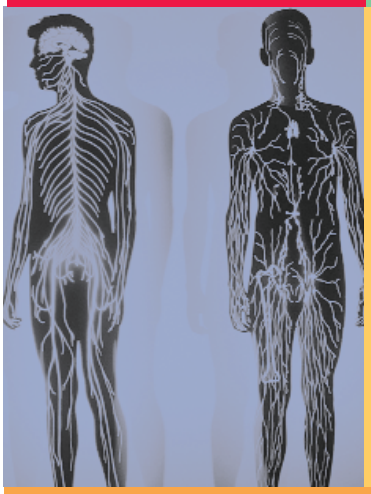
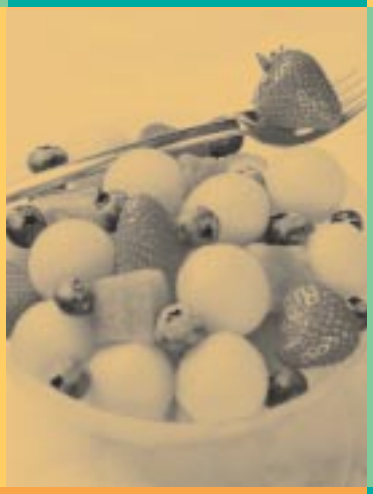
NUTRIENTS: THEIR INTERACTIONS





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TEACHER'S GUIDE

INTRODUCTION

This Teacher's Guide provides information to help you get the most out of *Nutrients: Their Interactions.* The contents in this guide will allow you to prepare your students before using the program and present follow-up activities to reinforce the program's key learning points.

This program is designed to provide students with an understanding of the impact of nutrients on the human body. The program provides information on:

- the six different types of nutrients;
- the foods in which different nutrients are found; and
- the importance of nutrients for healthy functioning of the human body.

LEARNING OBJECTIVES

After viewing the program, students will be able to:

- List the six different nutrients essential to humans.
- Identify the role of nutrients in maintaining a healthy body.
- Describe the role that specific nutrients (Vitamins A, B1, B2, B3, B6, B12 and folate, Vitamins C and D and the minerals iron, calcium, phosphorus, fluoride, iodine, and sodium) have in the major body processes.
- Describe how food is converted into energy.
- Describe the role that protein, fat, and carbohydrates play in the functioning of the human body.
- Discuss the role of dietary fiber in the human body.

EDUCATIONAL STANDARDS

National Standards

This program correlates with the National Science Standards from the National Academies of Science, the National Health Standards from the American School Health Association, and the National Standards for Family and Consumer Science from the Family and Consumer Science Education Association. The content has been aligned with the following educational standards and benchmarks from these organizations.

- Identifies nutrients, and understands that nutrients perform specific functions and influence body composition.
- Defines the primary types of vitamins and their specific functions. Explains how vitamins affect the body and the ways in which vitamins can be useful or detrimental to an individual.
- Understands essential concepts about nutrition and diet.
- Understands the effects of food selection and preparation on nutrient content.
- Understands how nutrient and energy needs vary in relation to gender, activity level, and stage of life cycle.
- Understands the reliability and validity of various sources of food and nutritional information (e.g., dietary supplements, diet aids, fad diets, food labels).
- Understands general nutritional principles, and knows the functions and sources of various nutrients.
- Uses criteria to evaluate sources of nutritional information (e.g., food labels, advertising).

- Knows factors to be considered for food and meal planning (e.g., nutritional principles, specialized dietary requirements).
- Understands various dietary guidelines and food guides and their use in planning a healthy diet (e.g., food pyramid, recommended daily allowances).

PROGRAM OVERVIEW

If taste were a reliable guide to a nutritious diet, candy and soda would be two food groups vital to good health—but it's not. That's why *Nutrients: Their Interactions* takes a scientific look at dietary nutrients, explaining what they are, why the body needs them, and how they work with each other to produce energy, stimulate growth, repair and maintain hard and soft tissues, and regulate bodily processes. Metabolism, energy yield from different food types, the composition and role of blood, key vitamins and minerals, dietary fiber, and recommended daily allowances are only a few of the topics covered in this detailed overview of the biochemistry of nutrition. The impact of nutritional deficiencies on short- and long-term health is also discussed.

MAIN TOPICS

Topic 1: Introduction
Introduces the topic by discussing the six categories of nutrients and the importance of nutrients to the human body.

Topic 2: Nutrients and Energy Production
Describes the role energy plays in the functioning of the body, and how your Basal Metabolic Rate (BMR) determines how much energy your body needs to maintain itself. Also discusses the types of nutrients and how efficient each type is when converted to energy.

Topic 3: Converting Food into Energy
Discusses the process of converting carbohydrates, fats, and proteins into energy, and how other nutrients play a part in that role. Focuses on the different minerals and vitamins that the body uses to convert food to energy.

Topic 4: Nutrients Impact on Essential Body Processes
Discusses the impact nutrients have on major body processes such as cell development, maintaining strong bones and teeth, preventing disease, blood clotting, etc.

Topic 5: Conclusion
Summarizes the program by discussing how to determine if you are getting the right amount of nutrients each day. Explains how the RDA guidelines can be used to help you monitor your nutrient intake.

FAST FACTS

- Nutrients are divided into six main groups: proteins, carbohydrates, lipids—commonly known as fats—vitamins, minerals, and water.
- Nutrients are needed for the production of energy, for growth, repair, and maintenance of hard and soft tissue, and regulation of the body's processes.
- The Basal Metabolic Rate varies from person to person because it is determined by a number of factors such as age, height, gender, growth, body composition, and environmental temperature.
- Approximately 10% of the energy we consume will be used just to digest, absorb, transport, and store the food we eat.
- A gram of fat yields more than twice the energy of a gram of carbohydrate.
- Health authorities generally recommend that 40% to 45% of our energy intake should come from complex carbohydrates, with only 15% coming from sugars or simple carbohydrates. In total, about 55% of our energy intake should come from carbohydrates.
- The higher a person's metabolic rate, the greater their energy requirements.
- Oxygen is used by our bodies to burn and deliver energy from the food we eat.
- The body uses iodine to regulate the heat it produces as it burns energy.
- The basic unit of all life is the cell.
- During digestion, protein is broken down into a variety of amino acids. These are the basic components of protein. Amino acids are often called the building blocks of life.
- Plasma, which is 90% water, is the liquid component of blood.
- About 97% of bone protein is made up of collagen, which is the major substance that holds cells together. Collagen is the soft tissue that gives bones structure.
- Vitamin D is needed to promote the absorption of calcium and phosphorous, and to keep calcium and phosphorous in balance.
- Cholesterol is vital to our body, forming part of the structure of every cell, acting as a building block for some hormones, and as a major component of bile, which is necessary for fat digestion.

VOCABULARY TERMS

Amino acids: Basic components of protein, often called the building blocks of life.
Basal Metabolic Rate (BMR): Minimum energy needed to sustain life in a resting individual.
Blood: Type of connective tissue largely made up of water and protein, and requiring the interaction of a number of nutrients to reproduce and remain healthy.
Carbohydrates: Includes sugars, starches, and celluloses, and serves as a major energy source in the diet.
Co-enzyme: Small molecule that works with an enzyme to regulate energy release from carbohydrates, fats, and proteins.
Dietary fiber: Cell wall of plants, the skin and flesh of fruit and vegetables, and the outer covering of grains such as wheat and rice.
Energy: The force or power that makes it possible for our bodies to function.
Lipids: Fats, oils, waxes, sterols, and triglycerides that are insoluble in water.

Minerals: Inorganic elements, such as calcium, iron, and potassium, that are essential to the nutrition of humans, animals, and plants.
Plasma: Liquid component of the blood.
Platelets: Part of blood cells that assist with blood clotting.
Protein: Component of all living cells and includes many substances, such as enzymes, hormones, and antibodies that are necessary for the proper functioning of an organism.
Red blood cells: The cells that carry oxygen from the lungs.
Vitamins: Group of organic substances essential in small quantities to normal metabolism.
White blood cells: The cells that help to fight infection.

PRE-PROGRAM DISCUSSION QUESTIONS

1. What are the main groups of nutrients essential to the human body?
2. What roles do Vitamins A, B1, and folate play in our diet?
3. What roles do minerals such as iron, calcium, and fluoride play in our diet?
4. What types of foods are considered part of a healthy and balanced diet?
5. What parts of the body are considered hard tissue? What parts of the body are considered soft tissue?

POST-PROGRAM DISCUSSION QUESTIONS

1. What happens to the extra food we eat that the body can't use as energy?
2. What role does iodine play in the normal functioning of the body?
3. What foods contain complex carbohydrates? Why are complex carbohydrates good for your body?
4. What foods are considered a good source of calcium? Why is calcium an important part of a healthy diet?
5. Why do we need protein in our diets?

GROUP ACTIVITIES

Fiber and Your Diet
List the benefits of having fiber in your diet. Then identify four to six sources of fiber, and create a daily meal chart that incorporates the items into a healthy and well-balanced diet.

Healthy Foods Checklist
Develop a list of foods that contain the following nutrients. Describe the benefits of each nutrient to the human body.

- Calcium
- Protein
- Vitamin B12
- Complex carbohydrates
- Iron
- Vitamin A

Cholesterol…The Good and the Bad
Identify the different types of cholesterol and their role in the body. What types of foods should you eat to help increase good cholesterol and decrease bad cholesterol in the body?

INDIVIDUAL STUDENT PROJECTS

What Do I Eat?

Ask students to keep a food diary for a week. The diary should record the following for each item consumed:

- What they ate
- The amount of calories per serving, and how many servings they ate
- Percentage of daily servings for the following nutrients: protein, carbohydrates, iron, calcium, vitamins A, B1, B2, B3, B6, and B12

At the end of the week, ask students to total their daily caloric intake and the percentage of nutrients they consumed and compare it to the recommended daily intake for each. Based on the diary, students should create a list of the foods they need to eat more or less of to ensure they consume the recommended daily allowance for each nutrient listed above.

Develop a Low Sugar Diet

Use nutritional guidelines to identify foods that are considered high in sugar (be sure to look for hidden sugars such as fructose, corn syrup, etc.). Develop a strategy for cutting down on the sugar you consume.

Determine the RDA for Key Nutrients

Determine your RDA for the following nutrients:

- Iodine
- Vitamin A
- Protein
- Fat
- Iron
- Folate
- Zinc
- Vitamins B1, B3, B6 and B12
- Carbohydrates
- Vitamin C
- Calcium

INTERNET ACTIVITIES

Calculate Your Basal Metabolic Rate

Locate a Basal Metabolic Rate (BMR) calculator on the Internet and use it to calculate your BMR. Then, determine if you are consuming more calories than you are expending, by tracking your caloric intake for a day.

Identify the Calories Per Gram of Food

Define kilojoules. Explain the relationship between kilojoules and calories, and determine the energy value per gram (i.e., calories) of the following food components:

- Fat
- Carbohydrates
- Dietary fiber
- Alcohol
- Protein
- Water

Research Osteoporosis
Use the Web to research osteoporosis and what you can do to prevent it. Identify your recommended daily intake for calcium and Vitamin D to maintain healthy bones. Write a one- to two-page paper on osteoporosis and its prevention.

ASSESSMENT QUESTIONS

Q: In humans, energy is needed for:
(a) basal metabolic activity, physical activity, and for the digestion, absorption, and metabolism of food.
(b) basal metabolic activity, mental activity, and for the digestion, absorption, and metabolism of food.
(c) basal metabolic activity, and physical and mental activity.
(d) basal metabolic activity, and for the digestion, absorption, and metabolism of food.
A: (a)
Feedback: In our bodies, energy is needed for basal metabolic activity, physical activity, and for the digestion, absorption and metabolism of food. The Basal Metabolic Rate is the minimum energy needed to sustain life in a resting individual.

Q: List the six groups of nutrients.
A: Proteins, carbohydrates, lipids (i.e., fats), vitamins, minerals, and water.
Feedback: All nutrients belong to one of the six groups of nutrients.

Q: Approximately what percentage of the body's energy will be used to digest, absorb, transport, and store the food we eat?
(a) 5%
(b) 10%
(c) 15%
(d) 20%
A: (b)
Feedback: Approximately 10% of the energy we consume will be used just to digest, absorb, transport, and store the food we eat. Our body's energy comes from carbohydrates, fats, and proteins.

Q: List five to seven foods that contain complex carbohydrates.
A: Cereals, grains, vegetables, rice, pasta, fruits, and dairy products.
Feedback: Carbohydrates are found in almost every food source—complex carbohydrates come in cereals, grains, vegetables, rice, pasta, fruits, and dairy products; simple carbohydrates in sugar, syrups, fruit juice, and soft drinks.

Q: Health authorities generally recommend the following mix of energy intake from carbohydrates:
(a) 30% to 35% from complex carbohydrates, 5% from sugars or simple carbohydrates.
(b) 40% to 45% from complex carbohydrates, 15% from sugars or simple carbohydrates.
(c) 55% from complex carbohydrates, 20% from sugars or simple carbohydrates.

(d) 15% from complex carbohydrates, 15% from sugars or simple carbohydrates.

A: (b)

Feedback: Health authorities generally recommend that 40% to 45% of our energy intake come from complex carbohydrates, with only 15% coming from sugars, or simple carbohydrates. In total, about 55% of our energy intake should come from carbohydrates, and the balance from fats and protein.

Q: Excess energy consumed by humans is converted and stored as _____.

A: body fat

Feedback: Energy the body doesn't need gets converted and stored as body fat. Too much body fat can lead to significant health problems.

Q: The higher a person's _____, the greater their energy requirements.

A: metabolic rate

Feedback: The mineral iodine is an essential part of the hormone thyroxine, which regulates the body's metabolic rate. The higher the metabolic rate, the greater a person's energy requirements.

Q: During digestion, protein is broken down into a variety of _____.

(a) amino acids
(b) nutrients
(c) cells
(d) soft tissue

A: (a)

Feedback: During digestion, protein is broken down into a variety of amino acids. These are the basic components of protein. In fact, amino acids are often called "the building blocks of life."

Q: List three of the six items required to make healthy blood cells.

A: Protein, water, iron, folate, Vitamin B12, and Vitamin C

Feedback: To make healthy red blood cells requires protein, water, iron, folate, Vitamin B12, and Vitamin C. Folate and B12 are needed to make DNA (the genetic material of the cell) and to ensure the proper formation of red blood cells. Without sufficient folate and B12, red blood cells may not develop properly, and this will interfere with their capacity to carry oxygen. Vitamin C assists in the absorption of the iron necessary to make hemoglobin, the vital protein in red blood cells which carries the oxygen.

Q: Proteins make up approximately ___% of all our bodies' cells.

(a) 15
(b) 20
(c) 25
(d) 30

A: (b)

Feedback: Protein is the major nutrient necessary for cell development. Proteins make up around 20% of all our bodies' cells. When cells divide, new protein molecules must be made to form the basic structure of each new cell.

Q: Which mineral is needed in the blood to transport oxygen to all the cells in the body?

(a) Iodine
(b) Vitamin A
(c) Iron
(d) Vitamin B12

A: (c)
Feedback: Without the mineral iron the basic function of blood—transporting oxygen to cells—would not operate efficiently, because the body would be unable to create healthy blood cells in the first place.

Q: About ____ % of bone protein is made up of collagen, which is the major substance that holds cells together.
A: 97
Feedback: Bones are made up of a variety of materials such as blood cells, nerve cells, fat, protein, calcium, and phosphorous. About 97% of bone protein is made up of collagen, which is the major substance that holds cells together. Collagen is the soft tissue that gives the bone structure. It is into this framework that the minerals calcium and phosphorous are deposited. This process, called ossification, causes bones to harden.

Q: _____ is a dense network of collagen and elastin fibers that form into bone-like shapes.
A: Cartilage
Feedback: Hard tissues are our bones, cartilage, and teeth. Cartilage is a dense network of collagen and elastin fibers that form into bone-like shapes.

ADDITIONAL RESOURCES

Discovery.com—Basal Metabolic Rate Calculator
http://health.discovery.com/tools/calculators/basal/basal.html

Better Health Channel
www.betterhealth.vic.gov.au

National Osteoporosis Foundation
www.nof.org

US Food and Drug Administration—Reference Daily Intakes
Recommended daily allowances
www.fda.gov/fdac/special/foodlabel/rditabl.html

Doctor's Pocket Calorie, Fat & Carbohydrate Counter, by Allan Borushek. Family Health Publishers, 2002. ISBN: 1930448066. Information on food items and the amount of calories, fat, and carbohydrates they contain.

American Dietetic Association Complete Food and Nutrition Guide, by Roberta Larson Duyff and the American Dietetic Association. John Wiley & Sons, 2002. ISBN: 0471229245 Discusses how to eat healthy, with simple, practical tips and flexible guidelines designed to help you choose nutritious, flavorful, fun foods. Offers nutritional information, including the USDA dietary guidelines.

Snacking Habits for Healthy Living, by the American Dietetic Association.
John Wiley & Sons, December 1997. ISBN: 0471347043
Shows how to select a variety of snack foods and make them part of a healthy diet.

OTHER PRODUCTS

Nutrition and Cancer, VHS/DVD, Cambridge Educational
Over 360,000 cancer deaths each year are attributed to diet. This program focuses on the relatively new field of nutritional oncology and efforts to prove the relationship between cancer and nutrition. Various studies on animals and humans are discussed. One study, conducted on Japanese-Americans with high-fat diets, shows a high rate of colon and other cancers, while their counterparts in Japan with low-fat diets are virtually cancer-free. A breast cancer patient discusses how lowering body fat helped reduce the risk of recurrence. After analyzing how cancers develop, a doctor describes how low-fat diets, high in fiber and fresh fruits, actually inhibit the processes of cancer cell growth.
Item no: 7753, www.cambridgeeducational.com, 1-800-468-4227

Breakfast: Most Important Meal of the Day, VHS/DVD, Meridian Education
Greater physical stamina, better concentration at school or work, a more efficient metabolism—the evidence is overwhelming that a healthy breakfast is the key to a productive day. Yet it's the meal most likely to be skipped by children, teenagers, and adults alike. This video brings home the importance of the day's first meal by exploring the numerous mental and physical benefits of a nutritious breakfast. Viewers will understand the relationship between eating and metabolism, specifically between breakfast and blood-sugar levels. The kinds of foods that best fuel the body in the morning are also listed.
Item no: 30704, www.meridianeducation.com, 1-800-727-5507

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