

BioEdSM

*Teacher Resources from the
Center for Educational Outreach at
Baylor College of Medicine*



Food for the Brain

Activity from *Brain Chemistry: Teacher's Guide*

by

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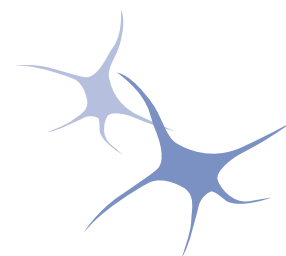
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The activities described in this book are intended for school-age children under direct supervision of adults. The authors, Baylor College of Medicine and the publisher cannot be responsible for any accidents or injuries that may result from conduct of the activities, from not specifically following directions, or from ignoring cautions contained in the text.

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“The brain is the last and grandest biological frontier, the most complex thing we have yet discovered in our universe. It contains hundreds of billions of cells interlinked through trillions of connections. The brain boggles the mind.”

James D. Watson
from *Discovering the Brain*
National Academy Press, 1992

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FOOD FOR THE BRAIN

OVERVIEW

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

CONCEPTS

- The brain and nervous system need many different kinds of raw materials from food.
- Breakfast is important.
- Recommended serving sizes are often smaller than the amounts people eat.

SCIENCE & MATH SKILLS

Observing, recording, inferring and drawing conclusions

TIME

Preparation: 30 minutes (to bake and cool pizza)

Class: 45 minutes for pizza dissection and class discussion

MATERIALS

Demonstration (optional)

- cup of raw, chopped carrots
- deck of cards
- medium-sized apple or orange
- slice of sandwich bread
- teaspoon of margarine

Each group will need:

- 2 craft sticks
- prepared and cooled slice of frozen “supreme” pizza (see SETUP)
- sheet of wax paper, 18-in.
- copy of Dissect That Pizza! student sheet

Each student will need:

- copy of Estimates & Servings student sheet and copy of the Nutrition Facts label from the pizza package

The brain and nervous system need 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 or cereals made with whole grains provide the brain with steady supplies of glucose. Sugars, white rice and refined flours (found in white bread and most cakes, crackers and cookies) also are carbohydrates, but 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 of electrical impulses in the cell membranes of neurons and are involved in the release of neurotransmitters in axon terminals. Vitamins are essential molecules needed in small amounts by cells throughout the body, including neurons. Choline, a substance found in egg yolks and leafy green vegetables, is the basis for the chemical messenger 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



LEGACY OF LOST CANYON

Story, Chapter 11; Science box, p. 13.

EXPLORATIONS

Fueling the Signals, p. 4.

THE IMPORTANCE OF EATING BREAKFAST

According to the American Dietetic Association, it is important for children to start their days with a healthy breakfast. In general, children who regularly eat breakfast perform better in school, and may even score higher on tests.

Breakfast eaters have better attendance records and fewer behavior problems in school. They concentrate better, solve problems more easily and have better muscle coordination. Also, students who eat breakfast are less likely to be overweight.

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.

SETUP

Before class, bake or microwave 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) recommended by the Nutrition Facts label on the pizza package. You will need at least one slice per group. Make a copy of the Nutrition Facts label from the pizza package for each student.

Optional. If possible, bring the following items to use for demonstration with Step 2 below: 2 slices of presliced, prepackaged sandwich cheese (milk products); 1 slice of sandwich bread (carbohydrates); 1 cup raw, chopped carrots (vegetables); 1 medium apple or orange (fruit); 1 teaspoon of butter or margarine (fats and oils); and 1 deck of cards (in place of 1 portion for meats, fish and poultry).

Have students conduct this activity in groups of 2–4.

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 common fast 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 Estimates & Servings student

What's in Food?

- **Carbohydrates**, a major source of energy, are found in fruits, vegetables, grains and flour. Fiber, starches and sugars are carbohydrates. Most US students tend to eat too many snacks and prepared foods that are high in sugars and refined flour.
 - **Fats** are rich sources of energy. Cooking oils, lard, butter, margarine and shortening are almost pure fat. Foods that contain large amounts of fat include some red meats, dairy products, chocolate, cakes, cookies, fried snacks (chips, crackers, etc.) and nuts. Fatty foods should be eaten sparingly, because the body will store any unused energy as additional body fat. Fats from plants (like olive or canola oil) or fish generally are healthier than butter, fatty meat, lard or margarine.
 - **Proteins** are building blocks for the body. Muscles, hair, skin and nails are mostly protein, as is the flexible collagen network within bones. Proteins help to carry out essential chemical reactions within every cell. The body can use protein as a source of energy. Meats, fish, poultry, eggs, low-fat dairy products, beans, peas and nuts are good sources of protein.
 - **Vitamins** are substances needed by the body in small amounts. Vitamin C is necessary for the development of connective tissue and helps
- Continued*

Continued

to prevent cell damage. Vitamin A is important for vision. Eating a variety of fruits and vegetables every day helps ensure that the body has the vitamins it needs.

- **Minerals** have many roles. Calcium, the most abundant mineral in the body, makes bones hard and is important in muscles and the nervous system. Good sources of calcium are low-fat dairy products, dark green leafy vegetables, tofu, sardines with bones and calcium-fortified juices and cereals.

Food & Health

- A child's brain grows rapidly before birth and for about two years after birth. Malnutrition during these periods can affect development of the nervous system.
- Only 53% of US adults eat breakfast.
- Chocolate contains about 380 chemicals. Some of these are stimulants, which may make you feel more alert. Other chemicals in chocolate may affect the pathways of neurotransmitters related to feelings of well-being.
- Vitamin A deficiencies can lead to night blindness (inability to adjust from light to dark environments) and other vision problems. Vitamin A is found in yellow/orange vegetables, dairy products and beef liver.

sheet. Discuss the portion sizes shown by the Quick Hand Measures and the recommended daily servings on The Food Pyramid.

Optional. Show students actual serving size samples from each of the food groups (see SETUP).

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 4 copies of the Nutrition Facts label from the pizza package.
5. Have each group follow the directions on the Dissect That Pizza! sheet and answer the questions. Next, have groups share with 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 the Brain Chemistry *Explorations*. Ask them to read the article, “Fueling the Signals,” on page 4 .
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.

BRAIN JOGGING

Here are more ideas for you and your students to explore.









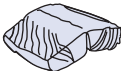

- Encourage students to create or find recipes that include many nutrients needed by the brain. Share these with the class OR have a “Brain Food Day, during which students (or parents) bring different foods to share in class, or prepare one or more of the students’ recipes in class.
- Have students use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

ESTIMATES & SERVINGS



Use the Quick Hand Measures to estimate the size of one serving of different foods. Use The Food Pyramid as a reference for how many servings of each good group are needed daily.

Quick Hand Measures

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

The Food Pyramid

Fats, Oils and Sweets

Eat sparingly (found in candy, chocolate, fried foods, cakes, pies, ice cream, butter and cream).

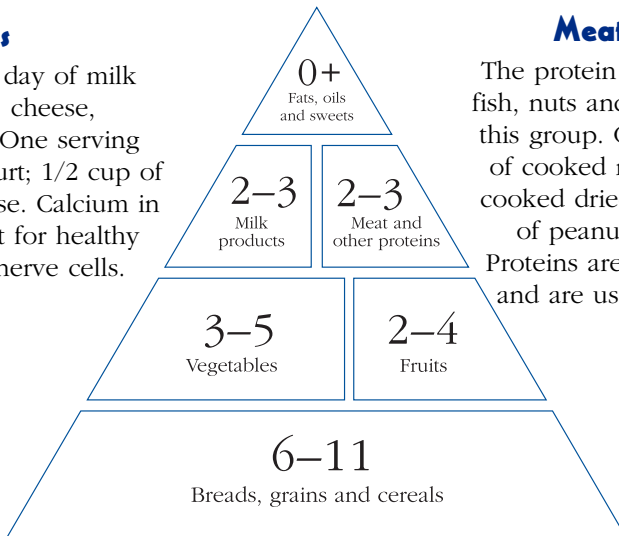
Fats should make up less than 30% of the calories consumed each day.

Milk Products

Choose 2–3 servings each day of milk products (milk, yogurt, cheese, cottage cheese, pudding). One serving equals 1 cup of milk or yogurt; 1/2 cup of pudding; or 2 slices of cheese. Calcium in dairy products is important for healthy bones and is needed by nerve cells.

Vegetables

Select 3–5 servings of vegetables daily. One serving equals 1 cup of raw, chopped (or leafy) vegetables; 1/2 cup of cooked vegetables; or 3/4 cup of vegetable juice.



Breads, Grains, Cereals and Carbohydrates

Have 6–11 servings of breads, grains, rice, potatoes, cereals, tortillas or pasta daily. One serving equals 1 slice of bread; 1 small tortilla; 1 cup of ready-to-eat cereal; 1/2 cup of cooked cereal, rice or macaroni; or 5–6 small crackers. Cakes, cookies, pies, french fries, candy and chips also count as carbohydrates, but are not the best choices (see Fats, Oils and Sweets). Members of this food group provide energy needed by the brain and nervous system.

Meat and Other Proteins

The protein group includes meat, chicken, fish, nuts and beans. Pick 2–3 servings from this group. One serving equals 2–3 ounces of cooked meat, poultry or fish; 1 cup of cooked dried beans; 2 eggs; 4 tablespoons of peanut butter; or 2/3 cup of nuts. Proteins are found in all cells in the body and are used to make several important neurotransmitters.

Fruits

Eat 2–4 servings of fruit every day. One serving equals 1 medium apple, banana or orange; 1/2 cup of cooked or canned fruit; or 3/4 cup of fruit juice. Vitamins from fruits and vegetables are essential for all cells. Vitamin A (thiamine), for example, is important for vision.



DISSECT THAT PIZZA!

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 part of the pizza (Food Part) in the table 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.

Food Part	Food Group(s) in which it belongs	Number of Servings (approximate)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

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.