Overview:
Students will learn about nutrients important for health by dissecting a slice of pizza.

Food for the Brain

The brain needs many different kinds of nutrients. Glucose, a kind of sugar, is the main source of energy for the brain. While all carbohydrates can serve as sources of glucose, some are better than others. Breads, pastas, cereals and other foods made with whole grains provide the brain with steady supplies of glucose. Foods that contain white sugar or corn syrup, white rice, white flour (found in white bread and most cakes, crackers and cookies) and other refined carbohydrates also supply energy. However, they cause glucose levels in the bloodstream to rise rapidly and then crash.

Proteins from food provide the amino acids used to make neurotransmitter molecules. Meat, fish, poultry, dairy products, eggs and beans (including soy beans) are good sources of proteins. The cell membranes of neurons are made of fats. The healthiest fats are liquid at room temperature. Olive, flaxseed and canola oils are examples of healthy fats. In addition, oils from coldwater fish, such as mackerel, salmon and trout are good sources of a kind of fat needed to build cell membranes in the brain.

Minerals such as calcium, sodium and potassium are vital for the generation and conduction of electrical impulses in neurons and are involved in the release of neurotransmitters from axon terminals. Vitamins are essential molecules needed in small amounts by cells throughout the body, including neurons. For example, choline, a vitamin found in egg yolks and leafy green vegetables, is the basis for the chemical messenger, acetylcholine, that transmits signals to muscles.

The diets of many adolescents are high in sugars and unhealthy fats. In addition, the “supersized portions” of snack and fast foods eaten by many students supply too many calories. Calories measure the amount of energy provided by food. They can be obtained from the breakdown of many different kinds of molecules, particularly fats, carbohydrates and proteins. The body needs a certain amount of calories each day as fuel.

Excess calories are stored as body fat. Unfortunately, even though many American children consume several times the amount of calories they actually need, they are not supplying their bodies with nutrients needed for optimum growth and development.
This activity is designed to promote student awareness of portion sizes, nutrient content of food, and the brain’s nutritional needs.

**MATERIALS**

**Per Group of Students (See setup)**
- 2 craft sticks
- 18-in. sheet of wax paper
- Prepared and cooled slice of frozen “supreme” pizza
- Copy of “Dissect That Pizza!” sheet

**Per Student**
- Copy of the “Nutrition Facts” label from the pizza package
- Copy of the student sheets

**Optional: Demonstration**
- 2 slices of cheese
- Apple or orange (medium)
- Cup of raw, chopped carrots
- Deck of cards
- Slice of sandwich bread
- Teaspoon of margarine

**SETUP**

Before class, bake one or more medium or large frozen pizzas with mixed or “supreme” toppings. Let the pizzas cool (refrigerate if necessary). Cut each pizza into the number of slices (serving sizes)
Extensions

- Encourage students to create or find recipes that include many nutrients needed by the brain. Share these with the class OR have a “Brain Food Day,” during which students (or parents) bring different foods to share in class, or prepare one or more of the students’ recipes in class.
- Have students use an online Calorie counter or App to investigate the caloric, fat and nutrient content of common fast foods.

PROCEDURE

1. Ask students, What do you think your brain needs to function? Students might respond that it needs some sort of food or fuel. Tell students that they will conduct an investigation of a popular food item to examine portion size and the amount and quality of brain food (or fuel) it provides.

2. Give each student a copy of the “Healthy Plates,” and “Estimates & Servings” pages. If time allows, have students complete the questions at the top of the “Healthy Plates” sheet. Discuss the portion sizes shown by the “Quick Hand Measures” and the recommendations on the “Healthy Eating Plate.”

   Optional. Show students actual serving size samples from each of the food groups.

3. Tell students that they are going to examine and dissect a popular food, pizza. But first, ask students, What are the ingredients in a pizza? Students probably will respond—crust, meat (various kinds), cheese, sauce and vegetables. Ask, Do you think pizza is good for you or meets some of your daily nutritional requirements? Why or why not? Record responses on the board.

4. Next, give each group of students a “Dissect That Pizza!” student sheet, a serving of pizza, a large piece of wax paper for a work surface, 2 craft sticks to use for the dissection and a copy of the “Nutrition Facts” label from the pizza package.

5. Have each group follow the directions on the student sheet and answer the questions. Next, have groups share their conclusions with the class. Ask, How does pizza rate as a healthy food?

6. Explain that fats and calories are only part of the story. To function at an optimal level, the brain needs specific nutrients. Give each student a copy of “Fueling the Signals” page.

7. Instruct students to write a paragraph explaining why pizza is or is not a good “brain food.” OR have students address the question, Would you eat pizza for breakfast before an important test?

8. Encourage students to share answers within their groups and then let each group present to the class.
Healthy Plates

1. List all the foods you have eaten in the past 24 hours, by meal (including snacks), on a separate sheet of paper.

2. Compare the foods in each meal to the recommendations in the Healthy Eating Plate below. Keep in mind that many foods combine items from two or more groups.

3. On separate sheet of paper, make a chart with each food group shown in the diagram. List the foods you ate under the appropriate food groups.

4. Write an explanation of how closely the amounts and kinds of food you ate matched the recommendations in the Healthy Eating Plate.
Serving sizes often are smaller than the portions we actually eat.

Look for low levels of saturated, hydrogenated and trans fats. These are unhealthy.

Cholesterol is found in foods of animal origin.

Look for foods that have more carbohydrates as fiber and fewer as sugar. Only foods from plants provide fiber.

Protein is important for muscles and growth. It is found in animal and plant foods.

Vitamins and minerals are essential for health. Calcium is important for bones and teeth.

Use this section as a guide for daily planning. The amount of calories needed by each person depends on many factors, including exercise. Foods with high amounts of saturated fats or sugars may not represent the best choices.

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**Quick Hand Measures**

- A closed fist = Piece of fruit or cup of raw vegetables
- Two fingers = Ounce of cheese
- A cupped hand = Cup of dry cereal
- An open palm = Single serving of meat
- Tip of thumb = Teaspoon of butter

Use the Quick Hand Measures to estimate the size of one serving of different foods. Use the Healthy Eating Plate to guide meal planning.
A healthy nervous system requires many different kinds of raw materials. These raw materials come from food. Amazingly, glucose (a kind of sugar) is the main source of energy for the brain and the rest of the nervous system. Under normal conditions, the brain depends on a continuous supply of glucose provided by the blood. Have you ever felt cranky after missing a meal or had trouble concentrating on a test when you skipped breakfast? Your brain probably was running low on glucose.

High carbohydrate foods such as bread, pasta and potatoes are important sources of glucose. Your body also can manufacture glucose from proteins and other energy-rich foods. The best kinds of carbohydrates are digested slowly and provide an even supply of energy. Breads, cereals and pastas, when made from whole grains, provide healthy carbohydrates. Candy and other sugary foods actually deprive your brain of fuel because they cause glucose levels in the bloodstream to rise rapidly and then crash.

Remember the electrical signals that are carried along neurons? The signals travel through the outer membrane (covering) of nerve cells. The cell membrane is made of fats. Certain kinds of fats and oils are healthier than others. Try to avoid saturated fats (found mainly in animal products) and fats that are solid at room temperature (such as shortening, butter and lard). Instead, chose healthier fats, such as olive, flax or canola oils. Some people call fish “brain food” because oily, cold-water fish like mackerel, salmon and trout supply a kind of fat needed to build cell membranes in the brain.

Central Nervous System

Virtually all functions of the nervous system—and thus, the whole body—are based on electrical and chemical communications inside and among neurons.

The foods you eat provide fuel for your brain and the rest of your nervous system. They also supply the nutrients, such as fats, proteins and vitamins needed to keep the nervous system working efficiently. When selecting foods to eat, ask yourself, Is this a good brain food?

Proteins from food provide amino acids that are used to make neurotransmitters (chemical messengers between neurons). Meat, fish, poultry, dairy products, eggs and beans are good sources of protein. In addition, choline, a substance found in egg yolks, whole wheat products and leafy vegetables, is the basis for the neurotransmitter, acetylcholine, which carries signals to muscles and also is important for memory.
1. You have been given one slice of pizza. Using the craft sticks provided, carefully separate the pizza slice into as many different kinds of foods as possible.

2. List each pizza ingredient in the “Food Part” column below. For example, you might find pepperoni, tomato sauce, cheese, olives, etc.

3. Use the information on the “Estimates & Servings” sheet to:
   a. identify and record the Food Group or Groups to which each part belongs; and
   b. estimate the Number of Servings of each food group represented by the parts of the pizza.

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4. Use the information listed on the Nutrition Facts label from the pizza package to fill in the blanks.
   a. List the total number of Calories in one slice.  ____________ Calories
   b. List the total number of Calories from fat in one slice.  ____________ Calories from fat

5. How does the serving size, listed on the Nutrition Facts label from the pizza package, compare with the serving sizes recommended by The Food Pyramid? What does this imply? Write your answer on the back of this sheet.

6. Considering all the ingredients in a slice of pizza, could it make a good breakfast? Why or Why not? Write your answer on the back of this sheet.