ Tough cut due to the connective tissues.	▪ Used to make corned beef. ▪ Slow moist cooking as for a pot roast.
Beef Plate ▪ Generally fatty and tough. ▪ Has a lot of cartilage.	▪ Cut into short ribs and skirt steak for braising. ▪ Used for ground beef.
Beef Shank ▪ Tough cut, due to a lot of connective tissues.	▪ Used for stews and soups. ▪ Slow moist method of cooking used to soften these cuts.
Beef Short Loin ▪ Tender cut.	▪ T-bone steak and porterhouse steak for grilling and broiling
Beef Sirloin ▪ Less tender than short loin. ▪ More flavourful.	▪ Excellent for roasting and barbequing,

Primal Cuts	Uses
Beef Tenderloin ▪ This is the finest cut.	▪ Suitable for grilling and broiling
Beef Round ▪ Lean meat with little fat. ▪ A tough cut.	▪ Suitable for braising.
Beef Flank ▪ Tough cut used for grinding. ▪ Low in fat.	▪ Can be braised to improve flavour.

Figure 11 Cuts of Beef

Activity

This activity is designed for you to have a quick reference tool to identify the tender and tough cuts of beef. You are required to divide the cuts of beef into tender cuts and tough cuts. This should be useful when purchasing meat according to the intended method of cooking. Tender cuts are suitable for quick methods of cooking, while tough cuts are suitable for slow methods of cooking.

In the following table, place the names of the tender cuts of beef in column A and the tough cuts of beef in column B.

Column A Tender Cuts of Beef	Column B Tough Cuts of Beef

Feedback

Now that you have completed activity 11.3-2, check the correct grouping stated below to see how well you did.

Column A Tender Cuts of Beef	Column B Tough Cuts of Beef
Beef rib	Beef chuck
Beef short loin	Beef brisket
Beef sirloin	Beef plate
Beef tenderloin	Beef shank
	Beef round
	Beef flank

Figure 12

How did you do? Did you group the cuts of beef correctly? If you did, well congratulations! If you did not, I'm sure that you made a good attempt to grouping the cuts of beef correctly. Review the relevant part of this session and try this activity again.

Lamb Cuts.

The following diagram in figure 13.3.2 shows the primal cuts of lamb.

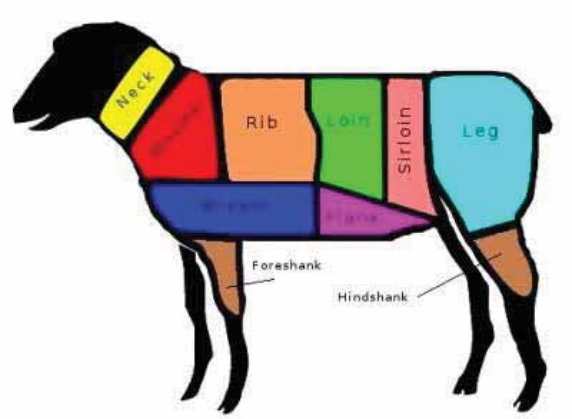


Figure 13 Lamb Primal Cuts.
http://culinaryarts.about.com/gi/o.htm?zi=1/XL&zTi=1&sdn=culinaryarts&cdn=food&tm=7&gps=80_36_1362_540&f=20&su=p284.9.336.ip_p830.4.336.ip_&tt=3&bt=1&bts=0&zu=http%3A//0.tqn.com/d/culinaryarts/1/0/x/H/-/-/lambcuts400.jpg
About.com/Wikimedia Commons/Danilo Alfaro

Primal Cuts	Uses
Lamb Shoulder	▪ Can be boned, stuffed rolled and roasted. ▪ Cut into chops and suitable for moist heat.
Lamb Rib	▪ Cut into rib chops, lamb crown roast and rack of lamb.
Lamb Breast ▪ A lot of cartilage and other connective tissues. ▪ Tough cut	▪ Suitable for stewing. ▪ Used for making ground lamb.
Lamb Neck ▪ Tough cut with a lot of cartilage.	▪ Suitable for stewing.
Lamb Shank ▪ Tough and a lot of connective tissues.	▪ Suitable for braising or stewing.

Primal Cuts	Uses
Lamb Loin ▪ Tender cuts.	▪ Cut into lamb loin chops and lamb loin roast for grilling.
Lamb Sirloin	▪ Cut into lamb sirloin chops or steak.
Lamb Leg	▪ Suitable for braising and roasting.

Figure 14 Cuts of Lamb

Pork Cuts

The following diagram in figure 11 shows the pork primal cuts.

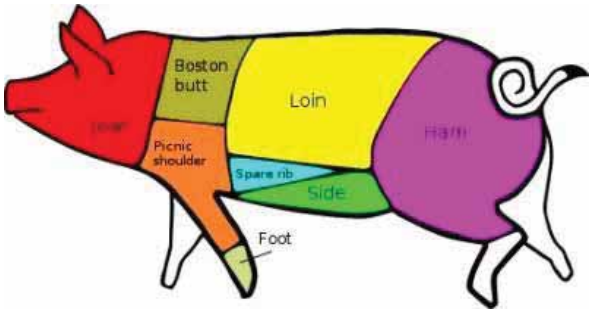


Figure 15 Pork Primal Cuts
http://0.tqn.com/d/culinaryarts/1/0/d/H/-/-/cutsofpork.jpg
About.com/Wikimedia Commons/Danilo Alfaro

Primal Cuts	Uses
Pork Butt ▪ Moderately tough cut. ▪ Has a lot of connective tissues.	▪ Cut into steaks. ▪ Suitable for braising and stewing. ▪ Used for making ground pork or sausages.
Pork Shoulder ▪ Tough cut	▪ Suitable for curing or smoking. ▪ Used for making ground pork or sausage meat.
Pork Loin	▪ Tenderloin for grilling.

Primal Cuts	Uses
	▪ Cut into chops. ▪ Used for making ground pork or sausages
Pork Ham	▪ Suitable for smoking or curing.
Pork Belly	▪ Used to make bacon. ▪ Can be rolled and roasted or even cut into steaks.
Pork Spareribs	▪ Suitable for grilling or braising.
Pork Jowl	▪ Used in making sausages. ▪ Cured and made into bacon.
Pork Foot ▪ High in collagen.	▪ Excellent source of gelatine. ▪ Used for soup and stews. ▪ Can be cured, smoked or pickled.

Figure 16 Pork Cuts

Choosing Quality Meats

Now that we have looked at the different cuts of meat, let's see how we should go about choosing fresh meat cuts. We have to pay attention to the physical characteristics of different types of fresh meats

Beef

Beef cuts should:

- Have a fresh, red colour.
- Be well marbled with firm, yellow fat.

Ground beef should be red colour throughout. Do not buy ground beef that is brownish in colour.

Veal

Veal cuts should:

- Be greyish pink in colour.
- Have firm flesh with very little fat or no marbling.
- Have fat clear, firm and white.
- Have soft and red bones.

Lamb

Lamb cuts should:

- Have firm flesh that is light to dark pink in colour. The lighter the colour. The more tender the lamb.
- Have little marbling.

Pork

Pork cuts should:

- Have more lean meat than fat and bone.
- Be firm and grayish in colour.
- Be well marbled and covered with firm white fat.

Activity

The prices of different cuts of meat vary greatly according to their quality. Visit a meat shop or supermarket and try to identify the following cuts and find out their cost per kilogram. Record the prices in the space provided.

Cuts of Meat	Price per Kilogram
Beef cuts ▪ Sirloin steak ▪ Prime rib roast ▪ Brisket ▪ Ground beef	
Lamb cuts ▪ Neck ▪ Shoulder ▪ Rib chops	
Pork cuts ▪ spareribs ▪ Loin chops ▪ Feet	

Feedback

How do the prices of the tender cuts compare to those of the tough cuts? Record your comments in the writing space provided.

Poultry

Poultry is the term used to include domestic bird used for food. Examples of poultry are chickens, turkeys, ducks geese and pigeons. They are sold either fresh or frozen. Fresh poultry should be kept at 26º F for a short period and frozen poultry should be kept at 0º F or lower.

Structure of Poultry

The structure of poultry is similar to that of meat, except for the fibres are shorter and the flesh is not interlaced with fat. The fat is found beneath the skin and around the internal organs. The flesh of poultry is not as moist as meat. The breast and wing of poultry are referred to as the white meat. The flesh of thigh and leg is coarser and darker because of the muscular activity.

Note it! / Warning

Have you ever seen terms such as “broiler”, “fryer”, “roaster”, “capon” or “hen” written on the package of chicken you have purchased? Do you know what these various terms mean? Continue to read on and these terms will be defined for you to understand them clearly.

- A broiler or a fryer is a very young bird. It’s flesh tends to be tender but lack flavour. It is suitable for roasting, grilling, frying or barbecuing.
- A roaster is a young bird with tender flesh. It is suitable for roasting, braising, barbecuing or stewing.
- Capon is a young castrated male bird with tender flesh. It is suitable for frying or roasting.
- A hen is regarded as an older bird which had one or two laying seasons. It is suitable for stewing or boiling.

Poultry Cuts

You can purchase poultry whole or smaller cuts. There are many different cuts available for purchase. The table below outlines the various cuts of poultry.

Poultry Cuts	Uses
Whole poultry	Excellent for roasting.
Poultry half ▪ Cut right down the middle.	Excellent for grilling.
Breast quarter ▪ The breast and one wing and consist of white flesh.	Excellent for grilling and barbequing.
Leg quarter ▪ The thigh and drumstick and consist of dark flesh	Excellent for grilling and barbequing
Breast ▪ Consists of white flesh.	Can be cut into breast halves and breast tenderloin.
Wing ▪ Consists of white flesh.	Can be used for stews, stocks or soups.

Poultry Cuts	Uses
Thigh ▪ Consists of dark flesh and has lots of flavour.	Excellent for roasting, braising and grilling.
Drumstick ▪ Consists of dark flesh and has lots of flavour.	Excellent for roasting, braising and grilling.

Figure 17 Poultry cuts

Choosing Quality Poultry

Now that we have looked at the different cuts of poultry, let's see how we should go about choosing fresh poultry cuts. In choosing quality fresh poultry, we have to pay attention to its physical characteristics.

Poultry

- Poultry flesh and bones should be pink in colour. The pinkness of the flesh and bones indicates their freshness.
- Poultry should have plump bodies, perfect skin and free from cuts, bruises or broken bones.

Buying Tips Purchasing Meat and Poultry.

- Consider the freshness, wholesomeness and quality of meat or poultry. Pay attention to the colour of the flesh, fat and bones.
- Consider the cooking method before purchasing cuts of meat or poultry.
- Consider less tender cuts of meat, when there is a limited budget. They provide good nutritional value.
- Examine meat or poultry packaging to ensure there are no openings or tears. Package should be wrapped securely.
- Ensure there are no signs of freezer burn on meat or poultry package. Freezer burn is seen as grey-brown spots on meat or poultry that is caused by air on the surface of it. Freezer burn meat or poultry turns out to be very tasteless when cooked.
- Compare the cost and the yield of meat or poultry. Consider the bones and trimming waste.
- Consider the resources available for meat or poultry preparation.
- Read the information labelling carefully. Pay attention to package dates, such as sell-by date; best if used before date; and use-by date.

These dates serve to guide the consumer so as to buy products dated furthest in the future.

- Consider the amount of storage space in refrigerator or freezer for storing meat or poultry.

How to Store Meat and Poultry at Home

Now that you have bought the meat and poultry of your choice; let's see how to store them at home.

Storing Tips

- Freeze meat or poultry at 0º F or lower immediately after purchasing it.
- If you have to divide meat or poultry into portions, do so before freezing it.
- If freezer bags are used to store meat or poultry, remove air from them before storage.
- Label meat or poultry and include freezing date.

Activity

Complete the activity below by filling the blanks of the following statements to make them true. Number one was done as an example for you to follow.

1. Poultry flesh and bones should be <u>pink</u> in colour.
2. Poultry should have _____ bodies with perfect skin.
3. Chicken drumstick and thigh consist of _____ flesh.
4. The breast quarter consist of a breast and one _____.
5. Freezer burn on poultry is seen as _____ spots.
6. Divide large amounts of poultry into _____ before freezing it.

Feedback

Now that you have completed the activity , check the correct answers stated below to see how well you did.

1. Pink
2. Plump
3. Dark
4. Wing
5. Grey-brown
6. Portions

Were you able to complete activity 11.3-3 successfully? If you did congratulations! If not, review the relevant part of this session and try again.

11.3-2 Fish Purchase

Fish is a source of high biological value protein and provides an alternative to meat. Fish is available in fresh, frozen, salted, smoked or canned form for purchase. Let's first look at the different types of fish.

Types of Fish

Fish can be classified into three groups: oily fish; white fish and shellfish. How is fish grouped? Fish is grouped according to a unique characteristic. Let's see what each characteristic is in each case.

Oily Fish

The oil of this type of fish is distributed throughout its flesh. How can you identify oily fish? The flesh of this type of fish is darker in colour. Examples of oily fish are salmon, herring, mackerel and bonito.

White Fish

The oil of this type of fish is stored in its liver. How can you identify white fish? You can identify white fish by its white flesh. Examples of white fish are red snapper, cod fish, carite and grouper.

Shell Fish

Shellfish is identified by its external skeleton which acts as its protective covering. The shell fish group can be further sub-divided into two groups:

- Crustacean has a segmented body covered with an external skeleton or crust and paired jointed limbs. Examples crabs, lobsters, shrimps and prawns.
- Mollusc has a soft body usually enclosed in a hard shell. Examples oysters, clams, mussels and scallops.

Let's see how the structure of fish differs from meat and poultry.

Structure of Fish

The flesh of the fish is made up of flakes and varies in size according to the fish. The fish flakes are held together by connective tissue. However the connective tissue in fish flesh is less than that which holds together meat fibres.

Cuts of Fish

We have looked at the different types of fish. Now let's look at the various cuts in which fish may be sold.

Fish can be sold whole or cut into fillets, steaks, cutlets and tail piece.

- Small fish, such as sardine, herring and mackerel, are sold whole.
- Larger fish, such as salmon or kingfish, may purchased whole or in desired cuts.

The following are the fish cuts and their descriptions:

- Fish fillets are boneless cuts from along the length of a fish.
- Fish steaks are whole slice obtained from cutting across the fish.
- Fish cutlets are slices with the gut opening of the fish.
- Fish tail piece is the tail from large fish, which has been cut into steaks and cutlets.

Choosing Quality Fresh Fish

Have you ever been to the fish market to buy fresh fish? If so, did you know what to look for in choosing the fish? The following are the physical characteristics to consider when purchasing fish:

Fresh Whole Fish

Fresh fish can be purchased from fishmongers or a market. When you have to purchase fresh fish of good quality, consider the following physical characteristics:

- Fish should have a pleasant fishy smell.
- The fish flesh should be plump and firm.
- The eyes of the fish should be bright and bulging.
- The gills of the fish should be bright red.
- The scales on scaly fish should be plentiful and firmly attached to the skin.
- The skin should be moist and shiny in appearance.

- Natural spots on fish skin should be bright in colour.
- The fish tail should be stiff.

Fresh fish fillet, steaks and cutlets

- Fish cuts should have a fresh sea odour.
- Fillet should be trimmed, boned and skinned neatly.
- The flesh of the fish cuts should be firm, elastic and moist.
- Fish cuts should have no bruising, blood spots or browning.

Shellfish

Crustaceans

Fresh Lobsters, and Crabs

- Crustaceans should smell fresh of the sea with no hint of ammonia.
- Lobsters and crabs are sold alive because they spoil quickly when they die.
- Lobsters and crabs should have all their limbs intact and leg movement should be seen.
- Shells should be clean without dark blotches or cracks.
- Lobsters and crabs should have a good colour and be heavy for their size.

Fresh Shrimp

- Shrimps should have firm flesh which fills the shell completely.
- The shell and flesh of shrimp should not feel slippery.
- The shells of shrimps should not have blackened edges or black spots on them. Dark areas on the shells indicate loss of freshness.

Molluscs

Fresh oysters, clams and mussels

- The shells of molluscs should be intact and not broken or cracked.
- The shells of clams and mussels should be tightly closed or shut when touched. If the shells remain open, do not purchase them.
- Fresh oysters should have a slightly milky liquid surrounding them
- The bottom shells of oysters should be deeply cupped.

Frozen Fish

Frozen fish can be purchased from the supermarket. When you go to purchase frozen fish of good quality, consider the following physical characteristics:

- Fish should be frozen solid with glossy surfaces.
- There should be no signs of frost in the interior of the frozen fish package.
- The flesh of the frozen fish should be evenly coloured with no white patches, which indicates drying or an orange colouration, which indicates rancidity.
- The frozen fish packaging should not be damaged and show no signs of thawing and refreezing.
- The frozen fish should have no strong or unpleasant odours.

Smoked Fish

Do you want to know what to look for when purchasing smoked fish? If you don't, consider the following points:

- The flesh of the smoked fish should be firm and not sticky.
- The smoked fish aroma should have a clean smoky odour.
- The smoked fish should have a glossy appearance.
- The smoked fish should show no signs of moulds, dried blood or salt crystals.

Some General Guidelines when Buying Fish

- Purchase fish of all types from reputable suppliers. The surroundings should be sanitary.
- Always choose fresh fish that is refrigerated or stored on ice.
- Do not purchase frozen fish if its package is damaged in any way.
- Do not purchase frozen fish with signs of ice crystals or frosting. This indicates that the fish was stored for too long or has been thawed and then refrozen.
- Do not purchase open cooked fish that has been stored and displayed alongside raw fish.
- Buy fish at a time to be taken home immediately and store appropriately.

Storage of Fish

Now that you have purchased fish of good quality, you need to know how to store it appropriately to maintain its quality. You can consider the following points when storing fish at home:

- Fresh fish should not be stored in the refrigerated for more than one day.
- Wrap fresh fish and store in the coldest part of the refrigerator.
- When freezing fresh fish, wrap it tightly with cling wrap and ensure that there is no air trapped inside the packaging. You can further wrap fish with aluminium foil and label the contents and date of freezing.
- Fish in its frozen state can be stored for the following periods according to the type of fish:
    1. Frozen shell fish should be stored for one month;
    2. Frozen oily fish should be stored no longer than two months;
    3. Frozen white fish should be stored no longer than three months.
- Smoked fish or salted fish should be stored on shelves above any raw foods in the fridge so as to avoid cross contamination.
- Avoid raw fish from coming in contact with cooked foods, as to avoid cross contamination.
- Wrap up smoked fish properly and keep it separate from other foods to prevent its odour from penetrating them.

Activity

Indicate by putting an X in the box provided to state whether the following statements are “True” or “False”.

Number one is done for you as an example for you to follow.

1. The fat in oily fish is distributed throughout the flesh.

   True☒ or False☐

2. Fish fillets are boneless cuts from along the length of a fish.

   True☐ or False☐

3. Fresh fish should be moist and shinny in appearance.

   True☐ or False☐

4. Lobsters, shrimps and prawns are referred to as molluscs.

   True☐ or False☐

5. Purchase oysters with their shells gaping open.

   True☐ or False☐

6. White patches on frozen fish indicate its rancidity.

True☐ or False☐

7. Smoked fish should show no signs of salt crystals.

   True☐ or False☐

8. Purchase frozen fish that has been thawed and refrozen.

   True☐ or False☐

9. Frozen oily fish should be stored for no longer than two months.

   True☐ or False☐

10. During storage avoid raw fish from coming in contact with cooked foods.

    True☐ or False☐

Feedback

Now that you have completed activity , check the correct answers stated below to see how well you did.

1. The fat in oily fish is distributed throughout the flesh.

   True☒ or False☐

2. Fish fillets are boneless cuts from along the length of a fish.

   True☒ or False☐

3. Fresh fish should be moist and shinny in appearance.

   True☐ or False☐

4. Lobsters, shrimps and prawns are referred to as molluscs.

   True☐ or False☒

5. Purchase oysters with their shells gaping open.

   True☐ or False☒

6. White patches on frozen fish indicate its rancidity.

   True☐ or False☒

7. Smoked fish should show no signs of salt crystals.

   True☒ or False☐

8. Purchase frozen fish that has been thawed and refrozen.

   True☐ or False☒

9. Frozen oily fish should be stored for no longer than two months.

   True☒ or False☐

10. During storage avoid raw fish from coming in contact with cooked foods.

    True☒ or False☐

Did you answer all the questions correctly? Well congratulation!!!

If you answered any of the questions incorrectly, review the relevant part of the session and try again.

Session Summary

Summary

In this session you learned that there are various types of meat, poultry and fish. Meat generally includes veal, beef, lamb, mutton and pork. Poultry includes domestic birds such as chickens, turkeys, ducks and geese. Fish is classified in white fish, oily fish and shellfish. The structure of meat, poultry and fish consists of bundles of fibres held together by connective tissues. Meat, poultry and fish are sold in various cuts, which may be tender or tough. Consumers can select meat, poultry and fish of good quality by being guided by their physical characteristics. These foods are highly perishable and should be stored appropriately after purchase to maintain their quality until they are used in food preparation.

Assessment

Assessment 11.3

Now that you have completed session 11.3, let's see how well you will do in this assessment. You are required to answer all of the following questions. Write in the writing space provided.

Assessment

1. State the three types of fish and give two examples of each type.

2. Describe the structure of meat.

3. What are the main poultry cuts available for purchase in the

supermarket or poultry shop?

4. Identify the points to consider when purchasing the following foods:

Veal

Poultry

Fresh shrimp

5. How should fresh fish be stored appropriately in the freezer?

Answers to Assessment

Answers to assessment 11.3

Now that you have completed assessment 11.3, you can check the answers to this assessment below.

1. White fish. Examples are carite, red fish, codfish, grouper.

   Oily fish. Examples are salmon, herring, bonito, mackerel.

   Shellfish. Examples are crabs, lobsters, shrimps, prawns, clams, mussels, scallops, oysters.

2. The structure of meat is made up of tiny thread-like fibres which are held together by connective tissue to form bundles. The connective tissue is made up of two proteins, collagen and elastin, which are insoluble in water. The bundle of fibres contains proteins, meat juices and fat cells between them.

3. The main poultry cuts are:

   Poultry half

   Breast quarter

   Leg quarter

   Breast

   Wing

   Thigh

   Drumstick

4. The following points are to be considered when purchasing:

- **Veal**

Veal cuts should:

- Be greyish pink in colour.
- Have firm flesh with very little fat or no marbling.
- Have fat clear, firm and white.
- Have soft and red bones.

- **Poultry**
- Poultry flesh and bones should be pink in colour. The pinkest of the flesh and bones indicates their freshness.

- Poultry should have plump bodies, perfect skin and free from cuts, bruises or broken bones.

- **Fresh shrimp**
- Shrimps should have firm flesh which fills the shell completely.
- The shell and flesh of shrimp should not feel slippery.
- The shells of shrimps should not have blackened edges or black spots on them. Dark areas on the shell indicate loss of freshness.

5. The storage of fresh fish in the freezer is as follows:

When freezing fresh fish, wrap it tightly with cling wrap and ensure that there is no air trapped inside the packaging. You should further wrap fish with aluminum foil and label the contents and date of freezing. Shellfish can be frozen and maintain its quality for up to one month. Oily fish can be frozen for no longer than two months, while white fish can be frozen for about three months and their quality maintained.

Were you able to complete assessment 13.3 successfully? If you did congratulations! If not, review this session and try the assessment again.

Session 11.4 Purchasing Milk, Cheese and Eggs

Introduction

In the session we will look at how to purchase three versatile foods. These foods are milk, cheese and eggs. How often do you include these foods in your diet? Do you drink a glass of milk daily? Do you prepare cheese or egg sandwiches? Despite how you include these foods in your diet, they have to be purchased. These foods provide us with high biological value proteins. Milk, cheese and eggs are highly perishable and should be selected carefully when being purchased.

This session will inform you on the various types of milk and cheese available for sale. We will also look at the structure of eggs and how to test their freshness. Points will be given on how to determine choice of these foods for purchase and how the store them at home.

Upon completion of this unit you will be able to:

State the various types of milk available for sale.

State the classifications of cheese available for purchase.

Outcomes

Outline the structure of an egg.

Explain how to test eggs for their freshness before purchasing them.

Identify wholesome milk, cheese and eggs of a good quality for purchase.

Explain how to store milk, cheese and eggs in a manner to maintain their good quality.

How long?

In order to complete this session, you need to schedule 2 hours formal study time. You are also required to allocate 1 hour self study time to review concepts and complete activities/assessments.

Terminology

Pasteurized milk: Pasteurized milk is heated to a temperature of 72º C for 15 seconds to kill most harmful bacteria.

Reconstituted milk: Reconstituted milk is dried milk that has had water added to make it into a liquid again.

Sterilized milk: Sterilized milk is heated to a temperature of 113º C for 15-40 minutes to kill harmful and souring bacteria.

11.4-1 Milk and Cheese Purchase

Milk

Do you know that in the past fresh milk was delivered to homes daily? The milk that was delivered to homes years ago had a very short shelf life due to the harmful bacteria present in it. Now milk is available in various forms in the food stores. These milks were heat treated to kill the harmful bacteria. As a result, the milk being sold in the food stores has a long shelf life.

The milk available for purchase varies according to its heat treatment and fat content. What type of heat treatment does fresh milk undergo? Fresh milk may be pasteurized, sterilized or ultra heat treated to kill the harmful bacteria. Have you ever seen what happens to fresh milk when you leave it to stand for a while? Yes, the cream of the milk rises to the top. Another process applied to milk is homogenization. If milk has to stay on the shelf for a while its quality must be maintained. Homogenization is a process whereby the fat particles in milk are broken up and dispersed uniformly so that the cream will not rise to the top After the milk has

been heat treated and homogenized, it can be evaporated, condensed or dried.

Have you ever heard the terms “full cream milk” “low fat milk” or “skimmed milk”? What do these terms indicate to the consumer? Yes, these indicate the fat content of the milk. The fat content of milk is modified to meet the needs of the consumer. Some of the various types of milk available for sale are described in the table below

Types of Milk	Description
Heat treated milk ▪ Pasteurized milk	▪ ▪ Heated to a temperature of 72º C for 15 seconds. ▪ Kills most harmful bacteria without adversely affecting the nutritional value or taste of the milk.
▪ Sterilized milk	▪ Heated to a temperature of 113º C for 15-40 minutes. ▪ Kills harmful and souring bacteria. ▪ Nutritional value is reduced slightly and has colour and taste changes. ▪ Extends the shelf life of the milk for about six months without refrigeration. ▪ Opened bottles or cartons of sterilised milk should be refrigerated and used with three days.
▪ Ultra Heat Treated (UHT) milk	▪ Heated to a temperature of 135º C for one second. ▪ Kills harmful bacteria. ▪ Nutritional value and colour are not adversely affected. ▪ Packaged in sterile containers. ▪ Has a longer shelf life. ▪ Opened cartons of UHT milk should be refrigerated and used with three days.

Types of Milk	Description
Evaporated milk	▪ The water content is reduced. ▪ Has the concentration twice that of fresh milk. ▪ Opened cans or cartons of evaporated milk should be refrigerated and used with three days.
Condensed milk	▪ The water content is reduced. ▪ Has the concentration three times that of fresh milk. ▪ 40% sugar is added to milk.
Dried / Powdered milk	▪ Water from milk is evaporated ▪ Milk is reconstituted easily with water.
Homogenized milk	▪ Fat globules in the milk are broken up into tiny droplets. ▪ Tiny fat droplets are evenly distributed throughout the milk.
Types milk according to its fat content ▪ Whole or full cream milk	▪ ▪ No fat has been removed.
▪ Low fat	▪ Some fat has been removed. ▪ May contain 1% to 2% of fat.
▪ Skimmed milk	▪ Most of the fat has been removed. ▪ May contain 0-0.5% fat.

Figure 18 Types of Milk

Did you realize that there are so many forms of milk available for purchase? You can become confused if you do not know how to distinguish between them. Do you purchase any of these different types of milk? What do you pay attention to when purchasing them?

Let's see how you do in the activity below before looking at purchasing milk.

Activity

Indicate the types of milk based on the following descriptive statements. Number one is done as an example for you.

1. Milk heated to a temperature of 135º C for one second.

Ultra heat treated milk

2. The fat globules are evenly distributed throughout the milk in tiny droplets.

3. Milk has all its fat content.

4. The water from milk has been removed and 40% sugar has been added.

5. The heat treatment does not affect the nutritional value or taste of the milk.

6. Milk can be easily reconstituted with water.

Feedback

Now that you have completed the above activity, check the correct answers stated below to see how well you did.

1. Ultra heat treated milk
2. Homogenized milk
3. Whole or full cream milk
4. Condensed milk
5. Pasteurized milk
6. Dried/powdered milk

How did you do? If you answered all correctly, congratulations! If not I'm sure that you made a good attempt to answer all correctly. So take some time to go over the relevant information.

Let's imagine we are going to the supermarket to purchase milk. What should we pay attention to when selecting milk for purchase? You are not sure? Let's see what these points are:

Purchasing Points for Milk

1. Choose milk according to the desired purpose for purchasing milk. For instance, if milk is to be given to children, whole milk may be selected. While evaporated milk can be used in food preparation. Condensed milk can be used in beverages and desserts.

2. Purchase milk with label date furthest in the future. This date can be seen as "use by date" or "sell by date" on the milk package. "Use by date" indicates that the milk no longer is safe to consumer after the specified date. The "sell by date" indicates that the milk should be purchased before the specified date.

3. Check for broken seal on milk bottle cover and opened carton or bag. If there are any openings, that means that air has entered into the milk and it is likely to be contaminated with bacteria.

4. Check canned milk for dents and bulging. Dented and bulging cans should not be purchased because of the high potential of botulism.

5. Compare the different brand names and prices of the milk available for sale. Different brands may differ in prices for the same type of milk. For example, brand A evaporated milk may be more expensive than brand B. Consumer should compare weight or fluid milliliters with prices and make purchase accordingly.

How should we store milk until we are ready to use it? Take note of the following points:

Points for Storing Milk at Home

1. Store unopened cartons or cans of milk in a cool dry place. Unopened carton or can of milk will maintain its quality for several months without refrigeration.

2. Refrigerate opened carton of milk immediately and consume within three days. The milk is contaminated we bacteria once the packaging is opened and causes milk to go bad.

3. Store dried milk in a cool dry place in a secured packaging to prevent absorption of moisture. If the packaging of the dried milk remains open the milk will absorb moisture from the atmosphere. This will deteriorate the quality of the milk.

4. Reconstituted milk should be kept in a cool place in a clean, covered container. This is important to reduce the likelihood of the milk being contaminated with bacteria.

5. Milk should be kept away from strong-smelling foods, such as fish and onion, as it absorbs odours.

Reflection

Milk is a very valuable and expensive food. It is important therefore to store it properly to avoid the growth of harmful bacteria and prevent the milk from going sour. A lot of times milk is thrown away due to spoilage. How is milk stored at your home? Is it stored properly? If not how can you ensure that milk is stored properly at your home? Write your response in the space provided.

Cheese

Cheese is a concentrated source of protein and is rich in calcium. How many types of cheese do you know? Which type do you enjoy best? The most commonly used cheese is cheddar cheese. However, there are many different types of cheese available for purchase. Cheese may be classified according to how they are manufactured. Before attempting to purchase cheese, it will be beneficial to know the different classifications of cheese available in the food store. Let's look at table below for the classifications of cheese, their descriptions and examples.

Classification of Cheese	Description and Examples
Hard pressed cheeses	▪ Contain little water. ▪ Cheddar, Cheshire and Parmesan are examples of hard cheeses.
Lightly pressed or soft cheeses	▪ Contain a high percentage of water. ▪ Do not keep as well as hard cheeses. ▪ Lancashire Wensleydale and Stilton are examples of soft cheeses.
Blue-veined cheeses	▪ Produced by allowing harmless mould to grow in the air space of the curd. ▪ Have a moist open texture with a creamy white body and blue veins. ▪ Blue Stilton and Blue Wensleydale are examples of blue veined cheeses.
Acid curd cheeses	▪ Texture and flavour are developed by the souring of milk by lactic acid bacteria. ▪ Have a lumpy texture ▪ Curd cheese and cottage cheese are examples of acid curd cheeses.
Cream cheeses	▪ Made from the cream of milk. ▪ Have a soft creamy texture with a mild acidic flavour.

Figure 19 Classifications of Cheese

It is important to know how to buy high quality cheese and how to store it. Let's look at the points to consider when purchasing cheese.

Purchasing Points for Cheese

1. Buy cheese from a clean grocery or supermarket, which has a quick turnover to ensure quality cheese is bought.

2. Make sure the cheese package is securely wrapped and sealed. Opened cheese package causes contamination and drying out of cheese.

3. Purchase cheese that looks fresh and appealing. The cheese should not look cracked and dried out.

4. Look out for the smell of ammonia when selecting cheese. This indicates that the cheese has aged too long or not aged properly.

5. Check expiry date on cheese package. Buy cheese with date reflecting its freshness.

6. Purchase only as much cheese as you can use in a short period of time. Hard cheeses can be frozen if wrapped in foil.

Points for Storing Cheese at Home

1. Fresh soft cheeses, acid curd cheeses and cream cheeses should be stored in their original containers in the refrigerator and consumed within a few day of purchase.

2. Wrap hard cheeses, such as cheddar cheese, in wax paper or aluminum foil first and then place in a plastic container. Keep cheese wrapped in wax paper or aluminum foil to allow it to breathe and develop further without drying out. This ensures that the quality of the cheese is maintained.

3. Wrap blue veined cheeses, such as Blue Stilton, in aluminum foil or wax paper since this will not affect their flavor. This type of cheese needs to breathe, so allow them to be unwrapped in the refrigerator for short periods of times.

4. Opened packages of soft cheeses should be wrapped in plastic to prevent their delicate texture from being destroyed. It should then be placed in a plastic container lined with paper towel. This ensures that the moisture released from the cheese is absorbed by the paper towel and the cheese maintains its quality.

5. Cheese is best stored in the warmest part of the refrigerator, such as the cheese or vegetable compartment.

6. Look for early mould growth and wipe it off from the cheese with warm water. Dry cheese and rub it with vegetable oil. Wrap and store in a clean container. Then refrigerate. When the mould starts to grow it consumes the oil before the cheese. Mould makes the oil rancid and causes the cheese to taste bad.

Tip

Avoid wrapping cheese directly with plastic wrap. Plastic wrap prevents the cheese from breathing and alters the flavor of the cheese. As a result, soft cheese will become soggy and hard cheese will dry out.

Always wrap cheese in wax paper or aluminum foil. These types of wrappings allow the cheese to breathe and preserve its flavor.

Activity

Matching activity. Match the brief description of the cheese in column A correctly to the classification of cheese in column B.

Column A Brief Description of Cheese	Column B Classification of Cheese
Developed by the souring of milk.	Hard pressed cheeses
Made from the cream of milk.	Lightly pressed cheeses
Contain very little water.	Acid curd cheeses
Produced by allowing harmless mould to grow.	Cream cheeses
Contain a high percentage of water.	Blue veined cheeses

Figure 20

Feedback

Now that you have completed activity 11.4-2, check the correct answers stated below to see how well you did.

Column A Brief Description of Cheese	Column B Classification of Cheese
Developed by the souring of milk.	Acid curd cheeses
Made from the cream of milk.	Cream cheeses
Contain very little water.	Hard pressed cheeses
Produced by allowing harmless mould to grow.	Blue veined cheeses
Contain a high percentage of water.	Lightly pressed cheeses

Figure 21

Were you able to complete the matching activity correctly? Well congratulations!!! If you were not able to complete the activity correctly, review the relevant part of this session and try this activity again.

11.4-2 Eggs Purchase

Eggs

Eggs provide our diet with a high biological value protein. Eggs are considered versatile as they serve many uses in food preparation. When you have to purchase eggs how do you select them? Do you just pick up a carton of eggs without checking them? Consumers need to know what to pay attention when purchasing eggs. Before looking at points for purchasing eggs, let's examine the structure of an egg; grading of eggs and egg freshness tests.

The Structure of an Egg

What is the basic structure of an egg? Basically, an egg is made up of three main parts: the shell, egg white and yolk. However, the table below

gives more details on the structure of an egg. This information will assist you in selecting quality eggs for purchase.

Parts of an egg	Description
The shell	▪ Shell may be white or brown in colour. The colour does not determine its nutritional value. ▪ The shell has tiny holes which allow bacteria and odours to enter the egg. Water and carbon dioxide escape through the pores of the shell.
Shell membranes Two membranes (outer and inner)	▪ These membranes surround the egg white to protect against bacterial entry.
Air space	▪ An air space is formed at the larger end of the egg between the shell membranes. This air space increases with age.
Egg white	▪ There are two types of egg white: ▪ The thick white nearest to the yolk. ▪ The thin white nearest to the shell.
Chalazae	▪ This is a twisted cord like part of the egg. ▪ The chalazae keep the yolk in the centre of the thick white.
Yolk membrane	▪ This membrane surrounds the yolk to support it and to separate it from the white.
Yolk	▪ The yolk is the yellow part of egg. The colour may vary with the feed of the hen. This difference in colour does not indicate nutritional content.

Figure 22 Description of the Parts of an Egg

Now that we have looked at the structure of an egg, let's examine the different grades of eggs.

Activity

What are the different sizes of eggs sold at the supermarket? Write your answer in the space provided.

Feedback

Eggs are graded according to their size. The different grades of eggs in the supermarkets are as follows:

- Jumbo
- Extra large
- Large
- Medium
- Small

Were you able to answer the question correctly? If your answer is correct well done! If you were unable to answer it correctly take a note of the answers.

Eggs are graded according to their size or weight. The size indicates the minimum required net weight per dozen of eggs. Table below gives a breakdown of the size grade of eggs and its minimum net weight per dozen.

Size Grade of Eggs	Minimum Net Weight per Dozen
Jumbo	30 ounces
Extra large	27 ounces
Large	24 ounces

Size Grade of Eggs	Minimum Net Weight per Dozen
Medium	21 ounces
Small	18 ounces

Figure 23 Various Sizes of Eggs

Note it! / Warning

Eggs are also Graded According to their Quality:

- Grade A eggs are of the best quality and are usually sold to the consumer.
- Grade B eggs may have dirty shells or may have been washed.
- Grade C eggs may have cracked or broken shells.

How can you determine if the eggs are fresh before purchasing them?

There are simple ways you can check the freshness of eggs before purchasing them:

- The egg shell should be slightly rough. Stale eggs usually have smooth shells.
- The egg should feel heavy. The loss of weight is due to the escape of moisture and the entry of air as the egg ages.
- If egg is held up to light, there should be no black specks seen.

Purchasing Points for Eggs

Consider the following points when purchasing eggs:

- Buy eggs from a supermarket that has a quick turnover. This ensures the availability of fresh eggs for sale.
- Buy refrigerated eggs with clean, shells without any cracks. Eggs that are cracked or dirty can cause illness from the salmonella bacteria. Inspect eggs carefully for any cracked or broken shells.
- Ensure to buy fresh eggs. This can be done by checking for the “best before date”. Do not buy out-of-date eggs. You can also check the

weight of the eggs and their shells. Eggs should be heavy in weight and have slightly rough shells.

- Choose the size most economical and useful for the desired purpose of the eggs. Eggs are graded according to their size and should be selected based on their intended use.

Storing Points for Eggs

The way eggs are stored affects their quality and freshness. The following are points for storing eggs properly after purchase:

- Store eggs in the refrigerator at constant temperature of 40º F or below. Temperatures above 40º F may cause bacteria to grow and multiply rapidly.
- Keep eggs in original carton and place on shelf inside the refrigerator where the temperature is cold and consistent. Avoid storing eggs in refrigerator door where warm air enters when the door opens.
- Have you ever wondered in which position should eggs be stored? Eggs should be kept with the pointed end facing downwards. This prevents any damage to the air space.
- Store eggs in original carton to slow down moisture loss from them. This also protects the eggs from absorbing strong food odours and flavours.
- Eggs should not be washed before storing them. This destroys the natural protective cuticle which helps to preserve the quality of eggs.
- Eggs may be stored in the refrigerator for up to five weeks if stored properly.
- If eggs have to be frozen, separate yolk from white and freeze them separately.

Session Summary

Summary

In this session you learned about how to select milk, cheese and eggs for purchase. The types of milk vary according to the heat treatment they undergo and their fat content. Milk may be pasteurized, sterilized or ultra heat treated to extend its shelf life. There is a variety of cheese available for purchase. They are classified as hard cheese, soft cheese, blue vein cheese, acid curd cheese or cream cheese. The structure of an egg is basically its shell, egg white and egg yolk. Simple tests can be preformed to ensure that eggs are fresh before purchasing them. Tests for freshness include examining egg shells for their roughness and the heaviness of their weight. Milk, cheese and eggs are highly perishable foods. When purchasing these foods, attention should be paid to the ”use by” or “best before” date written on their packages to select good quality. Milk, cheese and eggs can be stored appropriately in the refrigerator after purchase.

Assessment

Assessment

Now that you have completed session 11.4, let's see how you do in this assessment. You are required to answer all the following questions correctly.

1. State three types of milk based on their:

(a) Heat treatment

(b) Fat content

2. What advice would you give consumers on testing the freshness of eggs before purchasing them?

3. Identify five points to consider when purchasing milk from the supermarket.

4. You have purchased a soft cheese called Stilton for the first time and have to store it until you are ready to use it. Explain how you will store this soft cheese to maintain its quality.

Now that you have completed assessment 11.4, you can check the answers to this assessment below.

Answers to Assessment

1. a. **Heat treated milk**

   Pasteurized milk

   Sterilized milk

   Ultra heat treated (UTH) milk

   b. **Milk based on their fat content**

   Whole milk

   Low-fat milk

   Skimmed milk

2. The freshness of eggs can be tested before purchasing them by:

- Checking the egg shells for slightly roughness. Stale eggs usually have smooth shells.
- Checking the weight of the eggs for their heaviness. The loss of weight is due to the escape of moisture and the entry of air as the egg ages.
- Holding eggs up to the light to ensure there are no black specks seen.

3. Five points to consider when purchasing milk from the supermarket are:

- Choose milk according to the desired purpose. Choice depends on whether it is for direct consumption or food preparation.
- Purchase milk with label date furthest in the future. This date may be seen as “use by date” or “sell by date” on the milk package.
- Do not purchase milk in packages that has been opened in any way.
- Avoid purchasing milk in dented or bulging cans because of the high potential of botulism.
- Compare the different brand names and prices of the milk available for sale and choose accordingly.

4. Soft cheese should be stored in the following way to maintain its quality:

- The soft cheese should be refrigerated in its original container and consumed within a few day of purchase.
- When the soft cheese package is opened, wrap it with plastic to prevent the loss of its delicate texture. It should then be placed in a plastic container lined with paper towel. This ensures that the moisture released from the cheese is absorbed by the paper towel and the cheese maintains its quality.

- The soft cheese should be stored in the warmest part of the refrigerator, such as the cheese or vegetable compartment.

Were you able to complete assessment 11.4 successfully? If you did congratulations! If not, review this session and try the assessment again.

11.5 Purchasing Fruits and Vegetables

Introduction

Have you ever been to the market? Do you buy fruits and vegetables to use at home? There is a wide variety of fruits and vegetables available for purchase in the market and the supermarket. We benefit from the nutritional value and flavor of fruits and vegetables when they are bought at their peak of freshness. Consumers need to know how to purchase high quality fruits and vegetables. In this session we will look at how to go about selecting different types of fruits and vegetables for their purchase and how to store them properly.

Outcomes

Upon completion of this unit you will be able to:

Select a variety of fruits and vegetables for purchase.

Outline the benefits of buying fruits and vegetables in various forms.

Distinguish between high quality and low quality fruits and vegetables.

Explain how to store a variety of fruits and vegetables after purchasing them.

How long?

In order to complete this session, you need to schedule 2 hours formal study time. You are also required to allocate 1 hour self-study time to review concepts and complete activities/assessments.

11.5-1 Types of Fruits and Vegetables

A fruit refers to the sweet, fleshy, edible part of a plant that usually contains one or more seeds. Fruits are usually eaten raw and add a wide variety of colours, shapes and flavours to our diet. They provide us with vitamin A and C, water and dietary fiber. Do you eat a wide variety of

fruits? How many fruits do you purchase? There is a wide variety of fruits available for us to purchase. Let's look at table for information on the types of fruits. Fruits can be classified into five categories: citrus fruits, tropical fruits, stone fruits, berries and melons.

Types of Fruits	Examples
Citrus fruits	Oranges, grapefruits, limes, lemons, tangerines and mandarins
Tropical fruits	Mangoes, bananas, pineapples, guavas, sugar apples and sapodillas
Stone fruits	Plums, peaches, cherries, apricots and nectarines
Berries	Strawberries, raspberries, blueberries and cranberries.
Melons	Watermelon, honey dew melon and cantaloupe.

Figure 24 Types of Fruit

Vegetables refer to the edible parts of plants. Vegetables are rich sources of vitamins, minerals, dietary fibre and water. They add a variety of colours, flavors and textures to our meals. Do you include vegetables in your diet? Which vegetables do you enjoy best? The enjoyment of vegetables starts with purchasing those of high quality. Before we look at how to purchase vegetables, let's look at the types of vegetables that are available for sale. Table below gives information on some types of vegetables used in food preparation and their examples.

Types of Vegetables	Examples
Fruits (used as vegetables)	Tomatoes, cucumbers, pumpkins, christophene, ochro avocado and eggplant.
Flowers	Cauliflower and broccoli.
Seeds and pods	Bodi and salad beans.
Stems	Celery and parsley

Types of Vegetables	Examples
Leaves	Cabbage, lettuce, spinach, water cress, mustard green and patchoi.
Bulbs	Onions and garlic
Roots	Carrots, beetroot and radish.

Figure 25 Types of Vegetables

The types of vegetables seen in table above may generally be sold fresh. However, some are also available in frozen, canned and dried forms.

You may have to make a decision on whether to purchase fresh, frozen, canned or dried fruits and vegetables. You may decide on your purchase based on your desired quality, taste, shelf life, nutritional benefits, convenience and price.

Let's highlight the benefits of the different forms of fruits and vegetables.

Benefits of Purchasing Fresh Fruits and Vegetables

Fresh fruits and vegetables:

- Provide maximum nutritional value.
- Provide natural colour, texture and flavour.
- Have no preservatives added.

Disadvantages of Purchasing Fresh Fruits and Vegetables

- Nutritional value declines after a few days in storage.
- Require more preparation time.
- Require knife skills to peel, chop or slice up vegetables.
- Have a short shelf life. Fresh vegetables, such as tomatoes, lettuce and pumpkin, begin to deteriorate within days.
- Will have waste from peelings and trimmings.
- Need to have suitable and adequate storage.

Benefits of Purchasing Frozen Fruits and Vegetables

- Processed at their peak of freshness and nutritional value of them after harvest is preserved.
- Convenient for quick and easy food preparation.
- Have a long shelf life.

- Available when they are out of season.
- There is no waste when using them in food preparation.

Disadvantages of Purchasing Frozen Vegetables

- The colour, texture or taste of may not be acceptable by consumers.
- Frozen vegetables may not hold long after being cooked.

Benefits of Purchasing Canned Vegetables

- Canned vegetables are convenient for quick and easy food preparation. They require minimal additional cooking.
- Canned vegetables tend to be cheaper than fresh vegetables.
- Canned vegetables have a longer shelf life compared to fresh vegetables.
- There is no waste when using canned vegetables in food preparation.
- Canned vegetables are available when they are out of season.
- Canned vegetables can be easily stored and do not require much space.

Disadvantages of Purchasing Canned Vegetables

- Some nutrients in canned vegetables are lost during the heating process of canning.
- The quality of canned vegetables may be less desirable than fresh vegetables. The colour, flavour and texture of the canned vegetables may be affected adversely.
- Canned vegetables content added preservatives such as sugar and sodium.

Benefits of Purchasing Dried Fruits and Vegetables

- They convenient for quick and easy food preparation.
- They have a longer shelf life compared to fresh vegetables.
- There is no waste when using them in food preparation.
- They tend to be cheaper than fresh ones.
- Dried fruits and vegetables are available when they are out of season.
- Dried fruits and vegetables are not bulky in weight and therefore do not require much storage space.

Disadvantages of Purchasing Dried Vegetables

- Dried vegetables tend to lose their natural colour, flavour and texture. Some dried vegetables may have a tough or leathery texture.
- Dried fruits tend to have high sugar content.

11.5-2 Fruits and Vegetables Purchase

Now that you have learnt about the types of fruits and vegetables that are available and their forms, it's time for us to examine the points to consider when purchasing fruits and vegetables.

What do you look for when purchasing fruits and vegetables?

Purchasing Fresh Fruits

Let's look at table belowto see what to look for when buying fresh fruits according to their type.

Types of Fruits	What to Look for
Citrus fruits Examples: oranges, grapefruits, tangerines, lemon and limes.	▪ Citrus fruits should be firm and heavy for their size. ▪ Their skins should be bright and colourful. ▪ Citrus fruits with bruised, wrinkled or discoloured skins indicate that the fruits are old.
Tropical fruits Examples: mangoes, bananas, pineapples, guavas, sugar apples and sapodillas	▪ Fruit should be firm, bruise free and has a fresh appearance. Fruits with soft patches can develop into a bruise with ripening. ▪ Select fruits that are plump and feel heavy for their size. ▪ If the fruit has a fragrance this indicates its ripeness.
Stone fruits Examples: plums, peaches and nectarines	▪ Select stone fruits that are firm, plump and full coloured. ▪ Be guided by the fruit fragrance which indicates its ripeness.
Berries Examples: strawberries, blueberries, cranberries and	▪ Berries should be firm, plump and bright-coloured. ▪ They should be fresh looking with no moulds or bruises.

Types of Fruits	What to Look for
raspberries.	▪ Berries are better when they are free of the stem and leaves. ▪ Moisture causes berries to grow moulds so they should be clean and dry.
Melons Examples: watermelons, honey dew melons and cantaloupes	▪ Melons should feel have for size. ▪ Select a melon without scars, tears, bruises or blemishes in the skin. ▪ Look for the "field spot" on the melon. The "field spot" is a yellowish oval area formed where the melon was resting on the ground. This indicates that the melon is ripe. ▪ Inspect the spot where the stem was attached to the melon. The stem naturally detaches from the melon when it is ripe. ▪ Do not purchase overly soft, crushed or cracked melons. ▪ Buy whole melons instead of those cut.

Figure 26 Purchasing Fresh Fruit

Purchasing Fresh Vegetables

Let's look at table below to see what to look for when buying fresh vegetables according to their type.

Types of Vegetables	What to Look For
Fruits (used as vegetables) Examples: tomatoes, cucumber, eggplant, pumpkin and ochro.	▪ These vegetables should be firm and have full-colour. ▪ Avoid vegetables that are soft or have spots, bruises or cracks.
Flowers Examples: broccoli and cauliflower.	▪ Flower vegetables should be firm and closely packed florets. ▪ Their stalk should be firm and tender.

Types of Vegetables	What to Look For
	▪ Broccoli florets should be dark green, while cauliflower florets should be creamy-white.
Seeds and pods Examples: string beans and bodi	▪ These vegetables should have smooth, even pods. ▪ They should be crisp, blemish free and of good colour.
Stems Examples: celery and parsley.	▪ Stem vegetables should have crisp stems that snap when they are broken.
Leaves Examples: lettuce, spinach and mustard green.	▪ Leafy vegetables should be fresh, crisp, firm and of a good green colour. They should be heavy for their size. ▪ They should not be wilted and blemish free. ▪ Yellowing indicates the start of decay.
Bulbs Examples: onion and garlic.	▪ Bulb vegetables should have dry papery skins. ▪ They should be hard and well shaped. ▪ They should show no sign of mould or sprouting.
Roots Carrots, beetroot and radishes	▪ Root vegetables should be clean, firm and without cuts or bruises. ▪ They should be free from blemishes and of even size and shape.

Figure 27 Purchasing Fresh Vegetables

Purchasing of Fruits or Vegetables in Other Forms

Frozen Fruits or Vegetables

- Choose fruits or vegetables that are frozen solid. They that are not firm indicate their lost of quality. Avoid frozen fruits or vegetables

with stain on the package. This indicates that they were defrosted at some times.

Canned Fruits or Vegetables

- Choose canned vegetables that have no salt added if possible.
- Choose canned fruits in 100 % fruit juice or light syrup.
- When buying canned fruits or vegetables, do not buy cans that show signs of bulging or swelling at the end or of leakage. Do not buy badly dented cans.
- Bottled fruits or vegetables in glass jars with twisted-off lids should not be tampered with before purchase.

Dried Fruits or Vegetables

- Check package with dried fruits or vegetables to ensure it does not have any openings.
- Do not purchase any dried fruits or vegetables with mould or an unpleasant smell.

When you have purchased your high quality fruits and vegetables, you should know how to store them properly. Do you know why this is important? This is important to maintain the nutritional value, flavour, colour and texture of the fruits or vegetables purchased.

Storage of Fresh Fruits

- Although citrus fruits will keep at room temperature for several days, they can be store in the crisper drawer of the refrigerator for best results.
- Uncut exotic fruit can be kept at room temperature to preserve its fragile texture and delicate flavour.
- Cut exotic fruit should be covered and refrigerated.
- Store stone fruits on the counter at room temperature until desired ripeness. Ripe stone fruits should be stored in the crisper drawer of the refrigerator. These fruits will keep for about a week in the refrigerator.
- Store berries at home in the original plastic storage container on a shelf in the refrigerator.
- Rinse berries just before you are ready to use them. When berries are damp they spoil quickly and mould growth is encouraged. Moulds on berries spread quickly. Remove mouldy berries from the good ones.
- Uncut melons store well at room temperature. Cover the cut surfaces of melon refrigerate and consume with two to three days.

Tip

Do not use a plastic bag to store fresh fruits. This may cause decay and lead to off flavours in the fruits.

Never place firm or unripe fruits in the refrigerator. They can become dry, mealy and flavourless.

Storage of Fruits or Vegetables in Other Forms

- Store frozen fruits or vegetables at 0º F or lower. They can be stored for eight to twelve months.
- Store canned or bottled fruits and vegetables in a cool, dry place, and use within a year for top quality.
- Store dried fruits or vegetables in air tight container in a cool dry place. Use them within a few months.
- Store dried fruits or vegetables in small batches to maintain freshness and minimise the risk for contamination.
- Store opened package of dried fruits or vegetables in the refrigerator to preserve freshness.

Unit Summary

Summary

In this unit you learned how to purchase various foods. The next time that you are shopping you will know what to look for when buying dairy products, fruits and vegetables, meats, poultry, and legumes. There are so many forms for which food is packaged. Therefore it is a good idea to keep in mind key elements to look for. Not just that but, once you get the food home, you must know how to store the food effectively. This unit has given you the knowledge to do all these things.

Contents

Unit 12

Food Labels

Introduction

How do you know what ingredients are contained in the products you buy? In these health conscious days, what information do you use to choose the best foods to eat? How can you ascertain that you are getting value for your money when you purchase items at the grocery store?

Upon completion of this unit you will be able to answer these questions by reading and interpreting the labels on the foods you purchase and use everyday.

Upon completion of this unit you will be able to:

Outcomes

- *Describe* the information found on a food label
- *Explain* the purpose of the different types of labeling found on food products
- *Explain* the importance of reading and using food labels in food preparation
- *Interpret* nutritional information on food labels

How Long?

You need to devote fifteen (15) hours of study to this unit. Ten (10) hours of formal study time and five (5) hours of self study.

This Unit is Comprised of Four Sessions

Session 12.1 Parts of the Food Label

Session 12.2 Interpreting Information on Food Labels

Session 12.3 Special Labeling on Food Products

Session 12.4 Nutritional Labeling

Session 12.1 Parts of the Food Label

Introduction

Food labels serve a very important purpose. Not only do they make the package the food comes in look appealing, but they also serve a more important purpose about what you are buying. This session will teach you how you can use the information on the labels to make smart choices whenever you purchase food items.

Upon completion of this session you will be able to:

Outcomes

Identify the different parts of a food label

Describe the different types of labeling used on food products

Discuss the purpose for labeling foods

Explain the meaning of the terms used on food labels

How Long?

You will need to devote two (2) hours of formal study and one and half hours (1 ½) of self study to complete this session.

Terminology

Brand: This is a symbol, word or mark used to identify a product, company or service.

Calorie: This is a unit of energy. It is used as a measure of the amount of energy a particular food provides to the body. The calorie is a very small measure of energy so the kilocalorie (kcal) is used more often on

	food labels. 1000 calories = 1 kcal.
Serving Size:	This is a measure of the standard amount of food listed under a product's *Nutrition Facts*.
Food Allergy:	This is an adverse immune response to foods that contain protein.
Universal Product Code (UPC):	This is a barcode usually containing a twelve (12) digit number that is used to identify a product when scanned by a reader.
Osteoporosis:	A disease that causes the density of the bones to deteriorate which leads to a high risk of fractures.

Activity 12.1

Let's begin by exploring the parts of the food label. The label of any food product has several parts with which you should become familiar. Find a package of any food item and examine it. Let's begin at the front. What do you see? In the space below, write four (4) pieces of information from the label.

12.1-1 Parts of the Food Label

What does your list look like? Does it include the name of the product? The brand name? The ingredients it contains? Read below for a full list of the different parts of the food label.

Food labels, apart from attracting us to the product, help us decide what foods we should buy. How so, you ask? Food labels provide us with vital information about what is inside the package. Listed below are parts of the food label you should take note of as you examine any product label. Keep in mind that only processed foods are required to have these types of labels.

Name of the Product:

The common descriptive name of the product is printed on the label. "Diced Tomatoes" is the descriptive name found on the food label in Figure 1. Labels will also give you an idea of what kind of treatment the food has undergone, for example, smoked fish or breaded fish. This normally appears on the front of the package and should be easily seen and read by the customer. You will also see the brand name as well as brand logo (a symbol that is easily recognized by consumers).

Figure 1: Can of Diced Tomatoes
Image: Simone Reid-Foster

Brand:

This is an identifiable mark, logo or brand that makes the produce unique from another similar products.

Figure 2: Brand Name 'Hunt's' Displayed on the Label.
Image: Simone Reid-Foster

Weight:

The weight listed is the net weight which is the weight of the food product without its packaging. This is usually listed in grams or pounds.

Figure 3: Weight in Grams (g) and Ounces (oz)
Image: Simone Reid-Foster

Health Claims

These are claims made by the manufacturer about the benefit of a particular nutrient found in the product regarding your health. For example, some manufacturers claim that by consuming their product you will reduce the risk of developing a certain disease. The health claims are usually very visible and enable the consumer to make quick comparisons between different products.

'Healthy' Claims

Have you ever heard that consuming oat or bran cereals can reduce your cholesterol levels? This is one type of health claim called a *healthy claim*. Another example of a *healthy claim* is that adequate consumption of calcium and vitamin D can reduce the risk of osteoporosis. Look at the photos below to see the health and *healthy claims* they lists.

Figure 4: Healthy Claim on a Carton of Milk
Image: Simone Reid-Foster

Nutrient Claims

Another type of health claim that you can find on food labels are about the level of particular nutrients found in certain foods. Claims such as ‘high fiber’ cereals, ‘low fat’ cookies or “low sodium” soups are all nutrient content claims that can be seen on a number of food products.

Health claim; ‘low fat’; ‘no trans fat’

Figure 5: Health Claim on Packet.
Image: Simone Reid-Foster

Name and Address of the Manufacturer

Who made that diced tomato product? The name and address of the manufacturer, or the company that packages or distributes the product is on the food label.

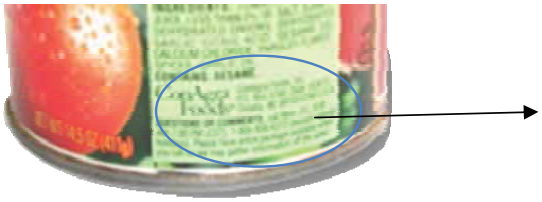


Figure 6: Manufacturer’s Name and Address
Image: Simone Reid-Foster

List of Ingredients

What is in a can of tomato sauce? Figure 7 below shows a list of ingredients. You will see that tomatoes are not the only ingredient. Other items may also be added like sugar, water, herbs and spices.. All of the ingredients contained in a

product must be listed on the label. Furthermore, the ingredients are listed in descending order of predominance by weight meaning that the ingredient that weighs the most is listed first and the ingredient that weighs the least is listed last.

Figure 7 shows that the most predominant ingredient is tomatoes, while the least dominant ingredient is garlic oil.

Figure 7: Ingredient Listing
Image: Simone Reid-Foster

Nutrition Information

Another part of the label is the Nutrition Facts panel. This panel provides you with nutritional information specific to the product. More details on the Nutrition Facts panel will be discussed in Session 12.4..

Figure 8: Nutrition Facts Panel
Image: Simone Reid-Foster

Product Dates

Have you ever seen a “use by” date stamp on a label? There are two types of date stamps that you may encounter on product; the “use by” date is the suggested date of which the product should be consumed by. The closed or coded date stamp is a packing code that enables the manufacturer to track the product. This code also makes it easy for merchants to rotate stock or recall products in the event there is a problem. This will be discussed further in a later lesson.

Figure 9: “Use By” Date on a Package
Image: Simone Reid-Foster

Country of Origin

The food label must show where the food was originally grown or produced.

Other information that may be displayed include:

Preparation and storage information:

- Preparation: information on how the item is to be prepared. For example, the length of time for cooking or whether it is suitable for microwaving. Suggestions for different uses may also be listed such as when a soup can be used as a sauce or in a casserole.

- Storage: how the product should be stored after opening. For example, evaporated milk should be refrigerated after it is opened.

Activity 12.2-1

1 Collect the labels of two (2) different products:

-a food product that is locally manufactured

-a non-food product such as shampoo

a) Identify the different parts of the food label and list them below.

b) Is there anything on the food label that was not on the non-food product label?

Feedback

a) Parts of the food label present on both: name of the product, brand name, weight, name and address of manufacturer, list of ingredients, preparation/use/storage directions.

b) Nutrition information, health/healthy claims, product dates.

12.1-2 Purpose for Labeling Food Items

Why label food items? As we said earlier, only processed food items need a food label. This is because they have been changed from their natural state and have had some substances added or taken away.

What if you went to a grocery store and all of food products were in unmarked plastic bags, cans and boxes. What might be some of the questions you would ask? First would likely be, “What is in the package:” Second might be “Who it made?” Another question might be “When was it made?” These are just a few of the questions you would want to know before buying the item.

What does this tell us about the purpose of food labels? Consider the following scenarios concerning food labels:

- You have an allergy to peanuts and quite a number of snack foods are prepared using peanut oil or are manufactured in facilities where peanuts are present
- You want to purchase tomato sauce, but there are several sauces made by different companies
- You opened a can of soup and there was a foreign object in it
- You open a jar of relish but don’t use all of it
- Your doctor told you that you need to purchase high fibre cereal

For each of the above scenarios, you need information in order to make your decision about which product to buy. The labels on the product provides this information making it easy for you to choose.

Write three (3) sentences/statements about the purpose of labeling foods.

1. _____

_____

2. _____

_____

3. _____

_____

Feedback

- To inform the customer about the product.
- To ensure the labels provide correct information and do not mislead the customer or make false claims about what the product can do.
- To distinguish one manufacturer's product from another.

Assessment

Assessment

You are making a dry-mix chocolate cake that you want to package and sell. You are required to prepare a label for the cake mix.

a On the blank diagram below, label the information that will be present on your package.

b In the blank table, explain why it is necessary to include each of these pieces of information on your label.

a)

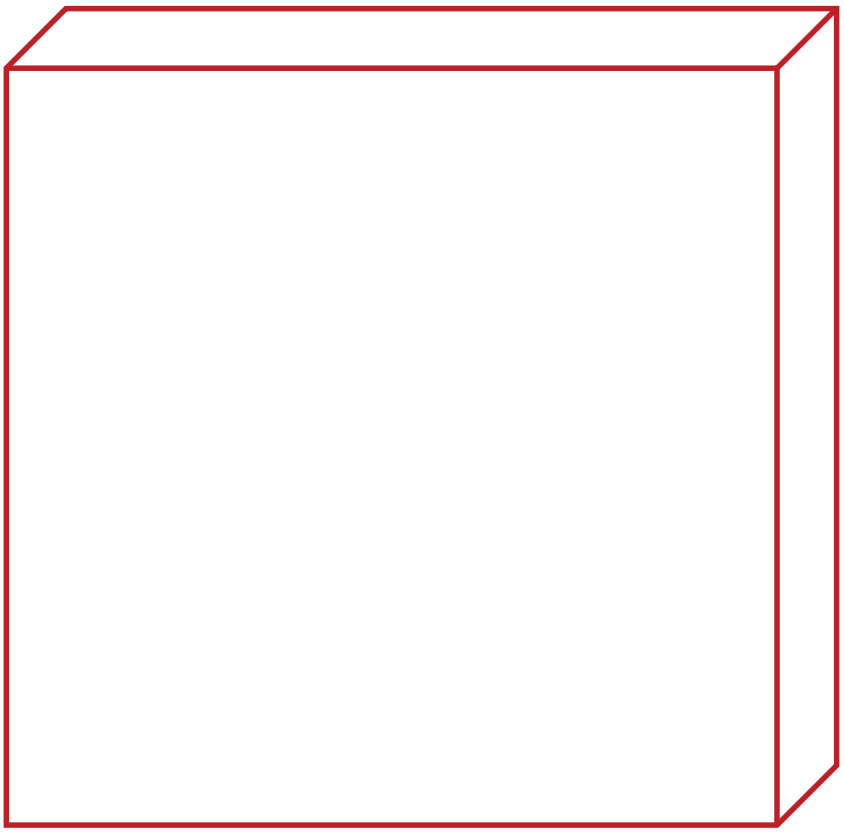


Figure 10: Label Your Chocolate Cake Box

b)

Part of Label	Reason
Name of Product	
Brand Name	
Weight	
Nutrition Facts Panel	
List of Ingredients	
Country of Origin	

Part of Label	Reason
Preparation and Storage Information	
Manufacturer's Name and Address	
Dates	

Figure 11: Parts of the Label

Feedback

Here are the answers to the questions above.

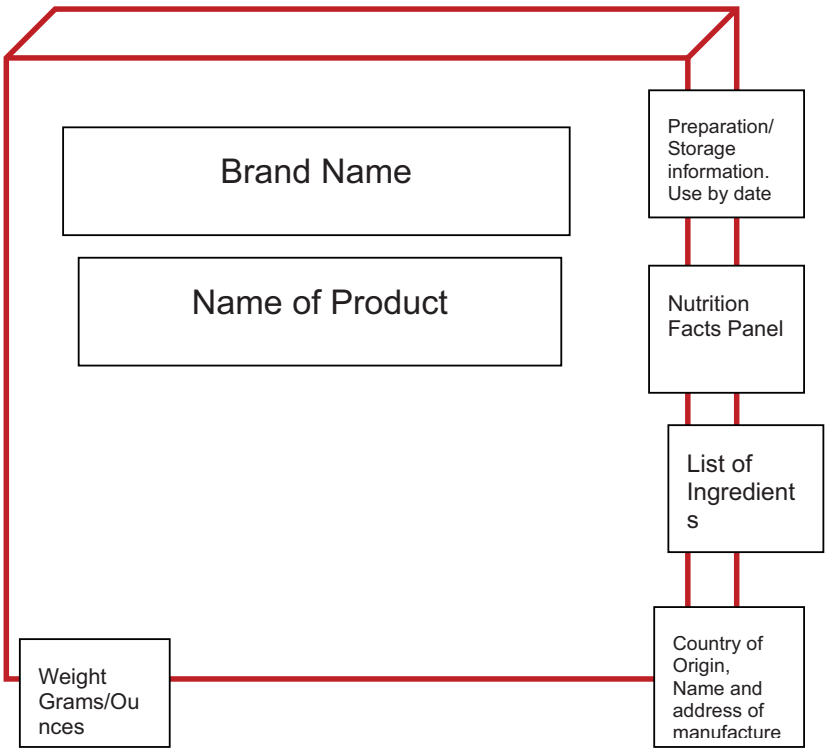


Figure 12: Information Found on a Box of Cake Mix

Part of Label	Reason
Name of Product	Gives the customer information
Brand Name	Identifies the product for the customer
Weight	Informs the customer of the quantity to help them determine how much they need
Nutrition Facts Panel	Informs the customers of the nutrients present and how much the product contributes to their daily nutritional needs
List of Ingredients	Informs the customer of ingredients present. Especially useful for those with severe food allergies
Country of |Origin	Informs the customer of the source of the product
Preparation and Storage Information	Gives guidance to the customer on the use and storage of the product.
Manufacturer's Name and Address	Informs the customer of who to contact in the event of a problem with the food product
Date Stamps	Informs the customer about the length of time they have to use the product and when the product is to be sold by the retailer

Session Summary

Summary

In this unit you learned about the parts of a food label. The table below provides a session summary.

Part of the Food Label	Description
Name of the Product	The common descriptive name of the product e.g. diced tomatoes.
Brand	The identifiable brand name, logo or mark that makes the product distinct from other similar products
Weight	The weight of the contents of the package
Health Claims	Claims make by the manufacturer linking health benefits to the nutrients found in their product
Name and Address of the Manufacturer	Who made the product and where did they make it
Ingredients List	A list of all the ingredients that the product contains labeled in descending order
Nutritional Information	The nutrition fact panel contains information about the number of servings in the package, serving size and nutrients
Product Date	Both calendar dates and coded dates may be present of the product.
Country of Origin	Provides information regarding the origin of the food

Part of the Food Label	Description
Preparation and Storage Information	Directions for the preparation of the product and how to store it after opening

Purpose of Labeling Food Products

-to inform the consumer

-ensure consumers are not misled

-distinguish one manufacturer's product form another

Session 12.2 Interpreting Information on Food Labels

Introduction

We agree that food labels provide us with valuable information. Labels give us more than just the ingredients, but also the nutritive composition.

Outcomes

Upon completion of this session you will be able to:

List the different types of labeling information on food product

Explain the use of the Universal Product Code on food products

State the advantages and disadvantages of the Universal Product Code

Explain how consumers can identify the ingredient quantity on a food product

Briefly explain nutritional labeling

Determine the freshness of various food products by interpreting the different dates stamped on a food label

How Long?

You will need to devote two (2) hours of formal study and one and half (1 ½) of self-study to complete this session.

Terminology

Nutrition Facts Panel: This a part of the food label that gives information about the number of servings, serving size, calories and the nutrients the product contains.

Serving Size: On the nutrition facts panel the serving size represents the amount of the food that you should eat in one sitting.

Open Dating: This a system of dating on the food label that gives both the retailer and consumer information about the freshness of the food and is expressed as a calendar date.

Closed Dating: This is a system of dating on the food label that uses a code instead of a calendar date. It gives the food manufacture information about the freshness of the food item.

Universal Product Code (UPC): This is a bar code found on a food label that identifies the product and gives the retailer and manufacturer information about the product.

These are different types of informational labeling on food products we will discuss in this section:

- The Universal Product Code (UPC)
- Content Labeling
- Nutritional Labeling
- Date Stamping

12.2-1 Universal Product Code (UPC)

Have you ever noticed the part of a food label that contains some black lines on it? This is a Universal Product Code, or commonly known as a bar code. When you are at the checkout counter at the grocery store this bar code is passed over a

machine that makes a beeping sound as it is recognized by the machine. Using bar codes decreases the time spent at the cashier. The code has other functions as well.

Figure 13: Universal Product Code
Image: Simone Reid-Foster

What is a Universal Product Code (UPC)?

- It is a bar code that is readable by a machine.
- It identifies the product as well as the package size and price.
- It provides information about who manufactured the product.
- It provides information about the contents of the product.

What do the bars and the numbers mean?

- The first six (6) digits under the bars identify the manufacturer
- The last five (5) digits is the *check digit*. Simply put, the scanner performs a calculation based on the last five digits to determine whether or not it scanned the item accurately

The first 6 digits of the UPC

Figure 14: First 6 Digits
Image: Simone Reid-Foster

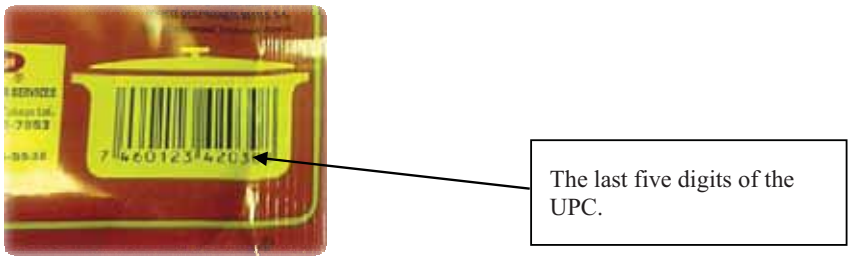


Figure 15: Last 5 Digits
Image: Simone Reid-Foster

12.2-2 The Advantages and Disadvantages of the using the Universal Product Code

Have you ever added an item to your shopping cart then couldn't remember how much it cost later on? This is one problem the consumer faces when using the UPC. There are however advantages as outlined in the cart below..

Advantages and Disadvantages of Universal Product Code:

Advantages	Disadvantages
• Less time is spent at the check our counter since the process is computerized and usually more accurate.	Since the price is only labeled on the shelves and not on the product itself, it can be difficult to keep track of prices and the total amount that is being spent.
• Items on your receipt are clearly itemized and sometimes categorized by department such as bakery, deli and frozen foods.	Pricing accuracy may be a problem if the computerized system is not updated often or accurately.

Figure 16: Advantages and Disadvantages of UPC

For the retailer, manufacturer, distributor and shipper, the UPC code makes keeping track of inventory easier and more accurate. Since all of the information about the product is available through the UPC code, a computerized database of the product can be shown at the touch of a button. Quantities of stock available,

location within a warehouse and dates of new versus older stock are all accessible through the UPC code.

Activity 12.2-2-5

Fill in the blanks below.

1.The Universal Product Code is:

2. The first 6 digits of the bar code identify:

3. The last 5 digits of the bar code identify:

4. Two advantages of the UPC to the consumer are:

5. One advantage of the UPC to a retailer, manufacturer, distributor or shipper is:

Feedback

1. This is a machine readable bar code that identifies the product, package size, the name of the product's manufacturer among other things.
2. The first 6 digits identify the manufacturer.
3. The last 5 digits is known as the *check digit* and determines whether or not the product has been scanned accurately.
4. Advantages to the consumer: less time is spent at the checkout counter and your purchased items can be clearly itemized and identified on your receipt
5. Advantages to the retailer, manufacturer, distributor or shipper: makes keeping track of inventory easier.

12.2-3 Content Labeling

What is in a can of mixed vegetables? Vegetables of course! But which vegetable listed is the most abundant in the can? As we discussed in the previous section, each food product has a list of the ingredients that make up the food product. Have you ever looked at this ingredient list before? What do you notice about the ingredients? The list places ingredients in descending order, meaning that the first ingredient is the most abundant. Look at the Figure 17 below. Which ingredient is listed first?

Figure 17: Ingredient or Content Listing in Descending Order
Image: Simone Reid-Foster

12.2-4 Nutrition Labeling

On each food label there is a panel either on the side or back of the package that lists the nutrients present in the product. On this panel you will also find the number of servings you can get form the package and the amount of calories each serving yields. Why would anyone want to know about numbers of servings and amount of calories contained in the package? People on special diets or those with nutrition related health concerns would need this information in order to make decisions about what and how much to eat. We will discuss nutrition labeling in more details in Session 12.4..

Before we more on from our discussion on nutrition labeling it is important that you know that:

- Nutrition labeling is mandatory in some countries and voluntary in others.

- Guidelines for nutrition labeling are governed by different organizations across the world. Here in the Caribbean the Bureaus of Standards of the respective countries set the nutrition labeling guidelines. Organizations such as the Caribbean Food and Nutrition Institute (CFNI) use labeling guidelines developed and governed by the Food and Drug Administration.

12.2-5 Date Stamping

You have been saving that packet of chocolate chip cookies for a special occasion but how long is it going to last before it spoils? How will you determine that the time is drawing near to either throw it away or eat it? If look at your favourite pack of cookies, you would see that there are some dates stamped on it.

Certain date stamps are used with food products to provide information about them. What are the different dates that can be found on the package? Let's discuss the *shelf life* of a product.

Each food product has what is called a *shelf life*. The *shelf life* of any product food, medicine or chemical is the length of time or the date by which the item is recommended safe to sell, use or consume.

Is the *shelf life* different from the expiration date of a product? Yes! While the *shelf life* deals with the quality or freshness of the food, the expiration date of a food product has to do with food safety. Prior to the expiration date, the presence of bacteria, toxins or moulds is the least abundant and therefore safe to consume.

The different dates stamped on food products form part of a system of dating called open dating. In open dating the actual calendar date is used as opposed to

closed dating where a code consisting of numbers is used. The customer is able to understand what these dates mean since an actual calendar date is printed on the packet. The customer is provided with information about the quality or freshness of the product. There are several types of open dates which include: *sell by*, *use by* or *best before* date and the *expiration date*.

- **Sell by Date**: This date tells the retailer how long to display the product and helps them keep track of old and new stock. The product can still be used past the sell by date as long as it has been stored properly after purchase.
- **Best Before** or **Use By** date: This is the suggest date in which the consumer should use the product as it will be at its best quality. It is safe to consume the product after this date but it may not be at its best quality or freshness.
- **Expiration Date**: this the final date up to which the product should be used. After this date the product's quality has been compromised. For example, medicine should not be used after the expiry date because the effect it has on the body can be altered the older it becomes. After the expiration date the medicinal quality is compromised.

What Type of Foods are Date Stamped?

Perishable foods such as meat, poultry and eggs, are items that are date stamped while canned, bottled or dried foods may be stamped with a closed dating code which is specifically used by the manufacturer.

Activity 12.2

Date stamping on food products is simple. Check your understanding of date stamping by completing the following activity:

Suppose you visited to the grocery store and purchased, baking powder, yogurt, milk and a rock bun from the store's bakery.

a) State the type of date that will be stamped on each of the products listed above. Explain what each date means.

Food product	Date
Yogurt	
Milk	
A rock bun (coconut cake)	

a) What does each type of date identified above mean?

1.

2.

3.

a) Distinguish between open dating and closed dating on food product labels.

How did you do with those questions? Check the answers below to find out.

Feedback

Food Product	Date
Yogurt	Best before date
Milk	Expiration
A rock bun (coconut cake)	Sell by or best before

1. Expiry date: the final date by which product should be used.

2. Sell by: tells the retailer how long to display the product

3. Best before tells the consumer when the product is at is best quality

With open dating, the actual calendar date is used and is easily identified by the customer. Closed dating is a code consisting of numbers more easily understood by the manufacturer.

Session Summary

Summary

In this unit you learned:

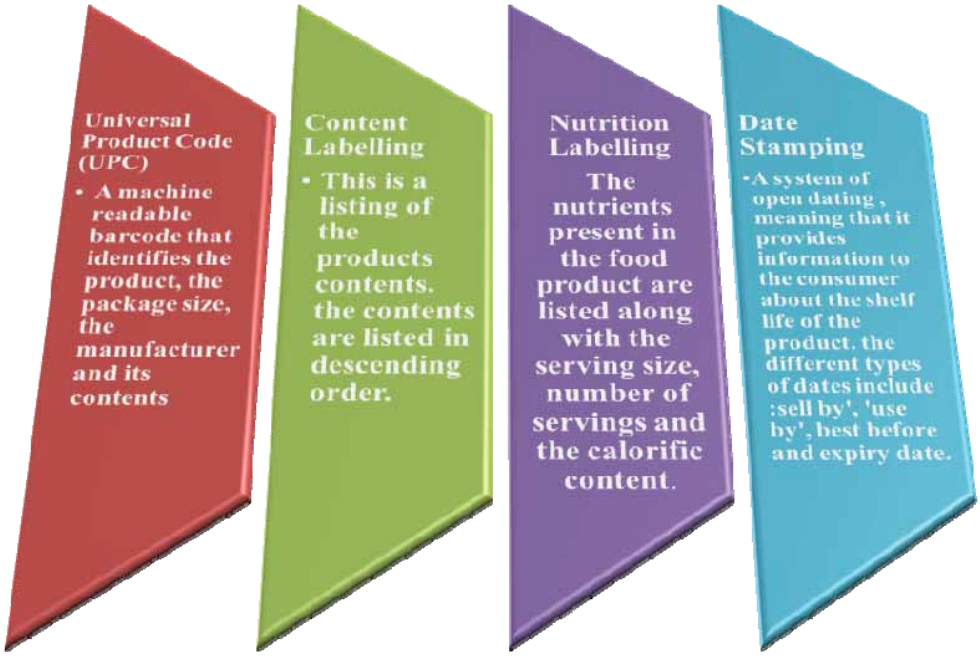


Image: Simone Reid-Foster

Session 12.3 Special Types of Labeling on Food Products

Introduction

In this session we will examine a few of the issues that may be of concern regarding the labeling of food and how it identifies specific characteristics of the item or contents of the package. This is of particular interest as food manufacturers create new food items or adjust or modify existing ones.

Upon completion of this session you will be able to:

Outcomes

- *Explain* what the term "enriched/fortified" as it relates to food products
- *Outline* the concerns when labeling genetically engineered or modified foods
- *Describe* the labeling used for functional foods
- *Explain* what "standards of identity" means as it refers to labeling of particular products

How Long?

You will need to devote two (2) hours of formal study and one and a half (1 ½) hours of self study to complete this session.

Terminology

Deficiency Disease: A disease caused by a dietary lack of specific nutrient(s) especially vitamins and minerals.

12.3-1 Adding Nutrients to Food

Have you ever looked at the label of a package of margarine or flour? You may see the words 'enriched with' or 'fortified with' and the names of some nutrients listed. While both of these terms mean that something has been added to the food item, the reasons for adding them differs. Let's find more out these added nutrients.

Figure 18: Milk 'Enriched' with Vitamin D
Image: Simone Reid-Foster

Why Did the Manufacturer Add Nutrients?

In the food industry, heat at very high temperatures is often used when food products are processed. This heat, whether used for sterilization or cooking, destroys some of the nutrients normally found in the raw food items. In order to maintain the food's original or near original nutrient levels, the manufacturer will add back or *enrich* the food with the nutrients that the processing procedure had destroyed. The manufacturer must conform to the specific legal limits allowed by the government when adding back these nutrients.

What foods are normally enriched with nutrients? The next time you are at your local grocery store, check the packages of flour and cereals and see what nutrients have been added.

Fortification of Foods

Fortified foods differ from enriched foods in that the unprocessed food items did not originally contain the nutrients with which the end product now contains.

Figure 19: Flour Fortified with Folic Acid
Image: Simone Reid-Foster

Why Fortify with Nutrients Not Naturally Found in Foods?

- This is done in order to meet the dietary needs of special groups of 'at risk' persons such as pregnant women, children and elderly.

- To help control the incidence of deficiency diseases among populations that may consume large amounts of staple foods such as rice or corn. In addition fortified foods maybe help prevent deficiency diseases in times of famine or disaster when well balanced meals are less readily available.

What Types of Foods are Fortified?

Many types of foods and drinks have been fortified to help improve the quality of our lives. Margarine has been fortified with vitamins A and D while drink mixes and fruit juices are fortified with vitamin C and calcium. Folic acid has been added to flour while iodine has been added to salt. Even water has been fortified with fluoride.

In a nut shell:

Enriched foods have nutrients added back to them to restore them to their original or near original state before they were processed.

Fortified foods have nutrients added to them to meet the nutritional needs of 'at risk' groups of persons and help to control or alleviate the incidence of deficiency diseases in populations that may eat primarily staple foods. Foods are also fortified to increase their nutritional values

The Nutrients added are usually vitamins and minerals.

Activity 12.3-1

Complete the following exercise. Follow the instructions given for each section.

Circle the BEST answer from the options provided below.

1. Enriched food products have _____ added to them.

   a) Ingredients

   b) Chemicals

   c) Nutrients

2. The substances that are added to enriched foods are destroyed during processing by the addition or use of_____.

   a) High temperatures

   b) Freezing temperatures

   c) Chemicals

   d) Crushing the food

3. Fortified foods such as cereals are fortified to_____.

   a) Cure incidences of deficiency diseases

   b) Control the development of deficiency diseases

   c) Treat the incidence of deficiency diseases

   d) Stop the development of deficiency diseases

4. Common foods that are fortified include which group of foods;

   a) margarine, orange juice, flour

   b) butter, ice-cream, frozen peas

   c) milk, soda, iced tea

   d) bagels, muffins, donuts

5. Identify which foods from the list below are enriched versus fortified. Write next to each item, ‘E’ for enriched or ‘F’ for fortified.

    a) Salt

    b) Flour

    c) Orange juice

    d) Margarine

    e) Pasta

    f) Bread

Feedback

Check the answers below to see how you did.

1. C - nutrients, 2. A - high temperatures, 3. B - control the development of deficiency diseases. 4. b - margarine, orange, flour.

2. A – Fortified, B – Enriched, C – Fortified, D – Fortified, E – Enriched, F – Enriched

12.3-2 Common Terms Seen on Food Labels and what they Mean

What does it mean when a carton of milk says it is ‘low fat’ or there is ‘fat free’ mayonnaise or ‘sugar free’ cookies? Let’s look at the differnt types of fat.

Type of Fat	Description
Low Fat	Less than 3g of fat (less than a teaspoon)
Fat Free	Less than 0.5g of fat or no added fat
Reduced Fat	Contains 25% less fat than the original product
Light or “Lite”	Contains 50% less fat or 1/3 fewer calories than the original product
Low Calorie	Less than 40 calories per serving

Type of Fat	Description
Low Cholesterol	20 mg or less per serving
Calorie Free	Less than 5 calories
No Sugar Added or Sugar Free	No sucrose has been added, but may contain other naturally occurring sugars such as glucose

Figure 20: Types of Fat

Note it! / Warning

It is important to note that the fat content on food labels refer to a single serving of the food and not the entire package. It is therefore prudent to identify the serving size before consuming the entire package, especially if you are watching your fat intake!

12.3-3 What About other Types of Foods and their Labeling?

Genetically Engineered or Modified Foods

Genetically engineered foods or the genetic modification of foods means that that the genetic makeup or DNA of the food has been altered in a way that does not occur naturally. These changes have a variety of effects; they make food more resistant to damage from disease carrying organisms or herbicides, allow trees to yield fruits or nuts earlier and in larger sizes and can bring animals to maturation more quickly.

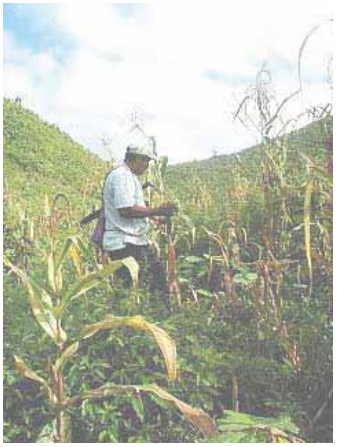


Figure 21: Field of Genetically Modified Corn
By Gmanacsa at en.wikipedia [CC-BY-SA-2.0 (www.creativecommons.org/licenses/by-sa/2.0)],

Would you want know whether or not the food you are consuming has been genetically engineered or modified? Most people would say yes. European law requires food labels to indicate if there are genetically modified ingredients in a food item. Consumers have a right to know not only what is in their food but also what has been done to their food. This will allow them to make informed choices about what they are putting into their bodies.

12.3-4 Standards of Identity

How much actual meat does a burger patty contain? How much 'juice' is in a cup of orange juice? Standards of identity describe food formulas made according to government standards.

- Meat patties can contain *fillers* such as bread crumbs and vegetables but actual meat in a certain percentage must be present for it to be labelled as a "meat patty".

- Consumers need to be aware of foods that contain flavorings. Examine the following points; are there any differences between them?

    - Orange-yogurt

    - Orange flavoured yogurt

    - Orange yogurt?

You may be surprised to find that the products above are different from each other. Orange-yogurt contains no natural fruit juice while orange flavored yogurt has some natural fruit juice. Orange yogurt must contain actual orange juice and in a higher percentage than the orange flavour yogurt. Be sure to make wise food choices based what is on your food label.

There is a lot of information on issues that confront you every day as you walk up and down the isle of the grocery store. Let's summarize what you have learned.

Session Summary

- In this unit you learned that enriched foods have nutrients added back to them to restore them to their original or near original state before they were processed.

Summary

- Fortified foods have nutrients added to them that were not present before processing.
- Nutrients added are usually vitamins and minerals.
- Flour and other cereal products are usually enriched with thiamine, riboflavin and niacin.
- Margarine is fortified vitamins A and D, while orange juice has calcium added to it.
- Some common terms found on food labels include the following:

Fat	Description
Low Fat	Less than 3g of fat
Fat Free	Less than 0.5g of fat or no added fat
Reduced Fat	Contains 25% less fat than the original product
Light or "Lite"	Contains 50% less fat or 1/3 fewer calories than the original product
Low Cholesterol	20 mg or less per serving
No Added Sugar or Sugar Free	No sucrose has been added, but may contain other naturally occurring sugars such as glucose
Calorie Free	Less than 5 calories

- Genetically engineered foods or genetic modification of foods means that that the genetic makeup of the food has been altered. Some important points about genetically engineered foods are:
    - They are more resistant to damage from disease carrying organisms
    - Europe requires food labels to state if the product has been genetically modified

- Modified foods have a shorter maturation period and usually yield larger products

Standards of identity describe food formulas made according to government standards.

- Certain foods such as meat patties must contain a certain percentage of meat to be labeled as a meat patty.
- Be aware of how food is labeled:
  - Orange-flavour yogurt, has no actual orange in it
  - Orange flavoured yogurt; have some real orange in it
  - Orange yogurt must contain actual oranges or real orange juice

Assessment

Assessment

As a nutritionist, you have been asked to help the residents in your community understand the meaning of the different terms found on food product labels.

You have been asked to explain the following:

1. Why a box of macaroni contains vitamins and why orange juice contains calcium. Explain the difference between enriched and fortified.

2. The meanings of "low fat" milk, "sugar free" grapefruit juice, "reduced fat" mayonnaise, "low calorie" salad dressing and strawberry flavoured milk.

Feedback

1. Macaroni and orange juice did not originally contain the vitamins or minerals that were added to them. They are therefore fortified products. Since both are widely consumed by children, they have been fortified to ensure their nutritional goals. Enriched items are products that had nutrients added back to them after they were processed.

2. "Low fat" milk has less than 3 grams of fat remaining in it.

   "Sugar free" grapefruit juice mean that there is no added sugar to the juice, however it may contain other naturally occurring sugars.

   "Reduced fat" mayonnaise contains 25 % less fat than regular mayonnaise.

   "Low calorie" dressing means that each serving of the dressing contains less than 40 calories.

   Strawberry flavoured milk is product contains some natural strawberry flavouring but in a low percentage.

Session12.4 Nutrition Facts Panel

Introduction

One of the best freedoms we have is the ability to choose. This includes the freedom to eat what we want when we want. To help us decide what to put into our bodies we can view at a glance the nutrients that are present in our foods by looking at the Nutrition Facts panel located on almost all food products. Who needs the nutritional information found on these panels? People with particular food allergies or specific dietary conditions will use this panel to determine if the food product will suit their needs. We will explore how to use and interpret the information found on this panel.

Upon completion of this session you will be able to:

Outcomes

- *Describe* the different parts of the nutrition facts panel
- *Calculate* the number of calories in more than one serving of any product

- *Explain* what the "daily percentage value" on the nutrition facts panel means
- *Determine* which food is more nutritious between two similar food products using the information on the nutrition facts panel

How Long?

You will need to devote two (2) hours of formal study and one and a half hours (1 ½) of self study to complete this session.

Terminology

Nutrition Facts Panel:	This is a part of the food label that gives information about the serving size, number of servings, calories and the nutrients that a food product contains.
Daily Values:	This indicates the amount of a particular nutrient contained in a single serving of the product. It helps us to make comparisons between similar foods.
Reference Daily Intake (RDIs):	The Reference Daily Intake is the recommended level of intake for a nutrient that is considered to be a sufficient level for the average person in the general population.
Daily Reference Values (DRVs):	A set of dietary references that applies to fat, saturated fat, cholesterol, carbohydrate, protein, fibre, sodium, and potassium.
Percent Daily Values:	This is a guide to the nutrients found in one serving of food based on a 2,000 calorie diet. It can help determine if the foods you are eating contain the recommended daily values of nutrients in one day.

12.4-1 Parts of the Nutrition Facts Panel

In Lesson 11.2 we briefly discussed the information contained on the nutrition facts panel. We will discuss this panel in depth so you will be able to lead a

healthier life based on better food choices. Take a look at the power point presentation then complete the activity that follows:

Here is a list of the different parts of the nutrition facts panel. Find the corresponding numbers on the sample nutrition facts label below.

1. Serving Size and Number of Servings Per Container
2. Calorie Count and Calories from Fat
3. Total Fats including Saturated and Trans Fats Cholesterol and Sodium
4. Total Carbohydrates
5. Nutrients such as Dietary Fibre, Sugars Protein, Vitamins A and C, Calcium and Iron
6. Footnote

Figure 22: A Sample Nutrition Facts Label with Instructions from the US FDA.

Activity 12.4-1

Match the following statements about the parts of the nutrition facts panel by drawing a line from the statement to the corresponding part.

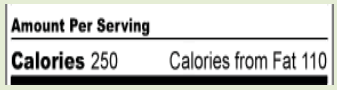
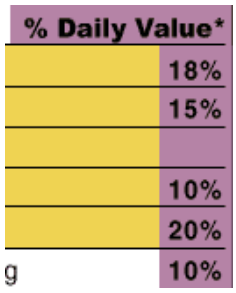
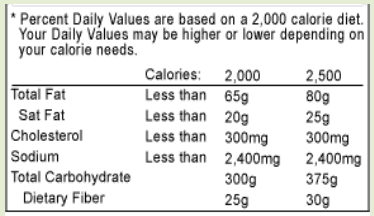
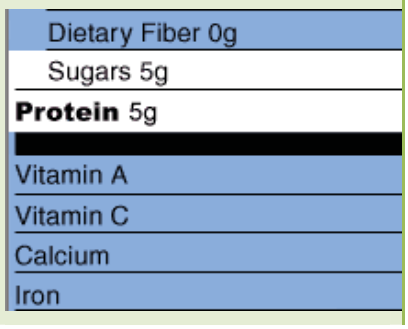
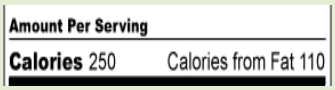
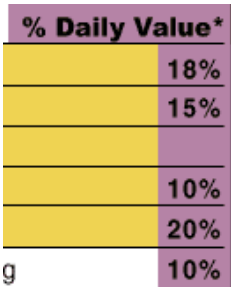
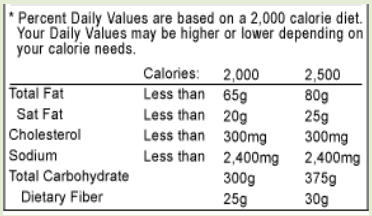
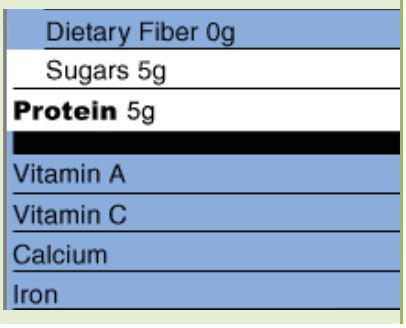
Description	Part of the panel
1. Found at the bottom of the panel it compares nutrient requirements for two different calorie intakes	
2. Lists the quantity of nutrients in grams	
3. Informs you about the amount of ---------- in a packet	
4.Tells the amount of calories in the packet	
5. Informs you of the portion of nutrients the particular food item contributes to your daily needs	

Figure 23: Parts of a Nutrition Facts Panel

Check the answers below to see how you did. Did you do all of them correctly? If not, re-read the information and try it again.

Feedback

Description	Part of the panel
1. Tells you the amount of calories in the packet.	
2. Informs you of the portion of nutrients the particular food item contributes to your daily needs.	
3. Found at the bottom of the panel it compares nutrient requirements for two different calorie intakes.	 * Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs. Calories: 2,000 2,500 Total Fat Less than 65g 80g Sat Fat Less than 20g 25g Cholesterol Less than 300mg 300mg Sodium Less than 2,400mg 2,400mg Total Carbohydrate 300g 375g Dietary Fiber 25g 30g
4. Informs you of the number of servings in a packet.	
5. Lists the quantity of nutrients in grams.	

Note it! / Warning

As we progress here are a few things to note about the nutrition facts panel:

It is placed on the food label to give you information so you can make better choices about what you eat.

It gives you information about the nutrients you should limit as well as those that you should increase. For example, you should limit the amount of salt to you intake while increasing the amount of calcium.

12.4-2 Understanding Percent Daily Value

What is the percent daily value? You can assume that in order to have a percentage of something we must have a whole. What then, are the 'whole" daily values and who determines these figures? Let's begin by discussing the concept of Daily Values.

Daily Values (DVs)

Daily Values on the nutrition facts panel was developed by the Food and Drug Administration (FDA) of the United States of America. It represents a set of standard nutrient intakes that is used as a reference for expressing the nutrient content of the ingredients that make up the food product or item.

The Daily Value indicates the amount of a nutrient that is provided by a single serving of a food item. The Daily Values are actually based on two sets of standards.

- **Reference Daily Intake (RDI)** (formerly known as the U.S. Recommended Daily Allowance) is the recommended level of intake for most vitamins and minerals. The RDIs are set for four categories of people: infants, toddlers, people over four years of age and pregnant and lactating women.

- **Daily Reference Values (DRVs)** are nutrient intake standards. These include standards for the consumption of proteins, carbohydrates, and fat including two major minerals, sodium and potassium as well as other dietary substances such as fibre for which no RDIs have been established. Standards for the quantities of consumption are set for these nutrients since they are also known to have a significant impact on health and disease.

The daily values set for each nutrient is listed in Figure 24 and can be found on a nutrition facts panel. Let's look at the DV for sodium:

- 1,000 milligrams = 1 gram
- 2,400 milligrams = 2.4 grams (2,400/,1000 = 2.4g)
- 1teaspoon = 5 grams

The total daily intake of sodium is roughly half a teaspoon! How much salt do you normally consume in one day?

Nutrient	Daily value
Total Fat	65 grams (based on 30% of 2,000 calories
Saturated Fat	20 grams (based on 8% to 10% of 2,000 calories)
Cholesterol	300 milligrams
Total Carbohydrate	300 grams (about 60% of 2,000 calories)
Fiber	25 grams
Sodium	2,400 milligrams
Potassium	3,500 milligrams
Protein	50 grams about 10% of 2,000 calories

Figure 24: Daily Values and Nutrients

Activity 12.4-2a

Just a quick check before we proceed. Answer the following questions.

1. What does the Daily Value represent?

2. What are the two components or standards that make up the Daily Values?

Feedback

This was pretty simple here are the answers.

1. The daily values indicate the amount of a particular nutrient that is provided by a single serving of a food item.

2. Reference Daily Intakes (RDIs) and Daily Reference Values (DRVs)

If you had any problems answering the questions, go back and review what was covered.

How Daily Values and Percent Daily Values are Related

- Each nutrient listed on the nutrition facts panel has designated Daily Values.
- The Percentage Daily Value is the dietary advice or goal based on a daily 2,000 calorie diet of an average healthy person.

We will examine the percentage daily value a little more but first let's explore the footnote.

Activity 12.4-2b

In your own words write a few lines describing the percent daily value (%DV).

Feedback

Your answer should include the following points:

- Based on a 2,000 calorie diet of an average person
- The percentages are calculated on a daily basis for a healthy individual

12.4-3 The Foot Note

The footnote is found at the bottom of the nutrition facts panel and makes reference to the amount in grams and or milligrams of a specific nutrient you should consume on a daily basis.

Note it! / Warning

The Percentage Daily Value represents the total amount of the nutrient you should consume throughout the day and not at one sitting or meal.

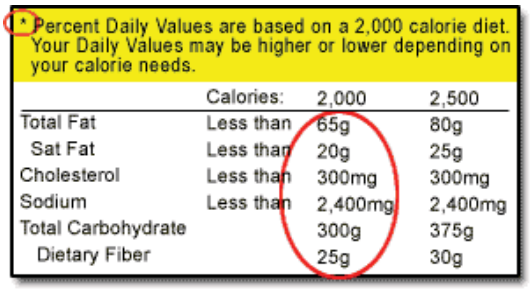


Figure 25: The Footnote

It is important to note that for Total Fat, Saturated Fat, Cholesterol and Sodium the Daily Values recommend *less than* a specified amount for each of the items listed. The FDA suggests that these values are around the maximum amount a person should consume in a single day.

Nutrient	Daily Value (DV)	Percent Daily Value (%DV)
Total Fat	65g	100%DV
Saturated Fat	20g	100%DV
Cholesterol	300mg	100%DV
Sodium	2,400mg	100%DV
Total Carbohydrate	300g	100%DV
Dietary Fiber	25g	100%DV

Figure 26: Recommended Daily Values (DV) Based on a 2,000 Calorie Diet

Based on recommendations by the FDA's nutrition experts, there are upper and lower limits of intake for each of the nutrients listed based on the 2,000 calorie diet. Let's explore the 'upper limit' .

Listing the u**pper l**i**mit**s or maximum amounts of the **suggested quantities for the nutrients** below, gives consumers a guideline for how much they should be consuming on a daily basis. **.**

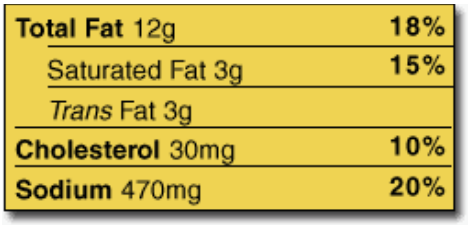


Figure 27: Nutrient Quantities Upper Limit

Nutrients with a maximum value are listed first on the footnote. These nutrients are Total Fat, Saturated Fat and Cholesterol. These nutrients have been listed as culprits in unhealthy diets and can lead to chronic diseases such as heart disease, hypertension and in obesity. It is therefore prudent for people who wish to lead a healthy lifestyle to aim to consume less than the Daily Values listed the nutrients above.

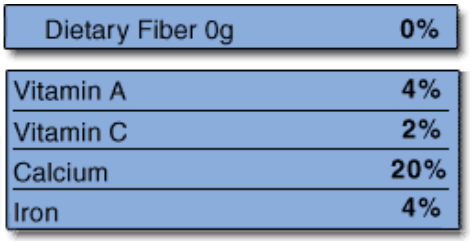


Figure 28: Nutrient Quantities Lower Limit

Figure 25 shows that the DV for dietary fibre is 25g for a 2,000 calorie diet. This is the lower limit of what a healthy person should consume in a single day. The nutrition facts panel in Figure 28 above shows a food product that contains 0g of dietary fibre. Since this food item provides 0 percent of the DV, it would be recommended that fibre from a different source be consume in order to have a balanced diet..

Percent Daily Values (%DV)

As stated, the Percent Daily Values (%DVs) are based on the Daily Value recommendations for specific nutrients for a 2,000 calorie daily diet. Additionally the %DV acts as a dietary guideline as you make food choices throughout the day. For example, your favourite fast food meal of two pieces of fried chicken and French fries will supply you with 900 calories in one meal. If you aim to consume 2,000 calories in one day, what would you suggest as a healthy dinner?

What really does the % DV do?

- It helps you determine if one serving of food is high or low in a particular nutrient. This in turn helps you to make better choices at the supermarket since you can limit or increase your intake of these nutrients by the choices you make.
- It helps you interpret the numbers or the quantities of nutrients in grams and or milligrams by basing them all on the same scale for the day (0-100%DV).
- It helps you to determine which nutrients contribute too much or too little to your daily recommended allowance.

Note that the %DV column doesn't add up vertically to 100%. Instead each nutrient is based on 100% of the daily requirements for that nutrient.

	% Daily Value*
Total Fat 12g	18%
Saturated Fat 3g	15%
Trans Fat 3g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Total Carbohydrate 31g	10%
Dietary Fiber 0g	0%
Sugars 5g	
Protein 5g	
Vitamin A	4%
Vitamin C	2%
Calcium	20%
Iron	4%

Figure 29: Percent Daily Value for Nutrients (in urple)

Note it! / Warning

As a guideline, if a food item lists the %DV as 5% or lower, the daily value of that nutrient is considered low. 20% or more of the daily value of a nutrient is considered high.

How Do I use the Percent Daily Value?

Let's look at the serving for fat in two similar food products.

One serving supplies 20% of the daily value for fat

One serving supplies 10 % of the daily value for fat

If you were to have one serving of the first product you will have consumed 20% of your fat allowance for the day. The recommended amount remaining for the day is therefore 80% Since fat is one of the nutrients we need to limit in our diets, would you choose to eat the first product, or the second? If the two products were similar in taste and serving size, the smart choice would be to go with the second product.

Since all food products list the fat content on the nutrition facts panel, you would then be able to calculate how much fat your other food choices contain. This will assist you in keeping within the limits of the Percent Daily Value for the day.

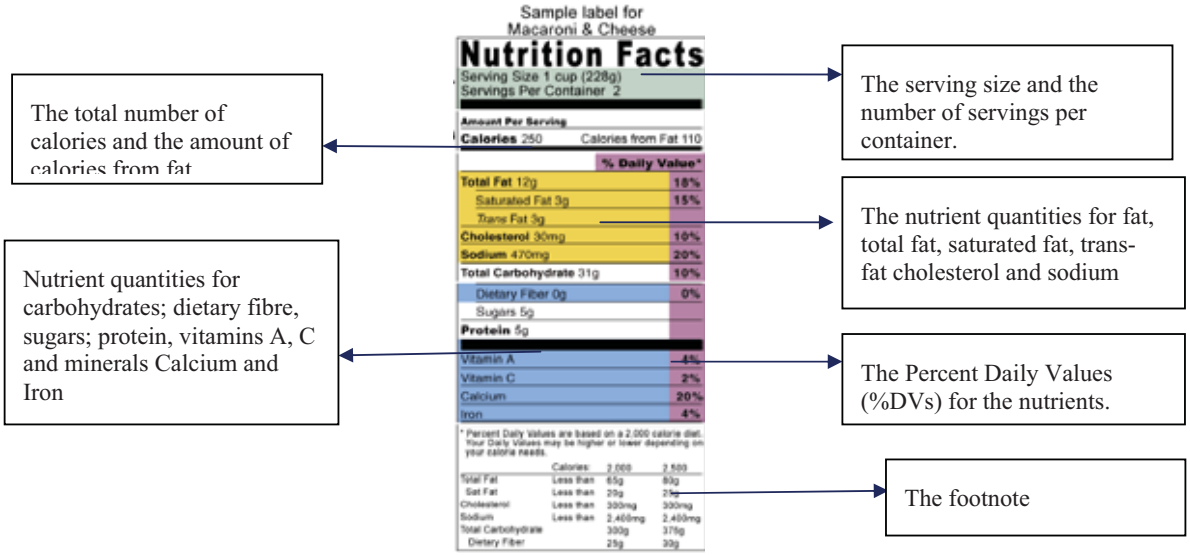
With the knowledge you have acquired in this session, you should be able to go into the supermarket and make better food choices and understand all the information of the food labels.

Session Summary

Summary

In this session you learned the following:

Parts of the Nutrition Facts Panel



Daily Values and How they are Related to the Percent Daily Value:

You learned that the Daily Values are a set of standard nutrient intakes that is used as a reference for expressing the nutrient content of the ingredients that make up the food product or item. They are developed based on a 2000 calorie diet and represent the total amount of the nutrient you should consume throughout the day and not at one sitting or meal.

Nutrient	Daily Value (DV)	Percent Daily Value (%DV)
Total Fat	65g	100%DV
Saturated Fat	20g	100%DV
Cholesterol	300mg	100%DV

Nutrient	Daily Value (DV)	Percent Daily Value (%DV)
Sodium	2400mg	100%DV
Total Carbohydrate	300g	100%DV
Dietary Fiber	25g	100%DV

You also learned that the Daily Values comprises two sets of standards:

Reference Daily Intake (RDI): these are the recommended level of intake for most vitamins and minerals. They are set for four categories of people; infants, toddlers, people over four years of age and pregnant and lactating women.

The Daily Reference Values (DRVs): are nutrient intake standards for the consumption of the macronutrients protein carbohydrate and fat and two major minerals sodium and potassium as well as other dietary substances such as fiber for which no RDIs have been established.

Then we explored the concept of the Percent Daily Value (% DV)

The Percent Daily Value (%DV)

- The % DV is a dietary advice or a goal. It is based on a 2,000 calorie diet or the amount of calories you should consume daily.
    - It helps you determine if one serving of the food is high or low in a particular nutrient. This in turn helps you to make better choices at the supermarket since you can limit or increase your intake of these nutrients by the choices you make.
    - It also helps you interpret the numbers or the quantities of nutrients in grams and or milligrams by basing them all on the same scale for the day (0-100%DV).
    - A good guide when using the %DV is when a food supplies 5% of the daily value of a nutrient that is considered low in that nutrient while a food that supplies 20% or more of the daily value is considered high in that nutrient.

You also learned how to use the Percent Daily Value to:

- Determine if you were within your nutrient daily nutrient allowance for a particular nutrient.
- Tell you which food contributes a higher percentage of fat to your daily fat intake since the serving sizes are consistent for similar type foods.

- Balance high fat foods with others that are lower in fat throughout the day so you do not go over the daily nutrient requirement for fat.

Let's use what we learned to complete the assessment exercise that follows:

Assessment

Assessment

You have come to the end of this session. Let's check to see how much you remember and understand. Answer the questions that follow in the space provided.

1. Nutritional labeling gives information on the _____, _____, and _____ that a food product contains.

2. State whether the following statements are true of false. Write '**T**' next to those that are true and **'F'** next to those that are false.

   a) Percent daily values add up to 100% of the nutrients you need. _____

   b) The nutrition facts panel tells the consumer the amount of nutrients in the product. _____

   c) If a packet of potato chips contains 20 grams of fat, this amount of fat relates to the quantity of fat in the entire packet _____

   d) The nutrition facts panel gives you the quantities of the different fats contained in the product. _____

   e) The percent daily values are based on a 2,000 calorie daily diet. _____

3. The nutrient listing for two different brands of orange juice is given below. State which of the two is more nutritious and why.

Nutrient	Juice A	Juice B
Serving size:	1 cup	1 cup

Nutrient	Juice A	Juice B
Servings per container:	3	2
Calories:	200	225
Calories from fat	0g	0g
Total fat:	0g	0g
Saturated fat:	0g	0g
Trans fat	0g	0g
Cholesterol	0g	0g
Sodium	20 mg	24 mg
Total carbohydrate	32 g	45 g
Dietary fibre	5g	0 g
Sugar	32 g	45 g
Protein	0 g	0 g
Vitamin A	0 %	0 %
Calcium	10 %	5 %
Iron	0 %	0 %
Vitamin C	80 %	100 %

Figure 30

Feedback

Let's see how you did. Check your answers below.

1. Serving size, calories and nutrients.
2. a) False, b) True, c) False, d) True, e) True.
3. Juice A: Less calories, sodium. More fibre, calcium,.

Unit Summary

Summary

Here is a summary of what you learned.

You learned that the label on a food product has several parts which include:

- Name of the product
- Name and address of the manufacturer
- Ingredient listing
- Serving size
- Calorie amounts
- Date of manufacture
- Expiry dates
- Health claims
- Information on:
    - Preparation/service
    - Storage
    - Quantity of the food

- Weight with/without packaging
- Net weight/ drained weight
- Origin of the food items

You learned that the food label was provides the consumer with various pieces of information and is there to ensure you are not misled about the contents, and to help distinguish one manufacturer's product from another.

In Session Two we explored the different types of labeling information on food products and how each of these label types provides useful information for the consumer.

- **Universal Product Code (UPC)**: this machine readable bar code that identifies the product, package size, price, who manufactures the product, contents of the package.
- **Content Labeling**: a listing of all the ingredients in the product, listed in descending order.
- **Nutritional Labeling**: found on the side panel of most food products it provides you with information about the nutrient content of the food.
- **Date Stamping**: a system of open dating that provides you with information about the shelf life of the food product. The different types of dates include the 'sell by' date, the 'use by' or best before date and the expiration date.

In Session Three we explored adding nutrients to food, and what that means on the food label. We learned that enriched food has nutrients added back to them to restore them to its original state before being destroyed by processing methods. Food labels that have 'fortified with' have nutrients added to the product in order to enhance the nutritional value of the food. Reasons for fortifying foods include:

- meeting the nutritional needs of 'at risk' groups of person
- controlling or alleviating the incidences of deficiency diseases in populations that may eat primarily staple foods
- increaseing the nutritional value of foods

Below are some other terms that may appear on labels which made certain nutritional claims about the product:

Low fat	Less than 3g of fat
Fat free	Less than 0.5g of fat or no added fat
Reduced fat	Contain 25% less fat than the original

	product
Light or “Lite”	Contains 50% less fat or 1/3 fewer calories than the original product
Low calorie	Less than 40 calories per serving
Low cholesterol	20 mg or less per serving
No added sugar or sugar free	The no sucrose added, but may contain other naturally occurring sugars e.g. glucose
Calorie free	Less than 5 calories

Continuing in Session Three, we discussed genetically engineered foods and how they provide crops that are resistant to diseases and yield plant and animal products that mature more quickly than unmodified foods. Also discuss was the importance of labeling these items because consumers have the right to know what they are purchasing. Currently only European counties are required by law to provide this information on labels.

We discussed standards of identity which describe food formulas made according to government standards. Certain foods such as meat patties must contain a certain percentage of meat to be labelled as a meat patty. In the case of food, flavours should contain actual fruit to be labelled as a fruit juice or yogurt etc.

Finally in Session Four we explored the nutrition facts panel. We explored and described the parts of the label

- Serving size and number of servings per container
- Calorie count, total number of calories and the amount of calories from fat
- Listing of the nutrients and the quantity in the food in grams
- Daily Percent Value
- Footnote

About the Daily Values and how they are related to the Percent Daily value:

You learned that the Daily Values are a set of standard nutrient intakes that is used as a reference for expressing the nutrient content of the ingredients that

make up the food product or item. They are developed based on a 2,000 calorie diet and represent the total amount of the nutrient you should consume throughout the day and not at one sitting or meal.

You also learned that the Daily Values comprises two sets of standards:

Reference Daily Intake (RDI): these are the recommended level of intake for most vitamins and minerals. They are set for four categories of people; infants, toddlers, people over four years of age and pregnant and lactating women.

The Daily Reference Values (DRVs): are nutrient intake standards for the consumption of the macronutrients protein carbohydrate and fat and two major minerals sodium and potassium as well as other dietary substances such as fiber for which no RDIs have been established.

Then we explored the concept of the Percent Daily Value (% DV)

The Percent Daily Value (%DV)

- The % DV is a dietary advice or a goal. It is based on a 2,000 calorie diet or the amount of calories you should consume daily.
    - It helps you determine if one serving of the food is high or low in a particular nutrient. This in turn helps you to make better choices at the supermarket since you can limit. or increase your intake of these nutrients by the choices you make.
    - It also helps you interpret the numbers or the quantities of nutrients in grams and/or milligrams by basing them all on the same scale for the day (0-100%DV).
    - A good guide when using the %DV is when a food supplies 5% of the daily value of a nutrient that is considered low in that nutrient while a food that supplies 20% or more of the daily value is considered high in that nutrient.

You also learned how to use the Percent Daily Value to:

- Determine if you were within your nutrient daily nutrient allowance for a particular nutrient.
- Tell you which food contributes a higher percentage of fat to your daily fat intake since the serving sizes are consistent for similar type foods.
- Balance high fat foods with others that are lower in fat throughout the day so you do not go over the daily nutrient requirement for fat.

We've come to the end of this unit. In order to check for your understanding of the areas covered complete the unit assessment below.

Unit Assessment

Assessment

You have just completed the unit on food labels. Answer the following questions in the spaces provided. Let's see how much you remembered and understood.

Fill in the blank in the following statements with the words supplied below.

Values
Same
Percent,
Laws
Calories
Serving
Health
Maximum
All
Deli
Nutrient
Minimum
Safety

1. The Daily Value for cholesterol is the _____ for all calorie levels.

2. _____ Daily Values tell you how a certain food fits into a 2000 calorie diet.

3. Information present on the nutrition label is regulated by _____.

4. _____ foods are part of a healthy diet.

5. Similar foods have similar _____ sizes.

6. Claims such as "consuming oats can reduce your cholesterol level" or "a diet rich in calcium and vitamin D can reduce the risk of osteoporosis" are _____ claims found on nutrition labels.

7. The Daily Value for Carbohydrate is the recommended_____.

8. Daily _____ are set by Food and Drug Administration (FDA) based on nutrition recommendations.

9. 'Light' and 'high fibre' are examples of _____content claims.

10. The Daily Value for cholesterol are the recommended _____.

Circle the ***BEST* answer from the options provided in the following questions.**

1. Dietary recommendations for the total fat, saturated fat, fibre and protein are
   a) The same for all diets.
   b) Only important to those with health concerns.
   c) Based on the number of calories a person eats.
   d) Based on a 2,500 calorie diet.

2. The MAIN reason for reading a label on a food product is to know
   a) The regulations governing how it is manufactured.
   b) How it is to be used and stored.
   c) The price of the item.
   d) The information on the ingredients.

3. The expiry date on a carton of milk means that the milk
   a) Should be discarded after that date.
   b) Can last for another week unopened.
   c) The quality of the milk is best if used before that date.
   d) The quality of milk deteriorates after that date.

4. There are several pieces of information that are found on a food label. Which of the following pieces of information listed below is NOT found on a food label?
   a) The contents.
   b) The net weight.
   c) The actual amount/quantity of each ingredient.
   d) The name of the manufacturer.

5. The serving sizes of similar food products are based on
   a) The size of the package.
   b) The amount that an average person normally consumes.
   c) The manufacturer's recommendations.
   d) Dietary recommendations.

6. Adding the _____of an individual nutrient for foods eaten in one day is a quick way to see if a person's daily diet is meeting nutrition recommendations for that nutrient.
   a) Grams.
   b) Dietary Reference Intakes.
   c) Daily Values.
   d) % Daily Values.

7. You are about to purchase a can tuna fish, what the most important piece of information you need from the label?
   a) The cost of the product.
   b) The expiry date of the product.
   c) The weight of the product.
   d) The country of origin of the product.

8. The carton of orange juice in your refrigerator is approaching the expiry date. What should you do with the juice once the expiry date has been reached?
   a) Throw the juice out on that date.
   b) Throw it out since the nutrients are depleted.
   c) Keep it since only the quality of the juice is not in question.
   d) Keep it for a few days more.

9. You will find all of the following information on the label of a carton of milk EXCEPT the
   a) expiry date.
   b) net weight.
   c) Cost.
   d) name of the manufacturer.

10. Persons suffering from diabetes and would most likely search for foods labeled with which of the following claims?
    a) A good source of dietary fibre.
    b) No added sugar.
    c) Low salt.
    d) Sugar free.

Assignment

Use the food label below to answer the questions that follow. Write your answers on a separate sheet of paper. Place your answer in an envelope that has been labeled with your name, address and the name of your facilitator. Submit to your respective NOSTT centre.

Image: Simone Reid-Foster

1. How many servings in this can of diced tomatoes?
2. How much is one serving of diced tomatoes?
3. How many calories does one serving provide? If you were to consume the entire can how many calories would you have consumed?
4. The information on the nutrition facts panel that relates to the quantity of sodium states that it supplies 12% of the %Daily value. What does this mean?
5. What are the nutrients that this can of diced tomatoes?
6. Which ingredient is the most abundant and the least abundant? How did you determine this?
7. A person who is suffering from hypertension would most likely be interested in the quantity of which nutrient and ingredient?

Contents

Unit 13

Kitchen Layout

Introduction

You may have heard someone remark how tired he or she felt after cooking in the kitchen.This may have been due to a poorly designed kitchen.Visualize your kitchen at home? Does it enable you to save time and energy? How are you able to tell? Kitchens should be designed to save labour and increase efficiency. That just means you should work smart and not hard. In this unit you will learn about the considerations for proper layout of a kitchen. You will learn things such as where the cooking area is most suitable, as well as how the equipment should be laid out. You will learn about the work triangle and the different types of kitchen layouts.

Upon completion of this unit you will be able to:

Outcomes

- *Outline* the factors to be considered when planning the layout of a kitchen.
- *Explain* the rationale of the kitchen work triangle.
- *Describe* the various kitchen surfaces.
- *Describe* the advantages and limitations of the various types of kitchen layout.

Terminology

Work Triangle: The arrangement of the sink, refrigerator and cooker in the form of a triangle in the kitchen to minimize walking to and fro.

Work Centre: Area in the kitchen where a specific task or a number of tasks are done.

Kitchen : Place where meals are prepared and sometimes eaten.

How long?

You will need to devote fifteen (15) hours to work on this unit. Ten (10) hours for formal study and 5 hours of self-study and completing assessments/assignments.

Session 13.1 Planning a Kitchen Layout

Introduction

These are some considerations which need to be thought out. A lot of times we look at things as being irrelevant and only to find out with a little planning how they can make our lives easier. For example the task of putting together a well laid out kitchen may seem to be a tedious task but towards the end it is a rewarding accomplishment.

It can be very frustrating when you are about to cook and you need to search through a mess to get the necessary tools and equipment to complete your task.

Before planning your kitchen you need to think about several things that may pertain to you. For example, the size of your family or the clientele (if it is a restaurant setting) the type of meals need to be prepared or whether or not your family or clientele eat and run or linger over their meals.

You must have a thoughtful plan before planning or remodeling a kitchen. You will learn that kitchen must not just be functional but should be one which is pleasant, efficient, physically and mentally comfortable.

Outcomes

Upon completion of this unit you will be able to:

- *Discuss* the points to consider when planning a kitchen.
- *Outline* the standards of the kitchen?
- *Outline* the guidelines for the setting up work centres.
- *Discuss* the components for the kitchen arrangement.

Terminology

Extractor Hood: Overhead fan situated above the cooker to remove heat from the kitchen.

Functional : Something more practical rather than decorative.

Base Units: Bottom cabinets; the surfaces are sometimes used as countertops.

How long?

You will need to devote three (3) hours of formal study to this session and two (2) hours of self-study.

13.1-1 Kitchen Planning Guidelines

There are a set of guidelines that you need to follow when planning a kitchen. Keep in mind no set of rules are absolute for any one person but it is just a guide to the planning stages. Let us go through them to see if we can design our own kitchen together. Do not get weary with the amount of information that you would be introduced to, some of the information may be new to you for others it may be overwhelming. Don't despair the planning stages for anything is always tedious but at the end it could be rewarding. Let us begin.

1. What do I need in a kitchen?

You should first formulate in your mind:

- Type of floors
- Walls
- Cabinets
- Work counters

Figure 1 Planning for the Kitchen
Image: Ambro / FreeDigitalPhotos.net

This will give you a visual idea about the spacing required, and appliances you will want in your kitchen.
Some appliances you may need are cooker or hob and oven, refrigerator or chiller, freezer, extractor hood, and dishwasher. In some instances you may have a laundry attached to the kitchen and you may need a washing machine, tumble dryer and the list goes on depending on the function of your kitchen.
This is whether it is a single unit for executing meals or for a dual function where a laundry is adjoined to the space.
You should also consider the color scheme and the arrangement of your kitchen appliances.

2. Measure

Measure your area space to know what you are working with and how your space would be divided into the various work areas.

Figure 2 Measuring Space Needed
Image: Ambro / FreeDigitalPhotos.net

3. Draw a Plan

1. Draw a plan to scale on paper to suit the space you are working with. Your plan should indicate the hot and cold water, drains, electric points, gas points, and extractor vents in the walls if necessary.

2. On a separate plan indicate the space for each appliance and sink you want to include in your kitchen.This would help you utilize your space efficiently and wisely. I mention wisely because a lot of time we purchase an appliance or equipment and discover that the item we purchased is too large for the space and that could cause a problem.

4. Work Areas and Space

1. Outline the three main work areas: (1) Preparation Area, (2) Cooking Area and (3) Washing-up Area. Each area should include all the appliances necessary and a work area size suitable around the area.

2. Strategically place the appliances on a blueprint in the most logical position necessary for the service to be done.

3. Decide how many base units you would place between any free areas in the kitchen. The base units would be your large equipment which would cover the floor area. For example, cooker, refrigerator, dishwasher counter space.

4. Ensure there is enough work top surface around the work zones. Counter tops for preparation, storage and resting surface for items.

5. If there is insufficient space in the kitchen for all the appliances try relocating pieces of equipment not directly related to the kitchen and place in another room, for example moving the washing machine to the garage.

6. Once you are satisfied with your floor arrangement, consider the wall area and how wall units would fit in the food preparation.

Additionally, once you have considered all of the above you are now in a position to do the following:

- State the number and style of both floor and wall units you require.
- State the appliances to be fitted in the allotted space and any other work you need to add or to reposition the services.

Bearing all this in mind you need to be mindful that the kitchen is the most important room in the home, because of the high level of activity. In certain kitchens you may have several activities such as cooking, eating and cleaning. When planning a kitchen you must satisfy all your family's needs as well as in the case of a commercial establishment the execution of the menu items for the enjoyment of the guests.

Always take into account whether there is adequate space for food preparation, storage, cabinet space, lighting and proper drainage before closing off your kitchen plan.

Activity

Fill in the missing guidelines in the form of short sentences in the spaces provided for each box.

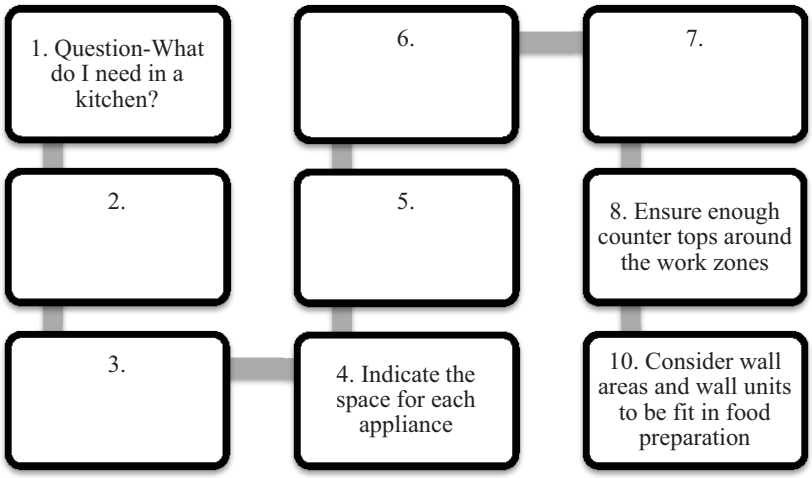


Image: Michelle John

Feedback

Answers:

2. Measure the area space

3. Draw the kitchen plan to scale

5. Outline the three main work areas.

6. Place the appliances in the most logical position

7. Decide how many base units would be placed between any free areas.

13.1-2 Kitchen Standards:

The kitchen standards ensure an efficient work space for the kitchen. In the first instance the work triangle helps link up the three major work areas. For example,

the distance between the refrigerator and the sink is 4'-7'; the distance between the sink and the range is 4'-6'; and the distance between the range and the refrigerator is 4'-9'.

Secondly, there are the comfort zones for easy reach across a counter and without the presence of a counter. It is also important to make sure that the right height is achieved so as to avoid any unnecessary stretching.

Thirdly, adequate height for the cabinets is needed whether for base cabinet, counters or wall cabinets. These are to ensure the kitchen space is used up efficiently.

Finally, the aisle space must be sufficient to allow a smooth flow of traffic and to avoid persons bumping into each other in the kitchen.

The table below gives you further details on the ideal standard measurements.

Areas	Measurements
Work Triangle	12'-22' the entire work triangle connecting the refrigerator, stove and sink 4'-7' distance from refrigerator to sink 4'-6' distance from sink to range 4'-9' distance from range to refrigerator
Comfort Zones	Height measuring between 21/2' and 5' are comfortable to reach 68"- Maximum comfortable reach over a counter 77"- Maximum comfortable reach without a counter
Cabinet Standards	34 1/2"-Base cabinet height 36"- Standard counter height 1 3/4"- Counter extends beyond base cabinet 3" height and 4" deep- minimum toe space 15"-18" between counter and upper cabinets 33"-42" wall cabinet height 27"- On both walls for base cabinets to turn a corner

Areas	Measurements
	15”-On both walls for upper cabinets to turn a corner
Aisle Space	3’-Passageways 4’-Passageways opposite work areas 41/2’-Between counter if two or more cook No more than six feet (6”) between counters

Dimensions for a Standard Kitchen

Session Summary

Summary

In this session you learned the proper and sensible way of a well planned kitchen. The type of floors, walls, cabinets, work counters and appliances give you a visual idea of your kitchen plan. You would have also noted that a well thought out kitchen is economical and allows you to save time and money.

The layout also provides the correct measurement and height for the various kitchen items and location of equipment. It indicates the infrastructure of hot and cold water, drains, electric supplies and gas points in the kitchen.

With all the necessary information for your particular kitchen in mind adequate space is of paramount for a specific design. A kitchen is an environment frequently used to provide meals for family members or guests in a restaurant or a meeting place for discussions. Whatever the activity the kitchen is a place where interactions between people happen.

Assessment

Assessment

Kitchen Layout

A. List and briefly describe four guidelines for kitchen planning.

B. Explain how the above guidelines would help you plan your kitchen efficiently.

C. Give the measurement range for the following:

1. Distance from refrigerator to sink
2. Distance from sink to range
3. Distance from range to refrigerator

Feedback

Answers to the above questions:

1. Kitchen layout-

Questions A & B refer to 14.1

Question C- 1. 4'-7' (4 feet-7 feet)

2. 4'-6' (4 feet-6 feet)

3. 4'-9' (4 feet -9 feet)

Session 13.2 The Work Triangle

Introduction

In this era where we are forced to multitask, everything is calculated into time and money. Our lifestyles have changed drastically to suit the present trends we are faced with, therefore, the kitchens where most of our meals are prepared or should be prepare must be carefully planned out to eliminate or minimize labour intensive work. What will you learn in this unit?

Firstly we start by discussing the requirements of a well planned kitchen and the three main work centres. These areas include the storage area (refrigerator), cleaning (sink), and cooking area (range or stove) which makes up the work triangle. You will learn to consider that our kitchens should have layouts that are both practical and functional to ensure easy movements in the kitchen. Your kitchen should be design to suit the individual, guests and family needs.

The three main work centres must be arranged to fit the space you have available.The space should not be too small that it looks cramped or too large where time and energy are wasted on covering a wide area to get items in the kitchen.

Upon completion of this unit you will be able to:

Outcomes

- *Identify* the types of work triangles.
- *Explain* the work centres.
- *Discuss* the advantages and disadvantages for each kitchen layout.

Terminology

Work Triangle:	Connects the three main work areas; refrigerator, sink and cooker/range.
Peninsula :	Unit attached at right angle to a wall or a set of cabinets.
Work Centre:	Area where a certain task in the kitchen takes place.

How long?

You will need to devote three (3) hours of formal study to this session and two (2) hours of self-study.

13.2-1 Types of Kitchen Layout

Kitchen layouts are made up of several shapes. For example, U-shaped, L-shaped, Corridor, Island, Peninsula, Single wall and G-shaped layouts exist. The work triangle connects the three main work areas; the cold storage area (refrigerator), the cleaning area (sink), and the cooking area (cooker/range).

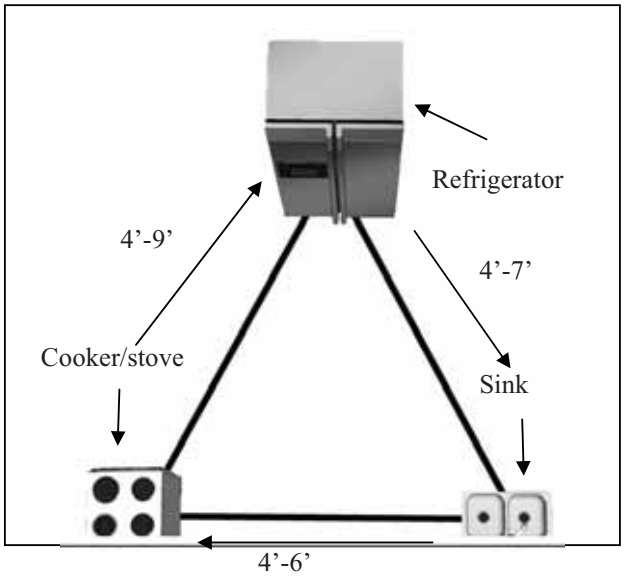


Fig. 3Basic Work Triangle
Image: DEU

U-Shaped: This type of layout is an ideal and efficient layout. What is good about this kitchen is it provides us with three walls of storage and area for a work space. You will need approximately four feet (4') of working room in the centre of the U-shape. This would mean eight feet (8') along length and width of the kitchen. There are advantages and disadvantages to each of the different types of kitchen layouts. Read on below for the advantages and disadvantages of the U shaped kitchen layout.

Advantages

1. Provides adequate space for storage and counter top space.

2. Offers three full walls.

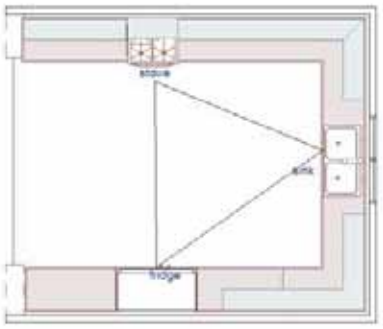
3. The three main work centres can be spread for maximum convenience and efficiency.

4. Prevents household traffic through the main work areas.

Disadvantages

1. If not structured properly it could prove to be labour intensive with excessive walking to and from.

2. It may feel somewhat boxed in, because of the three walls surrounding the kitchen.



Two dimensional drawing- U- shape kitchen layout
Image: Phelix Kirk

Fig. 4 Three dimensional-U- Shape kitchen layout
Image: Phelix Kirk

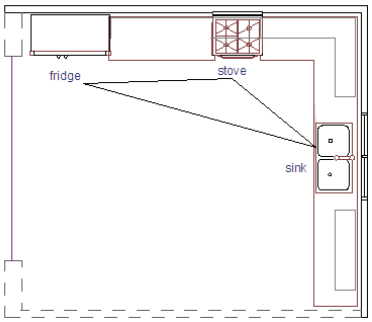
L- Shaped- The two adjacent walls which create a natural flow for your work triangle present an ideal kitchen layout for either a family kitchen or for entertaining guests at your home. This particular design allows for little interference for traffic flow if the work triangle is kept close to the corner. The legs of the L-shaped can be of similar or different lengths.

Advantages

1. The design allows accommodation for tables and chairs for entertaining.

2. The cabinets and countertops are all connected to provide a useful work area.

3. It provides flexibility in the arrangements of the various components in the layout.



Two dimensional drawing L-Shape kitchen layout
Image: Phelix Kirk

Fig.5 Three dimensional L- Shape kitchen layout
Image: Phelix Kirk

Corridor or Galley Shaped-

This design of kitchen has two rows which doubles the amount of cabinet and counter space. The galley shape is ideal for a single cook as it allows free movement from one area to another. A space not less than 4 feet and no more than six feet allowance between the counters for kitchen traffic and easy opening of cabinet drawers. The most appropriate arrangement is to place the refrigerator and sink on one side and the cooking range on the other to prevent the risk of accidents while moving around with hot items.

Advantages:

1. Double the amount of counter and cabinet space.

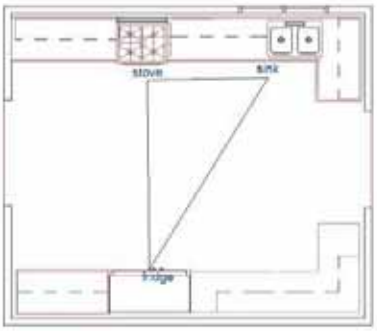
2. A door can be placed on one side to close off traffic.

3. Allows efficient use of space.

Disadvantages:

1. There may be a huge thoroughfare if one end of the aisle is not closed off.

2. Cooks may bump into each other if there is more than one person in the kitchen.



Two Dimensional Drawing- Corridor Kitchen Layout
Image: Phelix Kirk

Fig. 6 Three Dimensional Drawing- Corridor Kitchen
Image: Phelix Kirk

Island- Shape-

If you lived on an island you would be surrounded by water, well it's the same thing for this kitchen layout. This shape can either be a straight wall, L-shape or U-shape with a separate unit place in the kitchen to create an island. The kitchen should have adequate space for this added unit. The island helps to spread out the work triangle by adding a cooker or sink.

Advantages:

1. The island can be used for dining and entertaining.

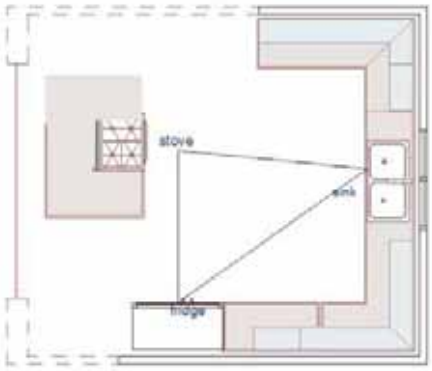
2. Redirect traffic around the island and not through the kitchen.

3. Extend the work triangle by placing a cooker or sink.

Disadvantages:

1. Require a lot of floor space.

Take a look at the layout below, note how the unit in the centre is surrounded by the other units in this Island kitchen.



Two Dimensional Drawing-Island Shape Kitchen Layout
Image: Phelix Kirk

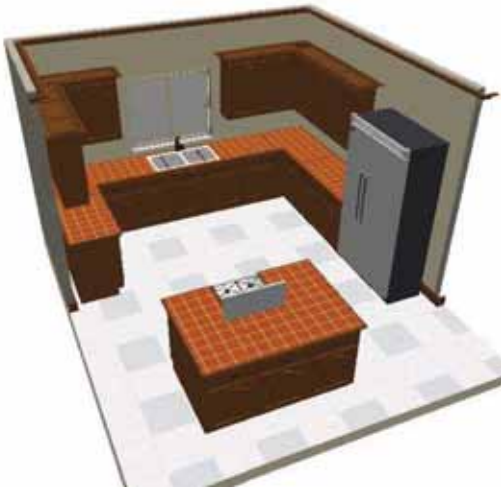


Fig. 7 Three Dimensional Drawing- Island Shape Kitchen Layout
Image: Phelix Kirk

Single Wall Shape-

This is a straight wall kitchen with the appliances and cabinets along one single wall. Allow 4 feet between appliances to provide adequate space for countertops. The main work units should be the sink in the centre while the refrigerator and the cooker are on either side of the sink. This arrangement is ideal for small condominiums and vacation homes. The kitchen both functions as a hallway and a work area.

Advantages:

1. Ideal for a narrow room

2. Dual functions as a work area and a hallway

Disadvantages:

1. Labour intensive

2. Least efficient kitchen layout

3. Limited to small apartments or condominiums

Two Dimensional Drawing Single Wall Shape Kitchen Layout
Image: Phelix Kirk

Fig. 8 Three Dimensional Drawing- Single Wall Shape Kitchen Layout
Image: Phelix Kirk

Additional Kitchen Layouts

Peninsula Shape-

If you ever did geography you would have learned that a peninsula is a piece of land that is almost surrounded by water, or projecting out into a body of water. The Peninsula shaped design kitchen layout is very similar to an island the only difference is instead of a free standing unit which makes up the island, a peninsula is attached at right angle to a wall or a set of cabinets. This area can be used for dining, added counter space or just to separate the kitchen from the living room.

Advantages:

1. Reduces the size of a work triangle.

2. Divert household traffic through the kitchen around the work triangle.

3. Help conceal kitchen clutter from the open view.

Disadvantages:

1. Needs adequate space for this type of layout.

2. It may have a box finish.

G-Shape kitchen-

A combination of a U-shaped with a peninsula attached at one end. The peninsula opens the space for the work triangle. This prevents the kitchen from being cramped. This layout provides a deep counter measuring between 36”-42” on the peninsula that works either as a counter or seating area.

Advantages:

1. Very versatile layout-peninsula acts as a counter or a seating area.

2. Opens the work triangle.

3. Shields off the kitchen from adjacent rooms.

Disadvantages:

1. Requires adequate space for this particular layout.

2. It may be expensive to furnish.

Activity

A. Identify the kitchen layout designs and the dimensional drawing for the diagrams below and give one advantage and one disadvantage for each.

1.

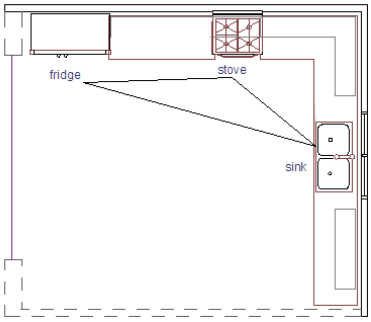


Image: Phelix Kirk

2.

Image: Phelix Kirk

3.

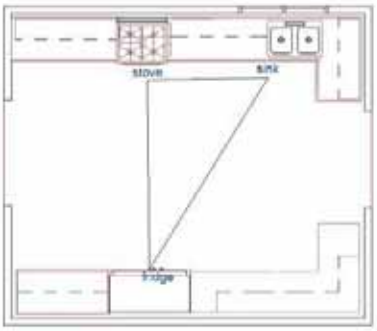


Image: Phelix Kirk

4.

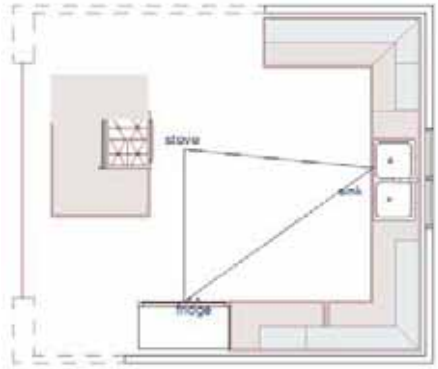


Image: Phelix Kirk

5.

Image: Phelix Kirk

1. Write your answers in the spaces provided.

Feedback

Answers

1. L-shaped-Two dimensional
2. U-shaped- Three dimensional
3. Corridor shaped-Two dimensional
4. Island shaped-Two dimensional
5. Straight wall shaped- Three dimensional

13.2-2 Work Centres

The work centre must be well organized and put together for the work to be performed efficiently. Particular utensils and equipment for the task should be close by for your convenience. This prevents having to walk over a distance to get the necessary tools to execute the job.

What is the work centre? It is an area where everything that is needed to successfully complete a task is grouped in a single zone.

The work surfaces must be of the appropriate height and comprised of the correct material. The main work areas are; the storage centre, cleaning-up centre, mix centre, and the cooking centre.

It is important to have your work centres in the right sequence so as to generate a smooth food flow. What does that mean? To grasp the concept of how food flows from the time it is purchased to the final preparation. The food purchased is first passed through the back door entrance, stored in a chiller/refrigerator or pantry, taken out of the storage areas, washed up at the sink, prepared and chopped at the mix centre, cooked and finally served. This is the basic sequence of the activities carried out in the kitchen whether in a commercial kitchen or in a domestic kitchen. The only difference is a domestic kitchen is function on a smaller scale.

Image: Simone Reid-Foster

Storage/Refrigeration- This centre comprises a refrigerator, freezer and cabinets for mostly canned items and packaged foods. A refrigerator is a very bulky piece of equipment, therefore it should not be placed along a run of cabinets. It is usually placed at the end of the work area near the entrance of the kitchen where groceries are brought to the home. The location of a refrigerator should never disrupt the free flow of food transfer between counters and the dining table and close to preparation centres.

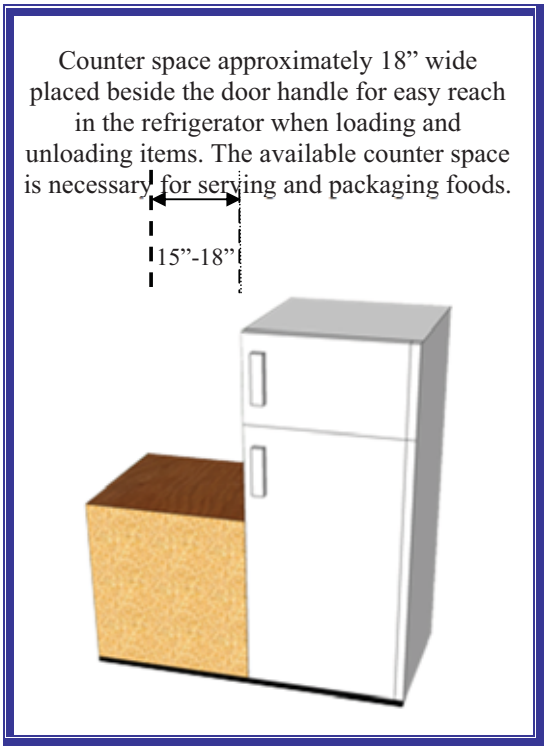


Fig. 9 Cold Storage Centre (refrigeration)
Image: DEU

Clean-Up Centre- This area is located around the sink and dishwasher. This area consists of a sink, drainage, dishwasher, food waste disposal, water heater and lots of counter space for stacking and a place for cleaning supplies. It is important to have the serving dishes, flatware and glasses stored close by so that it goes directly from sink or dishwasher to storage area.

The sink centre should be central to all other major centres because it is the most frequently used area in the kitchen. There should be 24” to 36” of counter space to the right of the sink and 18” to 36” at the left of the sink.

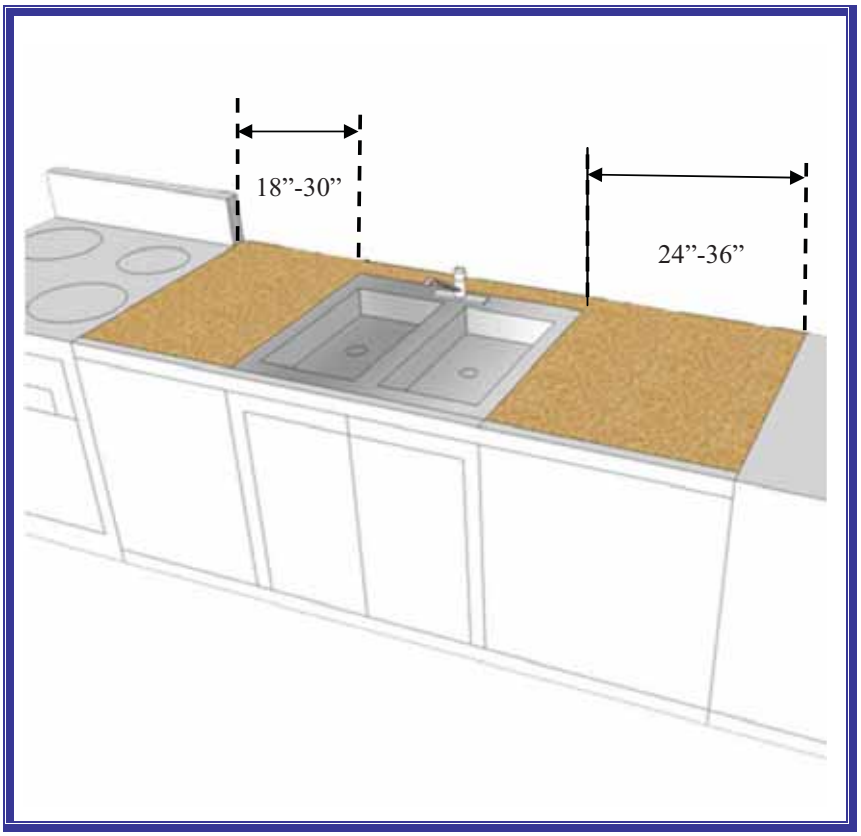


Fig. 10 Clean-Up Centre
Image: DEU

Mixing Centre- This centre should be located between the sink and the refrigerator and not between the sink and the stove/range which would require more back and forth movements by the cook. Avoid putting a window in this area as this would take away from wall space which can be used as storage.

Foods most frequently stored in this centre are packaged items, canned and bottled foods, equipment, baking pans and utensils used for food preparation.

There should be a minimum length of 36” of counter space in the mixing centre. The counter space requires outlets, storage for both small and large equipment, appliances and related food ingredients.

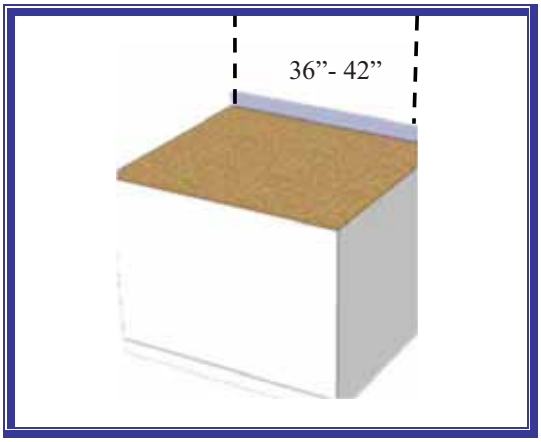


Fig. 11 Mixing Centre
Image: DEU

Cooking Centre- This area is where food is cooked and served. The necessary supplies for food preparation such as the necessary tools, equipment and serving dishes should be stored in this area. This area needs enough counter space on or both sides, cabinets for food, pots and pans and other kitchen equipment. For example ladles, knives, serving platters and spices.

The cooking unit for example a stove/range is generally 30” wide, however, commercial models are usually 36” or more to accommodate a larger volume of food production.

Counter tops placed on either side of the stove/range is more desirable with one being heat proof for hot items and serving dishes. Counter tops should not be less than 15”.

A window should never be placed in this area as it can be dangerous especially if curtains are placed there, other factors are; a window eliminates needed storage space and makes installation of a vent and hood difficult.

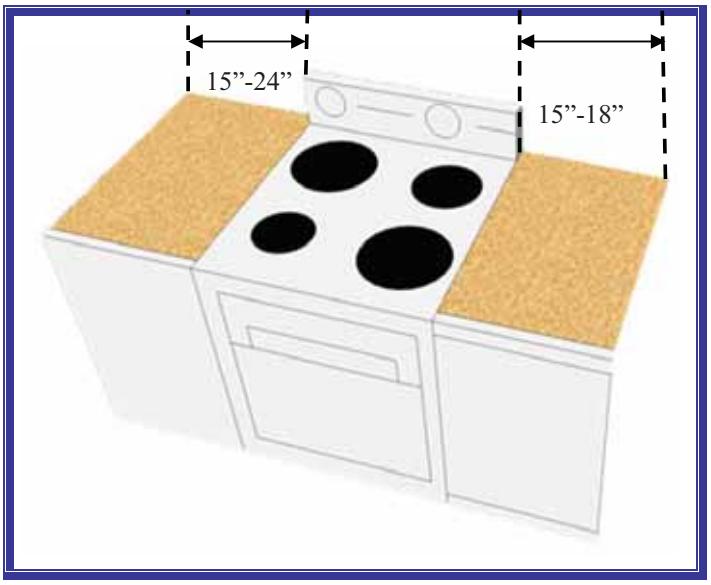


Fig.12: Cooking centre
Image: DEU

Additional/Optional Centres-

1. Eating Center: part of a counter or separate table that can either be in the form of an island or peninsular for dining or entertaining; adequate room is needed to provide for traffic or thoroughfare.

2. Small Appliance Center: for housing appliances which are frequently used in the kitchen during food preparation.

3. Planning Center: a sit-down desk area with multiple purposes and tasks for menu planning to provide meals for the household. You will find shopping lists for budgeting the efficient running of the kitchen; household records to ensure the smooth functioning of the kitchen; bookshelf and cookbooks for planning meals and exploring new recipes; telephones for easy communication; bulletin boards for constant reminders and a calendar for appointments.

4. Laundry Center: This may come in handy to allow you to multi task and speed up daily chores. You can simultaneously do the laundry while preparing meals for your family.

Session Summary

In this session you learned that there are several kitchen layouts to suit every home and the design of the kitchen owner. Let us pause and recap some of the kitchen layouts we have discussed in the above lesson. We have the U-shape, L-shaped, corridor, island, peninsula, single wall and

Summary

G-shape kitchens. Also, work triangles must link up the three main work centres. These are the sink which covers the cleaning area; the refrigerator which forms part of the storage centre and the cooker or range which covers the food preparation storage area and the food preparation area for the cooker or stove.

The work centres are strategically arranged to form what we know as the work triangle. The work triangle gives the direction of the kitchen flow. This arrangement allows us to minimize excessive to and fro in the kitchen and also to save time.

Each kitchen design provided the advantages and disadvantages to give us an understanding of the best suited kitchen layout for our space. Also, the spacing required.

Assessment

Assessment

Fill in the blanks:

1. The basic sequence of activities carried out in the kitchen is food storage, _____, cooking, _____ and _____.

2. _____ comprised of a sink, dishwasher and food waste disposal.

3. The cooking unit is normally _____ wide.

4. The most frequently used area in the kitchen is _____.

Feedback

Answers for the above questions:

1. Preparation; serving; and clearing up

2. Clean up centre
3. 30” wide
4. Sink centre

Session 13.3 Kitchen Surfaces

Introduction

What are the two most important considerations for the surfaces of a kitchen? If your answer was durability and easy to clean, you are absolutely correct and are on the right part. Kitchen surfaces must be able to withstand a high level of beating and as a result should be carefully thought out. They should be highly durable, heat, moisture and stain resistant. You want a kitchen that is beautiful, functional and contain timeless qualities.

Outcomes

Upon completion of this unit you will be able to:

- *Identify* the materials suitable for the kitchen.
- *Differentiate* which material is best suited for the kitchen.
- *Identify* the advantages and disadvantages.

Countertops: Flat work surfaces for transacting business and activities.

Cabinets: A furniture piece with drawers and shelves.

13.3-1 Kitchen Materials

Kitchen surfaces come in a number of types and for each type there are advantages and disadvantages. It is the responsibility of the home or industry owner to weigh both the advantages and disadvantages not only for aesthetics but also for durability and easy maintenance. Therefore a list has been provided to guide your selection.

Kitchen Surfaces:

Kitchen Surface	Type	Advantages	Disadvantages
Countertops 	Natural stone: Very luxurious and expensive. Some examples are; granite, marble, slate, limestone, sandstone.	Heat resistant; unfading appearance; comes in a wide range of styles	Expensive; absorbs stain which may required a sealant; depending on the style it may be prone to breakage
	Wood: Wood gives a warm natural feeling and comes in a variety of hues	Warm feeling; installed in several different ways	Wood is susceptible to water, scratches and stains which have an effect on the surface
	Stainless steel: Provides a contemporary look which is very resistant	Easy to clean; durable; heat, water and stain resistant	Stainless steel can be noisy; dents and dulls

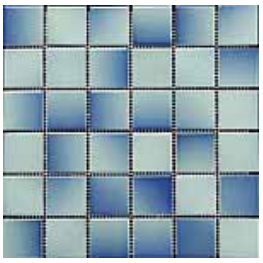
Kitchen Surface	Type	Advantages	Disadvantages
	Ceramic tiles: Beautiful and come in a wide range of colors, sizes and textures.	Inexpensive; low maintenance; easy to clean; Kiln-fired tiles are usually heat resistant	Chip and crack easily; the grout lines can be difficult to clean
	Man made solid surfaces: A synthetic surface made from a combination of acrylic resin and natural minerals	Durable; seamless; solid surface allows for sanding scratches.	Vulnerable to heat and stain damages

Table 13 (freedigitalphotos.net)

Cabinets and Walls:

Cabinets	Type	Advantages	Disadvantages
 Cabinets	Natural wood	Elegant;	Must be polished with melamine and veneers to protect from moisture
	Phenol-bonded marine ply	Water resistant	expensive

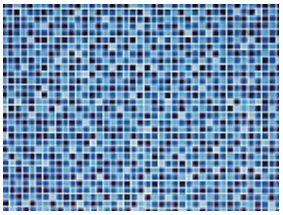
Cabinets	Type	Advantages	Disadvantages
	Stone	Easy to clean and less susceptible to insects infestation	
Walls 	Ceramic tiles: Mainly above the hob and the sink areas	Easy to clean; come in a wide range of colors; prevent seepage from the outside pipes	Susceptible to chipping

Table 14 (freedigitalphotos.net)

Windows and Doors

Windows and doors windows placed in a kitchen should have preferably a stone frame work and glass panes to allow natural light to pass through. Fancy curtains are not necessary and should be avoided in the kitchen. Curtains of any kind should not be placed close to the cooking range or stove.

Floors

Floors should be hard wearing, smooth, impervious, easy to clean and non-slippery. A floor must always maintain an even floor level so as to avoid any interruptions between the main work centres which may cause accidents.

Below are a few floor materials used in the kitchen:

Floors	Type	Advantages	Disadvantages
	Quarry stones Come in a variety of shapes and	Aesthetically appealing; good grip	Hard surface

	sizes		
	Granite To avoid slipping granite should be mixed with smaller stones to break up continuity	Desirable sheen and color	Hard surface; very slippery when wet
	Ceramic tiles Wide range of color and patterns	Easy to clean; heat and dust resistant	Hard surface
	Vinyl flooring Available in various colors	Very economical; waterproof	Short lasting; steins;

Table 15 (freedigitalphotos.net)

Activity

A. Identify the materials below and state the area it is best suited for in the kitchen and give one advantage and one disadvantage for each.

1.

2.

3.

4.

A. Write your answers in the spaces provided.

Feedback

1. Ceramic tiles- kitchen surface
    a. Advantages- low maintenance; inexpensive; easy to clean
    b. Disadvantages- chip and crack easily
2. Granite- kitchen surface; floors
    a. Advantages- desirable sheen and color
    b. Disadvantages- hard surface; very slippery when wet
3. Vinyl flooring- kitchen floor
    a. Advantages- very economical; waterproof
    b. Disadvantages- short lasting; stains
4. Wood- countertops; floors; cabinets
    a. Advantages- warm feeling; several different patterns
    b. Disadvantages- scratches; water susceptible; stains

13.3-2 Kitchen Units

Kitchen units provide work surfaces and storage space for every kitchen. Kitchen cabinets provide storage space for food, kitchen appliances and equipment, utensils, silverware, crockery and serving dishes. Whether your kitchen space is for home use or commercial, cabinets are important to every kitchen. Cabinets come in a variety of colors and materials to suit every individual preference. Kitchen cabinets are both functional and attractive.

Cabinets

A kitchen cabinet is usually in the shape of a box fixture comprised of drawers or doors for storing utensils. Some cabinets are free standing others may be built in the walls or in some cases attached to the walls.

Kitchen cabinets are made from wood or some other synthetic materials. Cabinets may have one or more drawers sometimes with a lock. There are also drawers along with the doors or drawers only.

Kitchen cabinets come in a number of structures for example; wall units; corner units; base units; top units; peninsula units; island units and complete units.

Kitchen Units

Wall Units

They are usually fit into corner spaces or along the walls. Provide lots of space for storage. Wall units should be of a safe height for the user to prevent accidents from occurring; for instance in the event trying to reach an item to far in the cabinet may result in the item falling unto the user. Another thing you should pay attention to is the fact that if your cabinet doors are too large they can disrupt the work top when opened.

Fig 16: Wall Units with a Corner Unit
Image: Michelle John

Corner Units

They come either as a top and bottom or as a continuous cupboard extending the full height of the kitchen walls. Corner units are use to fit in the corners of the kitchen to maximize the space. Corner units can be used as a broom cupboard or a pantry area.

Base Units

These units are sometimes made with a panel of drawers, without drawers, doors, doors as well as drawers. They usually have a finished surface on top as working countertops or simply as a display.

Fig 17: Image Base Units
Image: Michelle John

Top Units

These are used primarily for additional shelving above lower cupboards. They should be suspended properly to be able to withstand the weight placed in them.

Fig 18: Image- Top units
Image: Michelle John

Peninsula Units

They are base units that are separated from the wall to form a projection in the kitchen. They are usually used to form a barrier between the kitchen and the dining room and have cupboards on both sides of the cabinet for easy access of storage.

Island Units

These are also base units placed in the middle of the kitchen, with either a sink or a surface heater on top the work table. They may be surrounded with cupboards or have shelves on both ends of the unit.

Fig. 19 Island unit (www.flickr.com/photos)

Complete Units

These are free standing units that do not require installation. The top cupboards are narrower and shorter than the bottom cupboards which are usually wider and higher. This particular design provides a more balanced structure to prevent the unit from overbalancing. These units have both a back surface which separate the top cupboard from the bottom and working surfaces or countertops.

Fig 20 http://en.wikipedia.org/wiki/Kitchen_cabinet

Session Summary

Summary

In this session you learned that the type of surfaces used in any kitchen must be both aesthetic and functional. Aesthetic for your kitchen to look attractive and functional to be able to withstand stain, heat and moisture. Kitchen surfaces must be highly durable and easy to clean.

There are several materials used as surfaces for kitchen units, for example, stainless steel which is easy to clean and durable with a good appearance.

Also, in this session we learned the different type of units for the kitchen. They were as follows; wall units; top and bottom units; peninsular units; island units and corner units. These are used as work surfaces and storage in the kitchen.

Assignment

Assignment

14.3-2: Kitchen Material Research:

A. Visit your local hardware or tile factory and gather kitchen material samples for the following areas:

1. Countertops

2. Walls

3. Floors

4. Cabinets

Assessment

Assessment

14.3-2: Matching on kitchen units:

1. Base units	a. usually fit along the walls
2. Corner units	b. separated from the wall to form a projection in the kitchen
3. Island units	c. units with or without a panel of drawers
4. Peninsular units	d. sometimes use as a broom cupboard or a pantry area
5. Wall units	e. base units placed in the middle of the kitchen

Feedback

14.3.2: Solutions for assessment questions:

WORDS	PHRASES

WORDS	PHRASES
Base units	Units with or without a panel drawers
Corner units	Sometimes use as a broom cupboard or pantry area
Island units	Base units placed in the middle of the kitchen
Peninsula units	Separated from the wall to form a projection in the kitchen
Wall units	Usually fit along the walls

Session 13.4

Kitchen Maintenance

Introduction

In this session we will to explore ways to take care of the three main kitchen equipment; cooker/stove, refrigerator and sink. Most times we overlook the maintenance of supplies until they are no longer functioning. By this time it is too late and may require replacing instead of it being able to repair. Our kitchens are places where a lot of activities and interactions take place. For instance we prepare meals in the kitchen, sit and eat as a family; discuss family and other matters. For others the kitchens may be run as a business place where mass food production may be carried out (example catering on a large scale).

Regular upkeep of your kitchen equipment supplies ensures the preservation of these items for a longer period of time in terms of the functioning and appearance of the equipment. These help your kitchen to look better and save you money in the long run. Let us spend some time on this area so we too can help preserve our kitchen environment.

Upon completion of this unit you will be able to:

- *Explain* how to care for kitchen equipment.
- *Identify* maintenance and preservation measures.

Outcomes

- *Discuss* the precautionary measures taken when a crisis arises kitchen equipment.

Terminology

Refrigerants: Liquids present in tubes at the back of the refrigerator unit to remove heat.

Ice-box: Another name for a refrigerator.

Defrosting: Removing ice gathered from the build up of moisture in a refrigerator.

Hob : The flat top area of a cooker containing gas or electricity for cooking purposes.

Grill : A device which radiate heat downwards unto the food.

Oven : Heated compartment insulated with glass fibre and used for cooking.

Washing soda: Powder mixture containing sodium bicarbonate.

14.4-1 Caring for your Equipment

Refrigerator

This is the cold storage equipment in the kitchen and is often neglected until something goes wrong with it. Refrigerators provide adequate temperature to prevent food spoilage and poisoning. A refrigerator is made up of the main storage area-freezing area and a door. The shelves on the door are the warmest part of the refrigerator and should store items such as dairy products, juice and the bottled items.

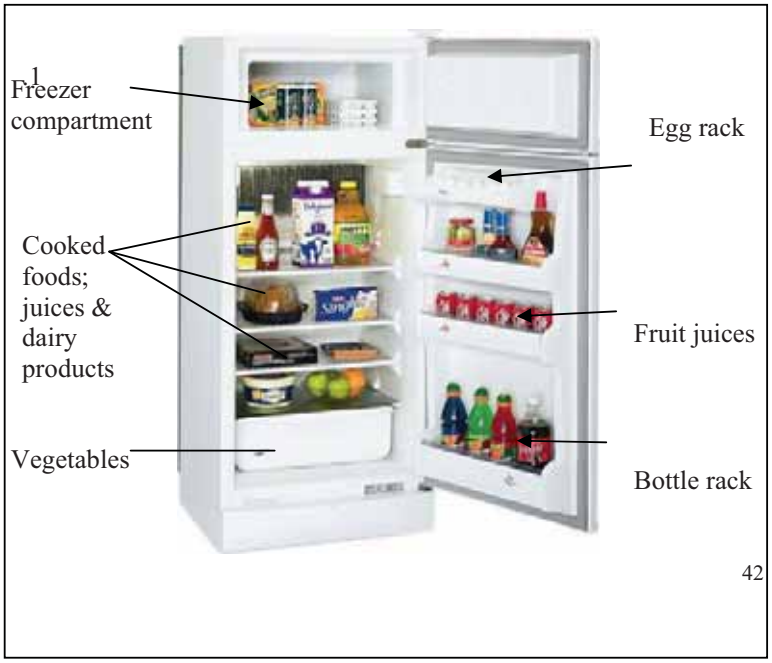


Fig 21 Open Refrigerator- bocah.org

Maintenance- Firstly why do we need to defrost our refrigerator. This is necessary because there is a constant built up of moisture from the air and food in the refrigerator which freezes on the surface of the ice-box or the heat exchange panel. The built up of frost in the freezer should not exceed ¼" thick. This frost affects the normal functioning of the refrigerator; therefore defrosting becomes necessary to remove the excess frost.

Defrosting can take place in one of three ways:

1. Manual Defrosting- The refrigerator is first switched off to allow the ice to melt. A container is placed below the ice-box to collect water from the melted ice. This is then removed and the refrigerator is cleaned with a mild solution for example bicarbonate of soda in water. The refrigerator is allowed to dried then restacked and reconnected.

2. Push-button Defrosting- There are some refrigerator models have a button which when pressed shut down the refrigeration process to allow the ice to melt. Once this is done the refrigerator process resumes to normalcy.

3. Automatic Defrosting- Defrosting occurs automatically once the ice reaches a certain thickness. Therefore it is not necessary to do prior checks for defrosting. However you should always keep your refrigerator clean both inside and outside with your cleaning solution.

   Another maintenance procedure should be to vacuum the condenser coils situated either to the back or on the bottom. The dust gathered around those areas slows down the effective running of the refrigerator. This can be done periodically once a month.

Cooker

This is the most frequently used piece of equipment in the kitchen. They can be found in gas or electricity. Most cookers are made up of three units:

1. The hobs- hotplates or burners on the range you actually cook your food on.

2. The grills- heating device either in the form of electricity or gas which radiates downwards on the food.
3. The ovens- insulated heated chambers either electric or gas for cooking.

Maintenance: The hob and oven need to be clean regularly to maintain your cooker. A non abrasive cleaner should be used to clean the hob so as to protect the enamel from scratches. However if the hob is made of ceramic a special powder or cream designed specifically to clean this type of surface.

The oven is cleaned with a caustic foam or cream. Precautionary measures should be taken to prevent your skin from burning or the metal and plastic from damaging. In the event of self cleaning ovens only a damp cloth is necessary to remove the ash left from the residue of foods.

The glass panels along the oven doors should be cleaned with a non scratch cleaner.

The grill can be easily dismantled and cleaned with a degreaser to remove any grease gathered.

Fig 22 Cooker/Range

Sinks

The sink forms part of the cleaning area and is made from stainless steel, enamel, fiberglass, plastic or fireclay. The draining boards may be separated, single or double. It is always advisable to have draining boards which form part of the sink unit, because separate draining boards harbor bacteria and are considered to be unsanitary.

Sinks are normally placed close to a window to allow fresh air, natural light and outlet where steam can escape.

Sinks should be kept clean and free from grease at all times using non-scratch cleaning supplies on a regular basis.

Maintenance: Always ensure no food and non-food particles and fats go down the sink as this results in blockage. In the event of a sink blockage the following guidelines should be followed:

1. Place boiling water down the drain to free any blockage and in the event of grease washing soda should be used.

2. A wire is placed in the plug hole to ease the blockage out from the hole.

3. A suction tool is used to move the blockage.

4. Remove the inspection screw and place the bucket under the U-bend of the sink to empty out the debris.

5. Hot water is finally used to flush any remaining particles.

If the above procedures do not work it is advisable to call a professional plumber.

Occasionally bleach or disinfectant should be poured in sinks to get rid of bacteria which may gather in the waste pipe.

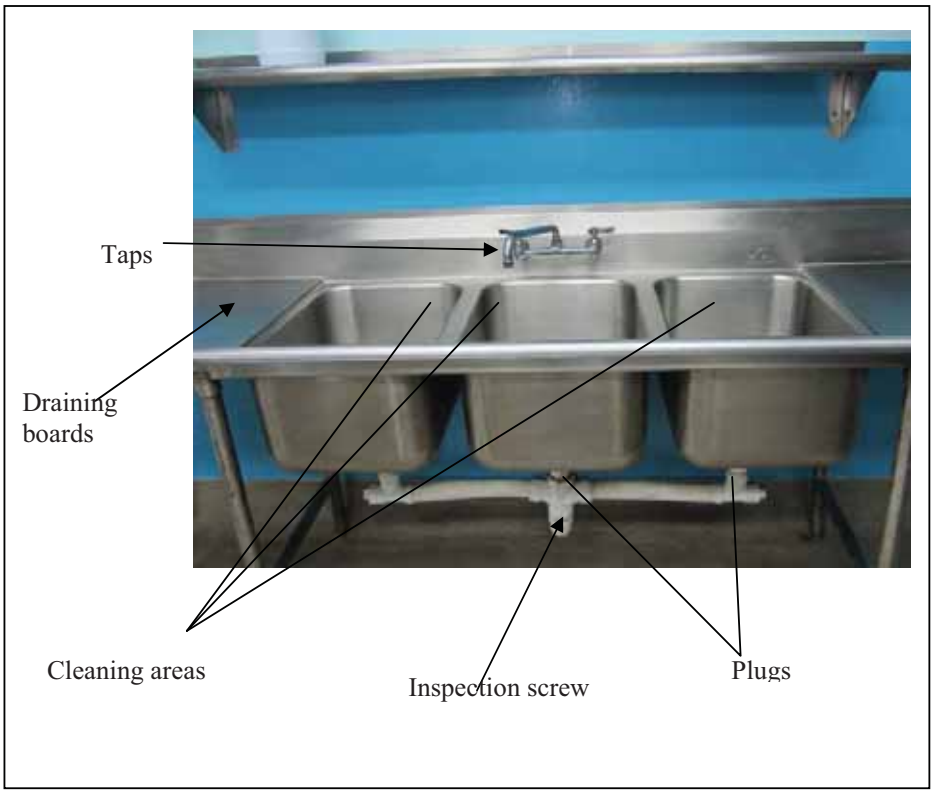


Fig. 23: Sink

Session Summary

Summary

In this session you learned about the importance of maintenance for your kitchen equipment. The cooker, refrigerator and the sink are very important pieces of equipment which need regular checking and servicing to maintain the functioning for a longer period of time.

The refrigerator needs to be constantly defrosting whether it is manually or automatically to prevent a build up of ice in the refrigerator which hinders the regular functioning of the unit.

The cooker should be cleaned with a caustic soda or cream foam to prevent scratches on the cooker. Precautionary measures should be taken when cleaning with caustic soda to prevent burns on the skin.

The sinks should have attached draining boards and should be appropriately placed in the kitchen.

Assessment

Assessment

Kitchen maintenance: Short answer questions

1. Why is it necessary for regular maintenance of your kitchen equipment to take place?
2. List three ways for defrosting a refrigerator
3. Why is it necessary to place a sink close to a window?

Write your answers provided below.

Feedback

Answers to the questions:

1. To preserve the life and regular functioning of the equipment by constantly servicing and cleaning the units properly.

2. 1. Manual defrosting

   11. Push-button defrosting

   111. Automatic defrosting

3. To allow fresh air, natural light in the kitchen and provides an outlet for steam to escape.

Unit Summary

Summary

In this unit you learned the importance of kitchen design and how a well thought out plan can help minimize wasted time from occurring. This is important because the kitchen is a place where a number of activities take place. For example; cooking for the family members; guests or catering purposes. Whatever the occasion the kitchen can become a busy place.

We went on to discuss the main kitchen layouts and work triangles for the individual layout. The purpose of a work triangle is to make the kitchen flow more efficient and easy to work in. The main work centres were identified and what they entail and the activities that take place in each centre.

Thirdly, we focused on kitchen surfaces and the important considerations taken. The importance of durability, moisture and heat resistance. We highlighted the advantages and disadvantages for each material. The reasons why you would prefer one over another; is it because of cost, durability or aesthetics? In this session we made mention of the different wall units and the functions of each in the kitchen.

Finally, how do we care and maintain our kitchen equipment.We discussed the reasons why these procedures are necessary and how we can preserve and maintain the life of our kitchen equipment. This is very

important to save cost and the regular functioning of the kitchen units.

Assignment

Assignment

Designing a kitchen:

Instructional Objective- Your aunt is a first time homeowner and you were selected to help design her kitchen layout. Base on your current information on this topic you are responsible for the followings:

1. Create a design layout to suit her needs and budget.
2. Draw a basic floor plan for the particular kitchen layout eg. U-shaped, L-shaped etc.
3. Identify the materials to be used for the counters, cabinets, floor, windows and walls.
4. Selection of the sink, cooker/range and refrigerator.

NB: Your finished kitchen should be both functional and aesthetic.

Information can be gathered from the above unit and internet sources or textbooks on kitchen layout.

Contents

Unit 14

Large and Small Kitchen Equipment

Introduction

One of the prerequisites for the successful completion of any recipe is the availability of equipment and the safe and accurate manipulation of them. Kitchen equipment consists of large and small equipment, appliances and utensils. There is an enormous variety available to the avid cook. Therefore it is important to use the appropriate equipment for the required job, to complete the task efficiently and in a timely manner. In addition to this we must be ever mindful that appliances used in the preparation of food items be used safely in order to avoid accidents which could cause injury to life and limb. In this unit several lessons have been prepared that will help you categorize and use kitchen equipment.

Outcomes

Upon completion of this unit you will be able to:

- *Categorize* kitchen equipment.
- *State* the appropriate uses of various pieces of kitchen equipment.
- *Describe* the appropriate method of maintenance for specific pieces of equipment.
- *Describe* the desirable features of various pieces of kitchen equipment.

How long?

You will need to devote fifteen (15) hours to work on this unit. Ten (10) hours for formal study and 5 hours for self study and completing assessments/assignments.

Terminology

Kitchen Equipment: The various utensils used to prepare and serve food.

Kitchen Appliances: Electrical tools used for particular purposes, they save time and energy.

Kitchen Gadgets:	Kitchen tools that improve the efficiency of food preparation.
Large Equipment:	Large items commonly found in a kitchen or food preparation area
Small Equipment:	Small tools used in the preparation of food and are made of a variety of materials.
Energy Star:	A label to help consumers identify appliances that are energy efficient and minimize air pollution.

This Unit is Comprised of Three Sessions

Session 14.1 Types of Kitchen Equipment

Session 14.2 Safe and Efficient use of Kitchen Equipment

Session 14.3 Maintenance of Kitchen Equipment

Session 14.1 Types of Kitchen Equipment

Introduction

In order to perform the preparation and cooking of food efficiently the correct equipment is required. This will help reduce the frustration levels you may experience when using the food lab at school or the kitchen at home. Sometimes you may have to substitute if the required piece of equipment is unavailable but you must always strive to use the correct equipment and become familiar with their names and functions.

Upon completion of this session you should be able to:

Outcomes

Classify kitchen equipment.

Identify kitchen equipment.

How long?

You will need to devote 3 hours of formal study and 1.5 hours of self-study to complete this session.

Terminology

Bakeware:	Food preparation equipment that is used for cooking baked goods.
Colander:	This is a bowl shaped kitchen utensil that has holes all around it used to drain, cooked pasta, rice or wash salad vegetables.
Tawa:	This is a large, round, flat metal Indian cooking utensil, similar to a pizza stone.
Meniscus:	This is the curved surface observed at the top of a liquid in a container.

14.1-1 Classification of Kitchen Equipment

In order to improve your food preparation skills and enhance the presentation and service of food, the right kitchen equipment is a necessity. They will help reduce your level of frustration during food preparation and will enable you to become more effective, efficient and creative. There are several types of kitchen equipment which you should become familiar with so that you could be better able to recognize the qualities and details they should possess. I know that you are anxious to go into the food lab and experiment with recipes but in order to enjoy that process you must complete this unit which will ensure that your explorations are enjoyable and satisfactory.

Kitchen equipment is the various items used in the preparation, cooking, and serving of food. They increase the efficiency with which food is prepared. Kitchen equipment is placed into categories or groups based on their main functions or uses and size which is listed below for you (however the examples given are not exhaustive).

Measuring tools

Liquid measuring cup

Scale

Solid measuring cups

Measuring spoons

Figure 1 Assorted Measuring Tools

Food Preparation Utensils

Gadgets used in the preparation of food to improve the efficiency. These include sieves; colanders; egg separators; spatulas; whisks; mixing bowls; jelly moulds; egg slicers; reamers; can openers; food thermometers; cookie press; basters; chopping boards and the like. They perform a myriad of functions and therefore do not fall into specific categories. However they improve the efficiency and dexterity with which various food preparation tasks are performed. These gadgets are hand held implements that are light weight and easy to care for.

Here are a few examples below.

Can opener

Citrus juicer/reamer

Sieves/sifters

Food baster

Figure 2 Assorted Kitchen Gadgets

Kitchen Cutlery

Cutlery that is used in the cutting, chopping, mashing, stirring and lifting of food includes kitchen knives; paring knives; cook's knives; palette knives; grapefruit knives; bread knives; boning knives; cleavers; graters; potato peelers; kitchen scissors; pastry cutters; wooden spoons; slotted spoons; ladles; pasta forks; and food tongs. The majority of them are made of stainless steel and others are made from wood.

Vegetable peelers

Boning knife

Bread knife

Grapefruit knife

Kitchen tongs

Fish slice/luner

Figure 3. Assorted pieces of equipment

Bakeware

Equipment used in the preparation of baked goods and pastries. These include baking tins; cookie sheets; pie plates; Swiss roll tins; muffin tins; sandwich cake tins; loaf tins; angel food tins; casserole dishes; roasting pans, cooling racks; pastry blenders; pastry brush; rolling pins; pastry boards; pastry crimper; skewers; forcing or pastry bag and tube and the like are made from a variety of materials.

Assorted baking trays

Casserole dishes

Pastry blender

Rolling pin

Pastry board

Pastry brush

Figure 4 Baking Equipment

Cookware

Receptacles that are used on the top of hobs or cooker tops for cooking food are referred to as cookware. These include saucepans; frying pans; double boilers; steamers; deep fat fryers; iron pots; pressure cookers; tawa or tava or tawha; percolators; and kettles. Saucepans and pots come in a variety of sizes and are made from several different types of materials. The handles of these saucepans should at most times be made from materials that are poor conductors of heat so as to safe guard your hands from the heat that metal pots absorb and conduct during the cooking process. It is always a good safety measure to use pot holders when operating saucepans and other cookware.

Kettle

Saucepans

Double Boiler

Tawa

Percolator

Frying/skillet

Figure 5 Cookware

Small Electrical Appliances

These are countertop appliances used in the preparation of food. These include cake mixers; blenders; juice extractors; electric fryers; electric can openers; food processors and the like. They have become an essential part in food preparation reduce the amount of manual labour that you would have to expend in the preparation of food items. If a recipe you were preparing required grated coconut and the only piece of equipment available for you to use was a grater, think of the amount of energy and time it would take to prepare the item. But if you had a small electric appliance such as the blender or food processor, your task would be completed in a relatively shorter timeframe. So it is important to invest in small electric appliances.

Stand mixer

Food Processor

Juicer

Electric can opener

Figure 6 Small Electrical Appliances

Large Electric Equipment

Large appliances used in the cooking and storage of food include cookers; refrigerators; freezers; and microwave ovens. Large electric equipment has become the main stay of modern kitchens and food labs. No longer are they considered luxuries but necessities. Equipment such as refrigerators and freezers will help you keep food such as meats and precooked food that would have lasted a relatively short time to have a longer shelf life. The microwave oven has become the lifesaver in many a home because it is used by those of us who live hectic lifestyles and have little or no time to prepare food from the very beginning. The microwave oven is used primarily by some for the reheating of food even though there are several other features available to the avid cook.

Refrigerator

Range/Stove

Microwave oven

Figure 7 Large Equipment

Activity

Do you know the different groups of kitchen equipment? List them in the spaces provided below.

Feedback

The different groups of kitchen equipment are measuring and weighing tools; food preparation gadgets; kitchen cutlery; bakeware and pastry making equipment; cookware; small and large electric kitchen equipment.

Note it! / Warning

Kitchen equipment is essential for the successful completion of food preparation. Each category of kitchen equipment is made up of various types of materials and it is important that you get the best quality of equipment for the value for money.

Activity

Know Your Equipment

The table below contains the names of some categories of kitchen equipment.

- Give a definition for each category of equipment listed.
- In each category give two examples of kitchen equipment/tool.

Image: Gail Samaroo

Feedback

Kitchen Gadgets: Tools that improve the efficiency of food preparation. Examples of kitchen gadgets are:- sieves; colanders; egg separators; egg slicers; spatulas; whisks; mixing bowls; reamers; can openers; food thermometers; cookie press; basters; graters; chopping boards.

Bakeware/Pastry Making: Tools used in the preparation of baked goods/ pastries. Examples of bakeware/pastry making equipment: baking tins; cookie sheets; pie plates; Swiss roll tins; muffin tins; sandwich cake tins; loaf tins; angel food tins; casserole dishes; roasting pans; cooling racks; pastry blenders; pastry brush; rolling pin; pastry boards; pastry crimper; skewers.

Measuring/Weighing Tools: Tools used to weigh and measure food accurately. Examples of measuring/weighing tools are: measuring cups; measuring jugs; measuring spoons; food scales.

Kitchen cutlery: Cutlery or cutting and stirring implements that are used in the preparation of food. Paring knives; cook's knife; palette knife; bread knife; boning knife; cleavers; potato peeler; kitchen shears/scissors; pastry cutters; wooden spoon; slotted spoons; ladles; pasta fork; food tong; fish slice.

14.1-2 Identifying Kitchen Equipment

There is an abundance of kitchen equipment in the school lab and in the department stores and even in your own home. It is important for you to become acquainted with them for easy recognition. To make the preparation of food enjoyable and less time consuming and to reduce your level of frustration you need to become familiar with kitchen equipment. Some common kitchen equipment found in the food lab or in the home has been included in this lesson to ensure easy identification.

In this lesson some of the various kitchen equipment have been pictorially represented so that you would be able to recognize them easily. Please familiarize yourself with them.

Who am I and what do I do?

Here are a few clues about some of these tools, you'll also be provided with some images, *circle the appropriate or matching images to the descriptions given.*

- These cups and spoons are used to measure both liquid and dry ingredients that are required in small amounts.
- They are made of plastic, stainless steel and aluminum and are available in sets of measures in either teaspoon (tsp) or tablespoons (tbsp) or in milliliters (ml). The measures range from 1/8 tsp, ¼ tsp, ½ tsp, 1 tsp, ½ Tbsp, 1 Tbsp or 25ml, 15ml, 5ml, 2 ml, and 1 ml.

- Here's how you'd use them:

  a If you have to measure liquid, fill the appropriate spoon measure with the required ingredient. You should hold the spoon over the liquid container or over a plate whichever one is convenient for you.

  b For a level measure of dry ingredients, fill the appropriate spoon with the ingredient. Use the dull end of a knife or spatula and level off the measure. Be sure to hold the measuring spoon over the container that holds the ingredient or over a plate, again whichever is convenient for you.

  c When measuring liquid ingredients such as milk, juice, water, oil and the like allow the measuring jug to stand on the counter top. Pour the liquid into the measuring jug until the desired or required level is obtained. You must not and I repeat must not lift the jug. To be really accurate you have to bend your back and read the measure at eye level. The surface of standing liquid forms a meniscus, which is a curve that forms on the sides of liquid. The meniscus must lie on the desired measure.

  d You can measure dry ingredients such as sugar, flour, rice, oatmeal, corn flour, cornmeal and the like. In addition to these cups can be used to measure chopped vegetables, sliced cheese, and chopped nuts. Semi solid foods that are dense such as molasses honey and cream cheese can also be measured using measuring cups. Can you think of any other ingredients which you can use these cups to measure? Share this information with your teacher and other members of your class and listen to what they think.

  e The cup or jug is different because it contains a lip for ease of pouring. It is made from heat resistant glass or plastic and has both imperial and metric measures marked on its side. Measuring jugs are available in 250 ml and 500 ml sizes and 1 cup and 2 cup measures in addition to pints and litre measures.

Figure 8 Who am I and what do I do?

These are usually made of stainless steel with plastic handles. They will help you open cans with ease. They are constructed with comfortable handles which will ensure that you have a secure grip when using them to open your cans and tins.

Here's how you'd use it;

- To use, you must first open the handles and place the jagged ends over the rim of the tins. Squeeze the handles together to enclose the cutting jagged ends snuggly over the rim. Turn the protruding knob clockwise and the can will open

This is is made from stainless steel or silicone. It has a tube handle with a sturdy wire or silicone balloon twisted beater.
How would you use this tool?

- You can use this tool for whisking eggs,l egg whites, meringues, sauces, whipped cream and the like. With this tool the efficiency and ease of whisking or beating food is simplified.

Made from stainless steel, plastic or bamboo rings that encloses mesh wire thesse come in a variety of sizes and are ideal for catching lumps of flour and sugar or even to to remove lumps from sauces and soups. Sieves are especially important in cake making when they are used to aerate flour.

Figure 9 Who am I?

Here are a Few More Pieces of Equipment

- Made from stainless steel and silicone this piece of equipment has a round bowl shape and contains many holes through out its body and two handles on its sides for ease in holding. It comes in various sizes and you can use the colander to wash fruits and vegetables, in addition to straining pasta and cooked vegetables such as cassava and the like.

- This next pieces of equipment is made of stainless steel, plastic or silicone. It contains a central cup which is used to hold the egg yolk. Around the cup there are several slits that will allow the egg white to pass through easily.
- A very handy tool this is used to cut even slices of peeled hard boiled egg. It is made of stainless steel or plastic material. It consists of a sloltted dish for holding the egg and also a plate that has serrated wires or blades for cutting through the egg.
- This has a strange name but this is used to manually extract citrus fruit juice from pulp. It is made from plastic, glass or stainless steel. Reamers consist of a centred ridged mound on which the cut citrus fruit is pressed to extract the juice. The juice passes through the attached bottom screen and is colleced in the reservoir pan and the solid pulp remains on top of the screen.
- Made from plastic or silicone or rubber heads with and handles also made of plastic. The heads are usually flexible and are designed to scrape the sides of jars, containers and bowls that were used in the preparation of food items such as cake batters and cheese fillings.

Figure 10 Who am I

Cutting Instruments

Here are some images of cutting instruments used in the kitchen. Can you name them and write at least one usage of each?

Figure 11. Who am I and what am I used for?

Activity

What about those used for baking and other tasks? What are the names of these pieces and what are they used for? Write the answers in the spaces provided in the table.

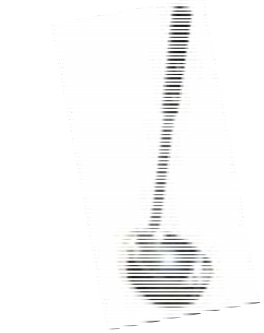
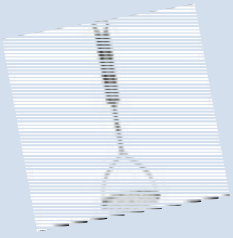
	
	
	
	
	
	

Figure 12 Equipment and Uses

What about these pieces of equipment? Can you name them and list at least two special features of EACH of them?

Figure 13 Equipment and Uses

Note it! / Warning

There are several categories of Kitchen equipment which include measuring and weighing, food preparation gadgets, kitchen cutlery, cookware, bakeware and pastry making, small and large electrical appliances.

Session Summary

Summary

In this unit you learnt that equipment is classified into groups such as measuring tools, cookware, bakeware, food preparation, kitchen cutlery and small electrical appliances.

Additionally the equipment can be made of materials such as plastic, wood, and stainless steel.

Assessment

Assessment

Your family will be spending Sunday at the beach. You are to prepare the following meal:

Chicken Pelau

Tomato/Lettuce Salad

Coconut Tarts

Fruit Punch.

From you knowledge of kitchen equipment, list the required kitchen equipment/tools that you need in order to prepare this menu.

Check for your answers at the end of this unit.

Come on you are doing a great job. If you forgot some equipment that is alright, you'll master it all eventually.

Reading

- Caribbean Home Economics In Action Book 1 by
  The Caribbean Association of Home Economists
- Home Economics Book 1 by Rita Dyer and Norma Maynard.

Feedback

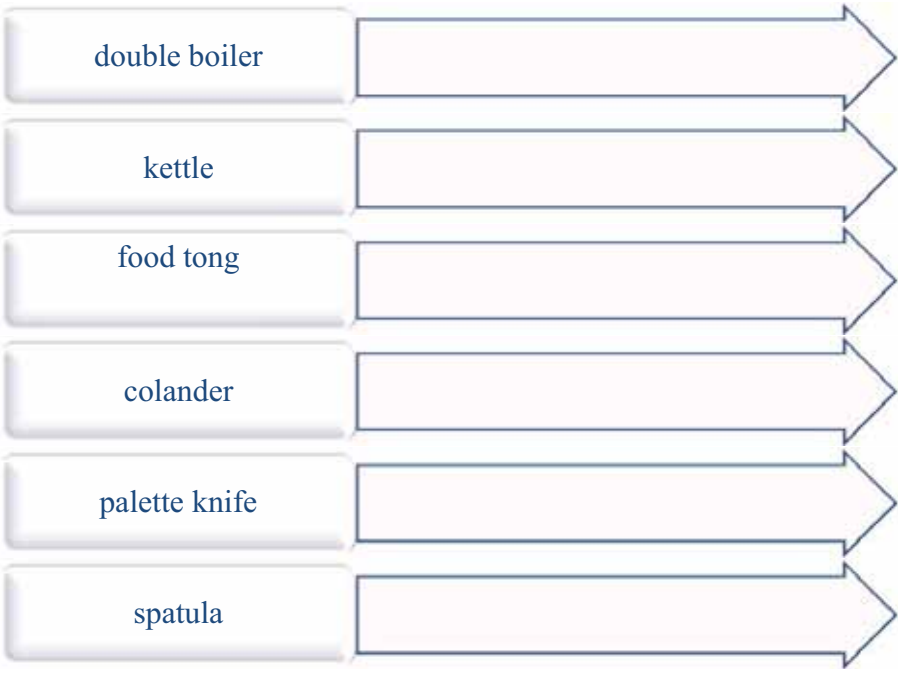
The required equipment for the meal are:

Mixing bowls; chopping board; cleaver; cook's knife; paring knife; measuring spoons; measuring cups; measuring jug; scale; iron pot; metal pot spoon; grater; vegetable peeler; sieve; strainer; pastry blender; pastry brush; baking tray; pastry crimper; blender; reamer; saucepan.

Compare your response, I do hope that you have all or almost all of the equipment listed.

Activity

Write in the space provided the functions of the equipment listed.



Feedback

Functions of the equipment.

Equipment/tool	Function
Kettle	Boiling water
Double boiler	Cooking custards and other liquids that should not be placed directly over heat
Palette knife	Spreading icings, fillings and the like onto food
Spatula	Scraping the sides of bowls

Equipment/tool	Function
Colander	Separating solid food from liquid, placing vegetables and fruits in for washing
Food tong	Lifting and serving food

Session 14.2 Safe and Efficient use of Kitchen Equipment.

Introduction

Safety is the prevention of accidents and it is important for all of us to note the safety practices to adhere to when operating kitchen equipment. We must remember that it is important to use kitchen equipment for its intended use only.You should use kitchen knives for cutting food only and not for opening cans or tins because the knife may slip and you in turn will get cut. No matter your level of skill, you must become very observant and careful when using sharp tools, hot pots and pans, electrical appliances and cooking equipment in order to prevent injury to yourself and others. In this lesson, a list of rules to adhere to for the safe and efficient use of kitchen equipment is not exhaustive.

Upon completion of this unit you will be able to:

Outcomes

- *Use* various pieces of kitchen equipment safely and efficiently.
- *Choose* appropriate small equipment for the task.
- *Discuss* the desirable features of small and large kitchen equipment.

Cold cuts: These are usually precut slice of cheese, sausages or other cured meat that are served cold on sandwiches or on a platter.

Terminology

14.2-1 Kitchen Cutlery knives

In food preparation kitchen cutlery includes tools that are used for chopping, cutting, dicing, slicing, grating, shredding, peeling, deboning, spreading, crushing and blending of food. The majority of them have sharp cutting edges which are usually made from stainless steel and if incorrectly used cuts and even the loss of a limb can result.

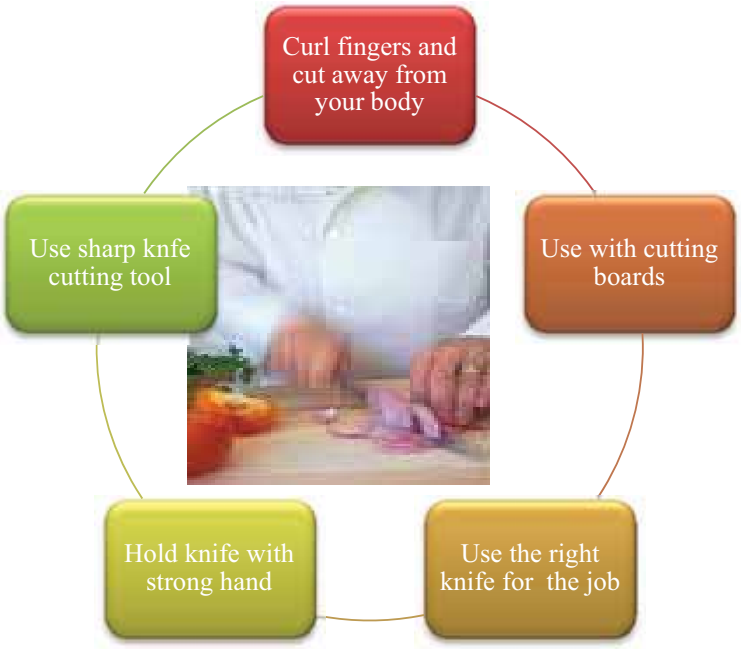


Figure 14 Knife Skills
Image: Gail Samaroo

14.2-2 Cookware and Bakeware

Saucepans that contain hot liquids such as water which gives off steam and oil should be viewed carefully because they could result in severe scalds and burns. This could happen if you touch the surface of hot pots and pans, baking tins, oven shelves, and hot plates of electric cookers. In addition to this if hot fat or oil spills or becomes overheated a fire might start. The steam rising from hot water or escaping from the pressure cooker or pot can also result in you being scalded. So be extremely careful when using this equipment during cooking.

Figure 15.Accurate Use of Various Types of Cookware and Bakeware
Image: Gail Samaroo

14.2-3 Small Electrical Appliances

In the food laboratory at school or in your family kitchen at home there may be several small electrical appliances that are used in food preparation. They help you save time and energy and improve the overall efficiency of food preparation. Because they are electrical you need to adhere to good safety practices in order to prevent injury. The most important rule to adhere to is to follow the manufacturer's instructions carefully.

Figure 16. Accurate Use of Small Electrical Appliances
Image: Gail Samaroo

In addition to the rules outlined above it is important to note that you must always read and follow the manufacturer's instructions when operating electrical appliances. This will ensure that the life of the appliance is not curtailed and there is safety in using. Reading the instruction manual will help you to become familiar with the parts of the appliance and the correct procedure for assembling it. Before you plug the appliance to the electrical outlet make sure that the on/off knob is turned to the off position.This will ensure that the machine becomes operational only when you are ready.

Small electrical appliances such as mixers and food processors should not be overloaded with liquid or mixture. This will prevent placing additional strain from being placed on the motor and causing spillage or overflowing of the ingredients. Spatulas, spoons and knives should not be inserted into operating blender jugs or food processors bowls because they may collide with the blades of the appliance and break off or cause denting of the blades. You must first stop the machines and then use the correct tools to remove the mixture from the sides of the appliance. You must also avoid placing large or uncut pieces of food such as whole cloves of garlic or large cuts of coconuts into the blender because they will negatively impact the blender blades. Food must be cut into manageable sizes to ensure smooth operation.

The machine should never be over run. This will cause the motor to burn out and this is signaled by the scent of burning rubber, followed by smoke, and eventually fire. In some instances the machines cease to operate. When operating these appliances you need to stop it and then to cool it down. The machine should be wiped with a damp cloth at the conclusion of its use and stored in a dry area.

14.2-4 Large Kitchen Appliances

The large kitchen appliances found in the food laboratory or kitchen include the cooker or stove, refrigerator, freezers, microwave oven and in some homes or establishments the dish washer. This equipment uses gas and electricity and you should be extremely vigilant when operating them.

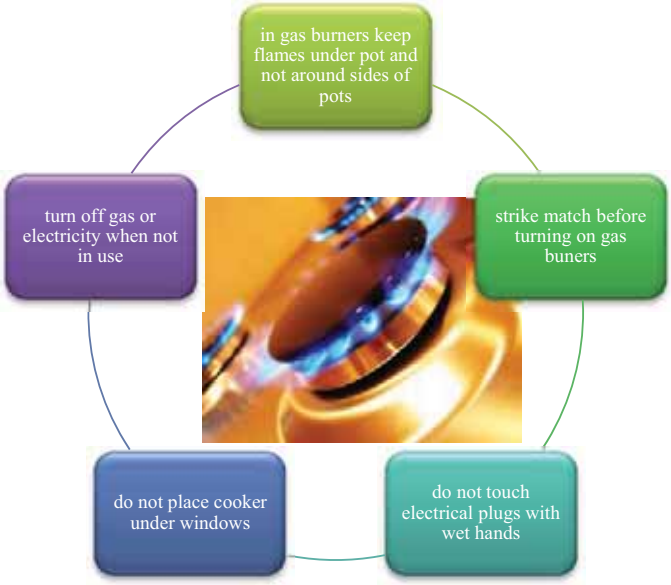


Figure 17. Using Large Appliances
Image: Gail Samaroo

The Refrigerator

The refrigerators as well as the freezer are special pieces of equipment that are used for storing perishable food or food that would spoil quickly. In the refrigerator at home or in school do you see food being stored in particular areas? I am sure your answer will be yes. Within the refrigerator there are several sections or storage areas which are suited for storing different types of food and they are the:

- freezing compartment or freezer
- chiller trays
- refrigerator compartment
- door
- crisper

In modern types of refrigerator there are several additional features of convenience built into them. These include:

- The front door ice maker – which makes ice and dispenses it from a chute.
- Custom cool control is a drawer which extends outward and the temperature can be set three different ways. (1) Allows you to keep food

such as fruits fresh. (2) chill food in minutes and (3) to thaw frozen food such as meat.

- Front door water dispenser which allow you to access water without the use of water bottles

Let us Take a Closer Look at the Basic Section Found in Most if not all Refrigerators

The Freezing Compartment:

In some refrigerators there are double doors whereby one contains the frozen food is stored in the freezer. Frozen food refers to bought ready frozen meat, fish, poultry, ice-cram, frozen vegetables and pre-cooked food such as waffles, and pizza. In some modern refrigerators the freezer compartment is found in the lower section of the refrigerator. In single door refrigerators the frozen section is behind the interior or inner door. Let's look at some simple guidelines for you to follow when using the freezing compartment:

- store all frozen food
- store pre- bought frozen food in their original wrappings or containers
- foods frozen at home should be wrapped in freezer paper, plastic container, plastic bags, freezer bags
- label and date packages carefully and use older ones first

The Chiller Tray:

In the single door refrigerator this is placed below the freezing compartment. Modern types have replaced this with the custom cool control that was mentioned earlier in this lesson you should use the chiller tray to store:

- store cold cuts such as cured and smoked meat such as smoke herring, saltfish, cooked ham and sausage such as salami, pepperoni and the like
- store foods in their original wrappings or wrap them in plastic wrap or aluminum foil

The Refrigerator Compartment:

This is the main section or body of the refrigerator with several shelves that are adjustable. They can be moved into various positions depending on what you need to store and accommodate the different heights of the items being stored. In this section most foods that need to be stored at low temperature to prevent contamination are stored here and they include:

- milk dishes – custards and puddings, milk – these should be stored in containers that are covered with the container cover or plastic wrap. This will prevent drying out or evaporation and also will prevent them from absorbing odours from other food
- stocks, soups, prepared or cooked dishes and left over food. You should note that a refrigerator is not a food cupboard and small scraps of food should not be left in it

- large cuts of meat, fish, poultry and the like that require thawing before cooking. You must not thaw out foods such as meat outside of the refrigerator before cooking this would give rise to the risk of food poisoning. These foods that require thawing out in the refrigerator should be placed into a container first
- marinated meat or fish before cooking. Raw or uncooked meat should not be stored over cooked meat because the blood could drip onto the cooked meat and contaminate it

The Refrigerator Door

This door is fitted with special shelves, racks and small compartment and is designed for you to store:-

- store eggs in the assigned egg compartment; cheese, cream butter; margarine and other solid fats in the dairy section which in most instances is labeled
- bottles – bottled drinks, ketchup and the like are stored on the door of the refrigerator

The Crisper

This section in most refrigerators is found under a glass or plastic cover at the bottom of the main compartment. To prevent the covers from cracking or breaking it is wise for you not to store heavy items on it. Some crispers contain two bins and others have one bin for the storage of food that requires high or low humidity such as vegetables. It is best to store the following foods in the crisper:

- all green leafy vegetables such as lettuce, cabbage, celery, watercress – these should be washed in cold water, drained and trim before storage. If space or room is limited lettuce can be stored on the lower shelf of the refrigerator compartment.
- green vegetables with skins such as sweet peppers, cucumbers, string beans, bodi – wash and dry them and place them into clean plastic bags.
- most fruits should be washed and dried and stored.

Figure 18 Inside the refrigerator

Note it! / Warning

Safety in the food lab or kitchen refers to the prevention of accidents when preparing and cooking food. The accidents that can occur in the kitchen or food lab are burns and scalds, cuts and scratches, falls and electrocution. These accidents can occur due to heat from steam, hot liquids, hot burners and pots. Sharp cutting tools such as knives cause cuts.

Reflection

Do you remember some rules to follow when cutting food or using the cooker or stove?

Here are some simple rules to follow when cutting food and using the cooker or stove. Cut food on a chopping board and hold the knife with your stronger hand, curl your fingers to hold the food and always cut away from you. Matches must be first lit and then gas burners turned on. Remember use the safe use of kitchen equipment is everyone's business.

Activity

For this activity you must wear your lab coat.

You will be asked by your food and nutrition teacher to demonstrate the following cookery terms to a group of form I students of your school.

You must use the correct kitchen equipment safely and efficiently:

- pureeing mango
- slicing tomato
- sautéing onions

Feedback

Using kitchen equipment/ tools safely and efficiently

Slicing tomatoes:

- Place washed tomato onto chopping board
- Curl fingers and hold tomato firmly
- Using a cook's knife slice tomato away from you

Sautéing onions:

- Strike match and place near to burner and turn on gas or turn on ignition
- Place saucepan onto lighted burner and pour oil into it wait until hot
- chopped onions gently into hot oil and sauté until it turns transparent
- Hold the pot hand with a pot holder while stirring the onions

Puree mango

- Make sure hands and blender are dry
- Assemble blender according to manufacture's instructions
- Pour orange juice into blender jug and place jug onto the motor base
- Gently place mango slices into the jug and replace cover onto jut
- Set blender speed level onto low and then press the puree knob
- Release the knob after two minutes and then stop. Repeat procedure until fruit is pureed stopping at intervals to prevent motor from burning out
- Remove jug from base and pour out pureed fruit and gently unplug cord from the outlet.
- Disassemble jug according to instructions and wash in warm soapy water and wipe blender base with a damp cloth.

Reading

For additional information please read and visit the following

- Caribbean Home Economics In Action Book 1 by

The Caribbean Association of Home Economists

- Hammond's Cooking Explained by Jill Davies fourth edition
- http://wwwhealthwithcooking.com
- http://wwwbetterhealthchannel.com

14.2-5 Selection of Kitchen Equipment

Whether you are underequipped or need to upgrade your kitchen equipment it is important that you purchase equipment that meets the required standard. Each piece of equipment has desirable features and you should ensure that your purchases meet these required standards to ensure that you get value for money and safety.

There are several **factors** you must consider before making an investment in kitchen equipment. They require careful consideration and some of them are listed below:

Figure 19 Wise Choice of Equipment
Image: Gail Samaroo

Features of Kitchen Equipment

Kitchen equipment has various features that are key to their efficient use and longevity. In this lesson some kitchen equipment and their important features are listed, this will guide you in making informed choices when selecting and using them.

Pots and Pans

In order to be efficient pots and pans should have the following features:

- Thick base and sides for strength and durability - so they do not burn food easily and will last a long period of time
- Stable base or bottom so that pots and pans balance evenly and will not tip over easily especially on the burner
- Insulated handles to protect hands from burning – wooden or heavy duty plastic
- Well fitting lid that is easily removed
- Flat base that has a good contact with the hot plate or burner
- Well fitting riveted handles that do not become loose easily
- Large pots should have two handles for safety when lifting

Kitchen Scales

These features are essential for kitchen scales:

- Easy to read dial in metric and imperial measures
- Scale pan big enough to take joints of meat and vegetables, etc
- Easy to remove and clean scale pan
- Hardwearing and sturdy case
- Accurate measuring that can be adjusted

Kitchen Knives

Kitchen knives used in the preparation of food should have the following features:

- Strong easy to grip handle
- Well made re-sharpen blade that retains its sharpness
- Rigid blade that does not bend during cutting

- Handles riveted or securely moulded to the blade

Kitchen Appliances

Kitchen appliances have become a main stay in the kitchen because of their use of electrical energy rather than manpower. These are tools used for particular purposes. They save time and energy and make the preparation of food easier.In the table below the desirable features of some kitchen appliances are listed.

Electrical Appliances	Desirable Features
Cake/ Food Mixer	Easy to fit attachments Easy to operate Deep bowl for free-standing model Hand held model comfortable in weight, balance, shape Strong well shaped beaters
Food Processors	Durable material Easy to clean Strong motor with high power Self regulated motor that maintains an even speed Attachments operate smoothly Easy to read speed dial Large capacity and durable material.
Blenders/ Liquidizers	Jar made of durable transparent glass or plastic Strong handle Base easy to assemble and remove Spouted jug Comprise several speeds such as puree, grate and the like Jug resistant to heat and cold temperatures Easy to clean Removable centre on cover/ lid to allow addition of ingredients during blending

Electrical Appliances	Desirable Features
	Tight fitting cover/ lid to prevent spilling

Figure 20 desirable feature of some kitchen appliances14

Large Equipment

Large Equipment	Desirable Features
Cookers	Autotimers can be preset to switch the oven on and off automatically. Grills or broilers located at eye level or enclosed as a separate compartment Ovens with glass door and interior light Fan ovens fixed at back of oven which blows heat around oven space – giving even temperature
Microwave Ovens	High wattage – cooks food faster Sensor cooking One touch controls Programmable cooking Combination of microwave/ convention ovens- will brown and crisp food Automatic one touch defrost
Refrigerators and Freezers	Durable material Easy to clean Adjustable thermostat Interior light Humidity control Defrosting system Large capacity Frost free

Figure 2115 Desirable Features of Large Equipment

Activity

You mother wants to upgrade her kitchen equipment.

Outline to her the following:

- List three features of a blender
- State three features of a kitchen knife
- State three features of a microwave

Feedback

Features of a Blender:

- Jar made of durable material – tempered glass/ plastic
- Strong handle
- Easy to assemble base
- Spouted jug
- Several operational speeds
- Heat/cold resistant jug

Features of a Knife:

- Easy to grip handle
- Easy to sharpen blade that retains sharpness
- Riveted handle
- Rigid blade – does not bend

Features of Microwave Oven:

- High wattage
- Sensor cooking
- One touch control
- Programmable cooking
- Automatic one touch defrost
- Combination microwave/convection oven

Reading

For additional information, please read

Food Home and Society by Deirdre Madden

Food and Nutrition Book 2 by Rita Dyer and Norma Maynard.

14.3 Maintenance of Kitchen Equipment

Introduction

To ensure the longevity of your small and large kitchen equipment, proper use and maintenance are important. This will improve the overall efficiency of our investments and will help you enjoy their use. Each type of kitchen equipment is unique and should be treated as such. They are made from different types of metals in addition to plastic and glass. Some are electrical in nature therefore care is a necessity.

Upon completion of this unit you will be able to:

Outcomes

- *Outline* the care and storage conditions of small kitchen equipment.
- *Outline* the care and storage of large kitchen appliances.

How long?

You will need to devote 2 ½ hours of formal study and 1 ½ hours of self-study to complete this session.

14.3-1 Care and Storage of Kitchen Appliances

Blenders, Mixers and Food processors

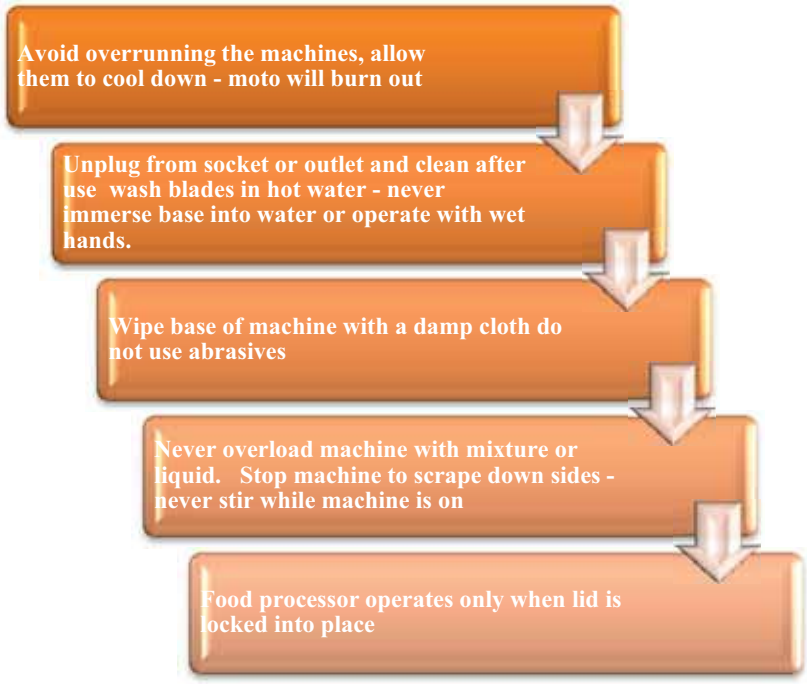


Figure 22 Caring for Small Electrical Appliances
Image: Gail Samaroo

Cookers

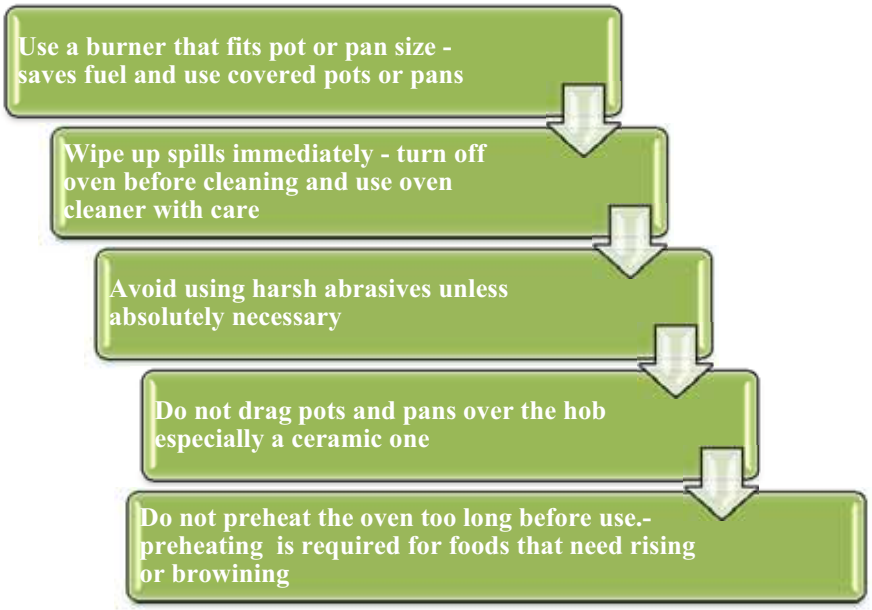


Figure 23. Caring for Your Cooker
Image: Gail Samaroo

Refrigerator and Freezer

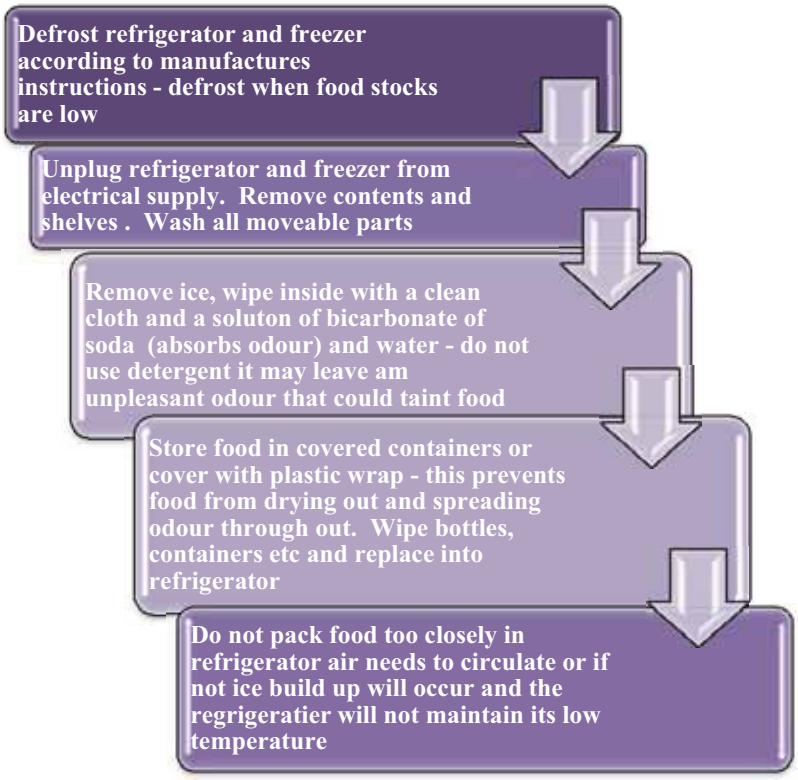


Figure 24. Caring for your Refrigerator
Image: Gail Samaroo

Note it! / Warning

Store foods as soon as possible after purchasing. Store in suitable containers with covers or plastic wrap or aluminum foil in the refrigerator using the appropriate or right temperature and within the appropriate timeframe. Never store bananas in the refrigerator they become black and never store lettuce in the freezing compartment they get ice/water logged and will wilt and become blacken.

14.3-2 Care and Storage of Small Kitchen Equipment

Kitchen equipment is made from a variety of material:

- **wood**
- **plastic**
- **aluminum**

- **stainless steel**
- **copper**
- **non-stick coating**
- **earthenware or ceramic**
- **glass**- cookware is made from borosilicate glass such as Pyrex and is safe for ovenware and cook top use. The clear glass allows for food to be seen during the cooking process
- **glass ceramic** –used to make items such as Corning ware, they can be taken straight from the freezer and placed directly into the oven because of they are almost immune to thermal shock
- **silicone** – is light, flexible, non-stick and withstands temperatures up to 675◦F or 360◦C

Below we have outlined for you in table form the care of some small equipment based on the material they are made of:

Material	Uses	Care & Storage
Wood	Spoons, pastry board, chopping board, etc	Do not soak because soaking will encourage rotting of the wood; wash with warm soapy water using a stiff brush. Rinse and air dry well or place into a warm oven before storing
Plastic	Measuring spoons, jugs, sieves, service ware, etc	Wash in warm soapy water. Do not use abrasives – they scratch surface. Dry well store in cool cupboard
Aluminum	Saucepans, pots, bakeware, measuring cups, spoons; etc	Hand wash in detergent and dry immediately. Remove stains or dull colour by boiling equal parts of white vinegar and water in cookware. Never cook fruits in these pots, the acid from the fruit will clean aluminum
Bristles	Pastry brushes	Pour hot water over bristles to loosen grease. Wash with hot soapy water and rinse in hot water. Air dry

Figure 25 Care of Kitchen Equipment

Figure 26 Care of Kitchen Equipment

Material	Uses	Care and storage
Stainless steel	Mixing bowls, cutlery, saucepans, etc	Wash in hot soapy water, rinse and dry thoroughly. Soak in warm soapy water to remove burned on food. Place pan on the burner and boil the soapy after for 10 to 15 minutes
Copper	Saucepans, moulds, kettles, etc	Do not use abrasives. Soak pots overnight in soapy water. Use salt and lemon juice to remove tarnish
Non-stick coating	Baking pans, saucepans, etc	Scratches easily, use with wooden, plastic or silicone cooking cutlery. Wash with warm soapy water using dish cloth
Earthenware or ceramic	Mixing bowls, bakeware, crockery	Avoid sudden change of temperature. Easy to crack or break. Wash in hot soapy water. Dry and store safely.
Glass and glass ceramic	Ovenware, saucepans, serving dishes, measuring jugs, mixing bowls, etc	Breaks easily unless made of heat resistant glass. Avoid sudden temperature changes. Wash in hot soapy water, dry and store carefully.
Silicone	Whisks, spatulas, muffin pans. cake pans	Remove baked goods after they cool completely. Do not soak, wash using a soft sponge, rinse and towel dry.

Activity

Get Them Clean

Explain how you would clean the following soiled items, write the answer in the spaces provided in the table.

Soiled item	Cleaning method
Greasy pastry brush	
Stained aluminum saucepan	
Wire strainer	
Wooden pastry board	

Reading

For additional information please read

- Caribbean Home Economics In Action Book 1 by
- The Caribbean Association of Home Economists
- Food and Nutrition by Rita Dyer and Norma Maynard

Note it! / Warning

When selecting kitchen equipment/ tools make sure you consider the kinds of tasks which they are to perform and the budget with which you are working with, Consider durability and quality of the material used in the construction of the equipment/tools.

Unit Summary

Summary

In this unit you learned that most modern kitchens are well equipped with a variety of kitchen equipment that can be operated either manually or electrically. It is important to select and use them wisely so that all who venture into the wide world of food preparation and service will do so safely and wisely with little or no frustration. Kitchen equipment should be long lasting and must withstand the wear and tear that is expected of them. Therefore they should be considered as an investment which is dependent on you to make wise choices which will ensure that quality is not sacrificed for cost. Kitchen equipment is placed into several categories, based on their functions or uses and each have essential features that must be considered in order to maximize their efficiency. To enhance their lifespan, kitchen equipment must be cared for, maintained and stored properly after use.They are made from several different types of materials ranging from metal to silicone therefore in order to prolong their shelf life each requires special care.

Assignment

Assignment

Your teacher has organized a practical on breakfast and your group has decided to make scrambled eggs as the protein for this meal. As the group leader you are to:

- Identify the essential tools required for preparing the item
- Outline the care that the identified equipment should receive

Describe two safety precautions that you should adhere to when using TWO of the identified equipment above.

Contents

Unit 15

Food Preservation

Introduction

Our ancestors did not understand why food spoiled but they recognized the need to preserve them and discovered some simple methods.

Fire and salt were readily available consequently smoked, dried and salted products were characteristics of Northern European foods. Meat, fish, fruits and vegetables required preservation so they could be used during the cold winter months.

In warmer countries the need was to extend the short life of perishable foods. Milk was fermented to produce cheese and yoghurt while grapes were made into wine. Eventually bottling, canning and freezing processes were developed.

The preservation of food, once the task of the house-wife, has become more an applied art of Cookery rather than a necessity.

All modern food preservation methods were developed from early methods. Science can now explain the fundamentals of food preservation and from these the food industry has made tremendous strides in commercial preservation.

The same principles are used when food is preserved in the home.

Upon completion of this unit you will be able to:

Outcomes

- *Explain* the term "food preservation"
- *Name* the main food preservation methods
- *Explain* the importance of food preservation
- *Define* the terms commonly used in food preservation
- *Outline* the various reasons for preserving food
- *Analyze* the principles on which methods of food preservation are based

How Long?

You will need to devote fifteen (15) hours of study to this unit. Ten (10) hours of formal study and five (5) hours of self study.

This Unit is Comprised of Five Sessions

Session 15.1 Why Do We Preserve Food

Session 15.2 Methods of Food Preservation

Session 15.3 Food Additives and their Uses

Session 15.4 Selection of Fruits and Vegetables for Food Preservation and Guidelines to Follow in the Preservation of these Foods

Session 15.5 .Milk Production

Terminology

Blanching: The vegetable or fruit is plunged into boiling water before being frozen. This inactivates enzymes.

Relative-Humidity: The amount of water vapour that exists in a gaseous mixture of air and water vapour. It indicates how moist or damp the air is. The smaller the percentage of Relative-Humidity the greater the ability to absorb moisture, allowing an increase in the rate of drying as a method of Preservation.

Browning: Most raw fruits with a high acid content turn dark when exposed to air. This is caused when tannin compounds and enzymes present in the fruit come into contact with air e.g. (apples and bananas).

Oxidation: This is a chemical reaction in which oxygen is added to an element or compound e.g. in apples, when exposed to air, turn brown.

Dehydration: The removal of water from food.

Sterilization: This is the elimination of all transmissible agents such as bacteria from food e.g. milk.

Solar-Drying: A simple process of drying food in the sun; also called sun-drying.

Enzyme-Action: A protein which changes chemical reactions of other substances without being destroyed or altered upon completion of the reaction.

Concentration:	The amount of dissolved substance in a given volume of solvent..
Pectin:	A complex carbohydrate found in the cell walls of plants particularly concentrated in the skin of fruit.
Canning:	A method of preservation in which the food is preserved and sealed in an air tight container. This produces a typical shelf life of 1-5 years.
Smoking:	An ancient method of preservation used to flavour and extend the shelf-life of food, particularly meat.
Bottling:	This is a common method of preserving fruit by heat treatment. The fruit are sterilized to destroy microbes and enzymes then sealed in glass heat-proof bottles to prevent contamination during storage.
Caramelization:	This is the process of browning sugar through heat. This process results in the food having a nutty flavor and brown colour.
Pickling:	A process of preserving food by fermentation in brine (a solution of salt and water) to a lactic acid.
Thawing:	This occurs when food passes from a frozen state to an unfrozen state. Food should be allowed to thaw in the refrigerator.
Osmotic-Dehydration:	An operation used for the partial removal of water from plant tissues or food items eg. fruits and vegetables.
Wrinkle-Test:	A method to determine when jam is ready for bottling. This occurs when you drop a spoonful of jam on a chilled plate and allow it to cool slightly. When the plate is turned on its side the jam should not slide off but instead wrinkle. This indicates that the jam is ready for bottling.
Water-Activity:	This is the ratio between the vapour pressure of food itself, when in a completely undisturbed balance, with the surrounding air media and the vapour pressure of distilled water under identical conditions.
Flake-Test:	A method to determine when jam is ready for bottling. A clean dry wooden spoon is dipped into the jam and lifted out of the pan. The jam is allowed to cool slightly. The spoon is then tipped so the jam falls back into the pan. If broad flakes

form and break off sharply, the jam is ready for bottling.

Potting: This is the process of covering food with a layer of fat. It is a method of preservation used mainly to preserve shrimp and fruit.

Brine: A solution of salt and water used to preserve fruits and vegetables

Session 15.1 Why Do We Preserve Food?

Introduction

What is Food Preservation?

Food preservation are methods of helping food keep longer by protecting it against deterioration caused by microorganisms such as bacteria, fungi and moulds.

The aim of preservation is to take food at the point where it is most palatable, fresh and nutritious and keep it in that state so it remains safe and appetizing to eat.

Food Preservation includes all procedures whereby organisms of decay are destroyed or rendered inactive and new ones are prevented from reaching the food. This ensures the food is kept at a high quality for a longer period of time.

Preservation of food is undertaken to prevent decay and to keep food as fresh as possible. All food in time will deteriorate and decay but the rate at which this occurs depends on the type of food and the conditions under which it is kept.

Food preservation can therefore be defined as the process of treating food to delay or stop the spoilage of food thus allowing for longer storage.

The aim in preservation is to preserve foodstuffs at their most nutritious stage so that they may be used when fresh food is not available. While preventing decay, preservation also aims to retain as many of the qualities of the fresh food as possible such as flavour, texture, colour, appearance and nutritive value.

Additionally, Food preservation aims to prevent micro-organisms, bacteria, yeasts and fungi from contaminating food once it is preserved by sealing it from the outside air.

In this session we will investigate what Food Preservation is and the reasons for the various methods.

Explain the term “food preservation”

State the principles on which the methods of food preservation are based

Outcomes

List the reasons for preserving foods

Identify the main food preservation methods

How Long?

You will need to devote 2 hours of formal study and 1 hour of self-study to complete this session.

Terminology

Moulds: Microscopic multicellular organisms that commonly grow in colonies or groups.

Bacteria: Microorganisms found almost everywhere. While some are harmless, others are pathogenic and cause infectious diseases.

Decay: To lose quality and strength.

Microbial: minute living being, causing disease and fermentation

15.1-1 Explaining Food Preservation

Why do we preserve foods? Here are the most common reasons why:

1. Commercially, preserved foods are easier to distribute and can be safely imported and exported all over the world.
2. Food such as fruits and vegetables, have limited harvesting seasons; preservation makes them available to use throughout the year.
3. Food purchased when they are most plentiful are cheaper, therefore it is more cost effective to buy and preserve foods at this time.
4. Preservation produces variety and flavour to the diet.. For example, grapes when dried become raisins while other fruits when preserved produce jams, jellies, pickles etc.
5. Preserved foods are easy to store and are useful in the store cupboard and freezer as Convenience foods, which in turn give variety to the diet.
6. Some countries have surplus food supplies which can be stored and exported in a preserved form.
7. To prevent natural and microbial decay.

8. To make available foreign foods not native to a country, for example, canned peaches found on Caribbean supermarket shelves.

Reflection

Did any of these reasons seem familiar to you? For each of the eight reasons, see if you can come up with an example of your own.

15.1-2 What Causes Food Spoilage?

Once food has been harvested, gathered or slaughtered it starts to deteriorate until eventually it becomes unfit for consumption .This deterioration is known as decay and leads to food spoilage.

There are certain factors which are responsible for food spoilage including natural decay, which occurs within the food itself and contamination by microorganisms, such as bacteria, moulds and yeasts. To avoid food spoilage various methods of food preservation are used.

Activity

Make a list of six (6) fruits and six (6) vegetables grown in your region which you think are suitable for preservation.

Collect as many pictures or illustrations of fruits and vegetables as you can and compile a booklet. Be sure to include in at least three (3) recipes of preserved fruits or vegetables.

15.1-3 The Principles on Which the Methods of Food Preservation are Based

There are Certain Scientific Principles Underlying all Methods of Preservation:

They are:

- To destroy by heat, any enzyme or microorganisms found in food
- To slow down or stop enzymes or microorganisms from spoiling food
- By removing air or water
- By reducing the temperature
- By using a strong concentration of sugar, salt or vinegar
- By the use of chemical preserving agents
- To prevent the further access of microorganisms to the food by careful storage in tins or tightly sealed jars

- The colour, flavor, texture and nutritive value should be kept as near as possible to that of fresh food

What methods are used to preserve foods?

1. Heat Transfer
2. Removal of Moisture
3. Addition of Chemical Preservatives
4. Freezing
5. Removal of Air
6. Reduction of Temperature
7. Irradiation

Session 15.2 Methods of Food Preservation

Introduction

How do we make jam? What about pickled cucumbers? There are several methods of preservation that may be used on various types of foods. Preservation is important because in times of plenty or scarcity, we have access to the foods we love and more importantly the foods we need.

In this session, we will explore these various methods and the principles that underpin each process.

Outcomes

Upon completion of this session you will be able to:

Describe the main methods of food preservation

Explain the meaning of each food preservation method under the various headings

Define the procedures involved in food preservation

Explain the terms used in food preservation

How Long?

You will need to devote 2 hours of formal study and 1 hour of self study to complete this session.

Terminology

Thawing:	To melt or cause to melt from a solid frozen state.
Dehydration:	To preserve by removing water.
Irradiation:	This is the process of exposing food to ionizing radiation to destroy harmful microorganisms that may be found within it.
Solar –Drying:	Using energy from the sun to dry foods.
Sterilization	The use of high temperatures to destroy all of the bacteria that may be present in food.

15.2-1 Main Methods of Preservation

Cold	Heat	Drying	Fermentation	Chemical	Physical
Freezing	Cooking	Tunnel	Alcohol	Sugar	Filtration/ Separation
Chilling	Pasteurization	Solar	Acetic Acid	Salt	Distillation
	U.H.T	Spray	Lactic Acid	Spices	Irradiation etc.
	Canning	Vacuum		Acid	Packaging
	Bottling	Hot-Air Beds		Preservatives e.g. nitrites	
		Freeze-Drying		Additives e.g. antioxidants	
				Fats & Oils	
				Antibiotics	

Figure 1: Methods of Food Preservation

Methods of Food Preservation

Let us take a more detailed look at Table 1 above which illustrates the methods of food preservation.

15.2-2 Cold

Preservation by Cold Treatment Involves:

A. Freezing

B. Chilling

Freezing is the method of food preservation most frequently used today, where the food is stored at a temperature whereby microorganisms cannot thrive or flourish. Freezing is suitable for preserving meat, poultry, fruits and vegetables.

Why is freezing so popular?

- Almost all foods are suitable for freezing. In addition, foods will maintain a high proportion of its original nutritive value, colour and flavour
- Appearance and texture of fresh food is retained
- Freezing is suitable for preserving meat, poultry, vegetables and fruits

Types of Freezing

- There are two main types:
- NORMAL FREEZING:

  32°– 25°F. This type of freezing causes loss of flavor and poor appearance when thawed.

Thawing is when foods pass from a frozen state to an unfrozen state.

- QUICK FREEZING:

  This type of freezing occurs when the temperature of food is rapidly reduced down to 20°F. This method causes no loss of flavor and is used for fruits, fish, meat, chicken, etc.

Important points to remember when freezing:

1. Foods must be sealed to retain flavor and avoid dehydration
2. Do not keep frozen foods long after purchase
3. Do not re-freeze after thawing

Selection of fruits and vegetables for freezing:

1. Vegetables should be prepared for freezing as soon as possible after harvest

2. Fruit should be just ripe and free from bruises

3. Some fruits, such as apples, must be blanched to prevent discoloration by oxidative enzymes

The Principles of Freezing

Food is preserved at low temperatures because enzyme activity and the growth of microorganisms are reduced. At temperatures below -18 C most enzymes are so inactive that they cause no further deterioration in food. Low temperatures do not kill microorganisms however in frozen foods, water is tied up as ice crystals therefore preventing microorganisms from growing and multiply or from enzyme reactions from take place.

Chilling

Chilling is a cold method of preservation, used in ships' holds to transport carcasses of meat at temperatures 32° to 40°F.

This keeps food for approximately 3-4 weeks.

This method is also used to transport butter and cheese but they must be wrapped to retain their flavour. It is also used for eggs as lower temperatures could crack their shells.

REFRIGERATION

Figure 2: Cold Methods of Preservation

15.2-3 Heat

Preservation by Heat Treatment Involves:

A. Cooking

B Pasteurization/Sterilization

C. U.H.T.

D. Canning/Bottling

Cooking

This is the most effective method of preserving food. The food is exposed to high temperatures for periods of time to either dispose of enough spoilage agents to allow the food to keep for some time or completely destroy all enzymes, bacteria, yeast, moulds and their spores.

Blanching

This involves rapid heat treatment in boiling water, given to vegetables and some fruits to destroy enzymes.

Pasteurization and Sterilization

These are methods dependent on heat. Pasteurization of milk for example destroys pathogenic bacteria by heat, while the sterilization of milk destroys all micro-organisms and enzymes in milk and fruit juices.

The heat destroys the enzymes and microorganisms and the addition of sugar reduces the water activity preventing the growth of any microorganism which may enter from air.

U.H.T.

Ultra Heat Treatment uses a very high temperature for a short time. For example, milk and cream are heated to 132^0 C for one second, cooled rapidly then packaged in foil lined containers.

Canning and Bottling

Canning and bottling is a combination of sterilization by heat with a sealing process to ensure the exclusion of air. The process cooks the food, which is then ready to eat when the can or bottle is opened.

The modern canning process involves various types of preparation for different foods. For example, when canning peaches, they must be of a certain quality, cut and pitted by machine, peeled in hot lye solution, (sodium hydroxide) sorted, then placed by hand in cans. The cans are finally filled with syrup of various sugar contents then sealed. The lids are sealed under vacuum or steam and the

cans sent to an automatically controlled cooker, after which they are cooled in water

THE BOTTLING PROCESS
Photo by Tony Swetman

Figure 3: Bottling

15.2-4 Drying or Dehydration

This oldest and simplest method of preservation involves the removal of water or moisture therefore preventing the action of enzymes and microorganisms within the food.

Bacteria need moisture to grow and reproduce and are destroyed by Dehydration.

In hot, sunny countries, varieties of meat, fish, vegetables, fruit, herbs, etc. continue to be dried in this traditional way. During drying, shrinkage takes place and in the case of protein foods such as fish, coagulation takes place as well.

Preservation by Drying or Dehydration Treatment Involves:

A. Tunnel

B. Solar Drying

C. Spray Drying

D. Vacuum

E. Hot-Air Beds

F. Freeze Drying

Figure 4: Hanging Food Dehydrator
Photo: Tony Swetman

Tunnel

This method is carried out on a commercial scale. The produce is placed on trays and passed through a tunnel where hot air is circulated and blown over them until the moisture content has been reduced.

Solar-drying

Also called sun-drying, this method is very effective in regions where there is an abundance of natural sunlight. It simply means the removal of moisture by placing the commodity in the sun. Microoganisms within the food are killed when the water from their cells are removed by *osmosis.*

Figure 5: Solar Drying View inside a *Hohenheim* Solar Tunnel
Photo: Tony Swetman

What is *Osmosis*?

This is the movement of fluid, usually water, through a semi-permeable membrane into a solution that is higher in solvent concentration. This movement of water will equalize the concentration of solvent on both sides of the membrane. For example, if a prune is placed in a bowl of water and left overnight the prune will become swollen because the water moved from bowl, through the skin and into the prune by *osmosis.*

Spray Drying

This method is used to produce a dry powder by spraying a mist of liquid into a very hot chamber of air. The mist turns into powder almost immediately. Common examples of spray-drying are used for dehydrating Soups and milk.

Vacuum Drying

This is an expensive method reserved for specialized products. Drying under vacuum is faster since evaporation of water takes place more readily at lower pressures.

Hot Air Beds

This method is used to dry solid foods. The food is put on perforated trays while hot air is blown through them.

Freeze Drying

Freeze Drying or Accelerated Freeze Drying (A.F.D.) is the most recent development in commercial drying. The moisture is removed from food while it is still frozen. This process is used for some vegetables, instant coffees, milk etc.

15.2-5 Fermentation Methods

Food fermentation is usually carried out with the use of microorganisms to convert carbohydrates to alcohols and organic acids such as acetic and lactic acids.

Preservation Using Fermentation Methods Includes:

A. Alcohol

B. Acetic (Vinegar)

C. Lactic

Alcohol

Fruit is preserved in brandy, rum or gin. Fruit juice when fermented with yeast turns to alcohol.

Acetic Acid (Vinegar)

This chemical protects the product from deterioration. The pH of the product is shifted to a lower, more acidic pH, where very few moulds, yeast and bacteria are able to grow and multiply.

Lactic Acid

Preservation using a combination of salting and lactic acid results in fermented products such as pickles, relishes etc. The bacteria ferment sugars in the food to lactic acid which then acts as a deterrent for growth of food poisoning and food spoiling organisms. Salt is added to control the types and rate of fermentation.

15.2-6 Methods of Preservation Using Chemicals

Chemical preservation of foods has been practiced for centuries. Traditional methods include salting, spicing, pickling, curing in nitrate salts and preserving in sugar or alcohol.

Preservation Using Chemicals Includes:

A. Sugar

B. Salt

C. Spices

D. Sulphur Dioxide

E. Preservatives

F. Additives

G. Fats and Oils

H. Antibiotics

Sugar

Sugar is used in jam and jelly making, canning and bottling. Bacteria are unable to thrive if the sugar concentration is high. Sugar is used to preserve some fruits by exchanging the water present in the fruit with a strong syrup by allowing them to soak in the sugar solution. Sugar is also used as a preservative in condensed milk.

Salt

Common salt is used as a preservative for salted meat, fish, and vegetables, as well as bacon, ham, sausages and cheese. Salt destroys organisms and causes spores to remain dormant.

Spices

Spices include herbs and salts and are used in chutneys, pickles etc. and is a popular form of home preservation. Spices are often used in combination with vinegar in preserving vegetables.

Sulphur Dioxide

This is used commercially in certain foods such as soft-drinks, beer, wine, fruit, fruit juices, pickles, flour, vegetables, sauces and sausages to keep them fresh. In some instances it is also used for the short term storage of fresh fruits like bananas while being shipped overseas. It is also used to preserve dried fruits such as raisins and mangos.

Preservatives

Nitrites are preservatives which are added to ham, pickled meats and bacon to preserve and to improve the colour of cured meats.

Additives

Food additives are used in the fruit drink industry to protect against microbial spoilage while nitrites are used in meat processing.

Fats and Oils

These are used to preserve fish and vegetables while *potting* is used to preserve shrimp and fruit.

Antibiotics

These are chemicals produced by microorganisms. They are used as a food supplement in rearing farm animals. Niscin, one of the more popular antibiotics, is commonly used in food preservation. It is found naturally in milk and milk products and is added to cheese and canned foods.

15.2-7 Physical Methods of Preservation

Preservation Using Physical Methods Includes:

A. Filtration/Separation

B. Distillation

C. Irradiation

D. Packaging

Filtration / Separation

Filtration is the process of separating a solid from a liquid. The solid is held on a supporting material through which the liquid can pass.

Ultra filtration is a process in which minute particles such as bacteria are filtered through materials with fine pores. The purification of water is an example of ultra filtration.

In milk production, a separator which is a centrifugal device, separates milk into cream and milk by whirling the milk at high speeds. The skimmed milk moves to the outside of the rotator leaving the cream to be drawn off. This cream can be then used to make butter.

Distillation

This process is also used to separate mixtures. The oldest use of distillation is in the separation of alcohols from fermented grapes and fruit juices.

Irradiation

This is the process of treating foods with doses of radiation to inhibit sprouting in vegetables, delay ripening and to keep away insects pests. This process kills microorganisms so it can be used to preserve food. The energy used is similar to ultra-violet light.

Two levels of radiation are used:

Low dose

This dosage stops sprouting, prevents insect damage to cereals, destroys parasites (tapeworms in pork), delays the ripening of fruits (bananas) and allows for longer storage of food.

Medium dose

This process kills most harmful bacteria, moulds, and yeast and enhances the storage of some foods.

The illustration below is the internationally recognized symbol used to label irradiated foods.

Figure 6: The Internationally Recognized Symbol used to Label Irradiated Foods
Illustration from: *Food and Nutrition* by Anita Tull

Packaging

Packaging essentially safeguards food at the raw material and finished product stages providing protection against harmful environment elements such as light, oxygen and moisture.

Selection of the appropriate packaging material for various products may be quite complex. The type of packaging for both bulk and retail items is a key factor in ensuring that the preserved and processed foods are protected.

The packaging of food therefore serves to ensure food safety as well as preservation.

In the canning process, factory workers must ensure that cans are free from pinholes in the seams through which insects may enter the product. They should also be free from dust and bulges which could cause improper closure.

All packaged products whether in glass, cartons or other materials, should be thoroughly sealed against post process contamination.

Suitable Packaging Used in Freezing

Food that is to be frozen must be well packaged to prevent the following:

- Dehydration and Oxidation; Cold air is very drying and if dehydration occurs oxidation reactions will take place in the foods.
- Contamination by dirt, insects and moulds.

Suitable packaging materials fall into three main groups:

- Sheet wrapping materials
- Bags
- Rigid Containers

Sheet Wrapping Materials

Aluminum Foil:

This is sold in rolls of varying lengths and widths. It is suitable for most foods except those that contain acid (e.g. fruits) and is flexible enough to be molded around foods of different shapes.

Polythene Sheeting

This is sold in rolls of varying lengths and widths. This sheeting needs to be sealed with special freezer tape that does not lose its adhesiveness at low temperatures. Thin clinging films are not suitable as outer coverings as they do not provide enough protection to food when in the freezer.

Freezer Paper

These are strong moisture-proof papers which are coated on the inside and can be written on the outside however they also need to be sealed with freezer tape.

Polythene Bags

120 - 150 gauge polythene bags should be used when freezing. These are specially produced for freezing and are available in a range of sizes. These bags should be sealed with paper-covered wire-ties. Most foods can be stored in these bags. Liquids can also be frozen into easy to store blocks, by placing the bags in empty cartons which can be removed once frozen.

Rigid Containers

Plastic/Polythene Boxes or Tubs

These re-usable containers usually have tightly fitting lids which make the boxes air-tight. Empty ice-cream and margarine containers can be used for this purpose.

Waxed Cartons or Tubs

These are only suitable for cold foods as the wax coating will melt easily and contaminate food.

Aluminum Containers

These are available in many shapes and sizes and can be used for heating the food once thawed.

Ceramic Containers

Ceramic casserole dishes can withstand cold temperatures but take up a lot of space in the freezer.

Labels

It is important to label food packages in order to be able to recognize them easily and to know the serving size and packing/expiration dates.

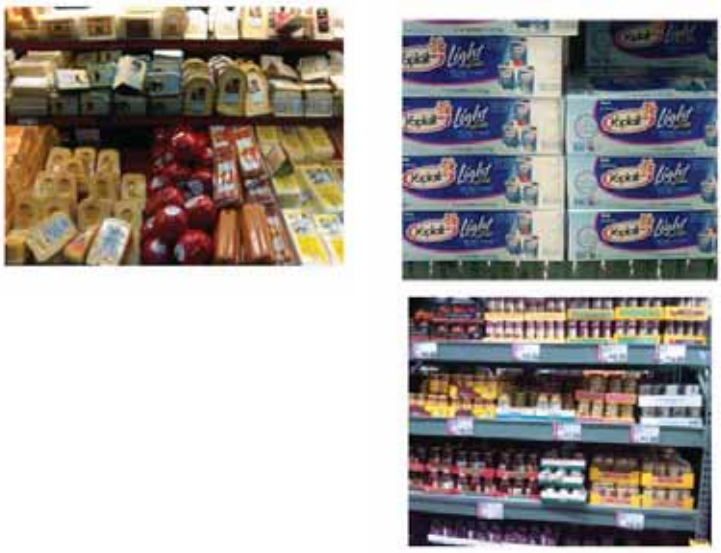


Figure 7: Different Types of Preserved Food Displayed on Supermarket Shelves
Image: Denise Clifford

Preserving Food at Home

Freezing is the most common form of preserving food in the home. This allows us to purchase in bulk and store the excess food instead of purchasing items needed on a daily basis.

Method	Description	Foods used	Notes
Drying	Suitable for foods with small volumes	Herbs – mint, sage Spices – red chilies	
Bottling	Fruit – heat to 75°-88° C. Vegetables – heat to 155°C	Any suitable fruit or vegetable	Use Kilner jars with sealing tops

	then seal		
Freezing	Domestic freezers operate at -18°-23°C. Food is first blanched to inactivate enzymes and destroy some microorganisms	Most raw and cooked food	Thawed food must never be re-frozen. “Drip “ of frozen foods may cause loss of water soluble vitamins
Salting	Dry salting – with salt crystals or brine	Dry – vegetables like runner beans. Brine – olives	Less popular method now
Jam Making	Fruit is first cooked until tender. Pectin is extracted by cooking. Sugar is added and temperature taken to about 104°C	Any fruit or mixture of fruit	Commercial jams are made with less sugar now. Some fruits low in pectin may need extra added
Pickling	Pickling vinegar contains 5% acetic acid which prevents growth of microorganisms	Onion, cabbage, mixed vegetables or fruit	Chutney is hot sweet pickle. Green tomatoes and cucumbers are suitable for pickling

Figure 8.Some ways of preserving food at home.

Activity

Examine the popular methods of preserving food at home:

I. Jam making

II. Pickling

III. Drying (herbs)

Make up a chart to explain how the processes used in each method and how it prevents enzymatic reactions and growth of microorganisms in each food.

Include illustrations in your chart.

Session 15.3 Food Additives

Introduction

Food Additives are substances which are added to foods. Most packaged foods contain food additives. There are about 3,500 additives that food manufactures use.

Additives include salt, alcohol, spices and sugar and have been in use for a long time. There are now many synthetic additives used in a variety of ways.

The use of both natural and synthetic additives is strictly controlled by law.

The use of food additives means that foods are available out of season; more foods can be imported from abroad and people can keep their kitchens stocked with fewer visits to the supermarket.

These preservatives also help protect the public from microbes that cause food poisoning.

Upon completion of this Session, you will be able to:

Outcomes

Explain the term "food additives"

State reasons for the use of food additives in food Manufacturing and food preparation

Name some of the main food additives and describe the uses of some of these additives

Identify food products which fall under the various headings of ood Preservation

How Long?

You will need to devote (2) hours of formal study and (1) hour of self-study to complete this session.

15.3-1 Why Do We Use Food Additives?

Activity

Tabulate your Answer. Identify at least four food products under each heading.

Food additives are mainly used for the following reasons:

- To preserve them from decay and spoilage
- To improve their keeping qualities
- To improve or enhance the flavour, colour, texture of a food
- To produce a uniform food during large scale manufacture
- To provide easy-to-prepare convenience foods for a busy society
- To produce new food products e.g. snacks and confectionery

Note it! / Warning

The information below should help you understand how food additives are classified.

15.3-2 Common Food Additives and their Uses

Emulsifiers and Stabilizers

Emulsifiers and stabilizers allow ingredients like oil and water to mix together when they would normally separate.

These are used to ensure that food products remain in good, stable condition for a certain period of time after they are manufactured which may be several months.

Emulsifiers are used in products such as salad dressings, low fat spreads and ice cream.

Figure 8: Emulsified by Lecithin in Egg Yolk
Image: Claire Clifford

Acids

These are used to develop an acid flavor in sweets, for setting jam and in baking powder e.g. lactic acid used in diary foods. They control the pH (acidity or alkalinity) of a food.

Acidity regulators

These are used to control how acid or alkaline a food is.

Non-stick agents

Used to prevent powdery foods from sticking together.

Colourings

Used to make foods more colourful. The most common is caramel which is made by over-cooking sugar. There are 58 permitted colours that can be used in food.

Note it! / Warning

Colourings are not used in baby foods. Some foods have to be coloured after processing as they lose their natural colour such as when canned peas turn gray.

Flavours and Sweeteners

Food flavours include: herbs, fruits, roots, seeds, berries etc. many flavours are also extracted from oils. Saccharin is the most popular sweetener.

Flavour Enhancers

Flavour Enhancers are substances that make existing flavours in food seem stronger. The most common enhancer is monosodium-glutamate (MSG).

Nutrients

During the processing of some foods, nutrients are lost and may be replaced by the manufacturer. This is called restoration.

Nutrients may also be added to foods to enrich or fortify them such as when vitamins A and D are added to margarine.

Foaming Agents

Foaming Agents are used to ensure that bubbles found in food are evenly distributed like those found in ice-creams.

Glazing Agents

Glazing agents add a sheen to the surface of foods.

Humectants

Humectants absorb water and are used mainly in sweets. For example the soft centers in chocolates are kept from drying out with the use of a humectant.

Sequestrants

Sequestrants help to improve the quality and stability of foods. For example a sequestrant will help fruit from ripening too quickly.

Modified Starch

Modified starches are added to dry foods such as soups and baby foods to add bulk and enable liquid to be evaporated easily. Starch is also used as a thickening agent.

Gelling Agents

The most common gelling agent is pectin and is particularly used in jams and jellies to help enhance their texture.

Propellants

Propellants are materials that produce pressurized gases which have many uses. In the food industry the most common use of pressurized gas is in cans of whipping cream.

Thickeners

Thickeners improve the texture and feel of some foods. It can be found in foods such as yogurt.

Antioxidants

Antioxidants stop oils and fats and fat soluble vitamins from combining with oxygen and going rancid.

Enzymes

Enzymes help speed up chemical reactions but are not consumed during the process. An example of an enzyme is *rennet* and is used to make cheese.

Firming and Crisping Agents

These agents keep canned or bottled fruits and vegetables crisp.

Releasing Agents

Releasing agents help stop foods from sticking to pans.

It is important to note that various consumer groups have put pressure on the food industry and Government to reduce the use of additives in food.

Food Additives in a Finished Product: *Carrot Cake*

The ingredients list must show all additives which perform a function in the final product.

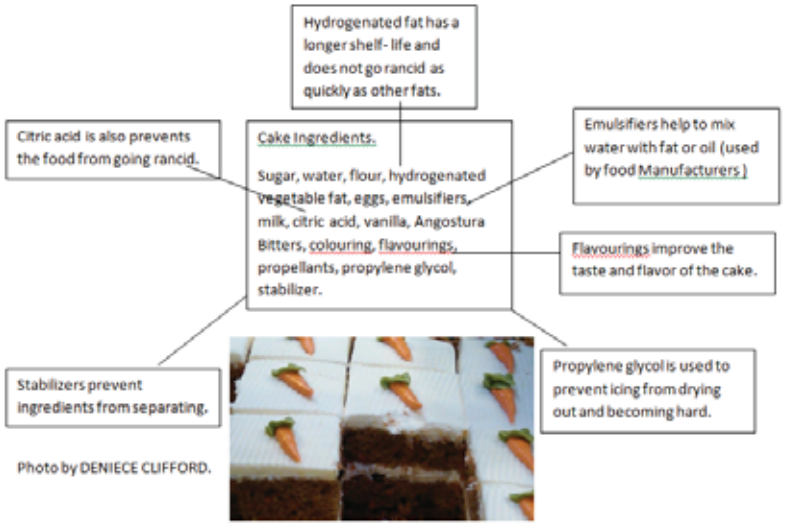


Figure 9: Food Additives in Carrot Cake
Image: Denise Clifford

Figure 10: Food Additive Wheel

Image: Claire Clifford

Session Summary

Summary

In this unit you learned that there are requirements for the use of food additives.

They must conform to certain principles such as:

- Safe for use.
- Effective for its intended use.
- Used in the minimum quantity.
- Must not mislead the consumer about the quality or nature of a food.
- Should be of nutritional value to the consumer where ever possible.

Assignment

Assignment

Choose any four (4) food additives from the Food Additive Wheel (Figure 18.10) above and describe the function of each, using at least two (2) illustrations in each case.

Assessment

Assessment

Answer the following questions about food preservation and food additives.

1 Why are food additives used as preservatives in many food products?

2 What are your views on food additives? Do you think they are they safe?

3 Do you think food additives are necessary in the food industry? Give reasons for your answers.

4 Why are emulsifiers and stabilizers used in the carrot cake shown in the illustration in Figure.9?

5 Explain why each of the following types of additives are used in food products:

1 colours

2 sweeteners

3 flavour enhancers

Give an example for each additive..

Session 15.4 The Preservation of Fruits and Vegetables.

Introduction

If you gave a team of food technologist and marketing experts the task of packaging a range of essential nutrients and valuable dietary fibre, they could not possibly come up with anything nearly as delicious and utterly irresistible as fresh and preserved fruits and vegetables.

Dried fruits have all the healthy virtues of fresh fruit.

The process of drying fruits and vegetables, whether it is by age-old means of exposure to the wind and sun or by modern controlled heat methods in hot air cabinets, evaporates the water found within them. Dried fruit from golden raisins to prunes are little concentrated packages of nutrients.

Preserved fruits are one of the most versatile of foods and thanks in no small part to their health properties, are firmly established in the traditional regional cultures around the world.

The acidity of fruits is of particular value to offset the saturated fats of red meat dishes. In poultry, which tends towards dryness, the juiciness of fruits and vegetables adds moisture to a balanced meal.

Due to modern preservation methods, swift transport and improved storage facilities fruits and vegetables from faraway places are now within reach of most. We can now buy exotic fruits such as kiwis, lychees, dates to name a few while they are both in and out of season.

Upon completion of this unit you will be able to:

Outcomes

Explain the importance of preserving fruits and vegetables

List the various methods of preserving fruits and vegetables

Describe the various methods of fruit and vegetable preservation

List guidelines in the selection of fruits and vegetables in food preservation

Describe the procedures involved in the preservation of fruits and vegetables

How Long?

You will need to devote 2 hours of formal study and 1 hour of self-study to complete this session.

Terminology

Pectin: A complex carbohydrates found in the cell walls of plants and unripe fruit. It is used as a thickener in jams and jellies by forming a gel with water.

Oxidation: The interaction between oxygen and the different molecules it comes into contact with.

Polysaccharide: Also known as a complex carbohydrate. A polysaccharide consists of long and sometimes branched chains of glucose molecules joined together.

Wrinkle-Test: A method to determine when jam is ready for bottling. This occurs when you drop a spoonful of jam on a chilled plate and allow it to cool slightly. When the plate is turned on its side the jam should not slide off but instead wrinkle. This indicates that the jam is ready for bottling.

Flake-Test: A method to determine when jam is ready for bottling. A clean dry wooden spoon is dipped into the jam and lifted out of the pan. The jam is allowed to cool slightly. The spoon is then tipped so the jam falls back into the pan. If broad flakes form and break off sharply, the jam is ready for bottling.

Brine: A saturated solution of salt and water used to preserve fruits or vegetables.

15.4-1 Guidelines for Selecting Fruits and Vegetables for Preservation

Guidelines for Selecting Fruits and Vegetables for Preservation

- Use firm, clean, dry fruits and vegetables.
- Use fruits and vegetables free from disease or moulds.
- Use fruits, just ripe or under ripe. Never use over-ripe or wet fruits.
- Use fruits and vegetables free from blemishes.

Figure 11: Fresh Fruits and Vegetables
Photo: Stacy Julian

Preservation of Fruits

Fruit for freezing should be just ripe and free from bruises. Some fruits discolour when frozen raw; to prevent this they should be frozen in syrup, a mixture of sugar and water. Some fruits like apples must be blanched to prevent discoloration by oxidative enzymes.

Fruit can be prepared in 3 ways:

1 In syrup: the fruit is packed in a mixture of sugar and water.

2 Loose: the fruit is spread in shallow trays and frozen then pack into containers.

3 In dry sugar: caster sugar is sprinkled over the fruit until it is well coated then pack into containers and frozen.

Preservation of Vegetables

Vegetables should be prepared for freezing as soon as possible after harvest. Most vegetables have to be blanched before freezing; a process by which the vegetables, after washing, peeling and cutting, are plunged into boiling water for a specific length of time then cooled rapidly in ice water.

Blanching retards the activity of enzymes in vegetables which would discolour them and spoil their flavour. Blanching of vegetables should be carried out in a large saucepan and no more than 450 grams of prepared vegetables should be blanched at any one time.

VEGETABLES	BLANCHING TIMES
Runner beans	1 minute
Cauliflower	3 minutes
Root vegetables	3 minutes
Broccoli	3 minutes

Figure 12: Blanching Times for Various Vegetables

A blanching basket or large sieve makes the transfer of vegetables from the pan to the ice water easy. After blanching, the vegetables should be well drained and packed for freezing.

15.4-2 Guidelines to Follow When Preparing

- Dried Fruit
- Chutneys
- Pickled Fruit
- Jams
- Marmalades
- Jellies
- Candied Fruit

Suitable Equipment Needed for Food Preservation:

- Pans: aluminum or stainless steel pans
- Bottles: clean, glass earthenware jars
- Covers: covers with waxed discs
- Spoons**:** wooden spoons with thin, long handles
- Tong: wooden boiler tongs or metal tongs
- Jugs: earthenware or oven–proof glass jugs with good spouts
- Ladles: ladles with pouring spouts
- Thermometers: sugar-boiling thermometers that clip on to the side of the pan
- Labels: use self-adhesive labels

.Figure 13: Equipment for Jam Making

Activity

In figure 13, the diagram illustrates the pieces of equipment used for jam making. State the use of each piece of equipment labeled in the diagram.

Equipment used in jam making	Use of equipment

Figure 14

15.4-3 Steps in Drying Fruit and the Reason for Each Step

Dried Mango

STEPS	REASONS
1. Wash, peel and cut mangos into 1/2cm slices	To remove dirt and dust and to expose maximum surface area
2. Place into salt solution for 10 minutes (1Tbs. salt to 1L water)	To preserve the colour. Water from the mangoes is drained out by

STEPS	REASONS
	osmosis
3. Rinse well and dry	To remove taste of salt
4. Lay on a tray and leave in a warm place	To allow remaining water to evaporate thus preventing enzymatic action
5. When dry, store in a covered jar in a cool, dry, dark place	Mangos are dehydrated enough to prevent the growth of microorganisms
6. Before use soak in water for 24 hours	To replace the water that was removed

Figure12: Steps in Drying Mangos

Recipe

Dried Preserved Tamarind

5 lbs tamarind

2 tbsp salt

2 hot peppers (seedless and ground)

Green tamarind leaves

Method:

1. Peel tamarind and remove fibres.

2. Separate seeds.

3. Add salt and pepper.

4. Blend well with hand and shape into small balls.

5. Cover with tamarind leaves and place in an enamel or glass container and place in the sun to dry.

Note it! / Warning

This preserve can then be kept for as long as 6 months and used as required.

Steps in Chutney Making

Chutney is a hot, sweet pickle or condiment originating in India and is usually made from mangoes and chilies. It is now widely varied to include fruits, vegetables, spices, vinegar and sugar. It has the consistency of jam but does not set. Chutneys turn an ordinary plate of sliced cold meat into something special.

Steps	Reason
1. Wash fruit	To remove stones, leaves, soil, etc.
2. Peel fruit with a stainless-steel knife	Knife will not be discoloured by the acid in the fruit
3. Grate or chop into small pieces	This allows faster penetration of sugar
4. Cook the pieces in a small amount of water	To soften Heat also destroys enzymes and microorganisms
5. Add sugar and salt	This helps to preserve the product
6. Allow the mixture to stand	To allow the salt and sugar to dissolve in the juices which seep from the fruit

Steps	Reason
7. Suspend a muslin bag, containing desired spices; such as garlic, cloves, ginger, etc. and continue to heat and occasionally stir	To blend the flavours and reduce the water content
8. When the mixture is thick, remove the bag, squeezing out any juices into the mixture	For added flavor
9. Add vinegar and continue to heat	To obtain the consistency of a jam
10. Pour the chutney into clean, pre-sterilized, wide-mouthed jars	To prevent cracking of jars To allow vinegar to cover vegetables completely
11. Close securely with non-metal covers	To prevent evaporation To prevent acid attacking the cover

Figure 13: Preparing Chutney

Recipe

Mango Chutney

3 cups minced green mango

1 oz. grated ginger

2 cloves garlic

6 medium onions (minced)

1 red hot pepper

1 ½ cups brown sugar

2-3 cups white distilled vinegar

¼ cup honey (optional)

1 cup minced raisins

2 tbsp salt

Method:

1. Bring to the boil vinegar, stir in sugar and cook until sugar grains dissolve.

2. Add minced mango, ginger, onions, hot pepper and garlic.

3. Cook until mango is tender. Add salt, honey and raisins.

4. Stir to blend well and cook until the consistency of marmalade.

5. Package immediately in sterilized bottles and cover.

15.4-4 Pickling

This is a chemical method of preservation in which fruits and vegetables are stored while completely covered with spiced vinegar.

The heating destroys the enzymes and microorganisms found naturally in the food and the vinegar, being acidic, prevents the growth of microorganisms which may later enter the bottle or jar.

Pickles give a spicy, tangy taste to savoury dishes. Always use fresh unblemished vegetables when pickling.

Prepare according to kind and cut into suitably sized pieces and either place in brine or sprinkle with dry salt. When bottles are covered, label and store in a cool, dark place.

Vegetable Pickles: Preparation of Cauliflower, Cucumber and Onions

Cauliflower

Trim cauliflower and divide into flowerets/ Place in Brine/ Leave to stand for 24 hours/Rinse and drain well before packing/Pack with flowerets to outside of jar/ Ready for use in 2 weeks.

Cucumber

Peel, slice and cut into lengths/ Place in dry salt in layers or brine/ Leave to stand for24hours/ Do not rinse/ Arrange slices in layers and stand lengths upright/ Ready for use in one week.

Onions

Choose small even-sized onions/ Place in brine /Leave to stand unpeeled for 12 hours then peeled and covered with fresh brine for 24 hours/ Rinse and drain well/ Pack firmly layer by layer/ Keep for 3-4 months before using.

Steps	Reasons
1. Prepare firm, fresh, slightly under ripe fruit Cut if necessary	For convenience in packing
2. Soak for 24 hours in brine	To reduce water content of

Steps	Reasons
(100g salt to 500mL water)	vegetables / fruits by *osmosis*
3. Rinse and drain	To remove excess salt
4. Pack into jars, leaving 1 cm space at top	To allow vinegar to cover fruit/vegetables completely
5. Heat 1L vinegar with 25g pickling spice and allow to cool	For added flavor
6. Pour vinegar into jars	Vinegar enters vegetables, thus reducing their water content
7. Cover tightly with non-metal covers	To prevent evaporation To prevent acid attacking the cover

Figure 14: Steps in Pickling

Recipe

Pickled Plums

2 cups green plums

1tbsp sugar

1 tbsp salt

1 cup cider vinegar

1 whole green pepper

METHOD:

1. Wash and pick stems from plums.
2. Prick plums all over and soak overnight in salted water.
3. Drain and pack into sterilized jars.
4. Bring vinegar to the boil and add sugar and salt to taste.
5. Add whole green pepper (which must not be allowed to burst)
6. Allow to cool then pour over plums.
7. Cover lightly and store for at least three months.

15.4-5 Steps in Jam Making

Jam is made from the pulp and or juice of fresh fruit. There is nothing like the tangy flavor of homemade jams on bread and butter or newly baked scones. Jam is also delicious as a topping on ice-cream, filling for tartlets or sweet omelets.

Use firm, fresh, ripe fruit as they contain more pectin and will allow the jam to set well.

Steps	Reasons
1. Wash fruits	To remove dirt and dust
2. Use a large pan	This allows space for frothing up, when sugar is added
3. Smear the inside of a stainless-steel container with butter or margarine	To reduce the formation of scum when the jam is boiled and to prevent the jam from sticking
4. Add the fruit and water and simmer	This causes the pectin to be extracted from the fruit
5. Heat the fruit slowly	To soften the flesh and extract the pectin
6. Boil the mixture rapidly	This is done before adding sugar to avoid hardening of the fruit
7. Test the mixture	To check the pectin level and consistency of the mixture
8. Add sugar gradually, stir to dissolve and bring to a rapid boil	To dissolve sugar completely and to reach setting point
9. When all the sugar have been dissolved, heat jam rapidly to a rolling boil and stir occasionally.	To prevent the jam from sticking and burning
10. Continue to boil the jam until it reaches its set point (at this stage the moisture content has been reduced) Stir in ½ oz. butter	To complete the cooking process
11. Use a wooden spoon to remove any scum which may have been left behind	To prevent the entry of air into the jam at this stage

Steps	Reasons
Cool the jam slightly	
12. Fill sterilized jars, almost to the top. Put jars to stand on a wooden board	Shrinkage usually occurs Prevents the jar from cracking
13. Seal immediately after filling After pressing waxed paper on to the jar	Also to prevent the entry of air Prevents the growth of mould
14. Invert the jars for 3 minutes	To pasteurize the covers
15. Cool jars quickly by using cold water	To prevent further heating
16. Label and store in a cool, dry, dark cupboard	This provides conditions in which microorganisms do not flourish

Figure 158: Steps in Jam Making

Recipe

Paw-Paw / Pineapple Jam

1 cup minced or grated ripe paw-paw

1 cup cooked minced pineapple

2 tbsp lemon juice

1 tbsp lemon rind

2 cups sugar

METHOD:

1. Put paw-paw and lemon juice to cook until liquid is reduced.

2. Add sugar and lemon rind and cook stirring occasionally until setting point is reached.

3. Blend in colouring, until desired colour is reached.

4. Pour into sterilized jars and cover immediately.

Marmalade Making

The name *marmalade* comes from the Portuguese *marmelada*, a preserve made from quinces, but it now generally means a preserve made from citrus fruits such as oranges, lemons, grapefruit or limes.

The same rules apply to marmalade-making as to jam-making but the citrus fruit needs to be simmered longer in larger amounts of water due to the high proportion of pectose in the pith and pips of these fruit.

Figure 16: Jam, Jelly and Marmalade Preserves
Photo: Denise Clifford

Marmalade is made with the shredded skin and or pulp of the citrus fruit. It is cooked at a simmering point for 2- 3 hours and left in its liquid. The pulp is then removed and allowed to drip without squeezing.

Two Methods of Preparing Marmalade:

1. Fruit are prepared, left to soak overnight then boiled the next day.

2. Fruit is boiled immediately for 1 ½ to 2 hours.

Recipe

Orange Marmalade

4 cups orange pulp (drained)

Juice of one lemon

Granulated sugar

METHOD:

1. Put drained orange pulp in strong bottom aluminum pot and simmer..

2. Stir occasionally until mixture dries out.

3. Remove from heat measure and allow one cup sugar to one cup pulp.

4. Return to the heat, stirring until sugar grains dissolve.

5. Cook, stirring occasionally until mixture becomes heavy and flakes from the spoon.

6. Add lemon juice, stir to blend. Remove from heat.

7. Bottle and cover immediately.

General Rules for Jelly Making

The difference between jam making and jelly making is that in jelly making no chunks of fruit are present. Only fruits with a high acid and pectin content can be used. To ensure this, fruits should be just ripe.

In jelly making the fruit needs little preparation. After very thorough cooking the fruit is left to drip in a jelly bag until all the drippings have stopped. The strained juice, or extract as it is called, is mixed with sugar and when setting point is reached all scum is removed. Waxed paper circles should be placed on top of the jelly immediately after the jars are filled.

The jars should be left to cool and set on a flat surface.

Note it! / Warning

It is not practicable to quote the yield in jelly recipes because the degree of ripeness of the fruit and the time allowed for the dripping process affect the quantity of juice obtained.

Recipe

Cherry and Apple Jelly

2 lbs cooking apples

2 lbs cherries

500 mL water

Sugar

METHOD:

1. Wash and cut apples without peeling or coring. Wash the cherries.

2. Put the fruit in a pan with the water and cook for about 1 hour, until tender. Mash occasionally with a wooden spoon.

3. Strain through a jelly bag or cloth and allow to drip.

4. Measure the extract and put in a pan with 1lb sugar to each 500 mL extract.

5. Stir until dissolved. Bring to a rapid boil for about 10 minutes or until a jell is obtained upon testing.

6. Skim, pot and cover.

#	Features of a Well-Made Jam	☑
1	Contains a fruity flavor	❑
2	Has a bright clean colour	❑
3	Properly set and keeps well	❑
4	Has a clear appearance	❑
5	Has an even distribution of fruit	❑
6	Cuts easily with a spoon	❑

Faults in Jam Making

There are some faults which occur in jam making and reasons for them.

Here are some of the main faults:

FAULTS	REASONS
1. Moulds	i. Jam is stored in a warm, damp place ii. The jar may have be insufficiently filled iii. Wet, poor quality fruit were used iv. Too little sugar was used
2. Fermentation	i. Too little sugar was used ii. Insufficient cooking
3. Crystallization	i. Too much sugar was used ii. Too little acid iii. Insufficient cooking iv. Fruit was overcooked
4. Jam has not set	i. Insufficient pectin or acid ii. Fruit was insufficiently boiled

Figure 19: Faults in Jam Making

Candied Fruit

Shaddock Candy

1 large shaddock

1 lb granulated sugar

METHOD:

1. Cut the shaddock into 8 equal parts from top to bottom.

2. Remove pegs of fruit from skin.

3. Thinly peel 8 portions of the skin to remove the oily pores only.

4. Soak in warm water for a few hours then pour off the water.

5. Put into a large pot, cover with water, heat to boiling point, then pour off water. Squeeze each piece gently to remove as much water as possible.

6. Add sugar and 1 cup water into a shallow but large saucepan. Add heat and keep stirring till sugar melts.

7. Add pieces of shaddock rind and simmer until thick and crystallized.

8. Remove from pan. Stand on foil and put into a warm oven at 180 ^{0}C. Leave for about 1 hour or until dry.

Activity

PRACTICAL LESSON:

Let us engage in an activity which involves Jam Making,

TOPIC: "PAW- PAW/PINEAPPLE JAM."

INTRODUCTION:

OBJECTIVES: Students should become familiar with each step in the preparation of Guava Jam.

The reason for each step.

The equipment necessary to carry out the task.

The desirable qualities in a well made bottle of jam.

The safety measures to observe when participating in the practical lesson.

LEARNING EXPERIENCE: Preservation of fruit in Jam Making.

EVALUATION: Practical Observation.

Recordings.

Labeling bottles: Name of Product/ Date etc.

RESOURCE MATERIAL: Guavas and Preserving Equipment.

Preservation of Meat, Fish and Poultry

Thanks to modern freezing techniques, it is now possible to buy whole sides of meat, portion them into usable sizes then freeze them for later user. All portions of meat should be closely wrapped with all the air removed to prevent *freezer burn*.

What is *freezer burn*?

Freezer burn occurs when grey spots appear on the surface of meat and poultry when it is poorly packaged and left in the freezer. To avoid *freezer burn* frozen

foods must be properly wrapped to minimize oxidation or the exchange of moisture in the food for the air inside the freezer.

Small cuts of meat such as chops and cutlets can be wrapped individually or separated with small sheets of grease proof paper.

Offal

This refers to the edible internal organs of animals such as the liver, kidney etc.

These must be very fresh for freezing and is best packed into tubs or cartons as they tend to be messy when thawing.

Fish

Fish should be frozen as soon as possible after being caught however it is not recommended to freeze at home as it deteriorates rapidly and will not be completely fresh. Small fish can be frozen whole (after gutting and cleaning) and large fish can be filleted or cut into steaks while white fish freeze better than oily fish.

Note it! / Warning

Thaw frozen fish slowly, by leaving overnight in the refrigerator.
Thawed fish and fish products should never be refrozen. Do not wrap fish in newsprint. Suitable materials are foil, films, grease-proof paper etc.
Do not store frozen fish at temperatures above (00C-290C).

Drying

Drying is the removal of water from fish and can be done in the following ways:

- The use of salt draws moisture out of the fish through *osmosis*.
- The application of pressure forces moisture from the fish.
- Evaporation of moisture using solar power.

Poultry

When freezing poultry, it should be done as quickly as possible. It is therefore better to buy large portions of already frozen poultry as opposed to buying fresh and freezing at home. Poultry should be closely wrapped with all the air removed to prevent *freezer burn*.

Activity

Visit a supermarket in your area and make a list of twenty (20) different preserved food products. Explain how the preservation has lead to a prolonged shelf life.

From your survey find out which is the most popular method of preservation used today. You could use a table like the one shown below to record your results.

FOOD PRODUCTS	METHOD OF PRESERVATION	"BEST BEFORE" DATE

Session Summary

Summary

In this unit you learned how food undergoes deterioration as a result of physical, chemical and microbial actions. Spontaneous enzymatic reactions take place once a food item is cut, peeled or bruised. Removal of moisture from foods can limit microbial and enzymatic activity and help to extend shelf life.

Addition of sugar salt and other chemicals are also used to preserve foods. Preservation is valuable in ensuring the availability of foods that are out of season.

In this session we learned about the following:

- Terms commonly used in food preservation.
- The various methods of food preservation.
- The various reasons for preserving foods.
- The guidelines to follow when selecting fruits and vegetables.
- The steps involved in the preparation of preserves using local fruits and vegetables.
- Food additives and their importance in the food industry.
- The preservation of meat, fish, poultry etc.

Session 18.5 The Process of Milk Preservation

Pasteurization of milk is one of the most popular methods of food preservation. This process kills most bacteria present and is of great benefit in giving us safe, clean, wholesome milk, which is always available.

Sterilized milk, however keeps longer because it has been given a more severe heat treatment.

U.H.T. milk, known as ultra-high-temperature milk will keep for months in sealed cartons without refrigeration.

Other than pasteurization, sterilization, homogenization and U.H.T., milk is also available in powdered or dried form. This milk is preserved by removing water so that the resulting powder contains 5% or less moisture. The spray-drying technique is used to produce powered milk in which a mist of homogenized milk is sprayed into a very hot chamber of air. The mist turns into powder almost immediately. The dried milk is then packed into foil-lined air-tight cardboard drums or tins.

Types of Preserved Milk

Condensed Milk

The water is removed from fresh milk and sugar is added. The milk is homogenized and heated under vacuum to 800c for 15 minutes. This milk is 22 times more concentrated than fresh milk. The milk is then cooled and put into sealed cans.

Evaporated Milk

This milk is prepared in a similar way to condensed milk but without the added sugar. It is put into sealed cans and sterilized for 20 minutes at 115.5 ^{o}C.

Skimmed Milk

The fat content of the milk is skimmed off or removed.

Semi-Skimmed Milk

The fat content is slightly less than half that of whole milk.

Frozen Milk

Pasteurized, homogenized milk can be frozen in polythene bags up for up to 1 year.

Dried Milk Substitute

Skimmed milk and non–milk fats are combined and used in the same way as dried milk.

Dried Artificial Cream (Whiteners)

These are preserved using vegetable fats, glucose, syrup etc. and are used in coffee instead of milk or cream.

Soy Milk

This is a beverage made from soy beans. It is produced by soaking dry soy beans and grinding them with water. Soy milk contains about the same proportion of protein as cow’s milk.

The coagulated protein from soy can be made into tofu just as dairy milk can be made into cheese.

Figure 19: Bottled Milk
Photo: Denise Clifford

Assessment

Assessment

ANSWER THE FOLLOWING QUESTIONS:

1. Give at least four (4) reasons why we need to preserve food.

2. How does heating preserve food?

3. Describe any three (3) methods of preserving food using heat.

4. Describe the following and give an example of a food treated by each process.

    a. Pickling

    b. Pasteurization

    c. Canning

    d. Freezing

5. Describe any four (4) ways in which fruit can be preserved.

6. Name three (3) chemical preservatives which can be added to food.

7. What is *osmosis*? Why is it important in the chemical preservation of food?

8. What is Irradiation?

9. List two (2) reasons for each of the following faults in a jam. Tabulate your answer as shown below.

   i. Jam did not set.

   ii. Growth of mould.

   iii. Fermented jam.

FAULTS IN JAM MAKING	REASON	
	1	2

10. Explain why each of the following types of Additives is used in food production.
    i. Colour
    ii. Glazing Agents
    iii. Emulsifiers
    iv. Humectants

Give an example in each case.

_____

_____

_____

_____

_____

_____

Assignment

Assignment

1. Complete the following statements, using words from the list below:-

Dehydration	Thawing	Freezing
Pectin	Blanching	Irradiation
Pickling	Preservation	Additives

1. _____ is the process of heating and the addition of vinegar.
2. _____ are substances which are added to foods during manufacture.
3. _____ of food is undertaken to prevent decay.

4. _____ is a cold method of food preservation.
5. _____ is when foods pass into an unfrozen state.
6. _____ is a substance which forms a gel and is responsible for setting jam.
7. _____ is rapid heat treatment in boiling water given to vegetables before they are frozen.
8. _____ is the process through which energy passing through the food kills bacteria.
9. _____ is the removal of moisture from foods.

2. Discuss three (3) advantages of freezing as a method of preserving food.

3. Suggest a list of foods which are useful to store in the home freezer.

4 Draw a table and divide it into the following categories:

FOODS FROM ANIMAL SOURCES.

FRUITS.

VEGATABLES.

OTHER.

For each group make a list of four (4) foods suitable for preservation.

Resources

Food and Nutrition

by ANITA TULL

The How and Why of Cookery

by N.M. HASELGROVE and K.A. SCALLON

Photos by Deniece Clifford.

Food and Nutrition Resource manual for the smaller scale food processor in the Caribbean.

C.F.N.I. P.A.H.O. / W.H.O.

In collaboration with the Food and Agriculture Organisation in the United Nation. 2003

Photos by Tony Swetman

Sylvia Hunt's Cooking.

Caribbean Fruits and Vegetables

By Beryl Wood.

Naparima Girls' High School Cookbook.

Photos by Claire Clifford.