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**ABSTRACT**

This resource manual is designed for use by teachers of grades 7 through 12 in conjunction with the "Nutrition Education -- Choose Well, Be Well" curriculum series. Based on the goals set forth in the Health Instruction Framework for California Public Schools and the topics identified in the publication entitled "Minimum Proficiency Levels for Nutrition Education in California Schools," the manual is intended to help teachers acquire the skills necessary for providing effective instruction in this area. Chapter 1 of the document presents an introductory overview to the manual's objectives and organization, while chapters 2 through 6 cover the five topics identified in the California nutrition education proficiency guidelines: food choices, factors influencing food choices, food-related careers, consumer competencies, and food handling. For each of these topics, minimum proficiency levels for students are indicated and specific questions are asked so that teachers can check retention of key facts. Answers are provided after each set of questions. (MP)

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# Nutrition Education Choose Well Be Well

## A Resource Manual for Secondary Teachers

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A list of other publications available from the Department may be found on page 49 of this publication

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# Foreword

National attention is being focused more and more on the importance of nutrition for good health. Studies have shown that nutrition plays a direct role in the overall development of children's mental and physical abilities. Therefore, it is critical that we focus on the important task of improving nutrition and the quality of our children's lives through an ongoing, effective nutrition education program. To accomplish this task, we must change children's attitudes toward food, modify their eating habits, and improve their ability to use nutrition information.

California, through the enactment of state legislation and participation in federal child nutrition programs, has made a major commitment to nutrition education. With financial support provided by the Child Nutrition Facilities Act (Senate Bill 120) and the National School Lunch Act and Child Nutrition Amendment (Public Law 95-166), the state has established a comprehensive nutrition education and training program.

One of the objectives of the Nutrition Education and Training Program is to teach children, through a positive daily lunchroom experience and appropriate classroom reinforcement, the value of a nutritionally adequate diet. To be effective, nutrition education efforts must combine the expertise and efforts of teachers, food service professionals, and parents. To build bridges between food service and instructional programs and between home and school is a challenge to those persons who accept the responsibility for nutrition education. I hope this publication and the others in the *Choose Well, Be Well* curriculum series will be of help to those who accept the challenge to build these most important bridges to good health for our children.



Superintendent of Public Instruction

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# Preface

This resource manual is designed for use by secondary teachers (grades seven through twelve) in conjunction with the *Nutrition Education—Choose Well, Be Well* curriculum series. The document is based on the goals set forth in the *Health Instruction Framework for California Public Schools* and the topics identified in the publication entitled *Minimum Proficiency Levels for Nutrition Education in California Schools*.

The background information presented in the resource manual is intended to give teachers an insight into the lessons in the *Choose Well, Be Well* curriculum series and to help them acquire the proficiency level necessary for providing effective nutrition education.

We hope that this document will be useful to teachers in helping students obtain the knowledge and skills they need to make wise food choices that will contribute to their overall health and well-being throughout life.

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# Introduction

New directions in life-styles in recent years have led to changes in eating habits and nutritional practices. Studies show that most individuals do not follow good nutritional practices and that more attention must be given to the relationship between nutrition and health. Therefore, nutrition educators must assume the important task of teaching individuals how to make food choices that will contribute to their overall health and well-being.

In an attempt to improve nutrition in the schools, the Department of Education has developed the curriculum series entitled *Nutrition Education—Choose Well, Be Well*. The publications have been developed by the Department to present accurate and current nutrition information to students, to facilitate an awareness of the students' own nutrition-related values, and to provide students with an opportunity to share their opinions and attitudes with other persons.

The Department has also prepared this resource manual for use by teachers and food service personnel in conjunction with the lessons in the curriculum series. The manual contains background information on the subject matter of the lessons, but it is not intended to be used as an instructional text. It is hoped that the document will help teachers attain the minimum proficiency level necessary for nutrition education.

The resource manual is divided into six chapters. Chapter one presents introductory information, and chapters two through six cover the five topics identified in *Minimum Proficiency Levels for Nutrition Education in California Schools*, which are as follows:

**Food Choices**—Daily food intake is related to the attainment of optimum health.

**Factors Influencing Food Choices**—Life-styles, peers, and individual family resources reflect similarities and differences in food choices.

**Food-Related Careers**—Needs, roles, responsibilities, and educational requirements affect choices in food and health nutrition-related careers.

**Consumer Competencies**—Effective utilization of existing resources may enhance the potential for satisfying individual and family nutritional needs and wants.

**Food Handling**—The quality and safety of foods are influenced by the handling, processing, and preparing of foods.

Minimum proficiency levels for students were developed for each of the above topics to ensure the systematic achievement of the goals of California's nutrition education program, as set forth in the *Health Instruction Framework for California Public Schools*. These goals are as follows:

1. To develop an understanding that eating patterns are dependent upon interrelationships among physical, social, psychological, economic, and cultural factors
2. To consider alternatives in meeting nutritional needs and decide on various ways to achieve good nutrition within these eating patterns
3. To develop eating patterns which contribute to wellness

Specific questions are asked after the presentation of each content area so that the teacher can check retention of key facts. Answers are provided after each set of questions.

## Quiz

2. What are the five topics in nutrition education?

a.

b.

c.

d.

e.

## Answers

1. The three goals of nutrition education are as follows
  - a. To develop an understanding that eating patterns are dependent upon interrelationships among physical, social, psychological, economic and cultural factors
  - b. To consider alternatives in meeting nutritional needs and decide on various ways to achieve good nutrition within these eating patterns
  - c. To develop eating patterns which contribute to wellness
2. The five topics in nutrition education are as follows
  - a. Food Choices
  - b. Factors Influencing Food Choices
  - c. Food Related Careers
  - d. Consumer Competencies
  - e. Food Handling

# Food Choices

Food choices are important because they have an effect on every individual's energy level, susceptibility to certain health problems, and emotional and physical fitness. Individuals cannot be forced to select a nutritionally adequate diet or to change certain ideas about eating. However, they should realize that food decisions made today may have an effect on the quality of their future lives.

## The Body and Food

The nutrients contained in food are used for energy, for growth, for maintenance and repair of body tissue, and for the regulation of body functions.

Food is necessary for **energy** for the body's activities, both internal and external. Examples of internal activities are the beating of the heart, the breathing action of the lungs, and the digesting of food. Examples of external activities are running, swimming, and studying.

Food is also necessary for **growth**. Most people weigh about seven pounds at birth. By the time they reach adulthood, their weight will have increased 15 to 30 times. The nutrients in food enable body cells to multiply, thus causing growth. Without nutritious food, the body would not grow adequately.

The nutrients in food are necessary for **maintenance and repair of body tissue**. An example of these activities is the replacement of body cells, which are constantly being worn down.

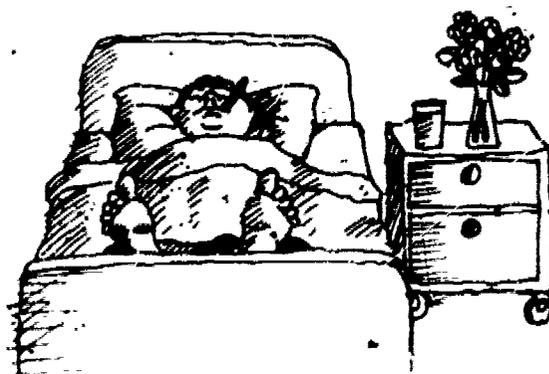
Finally, food is necessary for the **regulation of body functions**, such as the maintenance of normal body temperature, the movement of fluids, the control of the balance between acid and base, and the coagulation of the blood.

The body's need for nutrients varies from person to person and according to the age of the person. Nutritional needs are high during periods of growth, such as infancy, adolescence, pregnancy, and lactation.

During these periods of rapid growth, nutritional needs increase to meet growth requirements as well as to provide for energy, regulation of body functions, and repair and maintenance of body tissue.

Nutritional needs are high when a person is physically active, because the body needs more energy. Athletes and others who are engaged in strenuous occupations need more energy from food than people who have sedentary jobs. Older people are usually less active than younger people, therefore, using less energy and needing less food.

The nutritional needs of the body are also greater when it has been subjected to physical and psychological stress and trauma, such as when it is fighting infection or recovering from injury.



## Quiz

1. List four reasons why the body needs the nutrients obtained from food.

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_

2. What are three factors that determine a person's nutritional needs at various stages of the life cycle?

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_

## Answers

1. The body needs the nutrients obtained from food for the following purposes:

- a. Energy
- b. Growth
- c. Maintenance and repair of body tissue
- d. Regulation of body functions

2. Three factors which determine a person's nutritional needs at various stages of the life cycle are:

- a. The amount of growth or activity
- b. The degree of physical activity
- c. The amount of stress and fatigue

# Nutrients

Nutrients are substances in food that are necessary not only for growth but also for energy, maintenance and repair of body tissues, and regulation of body functions. The heart beats, the body replaces worn out cells with new cells, and the child grows into adulthood, all because nutrients have been obtained from food. Although not all nutrients have been identified, and the relationship of the nutrients to each other is not completely understood, it is known that each nutrient has a specific function and that no nutrient acts alone. Thus, one should consume many different nutrients every day by eating a variety of foods at each meal.

The six major nutrient groups are: protein, carbohydrate, fat, vitamins, minerals, and water. Protein, carbohydrate, and fat are classified as macronutrients because they are needed in large amounts. The macronutrients supply energy and are important

sources of the body's chemical building materials. Vitamins and minerals are important for building and regulating, but they do not supply energy. They are classified as micronutrients because they are needed in small amounts.

Water is not considered a food, but it is a nutrient essential to life. It does not furnish energy, but it is necessary for normal body functions. Water is the basis of blood and tissue fluids. Depending on a person's age and sex, approximately 50 to 75 percent of the body is composed of water. Water carries nutrients to the cells and removes the waste products from the cells. Water also helps to regulate body temperature. Typically, adults should drink one litre of water for each 1,000 calories of food consumed to maintain the correct water balance in the body. In addition to water, all liquids and most foods contribute to fulfilling the body's water requirements.



## Quiz

1. What is a nutrient?

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2. Why is water a nutrient?

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## Answers

1. Nutrients are the substances in food necessary for growth, energy, maintenance and repair of body tissues, and regulation of body functions.
2. Water is not a food, but it is a nutrient essential for normal body functions. Water carries nutrients and furnishes energy. It is essential for growth, maintenance and repair of body tissues, and the regulation of body functions.

# Protein

Protein is one of the most abundant compounds in the body, second only to water. Protein builds body tissue, and it is present in every cell. The need for protein to build new tissue and to maintain and repair tissue continues throughout life. Substances such as enzymes, which are essential in vital processes in the body, are made from protein. Protein also helps to facilitate water movement in and out of cells and to and from the bloodstream.

Proteins differ in nutritional value, because they are made up of combinations of different amino acids. These amino acids are classified as essential and non-essential, depending on whether or not the body can manufacture them. Those amino acids the body can produce are called nonessential amino acids. Those the body cannot produce are called essential amino acids, because it is essential to get them from foods.

Nine essential amino acids are known to be needed by humans. High quality proteins contain all the essential amino acids in amounts needed by the body

to maintain life and provide for normal growth and are sometimes called complete proteins.

As a general rule, proteins from animal sources, such as meat, fish, poultry, milk, and eggs, are high quality or complete proteins. Generally, proteins from plant sources, such as vegetables, cereals, grains, nuts, seeds, and legumes, are incomplete or partially complete proteins. Incomplete or partially complete proteins lack one or more essential amino acids, or they do not contain sufficient quantities of essential amino acids to meet human requirements. The protein quality of plant proteins can be improved by combining them with an animal source (e.g., cereal with milk), or by using two different plant proteins, each lacking a different essential amino acid, so that each supplies the amino acid missing in the other (e.g., rice and beans). The principle of combining plant protein with animal protein and combining various plant proteins to increase the nutritive value of the protein is known as complementing food proteins.

## Quiz

1. What are three functions of protein in the body?

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2. How does the quality of protein differ in foods?

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3. Describe the principle of complementing food proteins.

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## Answers

1. Three functions of protein are to build body tissue, to make enzymes that control rates of chemical reactions, and to help maintain water balance.
2. The quality of protein differs in various foods, because proteins are made up of various combinations of amino acids. Foods that contain all the essential amino acids are of a higher quality than those foods that do not contain all of the essential amino acids.
3. The principle of complementing food proteins involves the combining of incomplete proteins with complete or high quality proteins or the combining of various incomplete proteins to form complete proteins to increase the quality of the protein.

## Carbohydrate

Starches and sugars are the two principal forms of carbohydrate supplied by the diet. Starches are complex carbohydrates made of thousands of simple sugar molecules. Complex carbohydrates, or starches, are found primarily in cereals, grain products, vegetables, legumes, and fruits. The different types of sugars vary in chemical composition, and they are found in milk, fruits, honey, and the products of sugar beets and sugar cane. In the body, starches and all of the different sugars are converted to glucose. However, no matter what the source, all carbohydrates supply four calories of energy per grain.

In addition to supplying energy, carbohydrates also aid in the utilization of fats by the body, exert a sparing effect on proteins, and add flavor to the diet. Energy needs must be met before the building, repairing, and maintaining of tissue. If the diet is low in carbohydrates and fats, proteins will be used for energy rather than for their normal uses of building and repairing.

Relationships between carbohydrates and health are currently being researched. It is known that sugar intake plays a role in the development of dental caries and obesity. Theories also exist in regard to the role of carbohydrates in other conditions, such as hypoglycemia, hyperactivity, and diabetes, but current research does not support definite conclusions.

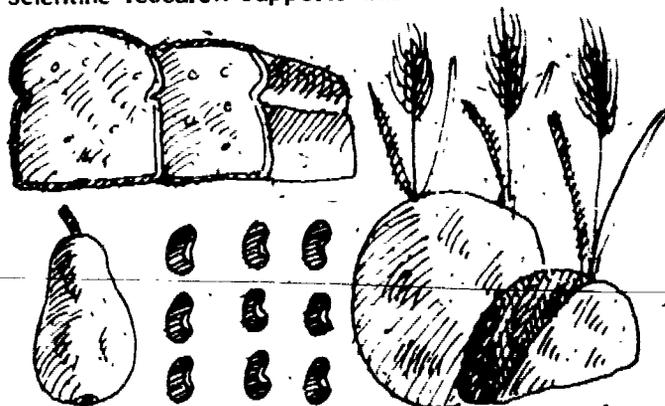
**Dental caries** are caused by bacteria in the mouth which break down sugar and produce acid. This acid, if allowed to remain in contact with the teeth, produces caries. Foods that are sticky and sweet (gum, caramels, jelly, and dried fruits) stay on the teeth longer and, therefore, may cause more caries than nonsticky sweets.

**Obesity** or overweight is caused by excess calories from any source (protein, fat, starch, or sugar). High sugar foods, however, tend to contain "empty calories," supplying calories but few other nutrients.

Excess consumption of food with empty calories contributes to obesity and may replace consumption of foods of higher nutritional value.

**Hypoglycemia** is a condition in which there is too little sugar in the blood, resulting from an abnormal carbohydrate metabolism. No evidence indicates that hypoglycemia is caused by eating too much sugar; however, people with diagnosed hypoglycemia have to eat less sugar and more protein.

**Hyperactivity** symptoms include irritability, restlessness, and aggressive behavior, generally in children. A currently popular belief is that children who eat excessive amounts of sugars, certain food additives, or certain food chemicals exhibit hyperactive symptoms. However, no evidence from controlled scientific research supports this belief.



**Diabetes** is a condition characterized by insufficient secretion of insulin from the pancreas. Lack of insulin leads to too much sugar in the blood, which in turn leads to a number of metabolic and physical problems. No evidence indicates that eating too much sugar causes diabetes; however, susceptible individuals or those who have been diagnosed as diabetic are usually advised to modify their total carbohydrate intake.

## Quiz

1. What is the current scientific evidence on the relationship of sugar to each of the following health problems?

a. Dental caries

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b. Obesity

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c. Hypoglycemia

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d. Hyperactivity

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e. Diabetes

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## Answers

1. The following are examples of health problems that are related to the use of sugar
  - a. Dental caries may be caused by sticky and sweet (sugar) foods that remain on the teeth for a long period of time
  - b. Obesity is caused by the consumption of too many calories from any source. However, foods high in sugar tend to contain empty calories and contribute to obesity
  - c. Hypoglycemia is too little sugar in the blood and is not caused from eating too much sugar. Diets recommended for individuals with hypoglycemia are generally lower in sugar and higher in protein
  - d. Hyperactivity is supposedly found in children who have had high sugar intakes or diets containing certain food additives or food chemicals. However, no scientific evidence supports this theory
  - e. Diabetes is a condition characterized by too much sugar in the blood. However, diabetes is not caused from eating too much sugar. Nonetheless, diabetics are usually advised to control their sugar intake

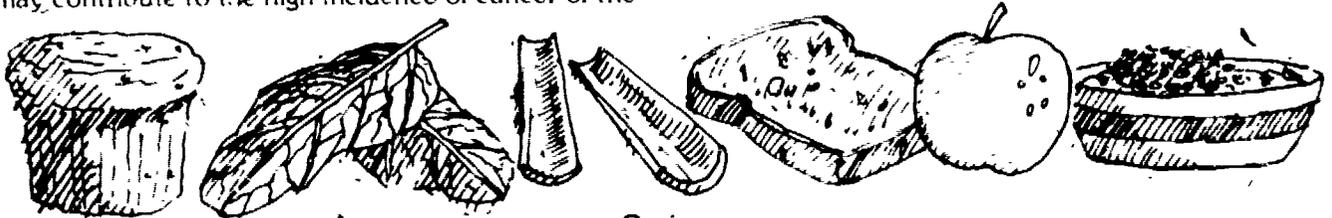
# Dietary Fiber

Dietary fiber is the indigestible carbohydrate in food. Fiber is found in the cell walls of plants. Different plant foods contain different kinds of fiber; bran and cellulose are in cereals and vegetables, and pectin and lignin are in fruits.

Fiber helps prevent constipation by aiding the normal passage and elimination of waste products. High intakes of dietary fiber are often found in populations that have a very low incidence of intestinal disorders, including constipation, inflammation, and cancer. This observation has led some researchers to propose that some evidence indicates that the lack of dietary fiber may contribute to the high incidence of cancer of the

colon and other intestinal disorders in the United States.

Milling removes the fibrous portions of cereals and grains, therefore, refined cereals and grains contain mainly starch. Vitamin and mineral content is also affected by milling. Iron, thiamin, riboflavin, and niacin are restored to refined cereals and grains during enrichment. Other nutrients lost in milling, such as magnesium, vitamin B6, zinc, and vitamin E, are not restored. Whole grains, therefore, have more fiber and more vitamins and minerals than the refined products.



## Quiz

1. What is dietary fiber?

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2. Describe two known benefits of including whole grain products in the diet.

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## Answers

1. Dietary fiber is the indigestible carbohydrate in food which aids the normal passage of undigested food through the intestinal tract.
2. Two benefits of including whole grain products in the diet are as follows:
  - a. Provide vitamins and minerals lost in refining and not replaced in enrichment.
  - b. Provide fiber which assists in digestion and elimination.

# Fats

Fats are important because they are sources of both energy and essential fatty acids which cannot be produced by the body. In addition, fats serve as insulation and provide protective cushions for certain organs. The richest sources of fats in the diet are vegetable oils and animal fats. Fats also add variety and flavor to many foods and carry vitamins A, D, E, and K.

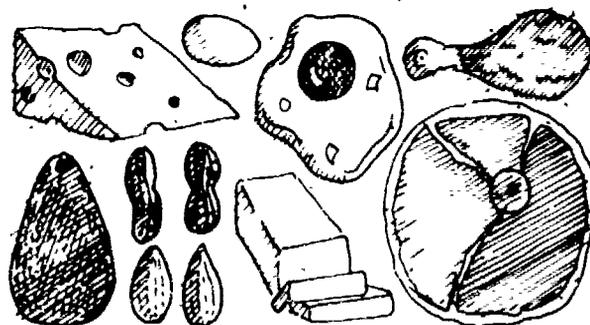
Fats contain both saturated and unsaturated fatty acids. Animal fats generally contain a higher ratio of saturated fatty acids and are solid at room temperature. Those rich in unsaturated fatty acids are generally vegetable oils and are liquid at room temperature. Both saturated and unsaturated fats contain the same number of calories.

Cholesterol is a fat-like substance that is normally present in cell membranes. It is manufactured by the liver and sent out to the cells through the bloodstream. Cholesterol is used by the body in several ways, one of which is to make vitamin D.

Cholesterol is found only in animal foods. Egg yolks and organ meats, such as liver and kidney, are especially rich sources.

The presence of cholesterol and fat in the blood at higher than normal levels is an indicator of risk of heart disease. The exact ways in which cholesterol is

involved in heart disease are still unknown. Cholesterol is one of several substances that deposit on the artery walls, and these deposits can block the flow of blood to important body organs, such as the heart and brain. When this happens, the person may suffer a heart attack or stroke.



Experiments with animals and humans have shown that cholesterol and fat levels in the blood may be related to the diet. Lowering the total amount of fat (especially saturated fat) and cholesterol in the diet can reduce blood cholesterol levels. In addition, weight loss in persons who are obese can sometimes have a cholesterol lowering effect. The real question that has not yet been answered is whether lowering blood cholesterol can prevent heart disease.

## Quiz

1. What general rules should be followed in identifying foods containing saturated and unsaturated fats?

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2. What is the current scientific evidence on the relationship of fat and cholesterol to heart disease?

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## Answers

1. Foods high in saturated fats are found in animal sources and are usually solid at room temperature. Foods high in unsaturated fats are found in plant sources and are usually liquid at room temperature.
2. The type and amount of fat in the diet can influence the amount of cholesterol in the blood. High blood cholesterol may be a risk factor of heart disease. However, it is not yet proven that changing the diet to reduce blood cholesterol will necessarily reduce the risk of heart disease.

# Vitamins

Vitamins are organic substances which must be provided in the diet for growth and maintenance of life. These regulatory substances are carried in the bloodstream to all parts of the body to help in body reactions that produce energy and to help in the processes that use protein to build, maintain, and repair body tissues. Vitamins are widely distributed in a variety of foods, such as fruits and vegetables, enriched and whole grain breads and cereals, meats, and dairy products.

## Vitamin Classifications

Vitamins are classified as water soluble or fat soluble. Water soluble vitamins are those which dissolve in water and are readily excreted through the kidneys in body fluids. Thus, there is very little storage of these vitamins in the body. Adequate quantities of water soluble vitamins must be supplied daily in food. All B-complex vitamins and vitamin C are water soluble.

Vitamins A, D, E, and K are fat soluble. The fat soluble vitamins are not readily dissolved in water or body fluids, and they can be stored in the body. It is possible to store excessive amounts of these vitamins; however, this generally occurs only with the addition of vitamin supplements to the diet.

Solubility is not only important in vitamin intake and excretion; but it is also an important consideration in the storage and preparation of foods. Water soluble vitamins are less stable than fat soluble vitamins and can be easily destroyed by heat and air, or washed away when too much water is used in cooking.

## Vitamin Sources

Vitamin preparations are manufactured from natural and synthetic sources. Natural vitamin preparations are those prepared from foods, while synthetic vitamins are those that are chemically produced. Atom for atom and molecule for molecule manufactured vitamins are the same as vitamins obtained from food. Before a product can be called a vitamin, it must demonstrate a capability for curing all the symptoms of a deficiency of that vitamin with the same efficiency and in the same period of time as demonstrated by the natural vitamin.

The body utilizes natural and synthetic vitamins in the same way. However, there are advantages to obtaining vitamins from food rather than from the pill or powder form of any vitamin preparation. Food contains nutrients such as protein, carbohydrate, fat, and additional vitamins and minerals that are not found in vitamin preparations.

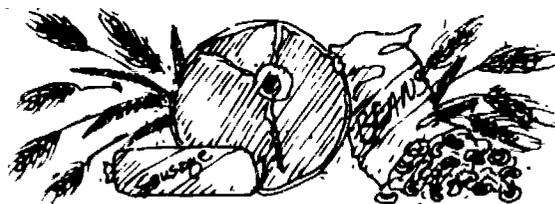
Vitamin A is found in liver, butter, fortified margarine, egg yolk, milk, and most cheeses. The yellow

pigment in plants, such as carrots, pumpkins, yams, and cantaloupe, is called carotene, which is used by the body to make vitamin A. Carotene is also found in deep green vegetables, such as spinach, watercress, collards, mustard greens, broccoli, and green peppers. Vitamin A is important for night vision—the ability to see in dim light and to adjust to dim light after exposure to bright light. Vitamin A is also important in bone growth and in healthy maintenance of the skin and the mucous membranes.

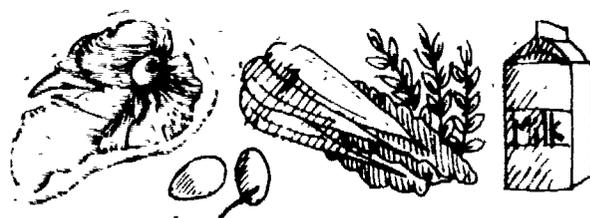


The B vitamins are nutrients that are necessary for every cell in the body. Many of them are part of the enzyme systems which help the body utilize food. Thiamin, riboflavin, niacin, vitamin B-6, pantothenic acid, biotin, folacin, and vitamin B-12 are important vitamins in the B-complex family.

Thiamin is part of the enzyme system that helps the body to use the energy from carbohydrates. Severe thiamin deficiency causes muscle wasting, nervous disorders, and cardiac arrest. The best sources of thiamin in the average diet are pork products, legumes, nuts, and whole grain and enriched cereals.



Riboflavin assists the cells in using oxygen. Signs of a deficiency are hypersensitivity to light, scaly skin around the nose, or cracking at the corners of the mouth. Milk is one of the best sources of riboflavin. It is also found in liver, cheese, eggs, lean meats, leafy green vegetables, legumes, and whole grain or enriched cereals.



Niacin is also part of the enzyme system that helps the cells use oxygen. Deficiency of niacin produces a disease called pellagra. This disease was common in the United States before the enrichment of refined cereals and grains. Good sources of niacin are peanut butter, organ meats, lean meats, poultry; fish, legumes, and enriched and whole grain cereals.



Vitamin B-5 aids the body in the use of amino acids and fatty acids and helps in the release of energy from foods. The best sources of vitamin B-6 are lean meats, liver, wheat germ, vegetables, and whole grain cereals.



Folic acid or folic acid is important for normal blood formation and necessary for proper liver functioning and for metabolic processes. Good sources of folic acid are liver, legumes, nuts, oranges, whole wheat products, and vegetables, such as asparagus, broccoli, leaf lettuce, and spinach.



Vitamin B-12 is also needed by the body for producing red blood cells and for protecting against nerve degeneration. It also helps the body use protein, fat, and carbohydrate. Good food sources of B-12 are animal products, such as liver, kidney, shell fish, lean meat, milk, eggs, and poultry.



Vitamin C or ascorbic acid is important in the formation and maintenance of collagen—the cementing material that holds the cells of the body together. This vitamin aids in the healing of cuts and wounds and in maintaining the strength of blood vessels. Vitamin C is also important in the body's use of calcium and iron. Some good food sources of vitamin C are citrus fruits, such as oranges, grapefruit, lemons, and limes; strawberries; melons; leafy green vegetables; broccoli; cabbage; tomatoes; and green peppers. A severe lack of vitamin C can cause the deficiency disease called scurvy. Fortunately, scurvy is not a major nutritional problem in the United States.



Many claims have been made that large amounts of vitamin C will cure colds and infections. It is true that general physical well-being depends a great deal on one's nutritional status. Optimal nutritional health will certainly aid the body in resistance to infection; however, the claims for large amounts of vitamin C have not been substantiated by controlled research studies.

Vitamin D is associated with calcium. This vitamin promotes calcium absorption in the intestines, influences calcium utilization in the bones and teeth, and helps maintain blood calcium levels. The best source of vitamin D is fish liver oils, a food not commonly eaten by most people. The body can form vitamin D when the skin is exposed to sunlight. In addition, most milk in the United States is fortified with vitamin D, because it is a rich source of calcium and phosphorus, the minerals that require vitamin D for absorption. The use of fortified milk is insurance against vitamin D deficiency in children. The requirement for a normal adult can usually be met by adequate exposure to sunlight. However, under certain climatic conditions, or because of chronic air pollution, a dietary source may be necessary.



## Quiz

1. What basic function do vitamins perform in the body? Give some examples of what specific vitamins do.

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2. Give two reasons why it is important to know whether a vitamin is fat or water soluble.

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3. Are there any scientifically proven benefits from consuming natural rather than synthetic vitamins?

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## Answers

1. The basic function of vitamins is to help in the body reactions that produce energy and in the processes that use protein to build, maintain, and repair body tissues. Examples of what vitamins do are as follows

<b>Vitamin</b>	<b>Function</b>
Vitamin A	Helps with night vision and promotes healthy skin
Thiamin	Helps produce energy from carbohydrates
Riboflavin	Assists the cells in using oxygen
Niacin	Assists the cells in using oxygen
Vitamin B <sub>6</sub>	Helps the body use amino acids and fatty acids
Folacin	Aids normal blood cell formation

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Vitamin B-12 Aids normal red blood cell formation and helps the body use protein, fat, and carbohydrate

Vitamin C Helps the body form collagen—the cementing material that holds cells together

Vitamin D Helps the body use calcium

2. Two reasons why it is important to know whether a vitamin is fat or water soluble are as follows:
    - a. Solubility is related to how the body eliminates or stores the vitamin. Fat soluble vitamins are stored in fatty body tissues. Excessive intake of fat soluble vitamins (especially vitamins A and D) can result in excessive storage and toxicity. Water soluble vitamins (B vitamins and vitamin C) are not stored. They are excreted in body fluids; therefore, it is less likely that toxicity will result from excessive intake.
    - b. Solubility also affects the stability of vitamins during storage and preparation. Water soluble vitamins are less stable. They can be easily destroyed by heat and air or can be dissolved in water if too much water is used in cooking for a long period of time.
  3. There is no difference in the chemical structure of natural and synthetic vitamins. The body utilizes natural and synthetic vitamins in the same way. There are advantages to eating vitamins found in foods rather than vitamin preparations, such as pills and powders. Food contains nutrients such as protein, carbohydrate, fat, and additional vitamins and minerals that are not found in vitamin preparations.
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# Minerals

Minerals are inorganic elements which are essential in small quantities for life processes. The functions of minerals can be divided into the categories of building substances and regulatory substances.

As building substances, minerals are:

1. Part of red blood cells—iron
2. Part of the hard tissues of the body, bones, and teeth, giving rigidity to the body—calcium, phosphorus, and fluoride
3. Part of the soft tissues, such as muscle and nerve tissue—sulfur, phosphorus, and iron
4. Part of the enzymes and hormones essential to the functioning of the body—iodine, zinc, cobalt, sulfur, and iron

As regulatory substances, minerals do the following:

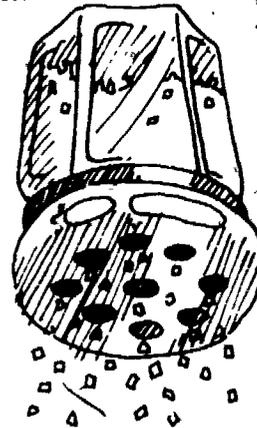
1. Contribute to the osmotic pressure of body fluids—sodium and chloride.
2. Contribute to the approximate neutrality in the blood and body tissues—sodium, calcium, magnesium, and phosphate and sulfate groups.
3. Make possible the normal rhythm in the heart-beat—calcium, potassium, and sodium.
4. Help maintain a normal response of the nerves to stimuli—calcium.
5. Are essential for blood clot formation—calcium.

Six minerals, calcium, phosphorus, sodium, chloride, potassium, and magnesium, are essential in the diet in relatively large amounts. Other minerals, such as iron, manganese, copper, iodine, fluoride, zinc, cobalt, chromium, selenium, and molybdenum, are needed in small amounts or traces. Thus, these minerals are often referred to as the trace elements.

Iron is necessary to form hemoglobin in the red blood cells, which carry oxygen from the lungs to the tissues. Good sources of iron include liver, meats, whole grain or enriched cereals, dried fruits, and leafy green vegetables. Anemia is a blood disorder that may result from a lack of iron.

Calcium has two main functions in the body—the building of bones and teeth and the regulation of body processes. Good sources of calcium are milk and milk products, legumes, and dark green vegetables.

Sodium and chloride are closely related in function and dietary intake and are thus often discussed together. Sodium and chloride are the major minerals in extracellular fluid and contribute to osmotic pressure. Sodium and chloride also help regulate the acid-base balance in the extracellular fluids. The most common source of both sodium and chloride is table salt. Processed and salted foods also contribute large amounts of sodium to the diet. Some other sources of sodium are soy sauce, monosodium glutamate (MSG), and baking powder.



In the past few years there has been much study of the relationships between sodium intake and heart disease, hypertension, kidney disease, and cirrhosis of the liver. People with these conditions have problems with sodium excretion and fluid balance. The role that sodium plays in causing these problems is still not entirely clear; however, people who have these problems or who are at risk of developing them may be advised to control their sodium intake, which can be done by limiting the use of salt and foods containing large amounts of sodium.

## Quiz

Name three functions that minerals perform in the body and give an example of a specific mineral associated with each of the functions.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

## Answers

Some functions that minerals perform in the body, with examples of specific minerals, include:

1. Part of hard tissues—calcium
2. Part of soft tissues—sulfur and iron
3. Part of enzymes and hormones—iodine
4. Contribute to neutrality—sodium
5. Normal heartbeat—calcium
6. Normal response of nerves—calcium
7. Essential for blood clotting—calcium
8. Part of red blood cells—iron

## Energy

The body needs energy to function. The energy demand increases and decreases at various times, but it never decreases below a specific minimum. Minimum energy is needed for various involuntary life support functions, such as the beating of the heart, the pumping of the lungs, and the functioning of the brain. This minimum energy level is known as the basal metabolic rate. Energy needs are thus based on the combination of involuntary actions (basal metabolic rate) and voluntary physical activity, such as running, swimming, and reading.

The amount of energy obtained from foods is measured in calories. One calorie is the amount of heat that will raise one kilogram of water one degree Celsius. The number of calories in a food is the amount of energy, as measured by heat increase, that the food will provide the body. The three nutrients that

provide the body with energy are carbohydrate, protein, and fat. However, the amount of energy is not the same for each nutrient: carbohydrate and protein each provide the body with four calories of energy per gram, while fat provides the body with nine calories per gram.

An important fact to remember is that the body's energy needs will be met before any other needs, such as growth, regulation of body functions, or repair and maintenance of body tissues. If not enough fat and carbohydrate foods are eaten to provide needed energy, important functions of protein, such as growth, repair, and maintenance, will be sacrificed. In fact, one could become protein deficient if fats and carbohydrates do not provide enough energy and the body must rely on protein for energy.



## Quiz

1. What determines how much energy (calories) a person needs each day?

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2. What is a calorie?

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3. What three nutrients produce energy in the body, and how many calories are produced from a gram of each?

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4. Are carbohydrates more fattening than protein?

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5. How can a protein deficiency result from a lack of carbohydrate or fat in the diet?

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## Answers

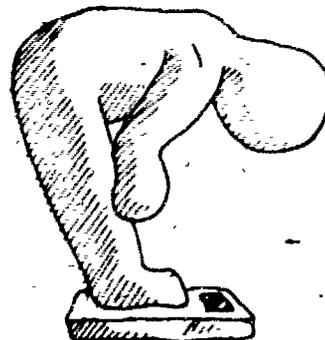
1. The combination of the basal metabolic rate (involuntary activity) and the physical activity determine the energy needs of a person.
2. A calorie is a measure of energy in the form of heat that is derived from food. One calorie is the amount of heat that will raise one kilogram of water one degree Celsius.
3. Carbohydrate and protein produce four calories per gram, while fat produces nine calories per gram.
4. Carbohydrates are not any more fattening than protein, because each provides four calories per gram.
5. If sufficient energy is not supplied from carbohydrate and fat, the body will use protein for energy. If protein is used for energy, it is not available for growth, regulation of body functions, and maintenance and repair of cells.

## Weight Control

The key number in weight control is 3,500. It takes 3,500 extra calories from food to add one pound (0.45 kg) of body fat. To lose weight, then, one would need to reduce the calorie intake below the body requirement and/or increase physical activities above the intake of calories. The most successful weight loss programs reduce calorie intake and increase activity level.

One needs to be cautious of the quick weight loss claims, especially those which state one can lose a pound a day. Since the average woman needs approximately 2,000 calories and the average man needs approximately 2,700 calories per day, it is impossible to decrease the diet by 3,500 calories to lose one pound (0.45 kg) of fat in one day. Furthermore, rapid

weight loss is usually temporary and can be unhealthy. Weight is regained again when one returns to his or her usual eating habits. Finally, diets that are extremely low in calories are not nutritionally adequate.



### Quiz

1. How many extra calories are needed to gain one pound of body fat?

2. How should a person reduce his or her energy intake to lose weight?

3. What are two problems that may result from crash weight reduction diets?

### Answers

1. To gain one pound (0.45 kg) of body fat, a person needs to consume foods containing 3,500 calories in excess of what is needed for energy.
2. To lose weight, a person should reduce his or her energy intake (calories) below body requirements and increase his or her energy requirements by increasing physical activity.
3. Two problems that may result from crash weight reduction diets are temporary weight loss only while on the diet and a nutritionally inadequate diet.

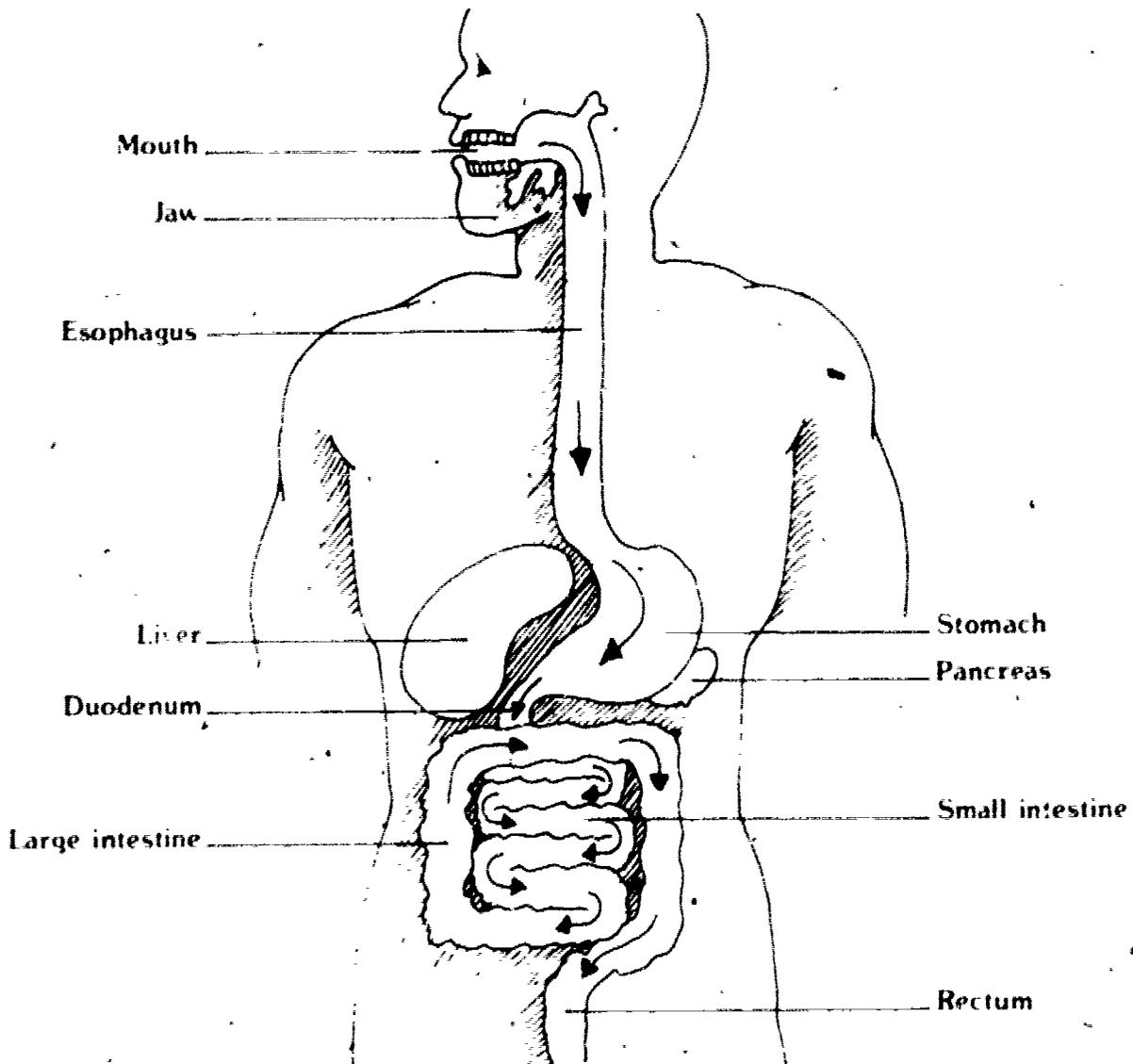
# Digestion

Digestion is the process by which food and the nutrients in the food are broken down into simple forms which can be used by the body cells. For example, carbohydrates are broken down into glucose, fats into fatty acids, and protein into amino acids. Glucose, fatty acids, and amino acids are simple forms of nutrients that the body cells can absorb and use for energy, growth, regulation of body functions, and repair and maintenance of body tissues.

Digestion begins in the mouth, where food is chewed by the teeth, and enzymes in the saliva begin to break down carbohydrates. The next step of digestion occurs as the food passes from the mouth to the stomach through the esophagus. Swallowing forces the food into the opening of the esophagus, and the food is mechanically moved downward to the stomach. This mechanical movement is called peristalsis.

In the stomach further breakdown occurs from the muscle actions and the acid secretions of the stomach. How long the food remains in the stomach varies with the person and the diet, but food generally leaves the stomach in three to four and one half hours.

In the small intestine, carbohydrates are finally broken down to glucose, and proteins are broken down to amino acids. Breakdown of fats to fatty acids also takes place in the small intestine. The simple forms of the nutrients are absorbed into the blood system for transporting to the individual cells. Whatever has not been absorbed from the small intestine goes to the large intestine. Water and some minerals are absorbed into the blood system from the large intestine. Undigested residues and other waste materials are then eliminated from the body.



## Quiz

1. What are the end products of digestion of the three major nutrients?

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2. List in order the five major parts of the body that are involved in the digestion of food and give their functions.

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3. Explain briefly how the nutrients reach the cells from the digestive tract.

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## Answers

1. The end products of digestion of the three major nutrients are as follows

<b>Nutrient</b>	<b>End product</b>
Carbohydrate	Glucose
Fat	Fatty acids
Protein	Amino acids

2. The five parts of the body involved in digestion and their functions are as follows

<b>Part of body</b>	<b>Action</b>
Mouth	Chewing
Esophagus	Peristalsis
Stomach	Initial breakdown of foods
Small intestine	Further breakdown and absorption of nutrients
Large intestine	Elimination of waste materials

3. Nutrients reach the cells by being absorbed into the bloodstream and then by being transported by the blood to the cells

## Recommended Dietary Allowances (RDA)

The Recommended Dietary Allowances (RDA) are national standards which establish nutrient requirements for groups of healthy people. The RDA is determined by a committee of the Food and Nutrition Board of the National Academy of Sciences. Recommended Dietary Allowances are periodically revised as new research provides better data on nutrient needs. The most recent revision of the RDA was published in 1980 (Tables 1 and 2).

The nutrients for which recommendations have been made are protein, vitamin A, vitamin D, vitamin E, ascorbic acid, folacin, niacin, riboflavin, thiamin, vitamin B-6, vitamin B-12, calcium, phosphorus, iodine, iron, magnesium, and zinc. The 1980 revision of the RDA also includes discussions on the needs for other trace minerals and the carbohydrate, fat, and fiber components of the diet.

Recommended Dietary Allowances are given for infants and children, for males and females in the age groups of eleven through fourteen, fifteen through eighteen, nineteen through twenty-two, twenty-three through fifty, and over fifty; and for pregnant and lactating women. The RDA is intended to provide for individual variations among most healthy persons

who live in the United States. For this reason a person does not necessarily have a nutritional deficiency because his or her diet fails to meet the RDA. The RDA is intended to be used as a guide for planning food supplies for groups of people. For example, the goal of the school lunch pattern is to supply one-third of the RDA for a child, ages nine through twelve years. The remaining two-thirds RDA is supposed to be supplied by other meals and snacks that children eat during the day. The theory is that if diets meet 100 percent of the RDA, it will be highly unlikely that people will suffer from a nutritional deficiency unless they are sick or have a condition that increases nutrient needs or interferes with nutrient utilization.

A variation of the RDA is the U.S. Recommended Daily Allowances (U.S. RDA) that appear on food labels. To ensure a U.S. RDA high enough for almost everyone, the RDA for the sex-age category with the highest allowance was selected for most nutrients. The U.S. RDA, therefore, is not meant to be used to determine whether or not a person is getting enough nutrients from foods. Instead, these standards are intended as an aid for comparing the relative nutritional values of different food products.

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### Quiz

Briefly state the purpose of the Recommended Dietary Allowances.

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### Answers

The purpose of the Recommended Dietary Allowances is to establish a guideline for planning adequate food supplies for groups of healthy people.

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**Table 1**  
**Food and Nutrition Board, National Academy of Sciences-National Research Council**  
**RECOMMENDED DAILY DIETARY ALLOWANCES<sup>1</sup>, Revised 1980**  
**Designed for the maintenance of good nutrition of practically all healthy people in the U.S.A.**

Age (years)	Weight (kg) (lbs)		Height (cm) (in)		Protein (g)	Fat soluble vitamins			Water soluble vitamins							Minerals						
						Vitamin A (µg RE) <sup>2</sup>	Vitamin D (µg) <sup>3</sup>	Vitamin E (mg α-TE) <sup>4</sup>	Vitamin C (mg)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg NE) <sup>5</sup>	Vitamin B6 (mg)	Folate <sup>6</sup> (µg)	Vitamin B12 (µg)	Calcium (mg)	Phosphorus (mg)	Magnesium (mg)	Iron (mg)	Zinc (mg)	Iodine (µg)	
Infants	0-0.5	6	13	60	24	kg=2.2	420	10	3	35	0.3	0.4	8	0.3	30	0.5	360	240	50	10	2	40
	0.5-1.0	9	20	71	28	kg=2.0	400	10	4	35	0.5	0.6	8	0.6	45	1.5	540	360	70	15	5	50
Children	1-3	13	29	90	35		400	10	5	45	0.7	0.8	9	0.9	100	2.0	800	800	150	15	10	70
	4-6	20	44	112	44		500	10	6	45	0.9	1.0	11	1.3	200	2.5	800	800	200	10	10	90
	7-10	28	62	132	52		700	10	7	45	1.2	1.4	16	1.6	300	3.0	800	800	250	10	10	120
Males	11-14	45	99	157	62		1000	10	8	50	1.4	1.6	18	1.8	400	3.0	1200	1200	350	18	15	150
	15-18	66	145	176	69		1000	10	10	60	1.4	1.7	18	2.0	400	3.0	1200	1200	400	18	15	150
	19-22	70	154	177	70		1000	7.5	10	60	1.5	1.7	19	2.2	400	3.0	800	800	350	10	15	160
	23-50	70	154	178	70		1000	5	10	60	1.4	1.6	18	2.2	400	3.0	800	800	350	10	15	150
	51+	70	154	178	70		1000	5	10	60	1.2	1.4	16	2.2	400	3.0	800	800	350	10	15	150
Females	11-14	46	101	157	62		400	10	8	50	1.1	1.3	15	1.8	400	3.0	1200	1200	300	18	15	150
	15-18	55	120	163	64		300	10	8	60	1.1	1.3	14	2.0	400	3.0	1200	1200	300	18	15	150
	19-22	55	120	163	64		800	7.5	8	60	1.1	1.3	14	2.0	400	3.0	800	800	300	18	15	150
	23-50	55	120	163	64		800	5	8	60	1.0	1.2	13	2.0	400	3.0	800	800	300	18	15	150
	51+	55	120	163	64		800	5	8	60	1.0	1.2	13	2.0	400	3.0	800	800	300	10	15	150
Pregnant						+30	+200	+5	-2	+20	+0.4	+0.3	-2	+0.6	+400	+1.0	+400	+400	+150	*	+6	+25
Lactating						+20	+400	+5	-3	+40	+0.5	+0.5	-5	+0.5	+100	+1.0	+400	+400	+150	*	+10	+50

- The allowances are intended to provide for individual variations among most normal persons as they live in the United States under usual environmental stresses. Diets should be based on a variety of common foods in order to provide other nutrients for which human requirements have been less well defined.
- Retinol equivalents: 1 retinol equivalent = 1 µg retinol or 6 µg β-carotene.
- As cholecalciferol: 10 µg cholecalciferol = 400 IU vitamin D.
- α-tocopherol equivalents: 1 mg α-tocopherol = 1 α-TE.
- 1 NE (niacin equivalent) is equal to 1 mg of niacin or 60 mg of dietary tryptophan.
- The folacin allowances refer to dietary sources as determined by *Lactobacillus casei* assay after treatment with enzymes (conjugases) to make polyglutamate forms of the vitamin available to the test organism.
- The RDA for vitamin B12 in infants is based on average concentration of the vitamin in human milk. The allowances after weaning are based on energy intake (as recommended by the American Academy of Pediatrics) and consideration of other factors such as intestinal absorption.
- The increased requirement during pregnancy cannot be met by the iron content of habitual American diets nor by the existing iron stores of many women; therefore the use of 30 to 60 mg of supplemental iron is recommended. Iron needs during lactation are not substantially different from those of nonpregnant women, but continued supplementation of the mother for 2 to 3 months after parturition is advisable in order to replenish stores depleted by pregnancy.

**Table 2**  
**Estimated Safe and Adequate Daily Dietary Intakes**  
**of Additional Selected Vitamins and Minerals<sup>1</sup>**

Age (years)	Vitamins			Trace Elements <sup>2</sup>							Electrolytes		
	Vitamin K (µg)	Biotin (µg)	Pantothenic Acid (mg)	Copper (mg)	Manganese (mg)	Fluoride (mg)	Chromium (µg)	Selenium (µg)	Molybdenum (µg)	Sodium (mg)	Potassium (mg)	Chloride (mg)	
Infants	0-0.5	12	35	2	0.5-0.7	0.5-0.7	0.1-0.5	0.01-0.04	0.01-0.04	0.03-0.06	115-350	350-925	275-700
	0.5-1	10-20	50	3	0.7-1.0	0.7-1.0	0.2-1.0	0.02-0.06	0.02-0.06	0.04-0.08	250-750	425-1275	400-1200
Children and Adolescents	1-3	15-30	65	3	1.0-1.5	1.0-1.5	0.5-1.5	0.02-0.08	0.02-0.08	0.05-0.1	325-975	550-1650	500-1500
	4-6	20-40	85	3.4	1.5-2.0	1.5-2.0	1.0-2.5	0.03-0.12	0.03-0.12	0.06-0.15	450-1350	775-2325	700-2100
Adults	7-10	30-60	120	4.5	2.0-2.5	2.0-3.0	1.5-2.5	0.05-0.2	0.05-0.2	0.1-0.3	600-1800	1000-3000	925-2775
	11+	50-100	100-200	4.7	2.0-3.0	2.5-5.0	1.5-2.5	0.05-0.2	0.05-0.2	0.15-0.5	900-2700	1525-4575	1400-4200
Adults	70-140	100-200	4.7	2.0-3.0	2.5-5.0	1.5-4.0	0.05-0.2	0.05-0.2	0.1-0.35	1100-3300	1875-5625	1700-5100	

- Because there is less information on which to base allowances these figures are not given in the main table of the RDA and are provided here in the form of ranges of recommended intakes.
- Since the toxic levels for many trace elements may be only several times usual intakes, the upper levels for the trace elements given in this table should not be habitually exceeded.

## Food Groupings

The nutrient requirements of an individual or group of people may be met in many ways. Because no one food contains all the essential nutrients, it is important to eat a variety of foods every day. Food guides have been developed that group foods according to their nutrient content. In this country, a general guide for meeting nutritional needs is the Four Food Groups, or the Basic Four. The guide below suggests daily food requirements for persons of various ages.

The Basic Four is a clear and simple guide for dietary planning; however, its use has some limitations. Since the nutrient composition of specific foods within each food group varies, the Recommended Dietary Allowances for all nutrients are not always ensured, even when a person eats the recommended servings from each of the groups. Furthermore, technology has developed combination foods which usually do not contain enough of any one food group to be listed as a serving. Categorizing these foods into one or more of the groups is difficult.

In addition, the Basic Four does not classify food by types or amounts of protein, carbohydrate, or fat, which are also important considerations when planning daily food intake. Although the Basic Four is a useful tool in meal planning, it does not completely

satisfy the need to learn about the nutrient composition of foods.

Depending on selections within each group, the Basic Four will supply approximately 1,000 to 1,500 calories per day. Additional calories can be obtained if one eats larger portions than those specified or consumes moderate amounts of sweeteners and desserts.

Nutrition can be improved in different ways when making food choices from the Basic Four. Choose whole grain products when selecting foods from the Bread and Cereal Group. Select vitamin C fruits and dark green leafy vegetables from the Fruit and Vegetable Group. Choose nonfat or low-fat products from the Milk and Cheese Group, and include vegetable protein foods, such as nuts, seeds, and legumes, when selecting foods from the Meat, Poultry, Fish and Beans Group.

A food grouping system consisting of five food groups has recently been developed by the U.S. Department of Agriculture. In addition to the four food groups mentioned, a fifth group, Fats-Sweets-Alcohol, has been added. This group provides mainly calories and little in the way of nutrients. The important rule to be emphasized is that the diet should include a wide variety of foods that contribute the nutrients the body needs.

<b>Food group</b>	<b>Number of servings suggested</b>	<b>Foods included in food group</b>
Milk and Cheese	Children under nine: 2 to 3 servings a day Children nine to twelve: 3 or more servings a day Teenagers: 4 or more servings a day Adults: 2 or more servings a day 1 serving is 8 oz (240 mL) of milk or equivalent	Whole, evaporated, skim, and dry milk, buttermilk, cheese, ice cream, and yogurt (Remember, the milk group does not include butter or eggs.)
Meat, Poultry, Fish, and Beans	Two 2 3/4 oz (84 g) cooked lean servings a day or 1 cup cooked dried beans or peas	Beef, veal, lamb, pork, liver, kidney, poultry, fish, eggs, dry beans and peas, lentils, nuts, seeds, and peanut butter
Fruit and Vegetable	Four 1/2-cup (120 mL) servings a day with one good source of vitamin C a day and one good source of vitamin A every other day	All fruits and vegetables
Bread and Cereal	Four servings daily	All breads and cereals that are whole grain, enriched, or restored, such as cornmeal, flour, macaroni, noodles, rice, and oats; also those foods made from the above products such as cornbread, muffins, crackers, and pancakes

## Quiz

1. From the Basic Four food groups, give the daily number of servings needed by a teenager. Name two nutrients supplied by each group.

Food group	Number of servings	Nutrients supplied
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

2. List three limitations in using the Basic Four as a guide for dietary planning.

\_\_\_\_\_

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3. What food selection recommendations could be made for each of the Basic Four food groups to improve their usefulness as a dietary guide?

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### Answers

1. The following is a brief summary of the Basic Four for a teenager

Food group	Number of servings	Nutrients supplied
Milk and Cheese	4	Calcium, riboflavin, protein, vitamin A, and vitamin D
Meat, Poultry, Fish and Beans	2	Protein, iron, B vitamins, fat, and zinc
Fruit and Vegetable	4	Vitamin C, vitamin A, folic acid, calcium, and iron
Bread and Cereal	4	Carbohydrate, iron, and thiamin

2. The following are limitations of the Basic Four as a guide for dietary planning

- Since nutrients vary for foods in specific groups, the RDA for all nutrients is not always assured
- Foods are not classified by types or amounts of protein, carbohydrate, and fat, which are also important considerations in dietary planning
- It is difficult to categorize combination type foods

3. The following food selections will improve the usefulness of the Basic Four as a dietary guide

- Include whole grains
- Include vitamin C fruits and dark green leafy vegetables
- Include vegetable protein foods
- Include nonfat and low fat milk products

## Vegetarian Approach to Eating

Vegetarianism is one approach to eating, but this practice requires careful planning to ensure that the vegetarian obtains the essential nutrients for good health. People choose vegetarian diets for many reasons, some of which include religious beliefs, desire for better health, lower cost, and ethical objections to animal slaughter. Vegetarian food habits are diverse and combine different foods.

**Vegans** are people who eat no animal foods. Meat, poultry, fish, eggs, and dairy products are not consumed. These vegetarians can obtain necessary nutrients to maintain good health if they take special care to include in the diet whole grain cereals, legumes, nuts, and nutlike seeds, as well as a wide variety of fruits and dark green vegetables. This variety is necessary to ensure that one has an adequate intake of essential amino acids and the more difficult to obtain vitamins and minerals. Vitamin B-12 is not supplied when animal products are eliminated from

the diet. This omission can cause a vitamin B-12 deficiency in vegans.

**Lacto-vegetarians** are people who include milk or milk products but exclude meat, poultry, fish, seafood, and eggs from their diets.

The **lacto-ovo-vegetarian** consumes dairy products and eggs but eats no flesh (e.g., meat, poultry, fish, and seafood). It is easier for the lacto-ovo-vegetarian to obtain the necessary nutrients to maintain good health, because foods included in the diet provide adequate amounts of protein, calcium, and B-vitamins. However, lacto-ovo-vegetarians and other types of vegetarians must give extra consideration to consuming adequate amounts of protein, vitamins, minerals, and energy-containing foods (calories). A well-planned diet, consisting of a variety of largely unrefined plant foods supplemented with some milk and eggs (lacto-ovo-vegetarian diet), meets all known nutrient needs.

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### Quiz

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How can a vegetarian diet be adequate, balanced, and healthful?

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### Answers

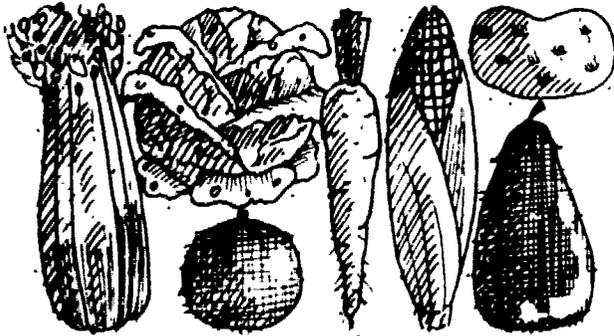
The vegetarian diet can be adequate, balanced, and healthful by using alternative animal protein sources (eggs, milk, cheese) and by taking special care in combining the vegetable proteins in the diet (cereals, grains, legumes, nuts, and seeds)

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# Sources of Food

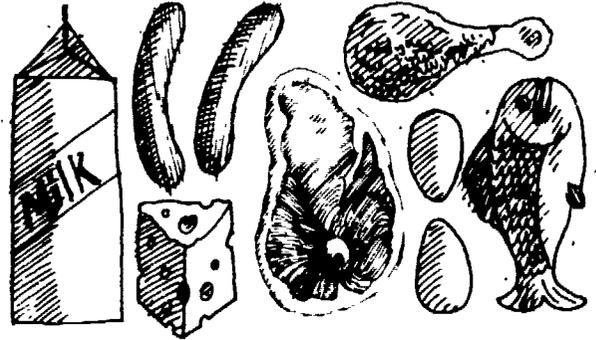
Two sources of food are available: **plants** and **animals**. Foods such as fruits, vegetables, nuts, and grains are derived from plants. The term **meat** refers to the edible portion of mammals, which includes cattle, swine, and sheep. Also included with the term **meat** for nutritional consideration and for meal planning purposes are poultry, fish, and other seafood products. Dairy products, such as milk, eggs, and cheeses, are also considered as animal products, because they come from animals.

Some plant sources of protein include legumes, nuts, grains, and seeds, while animal sources of protein include poultry, fish, beef, pork, milk, and eggs. Some plant sources of fat include cottonseed oil, corn oil, margarine (if made from vegetable oils), and nuts,



while butter and lard are animal sources of fat. Some plant sources of carbohydrate include fruits, vegetables, cereals, grains, and legumes. Animal sources of carbohydrate include milk and milk products.

Not all plants contain the same nutrients. The nutrients in a plant may vary for a variety of reasons. The plant variety, the mineral composition of the soil, and the amount of water available to the plant are examples of factors that cause variation in the nutrient composition in the plant. Not only are the nutrients of plants affected during growth, but the storage



and processing of the plant after harvest also affect the nutritional value of the food. Once the plant product is purchased by the consumer and taken home, the method of home storage and preparation affect the nutritional value of the plant product.

Some foods have been enriched or fortified to increase the nutritional value. Enrichment is a process which **replaces** the thiamin, riboflavin, niacin, and iron lost in the processing of grains. Fortification is a process that **adds** nutrients to foods in amounts that were not originally present. For example, milk is fortified with vitamin D, and margarine is fortified with vitamin A.

## Quiz

1. Give one animal and one plant source of protein, fat, and carbohydrate.

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2. List the factors that determine the nutrient composition of plant foods.

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### Answers

1. The following are plant and animal sources of carbohydrate, fat, and protein:

<b>Nutrients</b>	<b>Plant sources</b>	<b>Animal sources</b>
Carbohydrate	Fruits, vegetables, cereals, grains, and legumes	Milk and milk products
Fat	Vegetable oils, margarine (made from vegetable oils), and nuts	Butter and lard
Protein	Beans, nuts, grains, and seeds	Poultry, fish, beef, pork, milk, and eggs

- 2 Plant variety, composition of the soil, amount of water, storage and processing, and home storage and preparation are examples of factors that determine the nutrient composition of plant foods
- 3 Enrichment replaces the thiamin, riboflavin, niacin, and iron lost in the processing of cereals and grains. Fortification adds nutrients not present originally to foods
-

# Factors Influencing Food Choices

Students can learn the importance of a nutritionally adequate diet through a positive daily school lunchroom experience and appropriate classroom reinforcement. A continuing and sequential educational process will enable students to transform knowledge about their nutritional needs and the nutritive value of foods into decisions that affect their eating behavior and their health and well-being.

School food programs include the National School Lunch Program, the School Breakfast Program, the Child Care Food Program, the Special Milk Program, and the Summer Food Service Program for Children.

The National School Lunch Program serves nutritious, low-priced meals to children who attend participating schools and residential child care institutions. Children from low-income families may receive lunches, free or at a reduced price. Federal and state funds and federal commodities are provided to assist schools in the lunch and breakfast programs.

Lunches served at school are planned to meet the guidelines set by the United States Department of Agriculture (USDA). The school lunch pattern is based on the needs of a boy and girl ages nine through twelve years (refer to Table 3, Group 4). To better meet the food and nutrition needs of all children, USDA recommends, but does not require, that

food portions be adjusted by age/grade group. If portions are not adjusted, school lunch programs must provide to all children the food portions listed in Table 3, Group 4.

Schools may also participate in the School Breakfast Program, which provides nutritious, low-priced breakfasts to children. Children from low-income families can receive the breakfast free or at a reduced price. Since children who go to school hungry may find it difficult to stay alert and learn, the School Breakfast and Lunch Programs can help children attain their full potential, both mentally and physically.

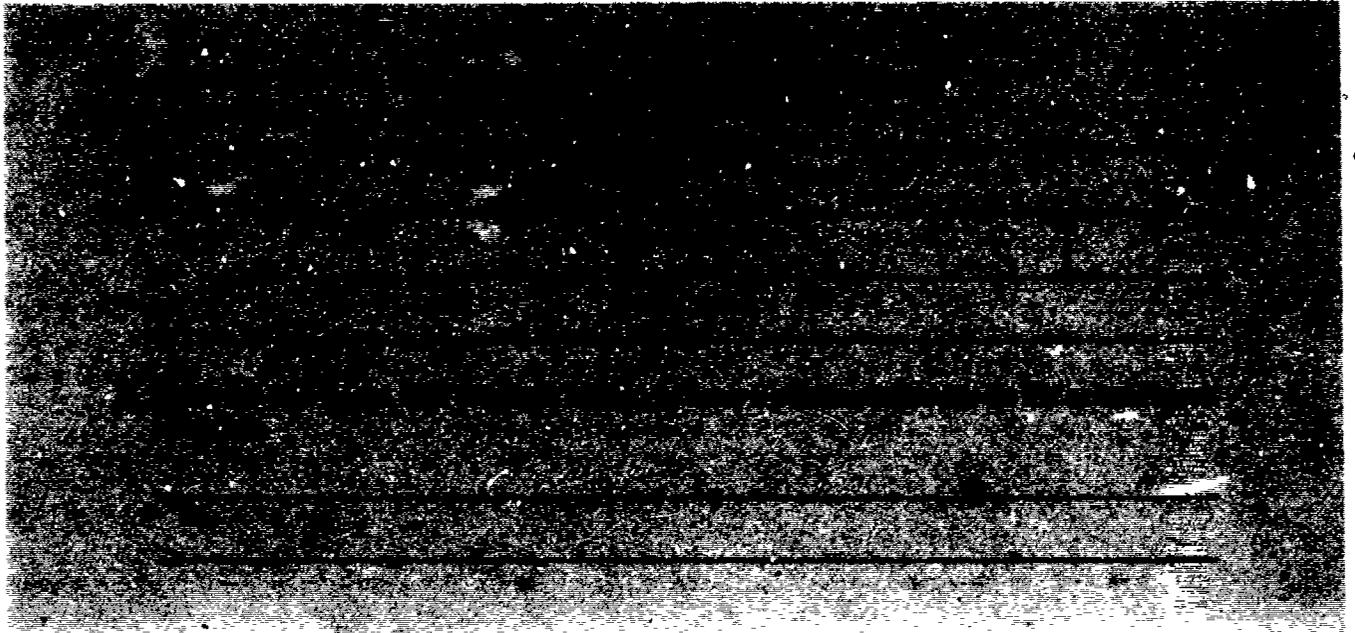
Students can participate in the school lunch program in many ways. The American School Food Service Association sponsors youth advisory councils, which are formed so that students, school staff, food service personnel, and parents can work together to influence school lunch programs. Examples of council activities are (1) making suggestions for school lunch menus; (2) improving the lunchroom environment with posters or clean-up campaigns; (3) developing nutrition education programs; (4) conducting surveys for opinions and suggestions; and (5) organizing food tasting panels to sample new recipes and food products.

**Table 3**  
**Minimum Food Quantities for Students Participating in the**  
**National School Lunch Program**

Food	Minimum quantities, by grade level				
	Preschool		Grades K-3 ages 5-8 (Group 3)	Grades 4-12 ages 9 & over (Group 4)	Grades 7-12 Recommended quantities (Group 5)
	ages 1-2 (Group 1)	ages 3-4 (Group 2)			
<b>Meat or Meat Alternate</b> A serving of one of the following or a combination to give an equivalent quantity: Lean meat, poultry, or fish..... (edible portion as served) Cheese ..... Large egg ..... Cooked dry beans or peas..... Peanut butter.....	1 oz (28 g)  1 oz (28 g)  1  ½ cup (118 mL)  2 Tbsp (30 mL)	1½ oz (42 g)  1½ oz (42 g)  1  ½ cup (118 mL)  3 Tbsp (45 mL)	1½ oz (42 g)  1½ oz (42 g)  1  ½ cup (118 mL)  3 Tbsp (45 mL)	2 oz (56 g)  2 oz (56 g)  1  ½ cup (118 mL)  4 Tbsp (60 mL)	3 oz (84 g)  3 oz (84 g)  1  ½ cup (118 mL)  6 Tbsp (90 mL)
<b>Vegetable and/or Fruit</b> Two or more servings of vegetables or fruit or both to total .....	½ cup (118 mL)	½ cup (118 mL)	½ cup (118 mL)	¾ cup (177 mL)	¾ cup (177 mL)
<b>Bread or Bread Alternate</b> Servings of bread and bread alternate .. <b>A serving is:</b> • 1 slice of whole grain or enriched bread • A biscuit, roll, muffin, etc., whole grain or enriched • ½ cup (118 mL) of cooked whole grain or enriched rice, macaroni, noodles, other whole grain or enriched pasta products, or other cereal grains such as bulgur or corn grits • A combination of any of the above	5 per week	8 per week	8 per week	8 per week	10 per week
<b>Milk</b> A serving of fluid milk ..... At least one of the following forms of milk must be offered: Unflavored lowfat milk Unflavored skim milk Unflavored buttermilk	¾ cup (6 fl oz) (180 mL)	¾ cup (6 fl oz) (180 mL)	½ pint (8 fl oz) (240 mL)	½ pint (8 fl oz) (240 mL)	½ pint (8 fl oz) (240 mL)

## Quiz

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### Answers

- 1 The four food categories in the school lunch pattern are as follows
  - a Meat or meat alternate
  - b Fruit and or vegetable
  - c Bread or bread alternate
  - d Milk
- 2 Some things students can do to have a positive influence on the school lunch program include the following:
  - a Form youth advisory councils
  - b Improve the lunchroom environment
  - c Work with food service personnel to develop nutrition education programs
  - d Obtain student suggestions and opinions

# Food-Related Careers

Food is the nation's largest business. One out of every five workers in the United States works on a farm or in a food-related industry. Farming alone employs 4.3 million workers. Two million people have jobs in providing supplies that farmers use in food production. Seven million people are employed in food marketing, including those in canneries, meat packing plants, transportation, and local supermarkets. The food service industry also employs cooks, waiters, chefs, dining room attendants, and food service managers.

Closely related to the food industry are the health professionals who provide information on food selection for general health. Some of these people include the dentist, doctor, nurse, nutritionist, and dietitian. These professionals work in medical offices, public health departments, cooperative extension offices, and state and local education agencies.

Hospitals, schools, cafeterias, restaurants, homes for the convalescent and aged, industry, governmental agencies, and food processing plants are just a few of the places that employ people in work related to food and nutrition. The career possibilities in these places of employment vary widely, ranging from those requiring limited skills to those requiring advanced graduate degrees.

## Professional Employment Opportunities

For people who enjoy traveling and who have earned a college degree in food and nutrition or home economics, employment opportunities are available in most states with the U.S. Department of Agriculture and with special interest groups, such as citrus growers, milk producers, and meat processors. Home economists employed by one of these agencies or special interest groups may travel extensively to dem-

onstrate meal preparation and programs for selected audiences. They do various types of promotional work, such as preparing recipe booklets and brochures, conducting radio and television programs, and developing educational materials.

Food researchers, food technologists, and food chemists are employed by governmental agencies and privately owned companies to conduct experiments with natural and synthetic materials, to discover uses for the by-products of the food processing plants, and to develop new food products.

Nutritionists have specialized training in nutrition and often combine the biological bases of nutrition with social science. This interdisciplinary approach gives a person the understanding necessary to coordinate all the social and scientific factors involved in solving nutrition problems associated with community nutrition jobs. Many jobs in community nutrition require an advanced degree in nutrition, public health, or related fields. These jobs, whether in the areas of teaching, research, or nutritional programs, are within health, education, and social service agencies at the local, state, national, and international levels.

Dietitians have specialized training in nutrition, biochemistry, food science, communication, and management techniques. To become a registered dietitian, a person must complete an internship or a program approved by the American Dietetics Association. Once dietitians are registered, they generally seek employment in administrative, therapeutic, teaching, research, or public health/public service positions in clinics, hospitals, schools, or other similar institutions. The role for dietitians is growing in settings other than health care institutions; for example, in state and federal nutrition programs, nutrition education, VISTA, Peace Corps, and cooperative extension work.

### Employment Opportunities for Skilled Persons

At the skilled level, a food service manager may supervise a restaurant, school eating facility, or short order drive in. The manager is usually responsible for hiring, training, and supervising other employees.

A caterer plans, prepares, and serves special food for large groups, who may be entertained in a private home or public place. A type of catering service which is gaining in popularity is "Meals on Wheels." In this program, meals are prepared in a central kitchen and then taken to the residence of the elderly, infirmed, bed ridden, or handicapped person. These programs offer opportunities for those persons who wish to do worthwhile volunteer service on a part-time basis.

Large food companies employ skilled and professional people to develop new products, recipes, and ways of using their products.

### Opportunities for Semiskilled Persons

At the semiskilled level, employment opportunities exist for food service employees, such as dietetic aides, cooks, and bakers who often work under the supervision of a dietitian or food service manager and

learn their skills on the job. In many large institutions, tasks for semiskilled employees have become so specialized that job duties may be limited to preparing trays, serving patients or customers, or making salads. Caterers or vending machine companies often employ people whose primary task may be preparing sandwiches.

### Job Factors

Before deciding on a career in the food industry, students should examine all factors that will contribute to job satisfaction and productivity. They should attempt to answer some of the following questions:

1. What are the typical duties and responsibilities of the job?
2. What are the educational and skill requirements of the job?
3. What impact will the job have on lifestyles?
4. Will there be travel or long hours?
5. What are the future possibilities of the job?
6. What are the rewards of the job, including income?
7. Does the job provide for career mobility and opportunities for advancement?

### Quiz

1. Name two careers in the food production and/or food handling industry.

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2. Name two careers in the food service industry.

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3. Name two health professionals who provide advice on food selection in relation to dental and general health.

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4. List five things students should consider when making decisions about food-related careers.

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## Answers

1. Vocations in the food production and or food handling industry include farmer, truck driver, processor, and storekeeper
  2. Vocations in the food service industry include cook, waiter, chef, and food service manager
  3. Health professionals who provide advice on food selection in relation to dental and general health are the nutritionist, dietitian, doctor, nurse, and dentist
  4. The following are things students should know to guide their decision making regarding food related careers
    - a. Typical duties and responsibilities
    - b. Education and skills required
    - c. Life style associated with the job
    - d. Future job market
    - e. Income and rewards
    - f. Physical requirements
    - g. Career mobility
-

# Consumer Competencies

Decisions about food influence all aspects of a person's well-being, and a person's economic well-being affects food choices and food availability. Satisfying the important need for food requires resources, whether they be thought of in terms of money or hours of labor. How adequately the need for food can be met depends on the extent of the resources, the cost of one's needs and desires (including those associated with food), the decisions made concerning the priorities of needs, and the external influences of merchandising and mass media in modifying or initiating behaviors. Thus, the effective use of resources may enhance the potential for satisfying individual and family nutritional needs.

## Food Decisions

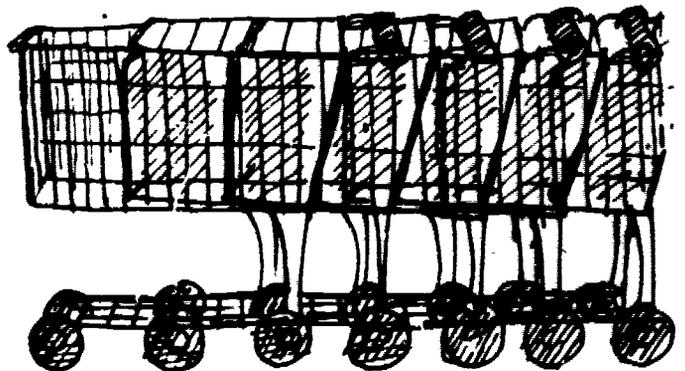
Consumer food purchases are influenced by many factors in addition to nutritional value. Consumers need to be aware of these influences so that they can select nutritious foods.

Because of the current inflation rate, most consumer food purchases are influenced by the cost factor. However, consumers need not sacrifice nutrition in order to stay within their budgets; they can use unit pricing to compare items and to select the best buy. Consumers can plan meals ahead and then shop with a list to limit impulse purchasing. Consumers can also take advantage of specials and modify their menus accordingly to include these foods. Consumers can purchase store brands or generic foods rather than the more expensive national brand foods. Finally, they can use coupons to save money on regularly purchased items.

External factors other than price influence food choices. Advertising in the media and in the supermarket affects what people buy. The availability of certain foods also determines whether or not they are purchased by the consumer. The convenience of preparation and storage also influences customer selections.

Consumers should also be aware of emotional factors which sometimes influence food purchasing.

Foods are often judged on the basis of appearance, odor, and taste. Children may have grown up with a particular food as a reward for a desired behavior, which carries over into adult life. A person's food intake is often affected by anxiety, depression, or stress. Some foods are used to express love. Some foods can take on a particular meaning if they have been associated with pleasant or unpleasant experiences in the past. Consumers need to have some insight into their own emotions regarding food to make wise nutritional choices.



## Quiz

1. List two ways consumers can reduce the food budget without sacrificing nutritional quality in the diet.

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2. List two personal or emotional factors that influence an individual's food decisions.

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3. List two external factors that influence an individual's food decisions.

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## Answers

1. Ways in which consumers can reduce food costs without sacrificing nutritional quality are as follows:
  - a. Use unit pricing
  - b. Plan ahead and use a shopping list
  - c. Take advantage of specials
  - d. Buy house brands or generic foods
  - e. Use coupons
2. Personal and emotional factors that influence food decisions are:
  - a. Past experience
  - b. Anxiety, depression, or stress
  - c. Expression of love
  - d. Reward for desired behavior
  - e. Appearance, odor, and taste
3. External factors that influence food decisions are:
  - a. Advertising
  - b. Food labels
  - c. Merchandising
  - d. Cost
  - e. Availability
  - f. Convenience
  - g. Cooling and storage required

## Labeling, Advertising, and Merchandising

Labels are essential for getting foods from the manufacturer to the consumer. Without food labels, it would be impossible to determine the contents of a container or to know how the food item should be stored. Furthermore, federal law requires food labeling. Every label must contain the brand name, the product name, the product ingredients listed in order of the greatest proportions first, net weight, lot number and expiration date, manufacturer's name and address, and in some cases nutritional information (Figure 1). Manufacturers need not list the ingredients on a product for which there is an identity standard if the product meets the standard. Examples of standard foods include milk, cheese, ice cream, margarine, certain seafoods, sweeteners, salad dressings, and mayonnaise.

Nutritional labeling must appear on any product in which a nutrient has been added or for which a nutritional claim has been made. The label on foods that have nutrients added during manufacturing, such as vitamin-enriched or protein-fortified foods, will list the nutritional information on the basis of serving portion. The number of calories and the grams of protein, carbohydrate, and fat will be listed per portion. The percentage of the U.S. Recommended Daily Allowances for protein, vitamin A, vitamin C, thiamin, riboflavin, niacin, calcium, and iron per serving will also be stated on the labels for packaged foods. Nutritional labeling allows one to compare the nutrient value of various foods to determine which foods are particularly good sources of various nutrients. New foods can be compared easily with familiar foods.

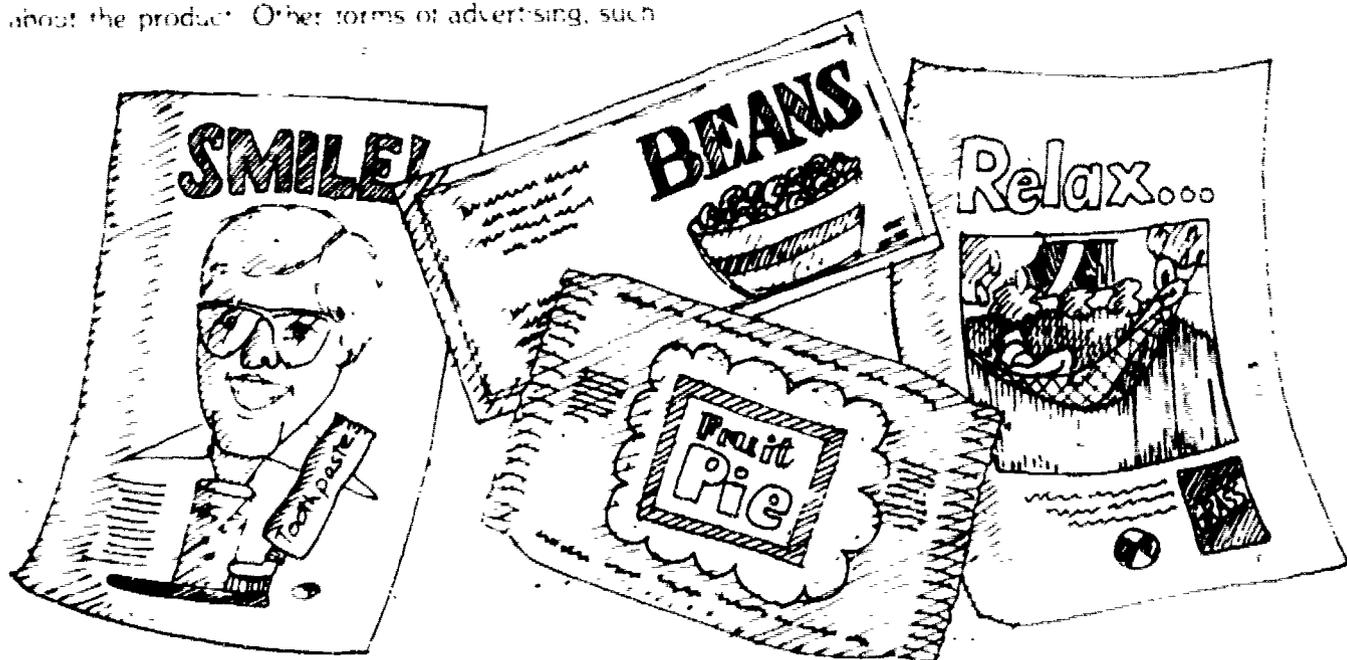
Labeling is a form of advertising. It is communication from the manufacturer or seller to the consumer about the product. Other forms of advertising, such

as television commercials and newspaper ads, also communicate to consumers what is available on the market and give consumers information upon which to make comparisons between various products.

However, not all advertising is considered favorable by consumers. Many consumers believe advertising increases the price of the product and does not give enough information for consumers to make valid decisions. Furthermore, much advertising is thought to be persuasive rather than informational.

Merchandising techniques are used by the store owner to get customers to purchase items once the customer is in the store. Purchases are influenced most by the particular layout of the store. For example, higher profit items are placed in the most accessible areas, while lower profit items are placed in the least desirable locations of the store. The same is true with the shelf location of items. It is no accident that certain foods are at particular locations on the store shelves. Much planning occurs with the placement. Generally, store "specials" are located deep in the store so that the customers are exposed to many items before they come to the "special." Oftentimes stores will place companion items together. Most stores will have ice cream toppings and ice cream cones near the ice cream even though they are not generally freezer items. All merchandising techniques are designed to encourage customers to purchase food.

Consumers need to be aware of the role that labeling, advertising, and merchandising play in their food selection. In order to make wise food purchases, consumers must be able to evaluate the information that is provided and the techniques that are used.



**6 Nutrition Information**  
per Serving Size 1 Cup with Juice  
Contains approx. 2 1/2 cups (2 1/2 servings) **8**

Calories 140  
Protein 1 gram  
Carbohydrates 35 grams  
Fat 1 gram

**7 Percentage of U.S. Recommended Daily Allowances (U.S. RDA):**

Protein	Riboflavin	2
Vitamin A	Niacin	2
Vitamin C	Calcium	2
Thiamin	Iron	4

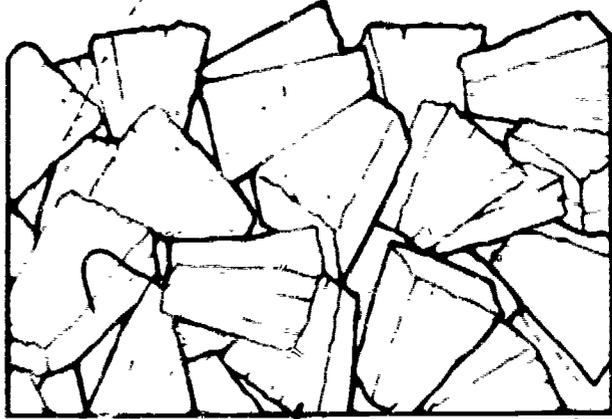
\*Contains less than 2% of the U.S. RDA of this nutrient **9**

**5 U.S. grade A**

**12 Best used before February 1983**



**10**



**2 NET WT. 16 oz (1 lb.) 454 grams**

**\*Weight of pineapple 10.5 oz.**

**3 Packed by Aloha Cannery  
Honolulu, Hawaii**

- 1 The name of the product must be on all food labels as well as variety, style, and how the product is packed.
- 2 The net contents or net weight, including liquid, must be on all food labels.
- 3 The name and place of business of the manufacturer, packer, or distributor must be on all food labels.
- 4 On most foods, the ingredients must be listed on the label and they must be listed in descending order with the ingredients of greatest quantity or weight listed first.
- 5 Some food products carry a grade on the label.
- 6 Nutrition information is required if the product says "enriched" or "fortified" or makes any other nutritional claim.
- 7 Percent U.S. RDA is required on all foods that say "enriched" or "fortified" or make any other nutritional claims, except fresh bakery goods, raw fruits and vegetables, and unprocessed dairy products. The label has to have the percent of protein, vitamin A, thiamin, riboflavin, niacin, vitamin C, calcium, and iron in one serving.
- 8 Serving information includes the size of the serving and how many servings are in the can.
- 9 An asterisk (\*) means the food contains less than 2 percent of the nutrient in one serving.
- 10 Many food labels now include a small block of parallel lines of various widths with accompanying numbers for computerized check outs and inventories.
- 11 The symbol **®** on a label signifies that the trademark used on the label is registered with the U.S. Patent Office.
- 12 To help consumers obtain fresh and wholesome food, many manufacturers open date their product or use code dating on products that have a long "shelf life".

Also required:  
If the product is below government standards, it must say "imitation."  
If any artificial flavor, color, or preservative is used, it must be noted on the label.

**Fig. 1. Typical Label on Canned Food**

Contains Chunk Pineapple  
and Pineapple Juice

④

Weight of pineapple means  
weight before addition of liquid  
necessary for canning

**MOM'S**® ⑪

NO SUGAR ADDED

**PINEAPPLE**

**CHUNKS**®

## Quiz

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1. State three ways that food labels can be used by consumers.

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2. Name one merchandising and one advertising technique; give an example of how each affects a person's buying habits.

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## Answers

1. Consumers use food labels in the following ways:
- To learn the ingredients in a food
  - To assist in comparison shopping
  - To learn the nutritional composition of various foods
  - To learn the quantity and number of servings in the package
2. Examples of one merchandising and one advertising technique are as follows:
- Easy access to groceries at eye level is a merchandising technique that can encourage unplanned and spontaneous purchases.
  - Television advertisements can persuade consumers to purchase a particular product.

# Nutrition Labeling

Under regulations from the U.S. Food and Drug Administration, any food to which a nutrient has been added, or any food for which a nutritional claim is made, must have the nutritional content listed on the label.

The number of calories and the amount of protein, carbohydrate, and fat in a serving of the product are listed on the nutrition label. The label also contains the percent of the U.S. Recommended Daily Allowances (U.S. RDA) of protein and seven important vitamins and minerals contained in each serving of the product. This nutritional information can help a person shop for more nutritious food and plan more nutritionally balanced meals.

Nutrition information is also given on a per serving basis. The size of a serving (for example: one cup [240 mL], two ounces [57 g], 1 tablespoon [15 mL]), the number of servings in the container, the number of calories per serving, and the amounts in grams of protein, carbohydrate, and fat per serving are listed on the label.

Protein is listed twice on the label, in grams and as a percent of the U.S. RDA.

Seven vitamins and minerals must be shown in a specific order (e.g., vitamin A, vitamin C, thiamin, riboflavin, niacin, calcium, and iron).

In addition to the mandatory vitamin and mineral listings on labels, 12 other nutrients may be shown. Nine of these 12 nutrients have RDA and include:

## Vitamins

Vitamin D  
Vitamin E  
Vitamin B-6  
Folacin (folic acid)  
Vitamin B-12

## Minerals

Phosphorus  
Iodine  
Magnesium  
Zinc

The U.S. RDA, as previously discussed in Chapter Two, are the approximate amounts of protein, vitamins, and minerals that a person should eat every day to keep healthy. Nutrition labels list the U.S. RDA by percent. For example, the label may state that one serving of the food contains 35 percent of the recommended daily allowance of vitamin A and 25 percent of the recommended daily allowance of iron. The total amount of food an individual eats in a day should supply the U.S. RDA of all essential nutrients in an amount sufficient to maintain good health.

## Quiz

1. What information may be obtained from nutrition labels?

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2. When is nutrition labeling required on a product?

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### Answers

1. Nutrition labels state the number of calories and how much protein, carbohydrate and fat are in a serving of the product. In addition, they give the percent of the US Recommended Daily Allowances (US RDA) of protein and seven important vitamins and minerals contained in each serving of the product.
  2. Nutrition labeling is required when a nutrient has been added to the product or when a nutritional claim has been made about the product.
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# Food Handling

No food, no matter how nutritious or good-tasting, is of benefit to human beings if it is unsafe. The safety and quality of food are influenced by the manner in which it is grown, processed, preserved, stored, and prepared.

## Food Production

An abundant food supply has resulted from technical advancements in agricultural production and food processing. Greater crop yields; faster growth rates of farm animals; improved appearance, flavor, and nutrient composition of foods; protection from food-borne illnesses; and longer shelf life are some of the advantages that technology has produced. These improvements have come about through the use of new varieties of plants, improved breeds of animals, and the use of fertilizers, pesticides, and food additives.

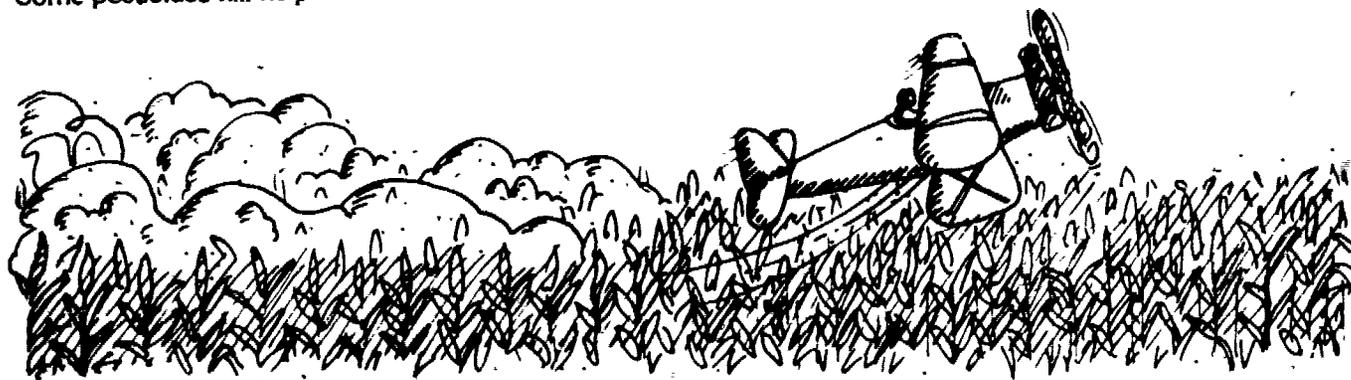
### Pesticides

Pesticides are chemicals used to control insects and diseases that attack crops. The use of pesticides increases crop yield, because losses resulting from damage and disease to the crops are reduced. However, there are costs to society from these benefits. Some pesticides kill helpful as well as harmful insects.

Other pesticides leave residues on food which may be hazardous to human health. Furthermore, while an insect or disease may be controlled by one pesticide, nature is busy developing a new, more resistant strain of pest. Pesticides developed to kill the new strains may be more potent than older pesticides and, thus, are potentially more dangerous to humans. Because of these risks, the United States Department of Agriculture is promoting an integrated insect and disease control program to reduce the use of pesticides. This program uses pesticides only when absolutely required and relies on biological control methods, such as preserving natural predators of insects and improving plant resistance to disease.

### Food Additives

Food additives have also contributed to an abundant supply of food. Additives are used in animal feed



to improve the growth of farm animals and in many food products to improve flavor and texture of food and to prolong shelf life. One of the most important functions of additives is to prevent growth of microorganisms that cause food-borne illnesses in humans.

As with pesticides, however, there is another side to the use of additives. Some food additives used in the past have been shown to cause cancer in laboratory animals. Some food additives, such as artificial colors, are used mainly to attract the consumer and do not necessarily improve the quality of the food.

The Delany Amendment of the Food, Drug, and Cosmetic Act, passed in 1958, protects consumers against some of these risks. This law regulates the amounts of additives that can be added to foods and bans those substances that cause cancer in animals, regardless of the dosage.

### Organic Versus Processed Foods

Some people believe that organic and natural foods are preferable to processed foods. Organic foods are usually defined as foods grown without the use of chemical fertilizers and pesticides. Natural foods are foods without additives and with minimum processing. Although there are some valid ecological and philosophical reasons in favor of natural and organic foods, no evidence indicates that they are more nutritious than foods grown with chemical fertilizers and pesticides. In scientific terms the word *organic* simply means that the compound contains carbon atoms. Most food products from plant and animal sources are organic in that they contain carbon. The consumer needs to be aware that there is currently in California a legal definition for the term *organic* and that the use of this word on a label should mean that the product has been grown organically and is free of synthetic additives.

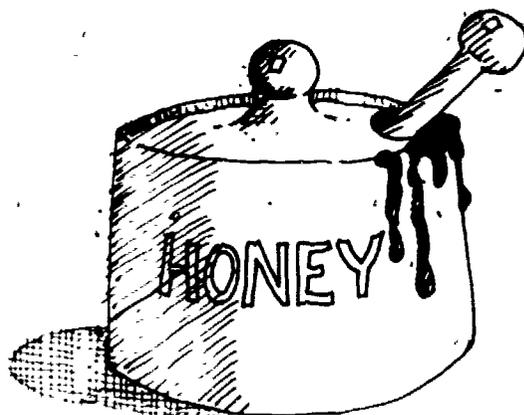
### Nutritional or Dietary Claims

An excellent example of the confusion that exists in the natural and organic food markets is the claim that honey and brown sugar, which are more natural food products, are nutritionally superior to white sugar. All sugars, whatever the source, provide the same number of calories. Most commercially available brown sugar is made by spraying white sugar with molasses, and

the vitamin and mineral content of white and brown sugar does not differ significantly.

Honey has been attributed with a number of beneficial nutritional properties, but none stands up to scientific investigation. The quantities of vitamins and minerals in honey are too small to make any significant contribution to nutrition.

The case of honey versus sugar is just one example of how consumers can be misled by nutrition claims. It is difficult for consumers to know all the technical



details about nutrition needed to separate fiction from fact. There are, however, some general guidelines that consumers can use to evaluate the validity of nutrition claims. For example, the author or promoter often uses value-laden or emotion-charged language rather than an objective presentation of facts. The author or promoter also relies on testimonials to support claims rather than scientific research. If research is cited to support the claims, the author or promoter may directly apply experimental research on animals to human beings without qualifications and claim seemingly miraculous, overnight effects from a dietary regimen. The author or promoter also claims nutritional relationships or dietary cures for a host of disease conditions on the basis of simple correlations between diet and the disappearance of symptoms without regard for the psychological placebo effect. The best defense consumers have against food and nutrition misinformation is a critical attitude towards any new claim and the willingness to test the claim against the steps of the scientific method.

1. Define the following terms: *nutrient*, *nutrient density*, and the scientific definition of the term *nutrient*.

2. Are there any nutritional benefits from using honey or brown sugar instead of white sugar?

3. What are some techniques that can be used to recognize unreliable and invalid nutrition information?

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## Answers

1. Pesticides and food additives are used in food production and processing to increase the yield of crops, to improve the growth rates of farm animals, and to improve the nutrient composition, shelf life, taste, and appearance of food. All of these uses of pesticides and food additives result in an abundant and widely available food supply. The current issue involves the costs to society from these benefits. Pesticides may kill helpful as well as harmful insects and leave toxic residues on foods. The side effects of some substances used to promote growth in farm animals may be harmful to humans. Some food additives used in the past have been shown to cause cancer in laboratory animals. Some food additives are used mainly to attract consumers and do not necessarily improve the quality of food.
  2. The popular definition of organic is natural food grown without the use of chemical fertilizers or pesticides and processed without additives, while the scientific definition of organic is natural or synthetic compounds that contain carbon atoms.
  3. There are no nutritional benefits from using honey or brown sugar instead of white sugar. All sugar, whatever the source, provides the same number of calories. It is true that there are some minute quantities of some vitamins and minerals in honey and brown sugar, but the amounts are too small to make any significant contribution to nutrition.
  4. The following are techniques often used by those making invalid nutrition or dietary claims:
    - a. Use value-laden or emotion-charged language rather than an objective presentation of facts.
    - b. Use testimonials to support claims rather than controlled scientific research.
    - c. Apply experimental research on animals to human beings without qualifications.
    - d. Claim seemingly miraculous overnight effects of a dietary regimen.
    - e. Claim nutritional relationships or dietary cures for a host of disease conditions.
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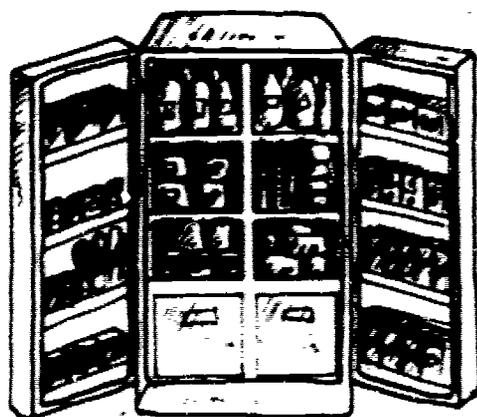
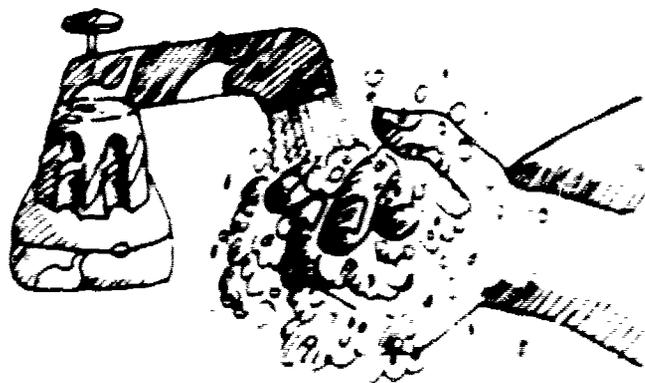
# Food-Borne Illnesses

Although many consumers fear that the quality and safety of our food supply is undermined by the use of chemical fertilizers, pesticides, and additives, the Food and Drug Administration maintains that microbiological contamination is a far more real and serious danger. Most incidents of food-borne illness go unreported, therefore, the scope of the problem is difficult to define.

Some illnesses caused by contaminated food are relatively mild. The symptoms are nausea, vomiting, diarrhea, and a general feeling of malaise. Other illnesses are more severe, causing fever, muscle and nervous system abnormalities, and even death. Some microorganisms contaminate food, while others cause food to carry harmful toxins or disease organisms. Generally, food-borne illnesses that result from poisons produced by bacteria are more severe than

food should not sit at room temperature but be refrigerated promptly.

*Clostridium botulinum* (botulism) is a spore former that produces a deadly toxin. Although the spores are not harmful, they will germinate in the absence of oxygen and acid into cells that produce the toxin. Since the spores are resistant to drying, freezing, and boiling temperatures, they are not easily destroyed.



illnesses that are caused by infection of the gastrointestinal tract. Infants, children, and elderly persons usually suffer more severe symptoms.

All persons who handle food must be aware of conditions that produce food-borne illnesses and must practice good sanitation. Three of the most common organisms that can cause illness are salmonella, *Clostridium botulinum*, and staphylococcus.

Salmonella grows on animal products such as ground meats, meat loaf, poultry, fish, and egg products, such as custards, where there is moisture and the temperature is between 45° and 114° F (7° to 46° C). Hands should be washed well before handling food, especially after touching surfaces contaminated with bacteria. Foods should be cooked thoroughly to be sure the interior reaches 170° F (77° C) or more to kill organisms remaining in the food. Persons with infections should not be allowed to handle food, and

temperatures above the boiling point are necessary to destroy the spores. Low-acid foods, especially home-canned foods that have not been processed at high enough temperatures, are a major cause of botulism poisoning. Safe home-canning procedures should be followed, using a pressure canner for low-acid foods, and any suspected foods should be destroyed. Discard food from cans that leak or bulge.

Staphylococcus bacteria are introduced to foods containing fat, such as meats (especially ham), poultry, meat salads, cream-filled desserts, custards, egg dishes, gravies, stuffings, and buttered bread, by persons with open and infected cuts or boils, or by a person using improper sanitary practices after going to the restroom. The bacteria multiply rapidly at room temperatures (50° to 115° F or 16° to 46° C) and produce a toxin. The toxin, unlike the bacteria, is not destroyed by cooking. To prevent staphylococcus contamination, the hands should be washed well before handling foods, and persons with open cuts or infections should not handle food. Suspected food should be thrown away. Foods should be thoroughly cooked (over 140° F or 60° C) and refrigerated promptly (at 40° F or 5° C) to prevent the formation of toxin.

A general rule to follow is to keep cold foods below 40° F (5° C) and hot foods above 150° F (66° C). If foods are to be kept for longer periods of time, they should be frozen at 0° F or 32° C.

Quiz

Explain the conditions that lead to the formation of a... (1) the conditions that lead to the formation of a... (2) the conditions that lead to the formation of a...

1. **Explain**

\_\_\_\_\_

\_\_\_\_\_

2. **Describe**

\_\_\_\_\_

\_\_\_\_\_

3. **Supplement**

\_\_\_\_\_

\_\_\_\_\_

Answers

1. The conditions that lead to the formation of a... (1) the conditions that lead to the formation of a... (2) the conditions that lead to the formation of a...

2. Describe... The conditions that lead to the formation of a... (1) the conditions that lead to the formation of a... (2) the conditions that lead to the formation of a...

3. Supplement... The conditions that lead to the formation of a... (1) the conditions that lead to the formation of a... (2) the conditions that lead to the formation of a...

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### 3. Staphylococcus

- a. Conditions—Introduced to food by persons with open and infected cuts or boils or by improper sanitary practices after using the restroom—bacteria multiply rapidly at temperatures between 60° and 110° F. or 15° and 40° C. and produce a poison.
- b. Food—Meats especially ham, poultry, meat salads, cream-filled desserts, and buttered bread.
- c. Protection—Wash hands before handling food; do not allow persons with open cuts or infections to handle food; throw away all suspected food; cook food thoroughly, and refrigerate promptly.

A general rule is keep all foods either below 40° F. (4° C.) or above 140° F. (60° C.)

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## Other Publications Available from the Department of Education

*Nutrition Education—Choose Well, Be Well: A Resource Manual for Secondary Teachers* is one of approximately 500 publications that are available from the California State Department of Education. Some of the more recent publications or those most widely used are the following

California Private School Directory	\$5 00
California Public School Directory	12 50
California Public Schools Selected Statistics	1 50
California's Demonstration Programs in Reading and Mathematics (1980)	2 00
Discussion Guide for the California School Improvement Program (1978)	1 50**
District Master Plan for School Improvement (1979)	1 50*
Eating Habits of Students in California Public Schools, A Summary (1981)	2 50
Establishing School Site Councils: The California School Improvement Program (1977)	1 50**
Guidelines and Procedures for Meeting the Specialized Health Care Needs of Students (1980)	2 50
Guidelines for School-Based Alcohol and Drug Abuse Programs (1981)	1 00
Handbook for Planning an Effective Reading Program (1979)	1 50*
Handbook for Planning an Effective Writing Program (1982)	2 00*
History—Social Science Framework for California Public Schools (1971)	2 25
Improving the Human Environment of Schools (1979)	2 50
Nutrition Education—Choose Well, Be Well A Resource Manual for Preschool, Kindergarten, and Elementary Teachers (1982)	2 25
Nutrition Education—Choose Well, Be Well A Resource Manual for Secondary Teachers (1982)	2 25
Nutrition Education—Choose Well, Be Well A Curriculum Guide for Preschool and Kindergarten (1982)	3 75
Nutrition Education—Choose Well, Be Well A Curriculum Guide for the Primary Grades (1982)	3 75
Nutrition Education—Choose Well, Be Well A Curriculum Guide for the Upper Elementary Grades (1982)	3 75
Nutrition Education Today, Curriculum Design for Nutritional Knowledge and Food Use, Secondary and Adult Education (1981)	2 50
Planning a Publicity Campaign (Nutrition Education Training Program packet) (1981)	2 00
Putting It Together with Parents (1979)	85*
Reading Framework for California Public Schools (1980)	1 75
The Relationship Between Nutrition and Student Achievement, Behavior, and Health (1980)	4 00
Science Education for the 1980s (1982)	2 00*
Science Framework for California Public Schools (1978)	1 65
School Improvement, Making California Education Better (brochure) (1982)	NC*
Simplified Buying Guide (1981)	1 50
Student Achievement in California Schools	1 75
Students' Rights and Responsibilities Handbook (1980)	1 50*

Orders should be directed to:

California State Department of Education  
P.O. Box 271  
Sacramento, CA 95802

Remittance or purchase order must accompany order. Purchase orders without checks are accepted only from government agencies in California. Sales tax should be added to all orders from California purchasers.

A complete list of publications available from the Department may be obtained by writing to the address listed above.

\*Developed for implementation of School Improvement  
\*\*Also available in Spanish, at the price indicated