

Outline of Lesson Growing with Protein Unit 2, Lesson 2 Grade 4-5

Lesson Time: 50 – 60 Minutes

Lesson Outline:

- 1. Introduction to Protein**
 - Definition and sources of protein
- 2. All About Protein**
 - Building a protein from amino acids
 - Serving sizes and recommended daily intake
 - Function of protein in the body
- 3. Bean Bag Activity**
 - Identifying different types of beans
- 4. Experiential Learning: Gardening**
 - Planting a lettuce garden

Student Learning Objectives:

By the end of this lesson students will:

- Be able to explain what protein is made of.
- Be able to identify at least 2 food sources of protein.
- Understand that eating a variety of foods rich in protein produces healthier bodies.
- Understand the role of seeds in producing healthy plants.

References:

- Teachers College, Columbia University. [LiFE Curriculum: Linking Food and the Environment](#) (Module 3, Lesson 16). 2002.
- University of California Cooperative Extension, San Mateo County. [TWIGS: Teams with Intergenerational Support Gardening and Nutrition curriculum](#). 1997.

Growing with Protein

Overview (for Teacher)

Pre-Class Preparation

⊗ *Items marked with this symbol may not be purchased using FSNE funding, nor included as part of cost share.*

- ⊗ Make a watering jug for your plants: a 16 oz plastic water bottle works best. Poke 5-8 holes in the plastic lid with a push-pin (poke from INSIDE the lid), replace the lid, and you have a great kid-sized watering jug.
- ⊗ Collect a 1 gallon jug (such as a milk container) for each learning team in your class. Cut off the top half of each jug off to make a planting container. Poke 8 holes in the bottom (from inside the jug) with a push-pin for drainage.

Teacher Involvement During Class



- Divide students into groups of 4 to 5.
- Assist student groups with indoor planting activity.
- Assist in behavior management of students.

Post-Class Teacher Responsibilities

- Make sure that students begin and continue documenting the growth of plants sown in this lesson on the **Plant Growth Log**.
- Serve healthy snack: Green pumpkin seeds.
- Have students complete Food For Thought Writing Question.

Vocabulary

Amino Acids- building blocks of protein. Our body makes 11 and we have to eat 9 more to make protein in our bodies.

Protein- a nutrient found in food that is made up of amino acids. Protein is one of the building blocks of a cell.

Cell- one of the tiny units that carry on the basic functions of life.

Tissue- a mass of similar cells that form a particular part or organ of an animal or a plant. Example: muscle tissue.

Variety- a wide selection of different things.

Vegetarian- someone who eats only plants, plant products and sometimes dairy and eggs.

Vegan- someone who eats only plants and plant products (no meat, fish, eggs or dairy).

Furrow- a shallow little row in the soil for planting seeds.

Indent- to make a shallow dent in something.

Germination- the time when a sprout and a root begin to emerge from your seed.

Critical Thinking Activity

- Have students answer one of the following questions:
1. "What is protein made of? Name 2 plant foods that are good sources of protein."
 2. "Name 2 plant sources of protein and 2 animal sources of protein that you like to eat."

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| Supplementary Activities | None |
| Web Resources | <ul style="list-style-type: none"> • MyPyramid Food Guidance system: www.mypyramid.gov • MyPryamid for kids summary: www.kidshealth.org/kid/stay_healthy/food/pyramid.html |
| Suggested Books for Reading in the Classroom | <ul style="list-style-type: none"> • Creasey, Rosalind. <u>Blue Potatoes, Orange Tomatoes: How to Grow a Rainbow Garden</u>. Sierra Club Books for children, 1997. • Gibbons, Gail. <u>From Seed to Plant</u>. Holiday House Inc., 1993. • Jurenka, N.A. & Blass, R.J. <u>Beyond the Bean Seed: Gardening Activities for Grades K6</u>. Teacher Idea Press, 1996. • Robbins, Ken. <u>Seeds</u>. Atheneum Books, 2005. |

Growing with Protein

EALR & GLE Alignment

| EALR | GLE | Lesson Applications |
|---|---|---|
| <p>Science</p> <p>1.1 Understand how properties are used to identify, describe, and categorize substances, materials, and objects and how characteristics are used to categorize living things</p> <p>1.2 Understand how components, structures, organizations, and interconnections describe systems</p> <p>1.3 Understand how interactions within and among systems cause changes in matter and energy</p> <p>2.1 Develop abilities necessary to do scientific inquiry</p> | <p>1.1.1 Understand how to use properties to sort natural and manufactured materials and objects</p> <p>1.2.1 Understand how the parts of a system go together and how these parts depend on each other</p> <p>1.3.8 Understand that living things need constant energy and matter</p> <p>2.1.2 Understand how to plan and conduct simple investigations following all safety rules</p> | <ul style="list-style-type: none"> • Introduction to Protein • All About Protein • Bean Bag Activity • All About Protein • Experiential Learning: Gardening • Gardening: Plant Growth Log |
| <p>Health and Fitness</p> <p>1.4 Understand the relationship of nutrition and food nutrients to physical performance and body composition</p> | <p>1.4.1 Identify the nutrients provided by a variety of foods and describe how bodily function and physical performance are affected by food consumption</p> | <ul style="list-style-type: none"> • All About Protein • Beans as a source of protein |
| <p>Communication</p> <p>3.1 Use language to interact responsibly and effectively with others</p> | <p>*GLE not available at this time</p> | <ul style="list-style-type: none"> • Bean Bag Activity • Experiential Learning: Gardening |
| <p>Reading</p> <p>2.1 Demonstrate evidence of reading comprehension</p> | <p>2.1.3 Apply comprehension monitoring strategies</p> | <ul style="list-style-type: none"> • Read all overheads with teacher |
| <p>Writing</p> <p>3.3 Write for different purposes</p> <p>3.4 Write in a variety of forms</p> | <p>*GLE not available at this time</p> | <p>The following apply to all Writing EALRs:</p> <ul style="list-style-type: none"> • Gardening: Plant Growth Log |

Growing with Protein

Preparation Outline

Activity Supplies

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Protein Demonstration

- Plastic baggie with 1 serving size of nuts or seeds (1 oz) for demo
- Food model of meat or fish to show serving size
- Purple protein label to put on board (from lesson 1)

Bean Bag Activity

- 12-1/2 cup bags of mixed beans (1 bag per pair of students)

Gardening Activity

- ⊗ 6-1 gallon jugs with tops cut off (1 per learning team)
- ⊗ Soil
- ⊗ Small trowel (or use hands)
- ⊗ Popsicle sticks for labeling
- ⊗ Variety of lettuce seeds
- ⊗ Small paper cups labeled with seed name (it is easier for small fingers to pull seeds out of a paper cups instead of seed packets)
- ⊗ 2 open seed flats to put under jugs to catch water
- ⊗ Watering can

Healthy Snack

- 1 ½ cups green pumpkin seeds (1 tablespoon per student)

Review

- Classroom Tasting Challenge checklist
- Healthy Person Contract
- Protein pictures for Healthy Person Contract

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| Overheads | <ul style="list-style-type: none"> • Diagram of a Seed • What's in Your Bean Bag? • Plant Growth Log |
| Student Handouts | <ul style="list-style-type: none"> • What's in Your Bean Bag? (1 per pair of students) |
| Teacher Handouts | <ul style="list-style-type: none"> • Plant Growth Log (1 per classroom) • Student Assessment and Answer Key |
| Changes for ELL Classes | <ul style="list-style-type: none"> • Omit Bean Bag Activity or omit Plant Growth Log and go straight to planting. When planting, assign each student a job. |
| Rainy Day Activity Supplies | None |

Growing with Protein

Outline

Introduction and Lesson Overview (4 Min)

Content

- Who can tell me what protein is? Why is it important that we eat foods high in protein? Write answers on the board.
- We call protein a building block nutrient because our bodies use it to build every single part. It is something we cannot live without. Every cell in our body uses protein in some way.
- In this lesson we will learn what protein is made of, why protein is important, learn about foods that have protein, and then we will plant seeds so we can grow a lettuce garden in the classroom.

All About Protein (15 Min)

- **Amino acids**
 - >Protein
 - >Cells
 - >Tissues
 - >Organs
- **Brainstorm foods that are high in protein**
- **Animal protein vs. plant protein**

What are proteins?

- Proteins are part of food that we need to eat to keep all cells in our muscles and organs healthy and strong.
- Our hair, skin, and fingernails are made up of protein.
- We also use protein as a source of energy.

What are proteins made of?

- Proteins are made up of 20 amino acids strung together. All foods have some amino acids in them and we will learn what foods can help us get all 20.

Which foods have protein?

- Lots of foods have protein. Animal based foods like fish, chicken, eggs, and beef are good sources of proteins.
- Plant foods like beans, seeds, and nuts are also good sources of protein.
- Our body makes protein out of 20 different amino acids (they are like puzzle pieces that fit together). Our bodies can only make 11 amino acids and need to get the other 9 from food. The 9 amino acids we need from food are called the **essential** amino acids.
- Put purple protein label on board and list protein foods underneath the label.

Animal vs. plant protein:

- Animal proteins are considered “complete” proteins. This means that when we eat eggs, dairy, beef, chicken or fish, we are getting high levels of all 20 amino acids from that food.
- Plant proteins are considered “incomplete” proteins. This is because plant foods don’t have high levels of all 20 amino acids. Also, plant foods in different food


groups contain different levels of amino acids. This means that if we don't eat animal foods (a person who eats no animal products is called a **Vegan**) we need to combine plant food groups to get high levels of all 20 amino acids.


What are some examples of plant sources that we could combine to get all the essential amino acids?

- In order to get all the essential amino acids it is important to eat a combination of foods from 2 or more of the following groups:
 - Legumes/Beans (peanuts, soy beans and tofu, chili beans, lentils)
 - Grains (brown rice, quinoa, tortillas)
 - Nuts and Seeds (almonds, sesame seeds)
 - Vegetables (leafy greens, corn)
- Examples of combining plant foods to get all essential amino acids:
 - Peanut butter (legume) & whole wheat bread (grain)
 - Beans (legume) & rice (grain)
 - Cornbread (grain and vegetable) & collard greens (vegetable)
- Eating from a variety of sources is the key to getting enough protein from plant foods.

How much protein do we need every day?

- The recommended amount of daily protein is **2-3 servings**.
- A serving size of protein is the same size as one of your palms. The amount of protein that each of us needs is based on how big we are, that is why you can use your hand as a measure- it grows with you!
- Have each student hold out their hands. It is recommended that you eat 2-3 servings of protein each day.
- One serving of **animal** protein from meat is the size of one of your palms, or a deck of cards (2 oz).
- One serving of **plant** protein from nuts, seeds or cooked beans is approximately the amount you can fit into both palms (1 oz nuts or seeds, ½ Cup beans).
- Have students trace the palm one of their hands to encourage kinesthetic learning.
- It is recommended that you eat one serving of a food that is high in protein at each meal.
- Show serving size visuals and have students compare this to the size of their palm that they just traced.
- Ask students for examples of protein foods they have eaten recently and have them gauge how many servings they think they ate by relating them to their

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| <ul style="list-style-type: none"> • Protein Visuals: A bag of nuts or seeds that is one average adult serving size. A food model of meat or fish to show one serving size. | <ul style="list-style-type: none"> • palm size. • Show serving size visuals. • <i>Additional Information for Educator: For the purposes of this lesson, 1 serving = 2 ounce equivalents. According to the MyPyramid Food Guidance system, children should eat 5 ounce equivalents of protein each day. Examples of 1 ounce equivalents include:</i> <ul style="list-style-type: none"> ○ 1 Tablespoon peanut butter ○ ½ Ounce nuts or seeds (~12 almonds, ~4 walnuts) ○ ¼ Cup cooked beans ○ ¼ Cup tofu ○ 1 Ounce meat (3 thin slices deli meat) ○ 1 egg |
| <p>Beans as a source of protein (3 minutes)</p> <ul style="list-style-type: none"> • Diagram of a Seed: Why do dried beans and seeds have more protein than most other plant parts? | <ul style="list-style-type: none"> • Put Diagram of a Seed on overhead. • Explain to students that a bean is actually a seed. If you plant a bean it will grow into a new bean plant. Because beans and other seeds provide an excellent source of food protein, we will be planting dried beans in class today. We will be able to harvest the leaves in a few weeks. Later, your teacher will also give you seeds as a healthy snack. • Dried beans and other seeds have more protein than most other plant parts because their job is to create new plants when planted. Why do you think this part of the plant would have more protein? (Because they store all of the energy a new plant needs to grow) |
| <p>Bean Bag Activity (10 Min)</p> | <ul style="list-style-type: none"> • Teacher and educator pass out materials for planting while students read directions for Bean Bag Activity • Walk around and help students complete the activity. |
| <p>Experiential Learning: Gardening (20 Min)</p>  | <ul style="list-style-type: none"> • As we start to plant seeds, reinforce the concept that seeds are high in plant protein. A seed has all the protein a new plant needs to grow. <p><u>Planting Introduction</u></p> <ul style="list-style-type: none"> • Spacing of Seeds: Explain that when we plant inside, the plants are not going to grow to full maturity, so we can plant them closer together than we would if we were planting outside. For example, how much space do you think lettuce needs to grow big? We'll be snacking on the "baby-sized" versions of the plants (leaves will be harvested when they are about the size of baby spinach or lettuce mix that you can buy in bags at the grocery store). Explain that we will be planting our seeds very close together. |

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| <ul style="list-style-type: none"> • Wash Hands | <ul style="list-style-type: none"> • Tips: When pouring water, count to three and stop in between watering, use a circular motion while pouring water from watering can. • Demonstrate to each team at their table how to water with the watering container that the teacher has made for the class. <p><u>Hand Washing</u> Remind students that they need to wash their hands after gardening. Each student should wash his or her hands with warm water and soap for 20-25 seconds.</p> |
| <p>Critical Thinking Activity (5 Min)</p>  | <p>If there is any extra time have students start the Critical Thinking Writing Activity. Have students answer one of the following questions:</p> <ol style="list-style-type: none"> 1. “What is protein made of? Name 2 plant foods that are good sources of protein.” 2. “Name 2 plant sources of protein and 2 animal sources of protein that you like to eat.” |
| <p>Healthy Snack</p> | <p>Give the healthy snack of green pumpkin seeds “pepitos” to the classroom teacher (in front of the students). After class the teacher will give 1 tablespoon to each student as a protein-rich snack. Students should wash their hands before eating the snack.</p> |
| <p>Review and Reflection</p> <ul style="list-style-type: none"> • Healthy Person Contract: Protein • Check in on lettuce plant progress • Classroom Tasting Challenge | <ul style="list-style-type: none"> • Ask students to mention a couple of concepts that they learned about protein. • Healthy Person Contract: In this lesson we learned all about protein and protein as a building block to health. We learned that proteins are made of amino acids and that our bodies make 11 amino acids and need to get 9 more from the foods that we eat. We learned that there are many plant-based proteins like dry beans and seeds that have a lot of protein, and having enough protein keeps our cells, muscles and organs healthy and strong. <ul style="list-style-type: none"> • Have students think of foods they have eaten today that are high in protein. Select students to tape pictures of protein-rich foods onto a muscle of the Healthy Person Contract. • Indoor Gardens: How are the lettuce plants growing? Have they received the water they need? Let’s look at this chart and measure their growth. • Conduct the Classroom Tasting Challenge: After tasting the <u>green pumpkin seed</u> snack, ask students to raise their hands to show you how many students tasted, liked or did not like the snack. Record the number of students who raise their hands in the |

appropriate column on your Classroom Tasting Challenge checklist, out of the total number of students in class that day.

Lesson Materials

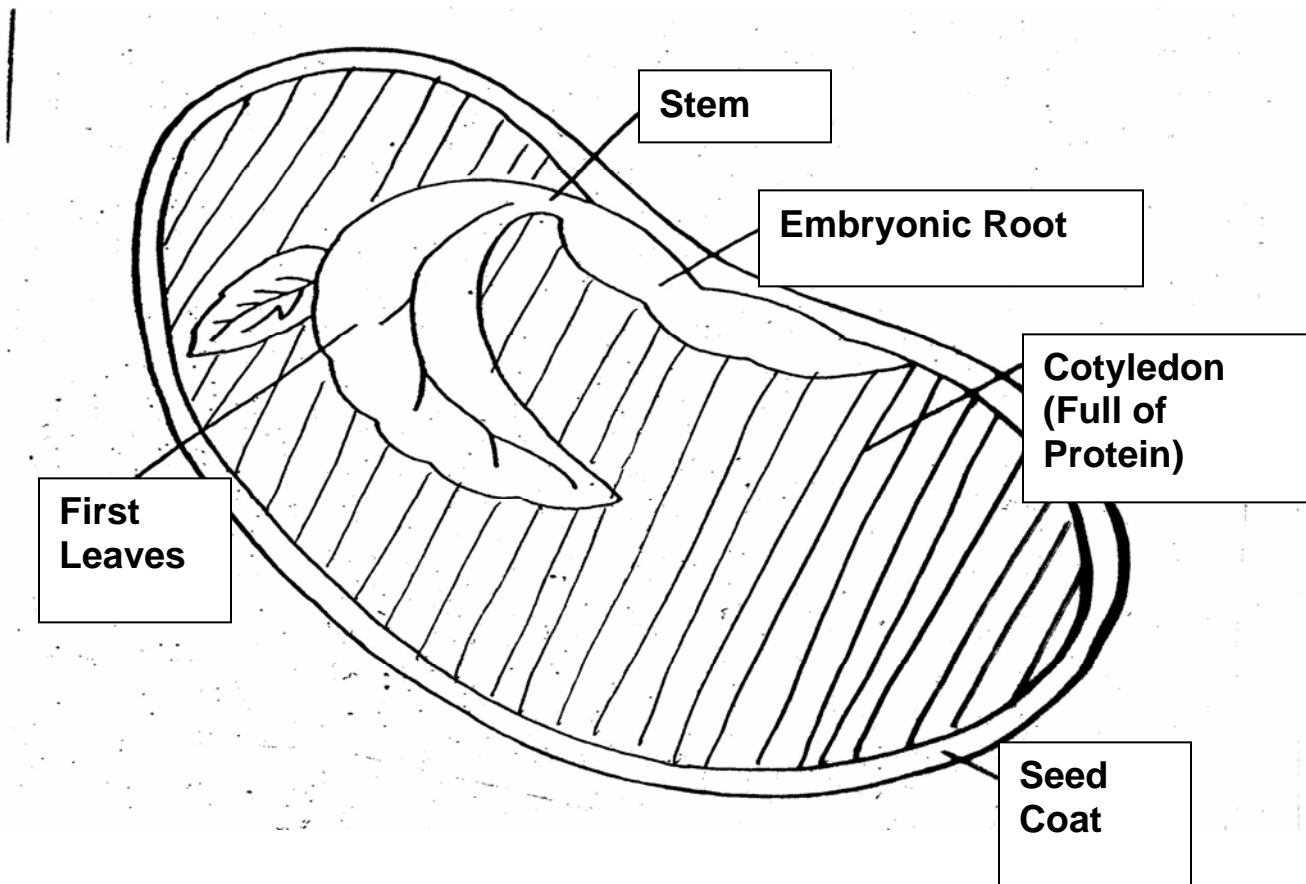
Growing with Protein

- **Diagram of a Seed**
- **What's in Your Bean Bag?**
- **Plant Growth Log**
- **Protein pictures for Healthy Person Contract**

Supplementary Activities

- **Student Assessment**
- **Assessment Answer Key**





Diagram of a Seed



Adapted from: University of California Cooperative Extension, San Mateo County. TWIGS: Teams with Intergenerational Support Gardening and Nutrition curriculum. 1997

What's in Your Bean Bag?

1. Each pair of students gets 1/2 cup of mixed beans (seeds). Find at least 6 different seeds.
2. Use the seed name and description to help you match the beans with their correct name.
3. Document the size by putting an **X** under small, medium, or large on the chart.
4. Draw your beans in the last column; some have been filled in for you!

| | Seed Name | Description | size | | | draw here |
|----|------------------|---|----------|----------|-------|---|
| | | | small | med | large | |
| 1 | Pinto | Brown with tan spots | | X | |  |
| 2 | Large Lima | Large white and flat | | | | |
| 3 | Blackeye | White w/black eye | X | | |  |
| 4 | Garbanzo | Tan and round (looks a little like a brain) | | | | |
| 5 | Baby Lima | Small, white and flat | | | | |
| 6 | Green split pea | Green and round, flat on one side | | | | |
| 7 | Kidney | Brownish Red | | X | |  |
| 8 | Cranberry bean | Pink with red spots | | | | |
| 9 | Small white | White | | | | |
| 10 | Pink bean | Light Pink | | | | |
| 11 | Small red | Red | | | | |
| 12 | Yellow split pea | Yellow and round, flat on one side | | | | |
| 13 | Lentil | Tan, round and flat | | | | |
| 14 | White kidney | White | | | | |
| 15 | Black bean | Black | | X | |  |

Date Planted: _____

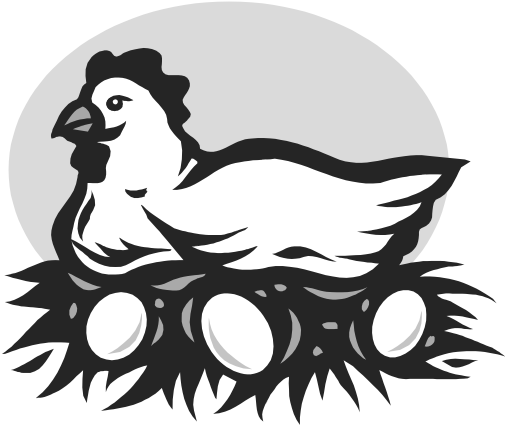
Classroom Plant Growth Log

Directions: Use this form to record the growth of all the lettuce plants in your class.

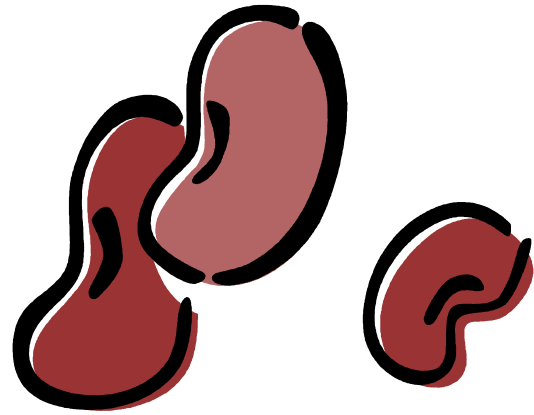
1. Write down the date you planted the seeds (today's date).
2. Write the name of each learning team (or name of each member) under "Learning Team Name(s)".
3. Write the name of the 3 lettuce seeds that each learning team planted under "Lettuce Names".
3. For each learning team and each type of lettuce, write down the date you see the first sprout.
4. For each learning team, once a week for 4 weeks, measure the height of all the plants in each row, add the heights and divide by the number of plants in each row to get an average height, and record the average height in centimeters.

| Learning Team Name(s) | Lettuce Names | Sprout Date | | | | Measurements | | | |
|-----------------------|---------------|-------------|---|---|---|--------------|---|---|---|
| | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 1. | 1. | | | | | | | | |
| | 2. | | | | | | | | |
| | 3. | | | | | | | | |
| 2. | 1. | | | | | | | | |
| | 2. | | | | | | | | |
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| 3. | 1. | | | | | | | | |
| | 2. | | | | | | | | |
| | 3. | | | | | | | | |
| 4. | 1. | | | | | | | | |
| | 2. | | | | | | | | |
| | 3. | | | | | | | | |
| 5. | 1. | | | | | | | | |
| | 2. | | | | | | | | |
| | 3. | | | | | | | | |
| 6. | 1. | | | | | | | | |
| | 2. | | | | | | | | |
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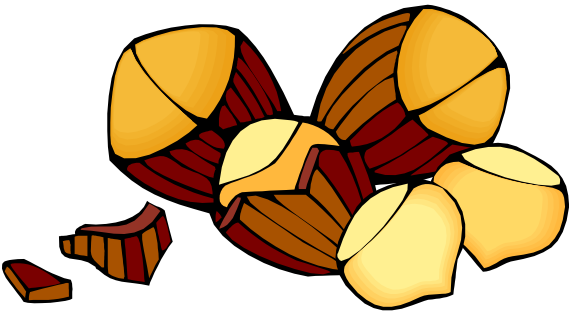
Pictures for Healthy Person Contract



Eggs
Protein



Beans
Protein



Nuts
Protein



Fish and Meat
Protein

Growing with Protein

Name: _____ Date: _____

1. The body makes protein from combinations of _____.
2. The body can only create 11 of the 20 amino acids needed for healthy development of protein. Where do the other nine amino acids come from?
3. Why are beans a good source of protein?
4. What are five other food sources of protein?
5. What is the size of one serving of protein from an animal source? Describe one serving of protein from a plant source.
6. How could a vegan (someone who does not eat any animal products) get enough of all the essential amino acids in their diet?

Growing with Protein

1. Amino Acids
2. From foods we eat
3. Beans have all the energy needed for a new plant to start growing.
4. Possible answers include whole grains, beef, pork, poultry, eggs, tortillas, rice, corn, etc.
5. Animal food source for protein serving size is about the size of the palm of one hand. One serving size of a plant based protein is about the size of two palms.
6. A vegan would need to choose a variety of plant based foods from 2 or more food groups (vegetable, grain, legumes/beans, nuts/seeds) in order to get all the amino acids a healthy body needs.