

The NASA SCI Files™
The Case of the Physical Fitness Challenge

Segment 3

While jogging at Sandy Bottom Nature Park in Hampton, Virginia, the detectives remember that the U.S. Surgeon General, Vice Admiral Carmona, had suggested that they need to learn more about the new food guide pyramid. They email Tony, who heads over to Texas A&M University in College Station, Texas to visit Dr. Joanne Lupton, Regents Professor and Program Leader for the National Space Biomedical Research Institute (NSBRI). Dr. Lupton also worked with the Food and Drug Administration (FDA) to help create new dietary guidelines, and she explains the new food guide pyramid categories and how to determine the correct number of portions in each group for an individual. Dr. Lupton recommends that they speak with Dr. Ted Mitchell of the Cooper Clinic in Dallas, Texas and a member of the Science Board for the President's Council on Physical Fitness and Sports. Bianca and Blake dial up Dr. Mitchell to learn about a person's basal metabolic rate (BMR) and why it is important to calculate BMR. Bianca and Blake also get some help from a NASA SCI Files™ Kids' Club member, Callum Mackie, who visits Ms. Gill Poulter at the Discovery Point Antarctic Museum in Dundee, Scotland. Ms. Poulter explains the importance of nutrition in exploration and tells them that when the RRS *Discovery* made the first exploration expedition to Antarctica, nutrition was a concern but little was known about it.

Objectives

Students will

- interpret the new food guide pyramid.
- test foods for complex carbohydrates.
- compare estimated portion sizes to the recommended portion size.
- determine the importance of portion size to a healthy diet.
- determine which kinds of foods contain protein.
- discover which foods contain fat.
- design menus for special needs by using the new food guide pyramid.

Vocabulary

Basal Metabolic Rate (BMR) – an estimate of a person's energy needs at rest

Body Mass Index (BMI) – a formula to estimate how much body fat a person has based on height and age

discretionary calories – the small number of calories you can use on luxury foods, such as fats or added sugars, after choosing foods with the essential nutrients your body needs

nutrition – the study of food components (called nutrients) as they are eaten, used by the body, and removed from the body

scurvy – disease caused by lack of vitamin C

Video Component

Implementation Strategy

The NASA SCI Files™ is designed to enhance and enrich existing curriculum. Two to three days of class time are suggested for each segment to fully use video, resources, activities, and web site.

Before Viewing

1. Before viewing Segment 3 of *The Case of the Physical Fitness Challenge*, discuss the previous segment to review the problem and assess what the tree house detectives have learned thus far. Download a copy of the **Problem Board** from the NASA SCI Files™ web site, select **Educators**, and click on **Tools**. The **Problem Board** is also in the **Problem-Solving Tools** section of the latest online investigation. Have students use this section of the web site to sort the information learned so far.
2. Review the list of questions and issues that the students created prior to viewing Segment 2 and determine which, if any, were answered in the video or in the students' own research.
3. Revise and correct any misconceptions that may have occurred during previous segments. Use tools located on the Web, as was previously mentioned in Segment 1.
4. Review the list of ideas and additional questions that were created after viewing Segment 2.
5. Read the overview for Segment 3 and have students

add any questions to their list that will help them better understand the problem.

6. **Focus Questions**—Print the questions from the **Educators** area of the web site ahead of time for students to copy into their science journals. Encourage students to take notes during the program so they will be able to answer the questions. An icon will appear when the answer is near.
7. **"What's Up?" Questions**—These questions at the end of the segment help students predict what actions the tree house detectives should take next in the investigation process and how the information learned will affect the case. You can print them from the **Educators** area of the web site ahead of time for students to copy into their science journals.

View Segment 3 of the Video

For optimal educational benefit, view *The Case of the Physical Fitness Challenge*® in 15-minute segments and not in its entirety. If you are viewing a taped copy of the program, you may want to stop the video when the Focus Question icon appears to allow students time to answer the question.

After Viewing

1. Have students reflect on the “What’s Up?” Questions asked at the end of the segment.
2. Discuss the Focus Questions.
3. Have students work in small groups or as a class to discuss and list what new information they have learned about bones, muscles, and the importance of calcium to the body. Organize the information, place it on the Problem Board, and determine whether any of the students’ questions from the previous segments were answered.
4. Decide what additional information the tree house detectives need to determine how to become physically fit. Have students conduct independent research or provide students with information as needed. Visit the NASA SCI Files™ web site for an additional list of resources for both students and educators.
5. Choose activities from the **Educator Guide** and web site to reinforce concepts discussed in the segment. Pinpoint areas in your curriculum that may need to be reinforced and use activities to aid student understanding in those areas.
6. For related activities from previous programs, download the appropriate **Educator Guide**. On the NASA SCI Files™ home page, select the fence post that says “Guides.” Click on the **2002–2003 Season** tab and then click on *The Case of the Biological Biosphere*®. In the green box, click on **Download the Educator Guide**.
 - a. In the **Educator Guide** you will find
 - i. Segment 3 – *You Are What You Eat*, page 43Click on the **2004–2005 Season** tab and then click on *The Case of the Great Space Exploration*®. In the green box, click on **Download the Educator Guide**.
 - b. In the **Educator Guide** you will find
 - i. Segment 2 – *Eating Healthy in Space*, page 41
 - ii. Segment 2 – *Basal Metabolic Rate and Calories*, page 37To locate additional activities and worksheets on the Web, click on **Activities/Worksheets** in the tool bar located at the top of the window. Scroll to the **2004–2005 Season** and click on *The Case of the Great Space Exploration*®. In the **Activities/Worksheet** section, you will find
 - i. Sources of Energy (calories)Scroll to the **2002–2003 Season** and click on *The Case of the Biological Biosphere*®. In the **Activities/Worksheet** section, you will find
 - i. *Where Are the Nutrients?*
7. If time did not permit you to begin the web activity at the conclusion of Segments 1 or 2, refer to number 6 under **After Viewing** on page 15 and begin the PBL activity on the NASA SCI Files™ web site. If the web

activity was begun, monitor students as they research within their selected roles, review criteria as needed, and encourage the use of the following portions of the online, PBL activity:

- **Research Rack**—books, internet sites, and research tools
 - **Problem-Solving Tools**—tools and strategies to help guide the problem-solving process.
 - **Dr. D’s Lab**—interactive activities and simulations
 - **Media Zone**—interviews with experts from this segment
 - **Expert’s Corner**—listing of Ask-an-Expert sites and biographies of experts featured in the broadcast
8. Have students write in their journals what they have learned from this segment and from their own experimentation and research. If needed, give students specific questions to reflect upon, as suggested on the PBL Facilitator Prompting Questions instructional tool found by selecting **Educators** on the web site.
 9. Continue to assess the students’ learning, as appropriate, by using their journal writings, problem logs, scientific investigation logs, and other tools found on the web site. Visit the **Research Rack** in the Tree House and find the online PBL investigation main menu section, **Problem-Solving Tools**, and the **Tools** section of the **Educators** area for more assessment ideas and tools.

Careers

farmer
horticulturist
nutrition advisor
nutritional biochemist
nutritionist
registered dietician

Resources *(additional resources located on web site)*

Books

Barron, Rex: *Showdown at the Food Pyramid*. Penguin Putnam Books for Young Readers, 2004 ISBN: 0399237151.

Beery, Barbara: *Batter Up Kids Sensational Snacks*. Gibbs Smith, 2005, ISBN: 1586857983.

Bledsoe, Lucy: *The Antarctic Scoop*. Holiday House, Inc., 2003, ISBN: 0823417921.

Cowcher, Helen: *Antarctica*. Farrar, Straus, and Giroux, 1991, ISBN: 0374403716.

DK Publishing: *DK Children's Cookbook*. DK Publishing, 2004, ISBN: 0756605970.

Grosset and Dunlap: *The Wiggles Eat Right*. Penguin Putnam Books for Young Readers, 2005, ISBN: 0448437368.

Hooper, Meredith: *DK Readers: Antarctic Adventure, Exploring the Frozen Continent*. DK Publishing, 2000, ISBN: 0789466848.

Kalman, Bobbie: *Lunch Munch*. Crabtree Publishing Company, 2003, ISBN: 0778712737.

Leedy, Loreen: *The Edible Pyramid*. Holiday House, Inc., 1997, ISBN: 0823412334.

Rockwell, Lizzy: *Good Enough to Eat: A Kid's Guide to Food and Nutrition*. HarperCollins Publishers, 1999, ISBN: 0060274344.

Sears, William and Sears, Martha: *Eat Healthy, Feel Great*. Little, Brown, and Company, 2002, ISBN: 0316787086.

White, Andrea: *Surviving Antarctica: Reality TV 2083*. HarperCollins Publishers, 2005, ISBN: 0060554541.

Video

Cerebellum: *The Standard Deviants Learn Nutrition* (2004) Grades 5–12

Discovery School: *Food Pyramid* (2004) Grades 3–6

Disney: *Bill Nye the Science Guy: Nutrition* (1996) Grades 3–6

National Dairy Council: *Moo 2 You* (1999) K–5

Schlessinger Media: *All about Nutrition and Exercise* (2001) Grades K–4

Schlessinger Media: *Nutrition* (2005) Grades K–4

Yum Yum Studios: *Food Safari: Lunch* (2003) Grades K–4

Web Sites

NASA KSNNTM (Kids' Science News Network™)

Find the answers to questions like, "Why do astronauts eat tortillas instead of bread?" or "Are there grocery stores in space?" This site includes 60-second animations, activities, and resource links.

<http://ksnn.larc.nasa.gov/exploration.html>

Texas A&M University

The Texas A&M University System is one of the largest, most complex systems of higher education in the nation. Through a statewide network of nine universities, seven state agencies and, a comprehensive health science center, the A&M System educates nearly 100,000 students, conducts more than \$500 million in research, and reaches another 11 million people through service each year.

<http://tamusystem.tamu.edu/>

United States Department of Agriculture

This is the official web site of the new food pyramid. Learn all about the new nutrition guidelines that will help you lead a healthy life.

<http://www.mypyramid.gov/>

*Note: If you visit www.mypyramid.org, be aware that this site is not affiliated with the official USDA web site.

Dole 5 A Day

This site is packed with fun activities, all designed to motivate people to be physically active and to eat more fruits and vegetables.

<http://www.dole5aday.com/>

Department of Health and Human Services

Visit this Center for Disease Control and Prevention web site to learn more about your favorite fruits and vegetables.

<http://www.cdc.gov/nccdphp/dnpa/5aday/month/index.htm>

Southeastern Michigan Dietetic Association

Visit this web site to see sample food pyramids for cultural foods, such as Italian, Indian, and Mexican. Plan a healthy, well-balanced ethnic meal.

<http://semda.org/info/#pyramid>

Cooper Aerobics Center

The Cooper Aerobics Center is a multidivisional health and fitness complex in Dallas, Texas.

<http://www.cooperaerobics.com/default.aspx>

Discovery Point Antarctic Museum, Dundee, Scotland

Visit this site to learn about the Royal Research Ship (RRS) *Discovery*. Explore the ship, view a time line of important events, and learn all about the history of this special ship and its crew.

<http://www.rrsdiscovery.com/>

Activities and Worksheets

In the Guide	What's New in the Food Guide Pyramid? Participate in an exciting game that will get your heart pumping as you learn about the foods you should eat using the new food guide pyramid.	65
	Black and Blue Conduct a test to discover which foods contain the complex carbohydrates your body needs for energy.	67
	Portion to Portion Improve your estimation skills as you look at recommended portion sizes and learn about the importance of portions to a healthy diet.	69
	A Little “Pro” Testing With an adult's help, use your nose to determine which foods contain proteins.	72
	Getting to the Fat of the Matter How do you know which foods contain fats? Conduct this simple experiment to help you identify fatty foods.	74
	Answer Key	76
On the Web	Let's Plan Menus Explore the new food guide pyramid online while planning menus for people with specific dietary needs.	

What's New in the Food Guide Pyramid?

Segment 3

Purpose

To interpret the new food guide pyramid

Background

The new food guide pyramid was released in 2005. The pyramid symbol is simple and is meant to encourage consumers to make healthier food choices, to be active every day, and to make personal choices that fit their own needs. Physical activity, represented by the person walking up the side of the pyramid is a new element in the symbol. The steps on the side also represent the idea that individuals can benefit by taking small steps to improve their diets and lifestyles each day. The six color bands represent the food groups: orange is for grains; green is for vegetables; red is for fruits; blue is for milk or calcium rich foods; purple is for meats and beans (proteins); and the thin band of yellow is for fats and oils. The bands are wider at the bottom and get smaller toward the top to show us that moderation, or watching how much we eat from each group, and careful choices within each food group are important. The recommended daily amounts are given for a 2,000-calorie diet. To find the amounts that are right for you, go to <http://www.MyPyramid.gov> and investigate the new food guide pyramid.

Materials

Per Student

plastic bowl
sheet of legal size paper
science journal

Teacher Prep

1. In a large, open area, determine the playing field by using cones or other objects to mark boundaries.
2. Cut sheets of construction paper into rectangles (approximately 5 cm x 8 cm). Use the chart to determine the number of cards needed for each color. Label the different colored rectangles as follows:

Color	Label	Number of Students			
		5–9	10–15	15–20	20–25
Orange:	G-1oz.	36	60	90	120
Green:	V-1/2 cup	30	50	75	100
Red:	F-1/2 cup	24	40	60	80
Blue:	M-1/2 cup	36	60	90	120
Purple:	MB-1 oz.	36	60	90	120

Note: You may wish to laminate the cards so they will last longer.

3. Spread the cards over the large open area designated for play.

Procedure

1. Position your bowl at the edge of the designated playing field.
2. The bowl marks your home base.
3. The colored cards scattered over the field represent the five main food groups on the new food guide pyramid:
 - Grains – orange
 - Vegetables – Green
 - Fruits – Red
 - Milk – Blue
 - Meats and Beans – Purple

What's New in the Food Guide Pyramid?

Segment 3

4. Use the following rules to begin collecting food cards when signaled:
 - a. Collect one card at a time.
 - b. Put the card in your bowl before you collect another card.
 - c. Walk, don't run as you gather your food cards.
 - d. Try to get as many different colors as possible.
5. When all cards have been gathered, return to your classroom.
6. Divide a sheet of legal size paper into six columns.
7. Label each column the same as a column on the food guide pyramid: grains, vegetables, fruits, milk, and meats and beans.
8. Organize your food cards into the correct columns.
9. Pretend the cards you gathered are the foods you ate in one day.
10. Add up the number of servings you have in each column. For example, if you have four green cards and each card represents $\frac{1}{2}$ cup, you have eaten two cups of vegetables for the day.
11. Compare your numbers with the USDA recommended amounts for each category.
12. Determine whether you had a well balanced diet.
13. Visually represent the amount of food in each category that you gathered compared to the amount of food recommended by the USDA. A picture graph or a histogram might be helpful.
14. In your science journal, explain how to make your diet more well-balanced.
15. Make a list of foods to fit into each category.

Discussion

1. What is the USDA recommended amount of vegetables each day?
2. Why are milk products important to your diet?
3. What types of foods does the USDA consider grains?
4. How do you get protein into your diet?
5. Why do you think the USDA suggests that you "go easy on fruit juices?"
6. What does the new food guide pyramid mean to you?

Extensions

1. Play the game by using yellow cards to represent fats. Each time a yellow card is collected, you must run around the outside of the playing field one time before you can collect another card.
2. Add situation cards to the game. Situations might include the following:
 - You played a hard game of basketball today. You need one additional serving of meats and beans.
 - You did not go outside to play today so your body could not absorb any vitamin D, which helps process calcium. Lose one of your milk servings.
3. Visit MyPyramid.gov to find out more about the new food guide pyramid. Learn about discretionary calories. Get some tips for adding more whole grains to your diet.
4. Find out how many calories you burn doing common activities. Write a poem or make a poster about what you learned. Share it with your class.

Black and Blue

Segment 3

Purpose

To test food for complex carbohydrates

Background

Carbohydrates are large groups of compounds that include sugars and starches. These compounds are made naturally by plants. Carbohydrates are the major source of energy for the body. Most foods contain carbohydrates. There are two major types of carbohydrates—simple and complex. Both simple and complex carbohydrates are necessary for a healthy body.

Simple carbohydrates are also called simple sugars. Simple sugars are found in fruits, milk, and foods with refined sugars, such as sugary snacks. Simple sugars from fruits and milk are healthier because these foods contain vitamins, fiber, and other nutrients. Refined sugars should be limited because they contribute calories with very few nutrients.

Complex carbohydrates are also called starches. Starches include grain products such as bread, crackers, pasta, and rice. Some complex carbohydrates are healthier than others. Refined grains are grains that have been processed, removing nutrients and fiber from the grains. White flour and white rice are examples of refined grains. Most refined grains are “enriched,” which means certain vitamins and iron, but not the fiber, are put back in after processing. Unrefined grains, or whole grains, contain vitamins, minerals, protein, and fiber. Fiber is very important for the digestive system and heart health.

The United States Department of Agriculture (USDA) offers tips to help put more whole grains in your diet. Visit the USDA web site at www.mypyramid.gov for information about eating a well-balanced healthy diet.

You can use an iodine solution to detect the presence of complex carbohydrates. The yellow-orange iodine will turn blue-black as it reacts with starch. (The iodine solution will show no reaction with simple carbohydrates or sugars.)

***Note:** Iodine may stain when it comes into contact with the skin. There may be some reactions associated with iodine. Please refer to a Material Safety Data Sheet (MSDS), which you can find online at sites such as <http://www.delasco.com/pcat/pdf/starchio.pdf>.

Teacher Prep

Cut the potatoes and apples into thin slices. Prepare an iodine solution for each group as follows:

1. Fill the measuring cup $\frac{1}{2}$ full of water.
2. Add 20 drops of iodine to the water in the cup and stir. Note: Straws or pipettes may be substituted for eyedroppers. See diagram 1.

Procedure

1. Put on gloves and safety goggles.
2. Place a small amount of cornstarch on a paper plate.
3. Using the eyedropper, apply a few drops of the iodine solution onto the cornstarch.
4. Observe the color of the iodine on the cornstarch. Because cornstarch is a complex carbohydrate, this sample will be a control for comparison of other samples.
5. Choose a food sample to test and place it on a paper plate.

Materials (per group)

bread slice
crackers
potato slice
rice
cornstarch
white granulated sugar
apple slice
paper plates
eyedropper
science journal
pen or pencil
gloves
safety goggles
500-mL measuring cup
with iodine solution

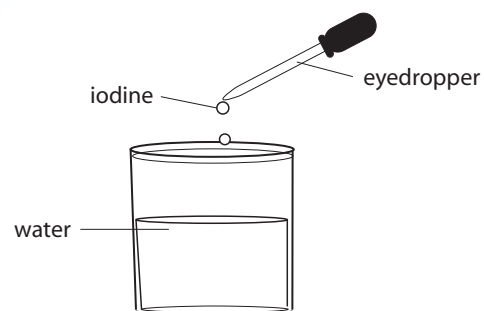
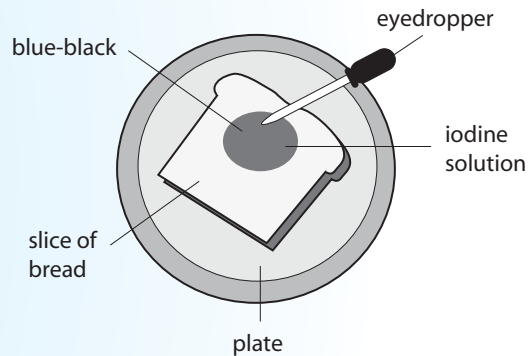


Diagram 1

Black and Blue

Segment 3

- Using the eyedropper, apply a few drops of the iodine onto the food sample.
- Observe and note the color of the area where the iodine solution was applied. Foods that contain starch will turn blue-black when the iodine is added to them. See diagram 2.
- Record your observations in your science journal.
- Continue testing until all samples have been tested.

**Diagram 2**

Discussion

- What are the two types of carbohydrates? Give examples of each.
- Which samples contained complex carbohydrates? How could you tell?
- Why is it important to add more whole grains to your diet?

Extension

- Research to find out more about carbohydrates. Explain why athletes need more complex carbohydrates in their diets.
- Test additional foods for complex carbohydrates.
- Conduct research to find a test for simple sugars.
- Plan a healthy diet that includes both simple and complex carbohydrates.

Portion to Portion*

Segment 3

Purpose

- To compare estimates of portion size to the recommended portion size
- To determine the importance of portion size to a healthy diet

Background

You can find food labels on nearly every type of food you buy. The nutrition facts on the food label are regulated by the Food and Drug Administration (FDA) to ensure accuracy. Some basic nutrition facts listed on a food label are serving size, calories, fat, cholesterol, sodium, carbohydrates, and protein. Serving size, or a portion, is very important to a healthy diet. Portion size gives the amount of food recommended to be eaten in a single sitting. Portion size can vary for different kinds of foods: solids versus liquids and raw versus cooked. Portion size helps people understand how much they are eating. For example, if a serving size listed on a nutritional label is 10 chips and you eat 20 chips, you just ate two portions of chips. To find the calories, fat, cholesterol, and other nutritional values for the chips, multiply each value listed on the label by two (the number of portions you ate). One package often contains multiple portions. You can use some common, quick-hand measures to help you estimate portions. For example, a closed fist is about the same size as a piece of fruit or a cup of raw vegetables. Understanding how to measure portion size is a key factor in maintaining a healthy diet.

The new food guide pyramid no longer uses the term serving size. It now promotes “portion size,” which is measured by using standard household measurements. Visit <http://www.mypyramid.gov> for more information.

Teacher Preparation

1. Place the food items and drink into the appropriate containers.
2. Remove the nutrition label from the food items and drink packaging.
3. Glue each nutrition label to 1/2 a piece of paper.
4. Fold the paper in half to hide the nutrition label from view.
5. Create four stations for students to rotate through by placing a container of each food item and drink at a different table.
6. Place a measuring cup (any size) at each station.
7. Place the folded paper with the nutrition label on the table so that it cannot be viewed.
8. Label the stations for easy identification by students.

Procedure

1. Using a marker, label three of the paper plates and one cup “estimate.”
2. Label the remaining three paper plates and one cup “actual.”
3. On the **Serving Size Worksheet**, write the names of the food items under Food Name on each table.
4. Go to the first station and estimate how many cups (or fractions of a cup) make up one portion size of that food item or drink.
5. Record your estimate on the **Portion Size Worksheet**.
6. Measure the estimated amount of the food item or drink and place it on the plate or in the cup labeled “estimate.”

Teacher Materials
frozen peas (2 packages)
dry breakfast cereal
popped popcorn
3 large containers (for the dry foods above)
2-liter bottle of regular soft drink
8 measuring cups (any size)
4 pieces of paper or cardstock

Materials

Per Group

6 paper plates
2 large, plastic cups
marker
Labels and Estimates Handout
pen or pencil
science journal
Portion Size Worksheet (p. 71)
Serving Size Worksheet (p. 71)

Portion to Portion*

Segment 3

7. Observe your estimated measurements and record.
8. Open the folded paper and read the "Nutrition Facts" label for the food item or drink.
9. Record the actual recommended serving size for each on the Serving Size worksheet.
10. Measure the actual recommended serving size and place it on the plate or in the cup.
11. Observe and compare your estimated portion size to the actual recommended serving size.
12. Record your observations in your science journal.
13. Rotate to the next station and repeat until you have visited all four stations.

Discussion

1. How did your estimated portion size compare to the actual portion suggested on the nutrition label?
2. Why do you think it is important to look at the serving size (portion size) on a label?

Extensions

1. Test your friends and family on their knowledge of portions. Prepare a similar activity for them by gathering various food items from your home and removing the nutrition labels. Have them estimate and compare their estimates to the recommended portion size.
2. Quick-hand measures are an easy way to help judge portion size. Look at some suggested hand measures below. How would you use them to help you determine portion size? Can you think of any other appropriate quick hand measures? Experiment to develop some quick hand measures of your own to help with portion size.

Use the Quick Hand Measures to estimate the size of one serving of different foods.

Quick Hand Measures



A closed fist
=
Piece of fruit or
cup of raw
vegetables



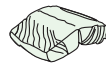
Two fingers
=
Ounce of
cheese



A cupped hand
=
Cup of
dry cereal



An open hand
=
Single serving
of meat



Tip of thumb
=
Teaspoon of
butter



* This hands-on activity was adapted from activities in *From Outer Space to Inner Space/Food and Fitness: Activities Guide for Teachers* created by Baylor College of Medicine for the National Space Biomedical Research Institute under NASA Cooperative Agreement NCC 9-58. The activities are used with permission of Baylor. All rights reserved. For additional activities visit http://www.nsbri.org/Education/Elem_Act.html

Portion to Portion*

Segment 3

Portion Size Worksheet

Food Name	1 Portion Estimate of Food – use cups as a measure

Serving Size Worksheet

Food Name	"Nutrition Facts" Food Label (recommended serving size) – use cups as a measure

A Little “Pro” Testing

Purpose

To determine which kinds of foods contain protein

Background

Proteins are compounds that are very important for almost all parts of the body. They are a source of calories, or food energy. Proteins build, maintain, and replace the tissues in your body. Your muscles, organs, and immune system are made up of mostly protein. Many foods, such as beef, poultry, fish, eggs, dairy products, nuts, seeds, and legumes (like beans) contain proteins. In the new food guide pyramid, proteins are contained in the “meat and beans section. Go to: www.mypyramid.gov.

There are two main types of protein—complete and incomplete. Complete proteins contain all nine essential amino acids. Amino acids are food that is broken down into basic units. These basic units can be reused to make the proteins your body needs. There are about 22 amino acids that are important to good health. The human body can make 13 of them, but the other nine (the essential amino acids) can only be obtained from protein-rich foods. Complete proteins come from animal sources, such as meat and milk. Incomplete proteins are considered incomplete because they lack one or more of the essential amino acids. Vegetables are sources of incomplete proteins.

A healthy diet has a balance of complete and incomplete proteins. The amount of protein needed for a well-balanced diet depends on age, gender, and physical activity. Most Americans get enough protein in their diet but need to make leaner (less fat) and more varied choices from this food group.

If you burn a food that contains protein, it will produce an unpleasant odor.

CAUTION NOTE: This activity should be done as a teacher demonstration only.

Procedure

1. Place the piece of aluminum foil on a flat surface.
2. Hold one end of the feather (the end without feathers) over the aluminum.
3. Using a lighter, carefully light the other end (with feathers).
4. Observe the smell of the burning feather. This smell is your standard when testing the other foods for protein.
5. Students should record their observations in their science journals.
6. Blow out the fire and soak the feather in water to be sure the fire is out.
7. Using a skewer, spear a food sample.
8. Hold the skewer over the aluminum foil and carefully light the food sample with the lighter.
9. Observe the smell of the burning food. Have students compare the smell of the burning food to the smell of the burning feather.
10. Have students record their observations in their science journals.
11. Blow out the fire and soak the food sample in water to be sure the fire is out.
12. Repeat steps 7–11 for the remaining food samples.

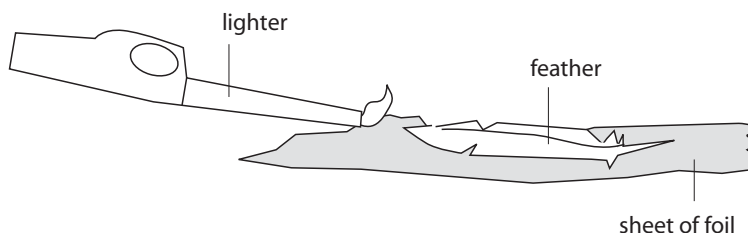


Diagram 1

Materials
 piece of aluminum foil
 feather
 skewers
 lighter
 food samples (i.e.:
 cheese, sugar, apple,
 hot dog, potato,
 bread, peanut butter,
 gum drops)
 water
 container for water
 science journal

A Little “Pro” Testing

Segment 3

Discussion

1. Which food contained protein? How did you know?
2. Why are proteins important to the body?
3. Explain the difference between a complete and an incomplete protein?

Extension

1. Another way to test for the presence of protein in foods is to use a solution of potassium or sodium hydroxide. Put the potassium solution into clear, glass jars. Add one food item to each jar. Add a few drops of diluted copper sulfate solution to each jar. If the food contains protein, the solution will turn pink or blue.
2. Using a computer with internet access, go to www.mypyramid.gov and click on the food guide pyramid. Go to the section about meats and beans. Check to see if the foods you identified as containing protein are on the list of protein foods. Find out how many servings of protein rich foods you should have each day.

Getting to the Fat of the Matter

Segment 3

Purpose

To determine which foods contain fat

Background

Fats are oily substances found in some foods, such as nuts, oils, butter, and some meats. Other foods, such as most fruits and vegetables, do not have any fat. Fat is an essential component to a healthy diet. Fat helps the body grow and develop normally. Fats help give the body energy and the ability to absorb some vitamins. Little children especially need fats to help their brains and nervous systems develop properly.

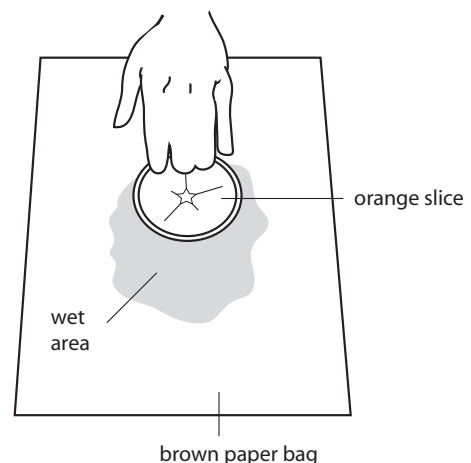
Although fats are a source of energy (calories), the body stores excess fat that may cause health problems. There are three types of fats: unsaturated fats, saturated fats, and trans fats. Unsaturated fats are found in foods that come from plants and fish. These fats tend to be beneficial to a healthy heart. Foods with unsaturated fats include olive oil, peanut oil, canola oil, tuna, and salmon. Saturated fats are fats found in animal products. Diets too high in saturated fats can raise blood cholesterol levels and increase the risk of heart disease. Some examples of foods with saturated fats are butter, cheese, beef, and milk (except skim milk). Trans fats are fats that can raise cholesterol and increase the risk of heart disease if eaten in large quantities. Trans fats are fats that are listed in the food ingredient list as hydrogenated or partially hydrogenated. Margarine is an example of a trans fat.

Fats, sugars, and salt (sodium) are represented on the new food guide pyramid with a small yellow band. The United States Department of Agriculture (USDA) recommends that we limit the amounts of fats, sugars, and salt we consume. The USDA also suggests that the majority of the fats in our diet should come from fish, nuts, and vegetable oils rather than from solid fats such as butter or margarine.

When fats are present in food, they leave a greasy streak behind on a piece of paper. When the paper is held up to the light after it has been heated, the light will shine through the paper.

Procedure

1. Choose a food sample and a square piece of brown paper bag.
2. Using a pen, write the name of the food on the paper bag.
3. Rub the food sample on the piece of paper bag and allow the paper to dry.
4. Hold the paper bag up to the light.
5. Observe and record your observations in your science journal.
6. Repeat steps 1–5 using the remaining food samples.
7. Place the paper bag squares onto a baking sheet and set it in direct sunlight.
8. Allow the baking sheet to sit in sunlight for approximately 15–20 minutes as you monitor the paper bags.
9. Check the paper bags for grease spots and record your observations.



Materials
various food samples
brown paper bags
cut into small square
pieces
baking sheet
science journal
pen

Getting to the Fat of the Matter

Segment 3

Discussion

1. Which foods left a mark on the paper after they were dried? Which did not?
2. Why did some foods leave a mark on the paper while other foods did not?
3. Classify the food samples according to the food groups found on the new food guide pyramid. Which food groups had samples that tested positive for fats?
4. What color on the new food pyramid represents fats? Why is this band so small?

Extensions

1. Repeat the experiment with other types of foods from each part of the food guide pyramid. Is there a difference between the fat content of the different categories of the food guide pyramid?
2. Research how a diet too high in saturated fats can be harmful to your health. Create a poster to show the health risks associated with fats and ways to reduce the amount of saturated fat in your diet.

Answer Key

What's New in the Food Pyramid Guide?

1. The United States Department of Agriculture (USDA) recommends $2\frac{1}{2}$ cups of vegetables each day.
2. Milk products provide the necessary calcium you need each day.
3. Grains such as cereals, breads, crackers, rice, and pasta are considered grains. At least half the grains you eat each day should be whole grains.
4. Include proteins in the diet by eating lean meats, fish, peas, nuts, and beans.
5. Many fruit juices contain large amounts of sugar.
6. Answers will vary, but students should understand that the new pyramid is designed to meet the needs of each individual, that it includes food from each of the food groups, and that physical activity and personal choices are important parts.

Black and Blue

1. The two types of carbohydrates are simple carbohydrates (sugars) and complex carbohydrates (starches). Fruits contain simple sugars, and bread, crackers, or pasta contain starches.
2. Answers will vary depending on the foods tested, but bread, crackers, potatoes, and rice should be listed. If the iodine turned blue-black when placed on the sample, the food contains starch or complex carbohydrates.
3. Whole grains contain vitamins, minerals, and fiber necessary for a healthy body.

Portion to Portion

1. Answers will vary, but most students will estimate much larger amounts than actual portion sizes.
2. Some packages may include multiple portions, and the label can help you determine not only the portion size but also the nutritional values related to one portion of that food.

A Little "Pro" Testing

1. Answers will vary. Foods with protein should produce a smell similar to the burned feather.
2. Proteins build, maintain, and replace the tissues in your body.
3. Complete proteins contain all 9 of the essential amino acids and come from animal sources such as meat or milk. Incomplete proteins lack one or more of the essential amino acids and come from vegetable sources.

Getting to the Fat of the Matter

1. Answers will vary depending on the foods tested.
2. Foods containing fats will leave a mark on the paper.
3. Foods from the meat and bean group and the milk group may contain fats.
4. The yellow band on the new food pyramid represents fats. It is so narrow because the USDA is reminding us to limit the amount of fat included in our diet.

On the Web

Let's Plan Menus

1. The food guide pyramid provides the recommended daily servings for an average person, but each person has special dietary needs based on body size, health, and lifestyle.
2. Answers will vary.
3. A person who is more physically active on a regular basis will require more calories to maintain a healthy diet. A person must find a balance between the amounts of food eaten and physical activity by making smart food choices from each food group.