

SWINE : *From the Animal's Point of View*

3

SUBJECT OVERVIEW AND BACKGROUND INFORMATION

Just as humans need to monitor the food they eat to help ensure optimal health, food that swine consume affects their health, too. Because domesticated pigs consume the food that humans make available to them, it is important for the pigs' caretaker to understand the nutritional needs of swine in order to provide them with a proper diet.

Swine and humans are very similar when it comes to the digestive system. Both have what are referred to as a simple stomach (monogastric), meaning that they have only a one-chambered stomach, compared to ruminants that have a four-chambered stomach. Furthermore, the digestive systems of humans and swine are comparable. For both species, digestion, or the breaking down of the food, starts in the stomach and most nutrients are absorbed in the small intestine. Finally, both pigs and humans are omnivores; their diets include foods from both animal and plant sources.

The nutrient requirements for swine are similar to the basic requirements for other animals. Pigs need an ample supply of fresh water, carbohydrates, fats, protein, and other vitamins and minerals. Most of the nutrients can be supplied by common commercial feeds, but some vitamins and minerals need to be added to ensure complete health.

The content in this curriculum is designed to introduce youth to swine behavior, needs and care. Additional emphases include life skills and positive youth development. This is not a guide to raising swine for market or exhibition.



Pig Nutrition: What You Need to Know

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Pigs in the wild use their snout to dig for food in the ground. This is called rooting behavior. Food such as earthworms and roots can be dug up and eaten this way. It is important for the domesticated pig to have dirt or a grassy area so that it can exhibit rooting behavior.

Concepts and Vocabulary

- **Balanced diet:** Eating the right types of food in the right amounts to maintain a healthy body.
- **Basic nutrients:** Substances that help maintain a healthy body. These include carbohydrates, proteins, vitamins, and minerals.
- **Essential nutrients:** Nutrients that humans and animals must have to live and function properly.
- **Life stages of swine:** Swine are categorized in different stages of development or life stages. Swine at each life stage have different nutritional requirements for growing and staying healthy.

Life Skills

Communication, contributions to a group effort, cooperation, critical thinking, decision making, healthy lifestyle choices, keeping records, planning/organizing, problem solving, sharing, teamwork

Subject Links

Science, Language Arts

Overview of Activities:

The first activity is entitled *Eat Your Vegetables!* In this activity, youth will look at a list of foods and categorize them according to the nutrients they provide. They will also be asked to create a list of the types of food they eat on a regular basis and categorize them based on their nutrient content. They will compare these lists and determine whether the foods they eat provide their necessary daily nutrients.

The second activity is entitled *Diet Detectives*. Each group of youth will be given a scenario of the diet and common daily activities of a fictional person. They need to determine whether the person received all of his or her necessary nutrients. If they did not, the youth will need to determine

what is in excess or what is lacking and how that might have affected the person's daily activities. The youth will also need to make recommendations regarding dietary improvements.

The third activity, *Shopping by Chance in Pigs*, teaches youth that pigs do not have the luxury of choosing what they eat, and that it is the job of the caretaker to ensure that his or her pigs are getting all their necessary nutrients. It is important for youth to know that pigs at different life stages have different nutrient requirements. This activity will allow the youth to discover the importance of reading food labels and the consequences of providing pigs an improper diet.

REFERENCES

- Rowan, J. P., K. L. Durrance, G. E. Combs, and L. Z. Fisher. 2009. The digestive tract of the pig. Electronic Data Information Source. <http://edis.ifas.ufl.edu/AN012>.
- Laerke, H. N., and M. S. Hedemann. 2012. The digestive system of the pig. In K. E. Bach Knudsen, N. J. Kjeldsen, H. D. Poulsen, and B. B. Jensen (eds.), *Nutritional physiology of pigs* (online publication). Foulum: Videncenter for Svineproduktion. http://vsp.lf.dk/~media/Files/Laerebog_fysiologi/Chapter%205.ashx.

FACTS ABOUT SWINE

NUTRITION

Basic Facts

- Swine are omnivores. Just like people, they eat foods from both plant and animal sources.
- A swine's digestive system is very similar to that of a human.
- Swine are monogastric, or simple-stomached, meaning they have only one stomach.
- Swine chew food with their incisors and molars and swallow their food only once. They do not regurgitate and chew their food a second time the way ruminants (e.g., sheep) do.
- Digestion occurs mainly in the stomach; most food nutrients are absorbed by the small intestines.

Required Nutrients

- Water is the most important nutrient of all. Water deprivation leads to reduced feed intake, which in turn slows growth. Too little water also negatively affects many body functions. The water-to-feed ratio of swine is approximately 2:1.

- Carbohydrates make up the main source of energy for pigs, mainly in the form of cereal grains such as corn, wheat, barley, and oats.
- Fat provides more energy than carbohydrates do. Adding fat to the diet will also increase the weight gain-to-feed ratio. However too much fat can cause health problems.
- Protein is required because it supplies specific amino acids that are needed by swine. Usually, there are adequate amounts of protein in common feeds, such as soybean meal, fish meal, cottonseed meal, or bone meal.
- Many vitamins are naturally produced in a pig's body, some are found in common feeds, and others need to be supplemented.
- Minerals that are often added to the diet are calcium, phosphorus, sodium, chloride, zinc, copper, iron, manganese, iodine, and selenium. Minerals should be added carefully, since an excess can be toxic.

Eating Behavior

- Swine exhibit a rooting behavior, where they dig in the soil with their tough snouts. They can find food such as worms and various roots this way.
- Pigs are pushy when it comes to their food, so when you have more than one pig, it is important to have enough space for all to feed because the larger one may push the smaller one away.

REFERENCES

- Hansen, J. A. n.d. Swine nutrition guide. <http://mark.asci.ncsu.edu/Nutrition/NutritionGuide/default.htm>.
- Meisinger, D. J. (ed.). 2010. National swine nutrition guide. Ames, IA: U.S. Pork Center of Excellence.

ACTIVITY 1

Eat Your Vegetables!

BACKGROUND INFORMATION

Do you know why it's important to eat vegetables? Different kinds of foods provide us with different types of nutrients that allow our bodies to function properly. Some of the basic nutrients that we acquire from the foods we eat are carbohydrates, proteins, fats and oils, calcium, vitamin C, vitamin A, and fiber. There are some people who are very conscious of the food they eat and the nutrients that it provides them, and there are some people who are not. Writing down what we eat can help us determine if we are getting the right nutrients in our daily diet.

Time Required

30–45 minutes

Concepts and Vocabulary

Basic nutrients (this includes carbohydrates, proteins, calcium, vitamin C, vitamin A, and fiber)

Life Skills

Communication, critical thinking, healthy lifestyle choices, keeping records, problem solving, sharing

Subject Links

Language Arts

State Content Standards

Language Arts

- Sixth Grade:
 - » Listening and Speaking Strategies – 1.8
- Fifth Grade:
 - » Listening and Speaking Strategies – 1.5

Suggested Grouping

Pairs

Materials Needed

(* = Materials provided in curriculum)

- * *General Source of Nutrients*
- * *List of Familiar Human Foods*
- Notebook paper
- Pens, pencils, or markers
- Flip chart paper

Getting Ready

- Make enough copies of the *General Source of Nutrients* worksheet so each youth can receive two copies.
- Pass out the *List of Familiar Foods* to each pair.
- Provide each pair with flip chart paper and something to write with.

OPENING QUESTIONS

1. **We've all heard our parents say, "Eat your vegetables!" Why do you think this might be important? What do you think makes vegetables and other foods such as fruit so important to our diet?** Ask the youth to explain their thoughts verbally or record their ideas on the flip chart paper provided.
2. **What other foods do you think are important to eat? Explain why you think they are important.** Ask the youth to share their ideas verbally or record their thoughts on the flip chart paper provided.

PROCEDURE (EXPERIENCING)

1. Working in pairs, have the youth look at the *List of Familiar Foods*. Have them organize the foods and place each one under the correct nutrient category (e.g., protein, carbohydrate) on the *General Source of Nutrients* worksheet.
2. Additionally, because everyone comes from a different background and culture, have each pair brainstorm and write down at least one other food that is common in his or her home or culture and that is not on the *List of Familiar Foods*. Have them place these food items, too, under the correct nutrient category.

SHARING, PROCESSING, AND GENERALIZING

Have the youth share their lists with the rest of the group.

Have them compare their lists to other groups' lists. What are the similarities? What are the differences, if any? If there are differences, discuss why. Have the youth also share their ethnic foods and compare them with those of other groups.

Follow the lines of thinking developed through the general questions raised by the youth to draw out their thoughts and ideas; if necessary, use more specific questions as prompts to get to particular points. Examples might include:

1. **If there are differences between how the groups categorized the foods, discuss these differences and work toward a consensus.**
2. **Why do you think it is important to eat a variety of foods each day?** Ask the youth to record their thoughts and ideas on the flip chart paper provided.
3. **Why do you think that certain foods are called “junk foods?”** What do you think the differences are between junk foods and healthy foods? Ask the youth to record their thoughts and ideas on the flip chart paper provided.

CONCEPTS AND TERMS

At this point, volunteers need to ensure that the concept of basic nutrients has been introduced or discovered by the youth. (Note: The goal is to have the youth develop concepts through their own exploration and define terms using their own words.)

CONCEPT APPLICATION

1. Ask each youth to develop a list of foods that they eat frequently.
2. Working in pairs, ask the youth to categorize their lists under the correct nutrient category on the General Source of Nutrients worksheet.
3. Have the youth discuss their food choices and, if they believe that their diet is not balanced, decide on some alternatives they might choose in order to obtain different essential nutrients.

REFERENCES

- Mann, J., and A. S. Truswell. 2007. *Essentials of human nutrition* (3rd. ed.). Oxford, NY: Oxford University Press.
- United States Department of Agriculture, Center for Nutrition Policy and Promotion. 2011. MyPlate.
<http://choosemyplate.gov>.

LIST OF FAMILIAR FOODS FOR HUMANS

- apple
- avocado
- banana
- beef
- broccoli
- brown (whole grain) rice
- butter
- candy
- canola oil
- carrot
- cheese
- chicken
- chili
- chocolate
- coconut oil
- corn
- cucumber
- deep-fried food
- donut
- egg
- grapefruit juice
- grapes
- green beans
- ice cream
- kidney beans
- lemon
- margarine
- milk
- oatmeal
- orange
- pasta (processed)
- pastry
- peach
- peanuts
- pork
- potato
- pretzel (processed)
- salmon
- soda
- spinach
- strawberry
- syrup
- tomato
- tuna fish
- white bread (processed)
- white rice (processed)
- whole grain bagel
- whole wheat bread
- whole wheat pasta
- yogurt (plain, low fat)

GENERAL SOURCE OF NUTRIENTS WORKSHEET

Protein

Protein is found in animal products, nuts, and beans.

1. _____
2. _____
3. _____
4. _____
5. _____

Carbohydrates

Carbohydrates are found in processed wheat and grains and in starchy vegetables.

1. _____
2. _____
3. _____
4. _____
5. _____

Fiber

Fiber is found in whole grains, beans, oats, and bran.

1. _____
2. _____
3. _____
4. _____
5. _____

Calcium

Calcium is found in dairy products and dark green vegetables.

1. _____
2. _____
3. _____
4. _____
5. _____

Vitamin C

Vitamin C is found in fruit, and especially citrus fruit.

1. _____
2. _____
3. _____
4. _____
5. _____

Vitamin A

Vitamin A is found in animal products and reddish foods.

1. _____
2. _____
3. _____
4. _____
5. _____

Fats and Oils

Oils can be found in fish, nuts, and vegetable oils. Fats come from many animal foods and processed vegetable oils, including butter and margarine.

1. _____
2. _____
3. _____
4. _____
5. _____

Limited Nutritional Value

These are foods that don't provide important nutrients. This group includes processed snack foods that are high in salt and sugar.

1. _____
2. _____
3. _____
4. _____
5. _____

GENERAL SOURCE OF NUTRIENTS KEY

Note: The examples for each category are common sources for each nutrient

Protein

- beef
- cheese
- chicken
- chili
- corn
- egg
- kidney beans
- milk
- peanut
- pork
- salmon
- tuna fish

Carbohydrates

- brown rice
- corn
- pasta (processed)
- pretzel
- white bread
- white rice

- whole grain bagel
- whole grain pasta
- whole wheat bread

Fiber

- apples
- broccoli
- brown rice
- chili
- corn
- kidney beans
- oatmeal
- orange
- peaches
- potato
- strawberry
- whole grain bagel
- whole grain pasta
- whole wheat bread

Calcium

- broccoli

- cheese
- low fat milk
- spinach
- whole milk
- yogurt (low fat, plain)

Vitamin C

- apple juice
- apples
- broccoli
- cucumbers
- grapefruit juice
- grapes
- green beans
- lemon
- orange
- peaches
- potato
- spinach
- strawberry
- tomato

Vitamin A

- beef
- broccoli
- carrot
- cheese
- egg
- green beans
- milk
- peach
- spinach
- strawberry
- tomato

Fats and Oils

- avocado
- butter
- canola oil
- coconut oil
- margarine
- peanuts
- salmon

Limited Nutritional Value

- chocolate
- deep-fried food
- donuts and other pastries with high sugar content
- ice cream
- other candy
- soda
- syrup

REFERENCE

Nutrition data. 2008.
www.nutritiondata.com

ACTIVITY 2

Diet Detectives

BACKGROUND INFORMATION

What we eat can have a big influence on what we can do and how we feel. Having deficiencies in important nutrients such as carbohydrates, proteins, calcium, vitamin C, vitamin A, and fiber for a period of time can lead to problems like low energy, poor concentration, and illness. A balanced diet that contains all essential nutrients will help keep our minds and bodies healthy, active, and strong.

Time Required

40–60 minutes

Concepts and Vocabulary

Balanced diet

Life Skills

Communication, contributions to a group effort, cooperation, critical thinking, healthy lifestyle choices, keeping records, problem solving, sharing, teamwork

Subject Links

Science, Language Arts

State Content Standards

Science

- Fourth Grade:
 - » Investigation and Experimentation – 6c
- Sixth Grade:
 - » Investigation and Experimentation – 7a, 7e

Language Arts

- Fourth Grade:
 - » Reading Comprehension – 2.3
 - » Listening and Speaking Strategies – 1.7, 1.8
- Fifth Grade:
 - » Reading Comprehension – 2.4
 - » Listening and Speaking Strategies – 1.5
- Sixth Grade:
 - » Reading Comprehension – 2.3
 - » Listening and Speaking Strategies – 1.5

Suggested Grouping:

Groups of 2 to 5 individuals

Materials Needed:

(* = *Materials provided in curriculum*)

- * *Sample Diets*
- * *General Facts on Nutrients Handout*
- * *General Sources of Nutrients Key*
- * *USDA MyPlate*
- Flip chart paper
- Pens, pencils, or markers
- Notebook paper

Getting Ready

- Make enough *Sample Diets* worksheets for each group.
- Make enough copies of the *General Facts on Nutrients Handout* and *General Sources of Nutrients Key* for each group.

- Make enough MyPlate handouts for each group.
- Pass the materials out to each group.

OPENING QUESTIONS

1. **When you hear the phrase “a balanced diet,” what does that mean to you?** Ask the youth to share their ideas verbally or record their ideas on the flip chart paper provided.
2. **What do you think might happen if we didn’t eat enough of the types of foods that provide the proper nutrients?** Ask the youth to share their thoughts verbally or record their ideas on the flip chart paper provided.

PROCEDURE (EXPERIENCING)

Facilitator Note: Please set up this scenario for the students. Explain to them that they are “Diet Detectives.” Their job is to review people’s diets and use the resources provided to recommend changes to make them more balanced.

1. A set of *Sample Diets*, a copy of the *General Facts on Nutrients Handout*, and a copy of the MyPlate handout will be distributed to each group.
2. Each group will read the *Sample Diets*. From the information provided on the diets, the *General Facts on Nutrients Handout*, and the MyPlate handout, youth will work together to determine:
 - » Which nutrients (if any) do they believe are missing or in excess from the different diets? Have them record and explain their ideas on the flip chart paper provided.

- » How can each diet be improved? What foods would they recommend be added to or removed from the diets to make them more balanced? Have them record and explain their ideas on the flip chart paper provided.
- » **Volunteer Note:** It may help to have the youth generate a chart to organize their thoughts.

SHARING, PROCESSING, AND GENERALIZING

After the youth have completed the procedure, have them share their thoughts and responses to the different scenarios. Follow the lines of thinking developed through the general thoughts, observations, and questions raised by the youth; if necessary, use more targeted questions as prompts to get to particular points. Specific questions might include:

1. **If your group's answers differ from other groups, compare and discuss why.** Ask the youth to share their ideas verbally or write their thoughts and ideas on the paper provided.

» **Volunteer Tip:** Below is a key for the different *Sample Diets*:

- › Mark's diet: Low in protein
- › Jenny's diet: Low in carbohydrates
- › Justin's diet: Low in calcium
- › Claire's diet: Low in Vitamin C
- › Ryan's diet: Low in Vitamin A
- › Molly's diet: High in fiber
- › Scott's diet: Too many sweets
- › Sydney's diet: Too much saturated fat

2. **What do you believe might happen if people who were missing an essential nutrient continued their diet for a longer period of time?** Ask the youth to share their thoughts and ideas verbally or record them on the flip chart paper provided.

3. **What are some ways you can make sure you have a balanced diet and get the proper nutrients?** Ask the youth to share their thoughts and ideas verbally or record them on the flip chart paper provided.

CONCEPTS AND TERMS

At this point, volunteers need to ensure that the concept of balanced diet has been introduced or discovered by the youth. (Note: The goal is to have the youth develop concepts through their exploration and define terms using their own words.)

CONCEPT APPLICATION

1. On their own piece of notebook paper, ask each youth to write down everything they can remember eating in the last three days. Ask the youth in each group to share with one another, and then have the different groups share and compare their results.
2. Using the piece of the flip chart paper, ask the groups to put the foods they have listed on their individual papers into categories based on food types. Then ask them to rank the categories relative to quantities (how much of a given food type) and importance (healthy vs. not-so-healthy).
 - » **Volunteer Tip:** Encourage the youth to develop their own organizational scheme for categorizing the food.
3. Once everyone has completed steps 1 and 2, ask them to compare their results with the *MyPlate handout*. What are some of their observations?
4. Based on the foods that they eat, ask each group to prepare a three-day menu that complies with the recommendations of the Human Food Pyramid.
5. Ask the groups to share and compare their three-day menus.

REFERENCES

- Mann, J., and A. S. Truswell. 2007. *Essentials of human nutrition* (3rd. ed.). Oxford, NY: Oxford University Press.
- University of Maryland Medical Center. 2013. *Nutrition*. <http://umm.edu/health/medical/altmed/treatment/nutrition>.

GENERAL SOURCE OF NUTRIENTS KEY

Note: The examples for each category are common sources for each nutrient listed.

List of Familiar Foods for Humans

Protein

- beef
- cheese
- chicken
- chili
- corn
- egg
- kidney beans
- milk
- peanuts
- pork
- salmon
- tuna fish

Carbohydrates

- brown rice
- corn
- pasta (processed)
- pretzel
- white bread
- white rice

- whole grain bagel
- whole grain pasta
- whole wheat bread

Fiber

- apple
- broccoli
- brown rice
- chili
- corn
- kidney beans
- oatmeal
- orange
- peach
- potato
- strawberry
- whole grain bagel
- whole grain pasta
- whole wheat bread

Calcium

- broccoli
- cheese
- low fat milk
- spinach
- whole milk
- yogurt (low fat, plain)

Vitamin C

- apple juice
- apple
- broccoli
- cucumber
- grapefruit juice
- grapes
- green beans
- lemon
- orange
- peaches
- potato

- spinach
- strawberry
- tomato

Vitamin A

- beef
- broccoli
- carrot
- cheese
- egg
- green beans
- milk
- peach
- spinach
- strawberry
- tomato

Fats and Oils

- avocado
- butter
- canola oil

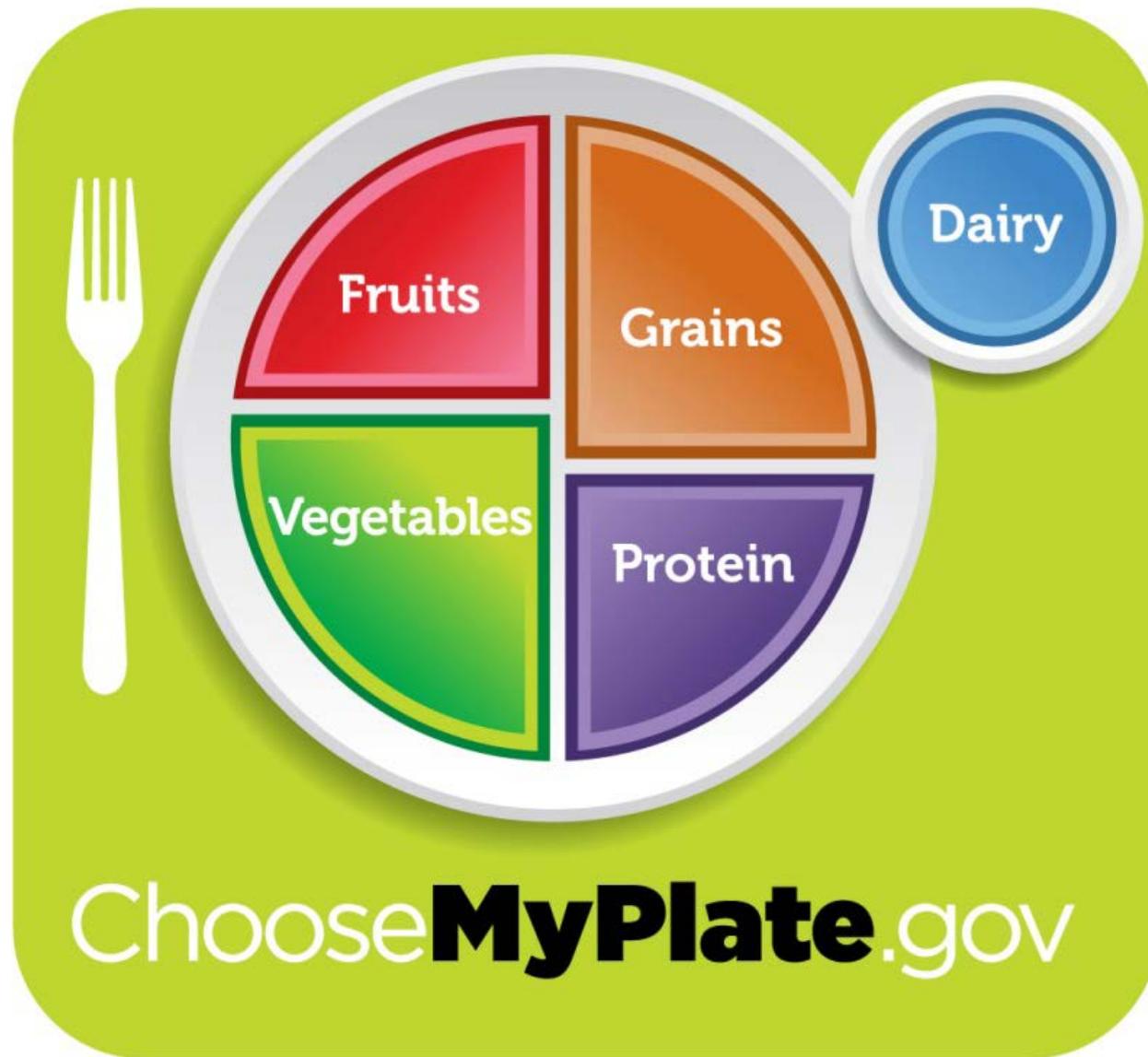
- coconut oil
- margarine
- peanuts
- salmon

Limited Nutritional Value

- chocolate
- deep-fried food
- donuts and other pastries with high sugar content
- ice cream
- other candy
- soda
- syrup

REFERENCE

Nutrition Data 2008.
www.nutritiondata.com



SAMPLE DIETS

Mark's diet:

- **Breakfast:** 3 pieces of white toast with butter
- **Lunch:** White rice with chopped spinach
- **Dinner:** White pasta with steamed carrots, apple juice

Jenny's diet:

- **Breakfast:** Eggs and sausage
- **Lunch:** Hotdog on a white bun
- **Dinner:** Steak with chicken, apple juice

Molly's diet:

- **Breakfast:** 2 pieces of whole wheat toast with butter, milk
- **Lunch:** Brown rice topped with peanuts, grapefruit juice
- **Dinner:** Whole wheat bagel with cheese, apple juice

Scott's diet:

- **Breakfast:** 2 donuts
- **Lunch:** 2 orders of French fries, one candy bar
- **Dinner:** Deep-fried chicken, broccoli, soda

Sydney's diet:

- **Breakfast:** Bacon, French toast (made with white bread) with lots of butter and syrup
- **Lunch:** Fried chicken strips, French fries
- **Dinner:** 4 slices of cheese pizza, chocolate cake

REFERENCE

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

GENERAL FACTS ON NUTRIENTS HANDOUT

Carbohydrates

- **Function:** Carbohydrates provide energy to the body, especially to the brain and the nervous system.
- **Types and sources of carbohydrates:**
 - » **Simple carbohydrates:** Fruits, some vegetables, some dairy products, refined grains (processed flour), sugar, and corn syrup.
 - » **Complex carbohydrates:** Starchy vegetables, whole grains and cereals.
- **Possible effects:**
 - » **Too little:** Fatigue or lack of energy, malnutrition, and increased fat intake.
 - » **Too much:** Obesity.

Protein

- **Function:** Protein is an important source of energy and is essential for growth and organ function.
- **Sources:** meat, fish, eggs, cheese, beans, lentils, tofu, and nuts.
- **Possible effects:**
 - » **Too little:** Muscle loss, decrease in growth, decreased immunity (easier to get diseases or illnesses).
 - » **Too much:** Can cause high cholesterol and different types of diseases like gout.

Calcium

- **Function:** Calcium is a very important mineral because it makes up important structures like teeth and bones. It helps us grow and maintains our bodies. It also helps to prevent diseases like osteoporosis (weak bones).
- **Sources:** It is found in many types of foods, but is very abundant in dairy products. It is also found in green leafy vegetables (e.g., broccoli), some seafood (e.g., salmon), almonds, and dried beans.
- **Possible effects:**
 - » **Too much:** Normally no side effects appear, but if calcium intake is high over a long period of time it can cause the development of kidney stones.
 - » **Too little:** Deficiencies in calcium can lead to increased chance of broken bones or tooth decay.

Vitamin A

- **Function:** Vitamin A helps maintain healthy teeth, bones, soft tissue, and skin. It also helps promote good vision.
- **Sources:** Meats and animal products (milk, eggs), dark leafy green vegetables (e.g., spinach), and brightly colored vegetables (e.g., carrots) and fruits (e.g., cantaloupe).
- **Possible effects:**
 - » **Too little:** Vision problems; decreased resistance to disease.
 - » **Too much:** Can cause Vitamin A poisoning when consumed in very large amounts.

Vitamin C

- **Function:** Vitamin C is essential for normal growth and development. It is needed to make skin, scar tissue, heal wounds, and repair bone, cartilage and teeth. Since our body cannot make or store vitamin C, we must get it from foods we eat.
- **Sources:** Fruits and vegetables.
- **Possible effects:**
 - » **Too little:** Damaged hair, bleeding gums, rough and dry skin, easy bruising, slow healing of wounds, and nosebleeds.
 - » **Too much:** Vitamin C toxicity can occur which can lead to upset stomachs and diarrhea.

Fiber

- **Function:** Fiber is important in the diet because it helps us feel full after eating which can help with weight control. It also helps with digesting food and prevents constipation.
- **Types and sources of fiber:**
 - » **Soluble:** This type of fiber is slowly digested in the body and can lower cholesterol and help prevent heart disease. Sources of soluble fiber include oat bran, barley, nuts and seeds, beans, and some fruits and vegetables.
 - » **Insoluble:** This helps food pass through the stomach and intestines faster and adds bulk to the stool. Types of food high in insoluble fiber include wheat bran, vegetables, and whole grains.
- **Possible effects:**
 - » **Too little:** Constipation (difficulty passing bowel movements).
 - » **Too much:** Eating too much in a short period of time can cause gas, bloating, and cramps.

Fats and Oils

- **Function:** Fats and oils are a source of energy. There are essential fatty acids that our body cannot make so we must get them from our diet. Fats are like storage boxes, storing calories for when we do not have food to eat. Fat also helps insulate the body, maintains healthy hair and skin, and helps our body absorb different vitamins.
- **Types of fats:**
 - » **Saturated fats:** These types of fats tend to raise levels of LDL or “bad cholesterol” in a person’s blood. Increased levels of LDL can lead to heart disease. Saturated fats are found in some animal products (e.g., butter, cheese, ice cream) and fatty meats.
 - » **Unsaturated fats:** These types of fats tend to raise levels of HDL or “good cholesterol” in a person’s blood. They are found in most liquid vegetable oils.
- **Possible effects:**
 - » **Too little:** Hair loss or dull hair, brittle nails, and lack of cushioning for organs (Note: This is for unsaturated fats).
 - » **Too much:** Too much of saturated fats can cause heart disease, clogged arteries, and obesity.

Sweets

- **Function:** Quick source of energy
- **Sources:** Processed foods that have an excess of sugar (e.g., candy)
- **Possible effects:**
 - » **Too much sugar:** Can cause a “sugar high,” which is when a person gets a “rush” of energy for a period of time and then slows down with an energy “crash.” Dental decay, excess weight gain, and stomachaches can occur from eating too much sugar.

REFERENCES

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ACTIVITY 3

Shopping by Chance for Pigs

BACKGROUND INFORMATION

Swine have long been domesticated and they rely on their owners for the type and quality of food they eat as well as the quality and amount of water they drink. Therefore it is important for owners to know what the essential nutrients for pigs are.

One misconception is that pigs can eat the same types of foods humans eat. With this understanding, many people think that feeding pigs table scraps is sufficient enough to meet their daily nutrient requirements. This is not true. In reality, the nutrient requirements for humans and pigs are different. Humans and pigs do need essential nutrients such as energy, protein, lysine, vitamins, and minerals in their diet, but the amounts of these nutrients differ for the two. Equally important is the fact that, just like humans, swine at different life stages require different types and quantities of nutrients.

Time Required

40–60 minutes

Concepts and Vocabulary

Essential nutrients, life stages of pigs

Life Skills

Communication, contributions to a group effort, cooperation, critical thinking, decision-making, keeping records, planning/organizing, problem solving, sharing, teamwork

Subject Links

Science, Language Arts, Math

State Content Standards

Science

- Fifth Grade:
 - » Investigation and Experimentation – 6g, 6h
- Sixth Grade:
 - » Investigation and Experimentation – 7d, 7e

Language Arts

- Fourth Grade:
 - » Listening and Speaking Strategies – 1.2, 1.7, 1.8
- Fifth Grade:
 - » Reading Comprehension – 2.4
 - » Listening and Speaking Strategies – 1.5
- Sixth Grade:
 - » Listening and Speaking Strategies – 1.5
 - » Speaking Applications – 2.5b

Math

- Fourth Grade:
 - » Statistics, Data Analysis, and Probability: 1.0
- Students organize, represent, and interpret numerical and categorical data and clearly communicate their findings – 1.1

Suggested Groupings

Work in pairs or small groups

Materials Needed

(* = Materials provided in curriculum)

- * Pig Life Stage Cards

- * Pig Nutrient Requirements
- * Feed Cards
- * Nutrients Worksheet
- * Nutrient Comparison Graphs Worksheet
- * Facts about Nutrients
- * Appendix B: Pig Nutrient Requirements Tables (Concept Application)
- * Appendix C: Feed and Feed Ration Handouts (Concept Application)
- Flip chart paper
- Markers or colored pencils
- Tape

Getting Ready

- Make 3 to 5 copies of each of the *Feed Cards* and staple identical cards together. Display the different *Feed Cards* on a table.
- Make enough copies of the *Pig Life Stage Cards* so each group gets a card. Additional copies may be needed later. Cut out the cards.
- Make enough *Pig Requirement Tables* for each group.
- Make enough copies of the *Nutrients Worksheet* for each group.
- Make enough copies of the *Appendix B: Swine Nutrient Requirements Tables* and *Appendix C: Feed and Feed Ration Handouts* for each youth (Concept Application).

OPENING QUESTIONS

1. **What do you know about the different types of food that pigs eat?** Ask the youth to share their ideas verbally or write their thoughts and ideas on the paper provided.
2. **Recall what nutrients are essential for humans. What do you think some of the essential nutrients for pigs might be? How do you think pigs acquire these nutrients?** Ask the youth to share their ideas verbally or write their thoughts and ideas on the paper provided.

PROCEDURE (EXPERIENCING): PART A

1. Pass out the *Nutrients Worksheet* to each group.
2. Each group of youth will have a pig from a specific life stage. Determine that by passing out a *Pig Life Stage Card* at random to each group. Have them write the life stage of the pig they received under Part A of the *Nutrients Worksheet*.
3. Explain the scenario to the youth: They are pig owners and their group is going to the store to buy a type of feed for their particular pig.
4. Have each group go to the “store” (table with feed labels) to pick out a feed for their pig. Once each group has decided on the feed they want, have them remove one label and take it back with them. Write this feed type they picked under Part A of the *Nutrients Worksheet*.

SHARING, PROCESSING, AND GENERALIZING

Ask each group to discuss why they chose the particular feed that they did. Ask the youth to please share their ideas verbally or write their thoughts and ideas on the paper provided.

PROCEDURE (EXPERIENCING): PART B

1. Pass out the *Pig Nutrient Requirements* to each group.
2. Have the youth determine the particular nutrient requirements for their pig and record the information down under Part B of the *Nutrients Worksheet*.
3. Next, have the youth compare the feed they chose with the nutrient requirements of their pig. Did the feed they chose meet the nutrient requirements of their pig? Why or why not? Have them fill out and write their responses under Part B of the *Nutrients Worksheet*. Pass out the *Facts about Nutrients* page to help them complete the *Nutrients Worksheet*.

SHARING, PROCESSING, AND GENERALIZING

As a group, have each group discuss their pig's diet and whether they met the pig's nutrient requirements. Have them also discuss potential benefits and possible drawbacks with respect to their pig's diet. Discuss ways each group can improve their pig's feed.

PROCEDURE (EXPERIENCING): PART C

1. For those groups that did not pick the correct diet, ask them to return to the “store” and shop for another diet that best meets their pig's requirements. Include any modifications that might be needed. Have them fill out and write their responses under Part C of the *Nutrients Worksheet*.
2. For those who picked the correct diet, have the youth go and choose appropriate diets for the other pigs listed in the *Pig Nutrient Requirements*.

3. Have them fill out the table in Part C of the *Nutrients Worksheet*.
4. **Note:** The youth who completed step 1 may now continue with steps 2 and 3. Wait until each group has completed at least one other pig before moving to the next section.

SHARING, PROCESSING, AND GENERALIZING

Have each group share the diets they picked for each pig and explain why they chose as they did. Have each group compare their findings, see if they are similar or different, and try to understand why.

PROCEDURE (EXPERIENCING): PART D

1. Using the *Nutrient Comparison Graphs Worksheet* and the *Pig Nutrient Requirements* handout, have the youth plot the nutrient requirements for each life stage as a line graph.
2. Once each group has completed graphing, have them look at the trends in nutrient requirements for each life stage. Have them share their thoughts and ideas either verbally or on the flip chart paper provided.

SHARING, PROCESSING, AND GENERALIZING

Follow the lines of thinking developed by the youth as they share and compare their thoughts and observations on the overall activity. If necessary, use more targeted questions as prompts to get to particular points. Specific questions might include

1. **Asking each group share their thoughts and ideas to the trends of each life stage.**
 2. **Asking the youth to share what they learned about different life stages of pigs.** Have them share their thoughts and ideas either verbally or on the flip chart paper provided.
 3. **Asking the youth to share what they learned about food labels.** Have them share their thoughts and ideas either verbally or on the flip chart paper provided.
 4. **Asking the youth to explain why they think it is important to read food labels.** Have them share their thoughts and ideas either verbally or on the flip chart paper provided.
- » **Volunteer Tip:** Notice on the different feed diets that crude fat and crude fiber are shown. Since it is complicated to calculate these specific requirements for pigs at different life stages, we have omitted them here to avoid confusion. However, it is important to recognize that both nutrients are extremely important in a pig's diet, so it is always important to take both the crude fat and crude fiber content of each feed and its relation to the

pig's life stage requirements into consideration for different pigs. Please consult a pig nutrition book or your local feed store to find the best diet for your pig.

CONCEPTS AND TERMS

At this point, volunteers need to ensure that the concept of life stages of different pigs and the term essential nutrients have been introduced or discovered by the youth. The goal is to have the youth develop concepts and terms through their own exploration and define terms using their own words.

CONCEPT APPLICATION

Ask youth who do have a pig to . . .

- Determine the life stage of their pig.
- Use the *Pig Nutrient Requirements* (from the activity) and *Appendix B: Pig Nutrient Requirements Tables* to figure out what their pig's nutritional requirements are.
- Go online and research how to obtain the essential nutrients for their pig.
 - » **Volunteer Tip:** Included in this publication is *Appendix C: Feed and Feed Ration Handouts* that youth can use with reference to their own pigs.

Ask youth who do not have a pig to . . .

- Choose a pig at a particular life stage that they might want.
- Use *Appendix B: Pig Nutrient Requirements Table* to figure out what the nutritional requirements are for that particular pig.
- Go online and research how to obtain the essential nutrients for their chosen pig.

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- Straw, B. E., J. J. Zimmerman, S. D'Allaire, and D. J. Taylor. 2006. Diseases of swine. Blackwell Publishing.

PIG LIFE STAGE CARDS

Print one-sided on heavy paper and cut out along dashed lines.



Early Weaned Pig



Finishing Pig



Growing Pig



Late Gestation Sow



Lactating Sow

PIG NUTRIENT REQUIREMENTS

(Note: These are approximations of the daily requirements needed for each pig).

Pig type	Nutrients			
	Crude protein	Lysine	Calcium	Phosphorus
Early weaned pig (under 40 lb)	24.5%	1.43%	0.85%	0.68%
Growing pig (40 lb to 125 lb)	19.5%	1.05%	0.65%	0.55%
Finishing pig (125 lb to 260 lb)	14.5%	0.68%	0.48%	0.42%
Late-gestation sow	12.5%	0.55%	0.75%	0.65%
Lactating sow	17%	0.95%	0.75%	0.65%

FEED CARDS (Note: The ingredients are from actual feeds but the names of the feeds are fictional.)



Super Pig!

...Guaranteed Analysis...

Crude Protein...Min. 19.93%

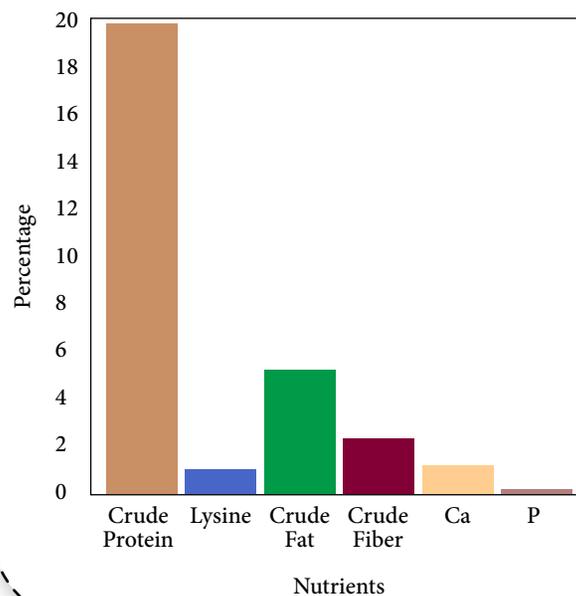
Lysine...Min. 1.18%

Crude Fat...Min. 5.75%

Crude Fiber...Max. 2.39%

Calcium (Ca)...Between 0.85% and 1.15%

Phosphorus (P)...Min. 0.65%



Healthy Organic Pig Feed

...Guaranteed Analysis...

Crude Protein...Min. 20.41%

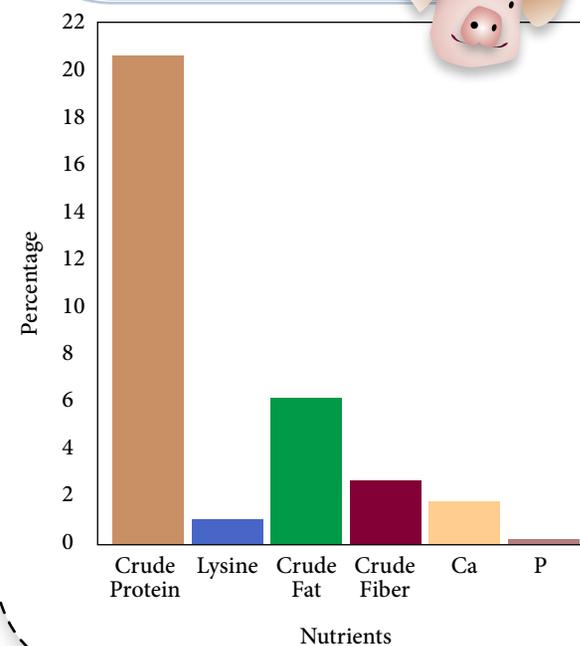
Lysine...Min. 1.18%

Crude Fat...Min. 6.53%

Crude Fiber...Max. 2.68%

Calcium (Ca)...Between 1.20% and 1.60%

Phosphorus (P)...Min. 0.70%



Complete Diet for Your Swine

...Guaranteed Analysis...

Crude Protein...Min. 13.50%

Lysine...Min. 0.60%

Crude Fat...Min. 3.20%

Crude Fiber...Max. 2.20%

Calcium (Ca)...Between 1.20 and 1.50%

Phosphorus (P)...Min. 0.83%



All Around Pig Feed Fit to feed YOUR pig!

...Guaranteed Analysis...

Crude Protein...Min. 16.10%

Lysine...Min. 0.80%

Crude Fat...Min. 8.30%

Crude Fiber...Max. 2.30%

Calcium (Ca)...Between 1.05 and 1.35%

Phosphorus (P)...Min. 0.69%

Recommended by veterinarians!



KING of all Pig Feeds Fit for a King!

...Guaranteed Analysis...

Crude Protein...Min. 20.06%

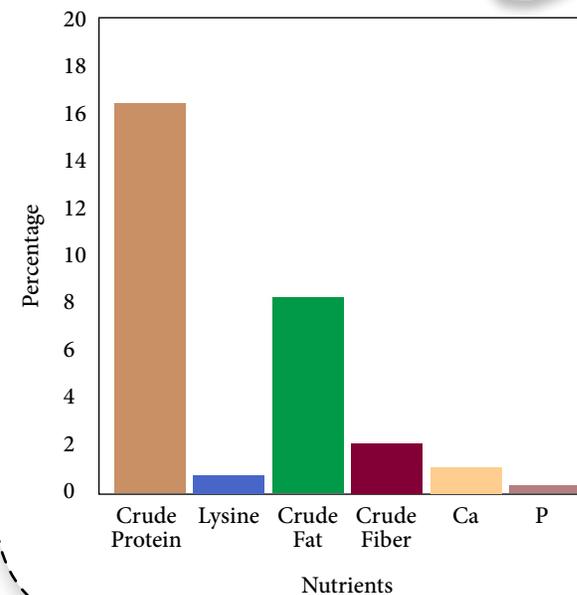
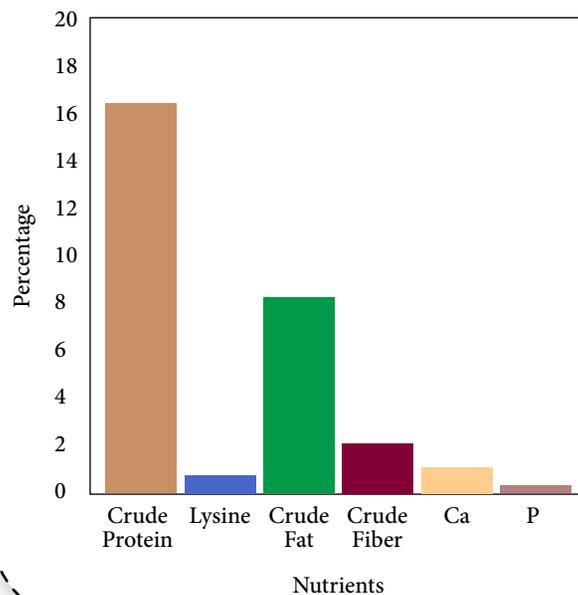
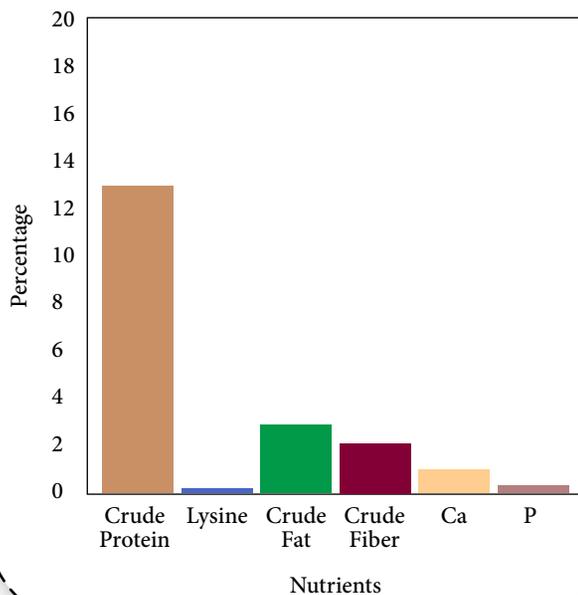
Lysine...Min. 1.20%

Crude Fat...Min. 5.41%

Crude Fiber...Max. 2.33%

Calcium (Ca)...Between 0.78% and 1.08%

Phosphorus (P)...Min. 0.73%



Pellets for Pigs

...Guaranteed Analysis...

Crude Protein...Min. 14.0%

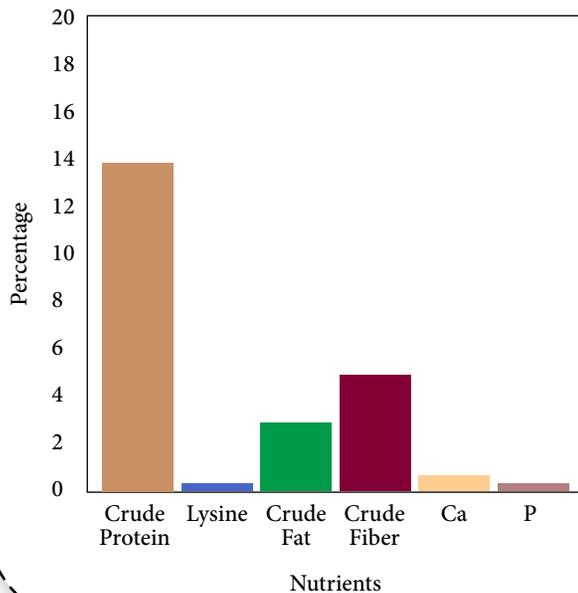
Lysine...Min. 0.60%

Crude Fat...Min. 3.0%

Crude Fiber...Max. 5.50%

Calcium (Ca)...Between 0.60 and 1.10%

Phosphorus (P)...Min. 0.50%



Cracked Corn

...Guaranteed Analysis...

Crude Protein...10.00%

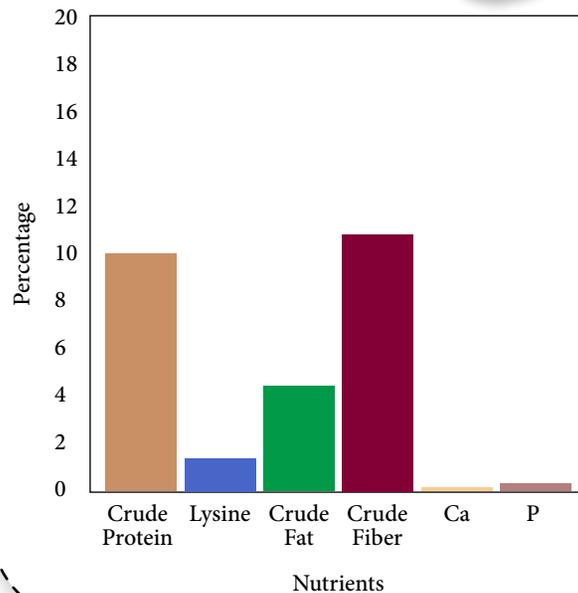
Lysine...1.45%

Crude Fat...4.10%

Crude Fiber...11.00%

Calcium (Ca)...0.03%

Phosphorus (P)...0.32%



Natural Nutrition Rolled Corn for Swine

...Guaranteed Analysis...

Crude Protein...9.00%

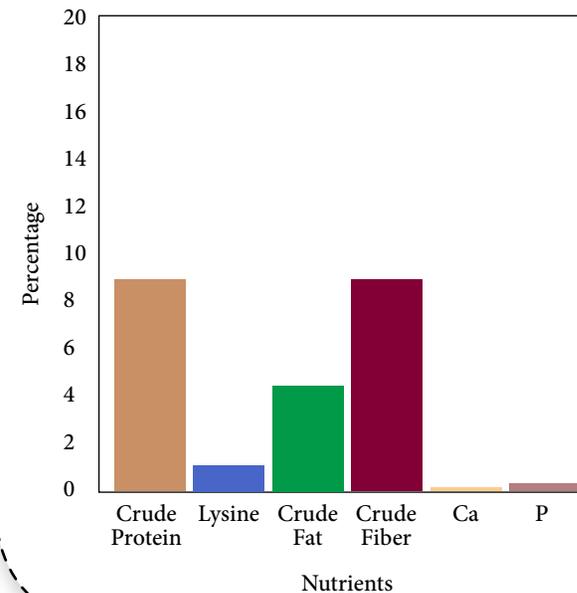
Lysine...1.50%

Crude Fat...4.10%

Crude Fiber...9.00%

Calcium (Ca)...0.02%

Phosphorus (P)...0.29%



Energy! Strength! Alfalfa Hay [Mid Bloom]

...Guaranteed Analysis...

Crude Protein...17.00%

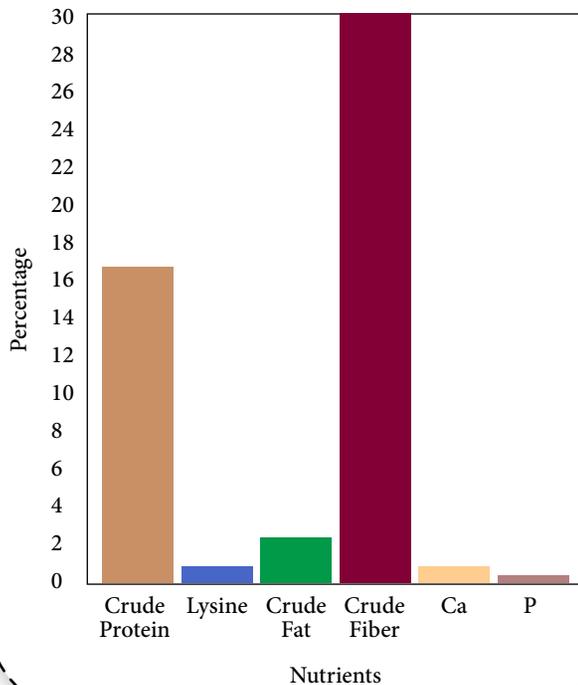
Lysine...1.37%

Crude Fat...2.30%

Crude Fiber...30.00%

Calcium (Ca)...1.40%

Phosphorus (P)...0.24%



Soybean Meal

...Guaranteed Analysis...

Crude Protein...50.00%

Lysine...0.97%

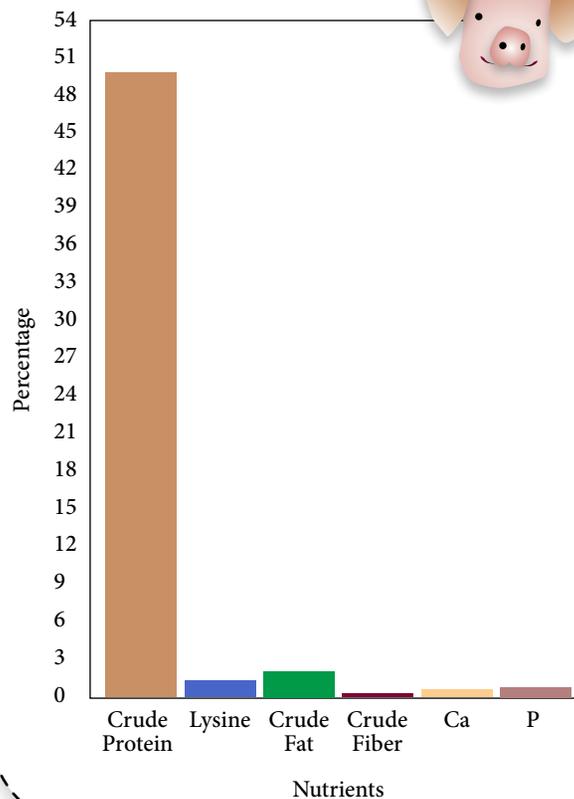
Crude Fat...1.80%

Crude Fiber...0.60%

Calcium (Ca)...0.39%

Phosphorus (P)...0.71%

Guaranteed to fly you to first place!



Cottonseed Meal

...Guaranteed Analysis...

Crude Protein...47.00%

Lysine...0.72%

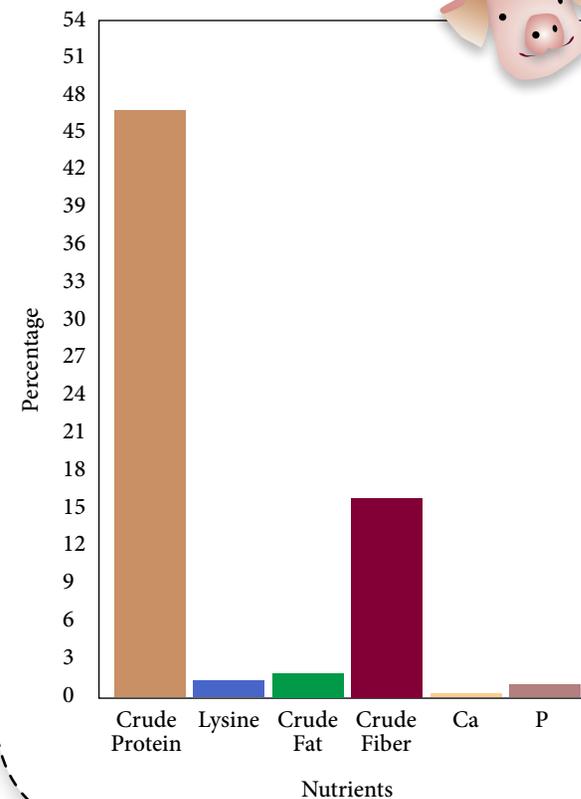
Crude Fat...1.30%

Crude Fiber...15.00%

Calcium (Ca)...0.22%

Phosphorus (P)...1.30%

All natural and great tasting!
Your pigs will LOVE it!



Oat Grain

...Guaranteed Analysis...

Crude Protein...47.00%

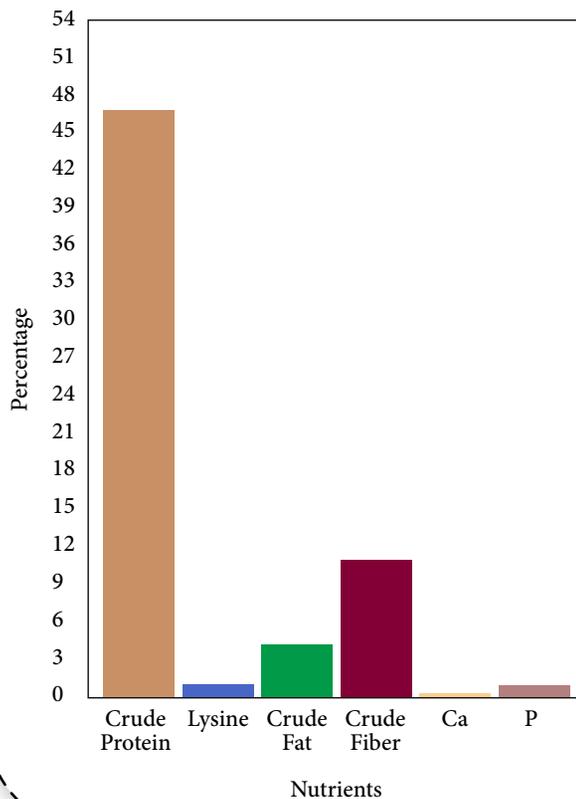
Lysine...0.55%

Crude Fat...4.90%

Crude Fiber...11.00%

Calcium (Ca)...0.05%

Phosphorus (P)...0.40%



NUTRIENTS WORKSHEET

Part A:

Life Stage of Pig: _____

Feed Type: _____

Part B:

Pig Nutrient Requirements

Crude Protein: _____

Lysine: _____

Calcium: _____

Phosphorus: _____

Feed Nutrients

Crude Protein: _____

Lysine: _____

Calcium: _____

Phosphorus: _____

Based on your understanding of your pig's nutritional needs, determine if you believe the feed you chose:

Sufficiently meets pig's dietary requirements, (please explain).

Doesn't sufficiently meet pig's dietary requirements, (please explain).

Unable to determine, (please explain). _____

Potential Benefits of the feed you chose: _____

Potential Drawbacks of the feed you chose: _____

What might you do to improve your pig's feed? (please explain).

Part C:

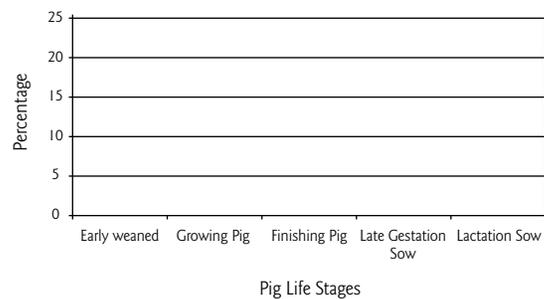
Of the feeds available, which diet best meets your pig's requirements? Please explain. Include any modifications you might have for the feed.

Life stage of pig	Feed type	Why did you choose this feed?
Early weaned pig		
Growing pig		
Finishing pig		
Late gestation sow		
Lactating sow		

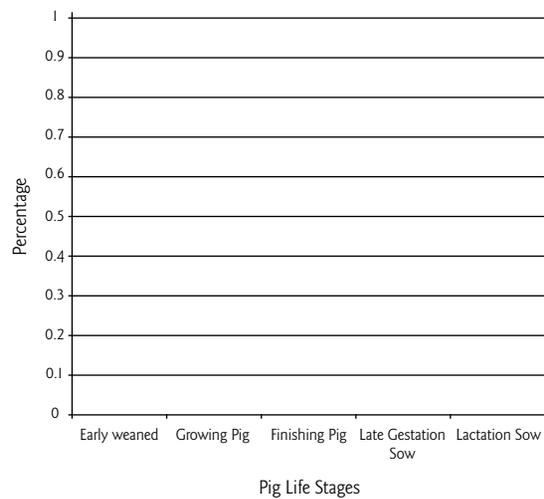
Part D:

Please use *Pig Nutrient Requirements* worksheet to complete each graph below as a bar graph

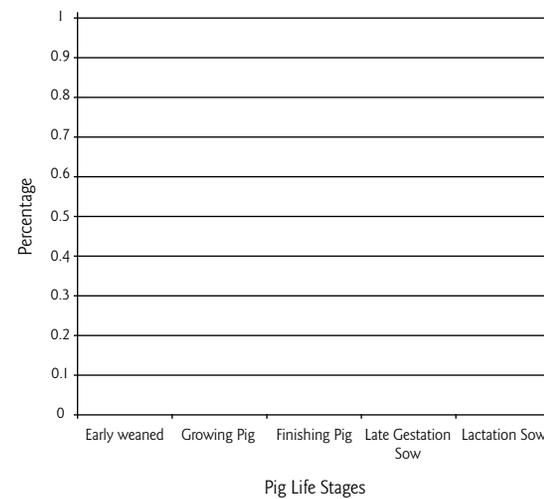
Crude Protein



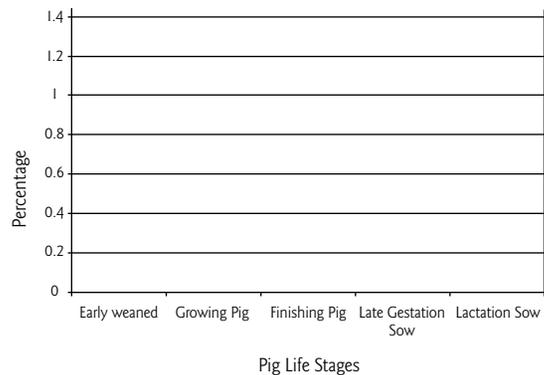
Calcium



Phosphorus



Lysine



FACTS ABOUT NUTRIENTS

Lack of Nutrients

- **Lack of Protein:** In general, this can cause a reduction in muscle gain and poor feed conversion. Different life stages have different symptoms. In growing and finishing pigs, the carcass is fatter. In lactating sows, milk production is reduced and weight loss occurs.
- **Lack of Lysine:** This can lead to a reduction in body weight, smaller muscles, and a declined growth rate.
- **Lack of Calcium:** This can lead to reduced growth and poor bone mineralization, which can cause diseases like rickets, osteomalacia (softening of the bone), and paralysis in the hind legs.
- **Lack of Phosphorus:** This can lead to reduced growth and poor bone development, which can cause diseases like rickets, osteomalacia (softening of the bone), and paralysis in the hind legs.

Excess of Nutrients

- **Excess Protein:** If a pig is fed an excess of protein, it is not just expensive; it is also an inefficient source of energy. Usually pigs can tolerate high levels of protein. Minor symptoms that may occur include mild diarrhea.
- **Excess Lysine:** In general, an excess of amino acids can lead to toxicity or imbalance in amino acids, depending on which amino acid is in excess. For lysine, it can cause antagonism. If a pig eats a lot of lysine, that decreases the amount of arginine available in its system.

- **Excess Calcium:** An excess amount of calcium can reduce a pig's performance. It can also increase a pig's need for other minerals and vitamins such as zinc and vitamin K.
- **Excess Phosphorus:** An excess amount of phosphorus can reduce a pig's performance.

OTHER IMPORTANT NUTRIENTS

Fat

- **Lack of Fat:** A lack of fat has indirect effects on the pig. Mainly it reduces the production of essential fatty acids, which can cause hair loss, skin problems, and an unthrifty appearance.
- **Excess Fat:** A decreased feed intake with over 10% fat can cause health problems in pigs.

Fiber

- **Lack of Fiber:** Fiber is important for a lactating sow. It has a laxative effect that helps keep her regular and comfortable during lactation.
- **Excess Fiber:** An excess of fiber can make the diet less digestible and reduce animal performance (for instance, gain and feed efficiency).

RECOMMENDATIONS TO IMPROVE PIG FEED

- Look at other feed types and see if there is one that better matches the type of pig you have.
- Combine different types of feed to meet your pig's nutrient requirements.
- Add supplements to the feed when there is a lack of particular vitamins or minerals.

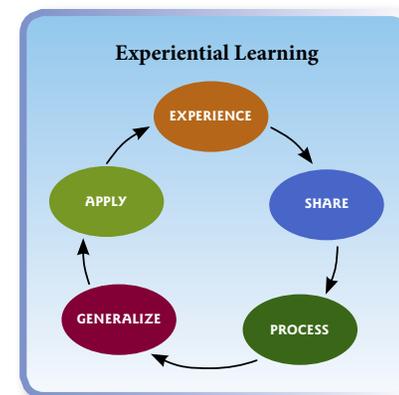
GLOSSARY

- **Balanced diet:** Eating the right types of food in the right amounts to maintain a healthy body.
- **Basic nutrients:** Substances that help maintain a healthy body. These include carbohydrates, proteins, vitamins and minerals.
- **Care:** Having concern for someone or something, which leads to tending or overseeing that person or thing.
- **Competition:** A struggle between individuals for food, space, and other important requirements for survival.
- **Direct contact:** Physical contact between an ill person or animal and a healthy person or animal.
- **Disease:** An abnormal condition that affects the normal function and health of an organism, decreasing the health of that organism.
- **Disease prevention:** Taking the necessary steps to prevent humans and/or animals from getting sick.
- **Disease transmission:** To transfer a disease from one person or animal to another.
- **Dominant:** Having influence, control, and authority over others.
- **Environmental needs of humans and swine:** The things that both humans and swine need in their home or living area to help them survive and live comfortably.
- **Essential nutrients:** Nutrients that humans and animals must have to live and function properly.
- **Germs:** A microorganism that has the potential to cause diseases.
- **Health care monitoring:** Closely observing an animal's health, behavior and activity everyday to determine what is normal or abnormal about your animal.

- **Illness:** Being unhealthy or in poor health.
- **Indirect contact:** When an uninfected person or animal touches the contaminated surface (e.g., table top) of an inanimate object (e.g., food dish).
- **Life stages of swine:** Swine are categorized in different stages of development or life stages. Swine at each life stage have different nutritional requirements to grow and stay healthy.
- **Olfactory receptors:** Structures that aid with an individual's sense of smell. The more receptors you have, the better your sense of smell.
- **Prenasal bone:** A bone found in the snout of pigs. This bone allows them to use their nose to dig for food in the ground.
- **Preventative health care:** The act of maintaining the health of humans and animals by preventing them from catching an illness or disease.
- **Responsibility:** Being accountable for one's actions or behaviors.
- **Rooting:** The act of pulling out or removing items from under the ground.
- **Rooting-disk:** A disk found in the snout of pigs that is very sensitive, allowing them to explore the surrounding environment.
- **Social dominance:** In a group, there are individuals that lead and have authority over others in the group.
- **Social hierarchy:** A system where individuals are ranked from top to bottom according to authority or importance.
- **Social order:** A system in place that keeps a group stable and functioning.
- **Subordinate:** Belonging to a lower level or rank in a group.
- **Tactile receptors:** Structures that aid with someone or something's ability to feel and touch items in the environment. The more receptors you have, the better your sense of touch.
- **Wallowing:** To roll around in the mud.

APPENDIX A

The activities in this curriculum were designed around inquiry and experiential learning. Inquiry is a learner-centered approach in which individuals are problem solvers investigating questions through active engagement, observing and manipulating objects and phenomena, and acquiring or discovering knowledge. Experiential learning (EL) is a foundational educational strategy used in 4-H. In it, the learner has an experience phase of engagement in an activity, a reflection phase in which observations and reactions are shared and discussed, and an application phase in which new knowledge and skills are applied to a real-life setting. In 4-H, an EL model that uses a five-step learning cycle is most commonly used. These five steps—Experiencing, Sharing, Processing, Generalizing, and Applying—are part of a recurring process that helps build learner understanding over time.



For more information on inquiry, EL, and the five-step learning cycle, please visit the University of California Science, Technology, and Environmental Literacy Workgroup's Experiential Learning website, <http://www.experientiallearning.ucdavis.edu/default.shtml>.

APPENDIX B

Pig Nutrient Requirements Tables (Adapted from the Nutrient Requirements of Swine, published by the National Research Council, 1998.)

Growing Pigs Allowed Ad Lib Feed Access

	Body weight (kg)					
	3-5	5-10	10-20	20-50	50-80	80-120
Average wt in range (kg)	4	7.5	15	35	65	100
DE content of diet (kcal/kg)	3,400	3,400	3,400	3,400	3,400	3,400
ME content of diet (kcal/kg)	3,265	3,265	3,265	3,265	3,265	3,265
Estimated feed intake (g/day)	250	500	1,000	1,855	2,575	3,075
Crude protein (%)	26.0	23.7	20.9	18.0	15.5	13.5
Lysine (%)	1.50	1.35	1.15	0.95	0.75	0.60
Ca (%)	0.90	0.80	0.70	0.60	0.50	0.45
P (%)	0.70	0.65	0.60	0.50	0.45	0.40

Gestating Sows

	Body weight at breeding (kg)					
	125	150	175	200	200	200
	Gestation weight gain (kg)					
	55	45	40	35	30	35
	Anticipated pigs in litter					
	125	150	175	200	200	200
DE content of diet (kcal/kg)	3,400	3,400	3,400	3,400	3,400	3,400
ME content of diet (kcal/kg)	3,265	3,265	3,265	3,265	3,265	3,265
Estimated feed intake (kg/day)	1.96	1.84	1.88	1.92	1.80	1.85
Crude protein (%)	12.9	12.8	12.4	12.0	12.1	12.4
Lysine, (%)	0.58	0.57	0.54	0.52	0.52	0.54
Ca (%)	0.75	0.75	0.75	0.75	0.75	0.75
P (%)	0.65	0.65	0.65	0.65	0.65	0.65

Lactating Sows

	Post-farrowing weight (kg)					
	175	175	175	175	175	175
	Anticipated lactational weight change (kg)					
	0	0	0	-10	-10	-10
	Daily weight gain of pigs (g)					
	150	200	250	150	200	250
DE content of diet (kcal/kg)	3,400	3,400	3,400	3,400	3,400	3,400
ME content of diet (kcal/kg)	3,265	3,265	3,265	3,265	3,265	3,265
Estimated feed intake (kg/d)	4.31	5.35	6.40	3.56	4.61	5.66
Crude protein (%)	16.3	17.5	18.4	17.2	18.5	19.2
Lysine (%)	0.82	0.91	0.97	0.89	0.97	1.03
Ca (%)	0.75	0.75	0.75	0.75	0.75	0.75
P, %	0.65	0.65	0.65	0.65	0.65	0.65

Boars

DE content of diet (kcal/kg)	3,400
ME content of diet (kcal/kg)	3,265
Estimated feed intake (kg/d)	2
Crude protein (%)	13.0
Lysine (%)	0.60
Ca (%)	0.75
P (%)	0.60

APPENDIX C

Feed and Feed Ration Handouts

Feedstuff	Protein %	Lysine %	Relative to SBM	Max inclusion rate
Plant protein sources				
Soybean meal, 44%	43.8	2.83	100	20
Soybean meal, de-hulled	47.5	3.02	100	20
Canola meal	35.6	2.08	91	10
Cottonseed meal	41.4	1.72	65	8
Linseed meal	33.6	1.24	57	5
Peanut meal	49.1	1.66	53	10
Animal protein sources				
Blood cells, spray dried	92.0	8.51	144	3
Blood plasma, spray dried	78.0	6.84	246	6
Blood meal, spray or ring dried	88.8	.45	131	3
Milk, dried skim	34.6	2.86	129	20
Fish meal	62.9	4.81	119	5
Whey, dried	12.1	0.90	116	35
Meat meal	54	3.07	88	5
Meat and bone meal	51.5	2.51	76	5
Feather meal, hydrolyzed	84.5	2.08	38	2

Feedstuff	Protein %	Lysine %	Relative to SBM	Max inclusion rate
Grain by product Sources				
Wheat bran	15.7	0.64	63	5
Brewers grains	26.5	1.08	63	15
Corn gluten feed	21.5	0.63	46	10
Distillers grain with solubles	27.7	0.62	35	20
Corn gluten meal	60.2	1.02	26	5
Grain sources				
Barley	11.3	0.41	56	—
Oats	11.5	0.40	54	—
Wheat	11.5	0.38	51	—
Corn	8.3	0.26	49	—
Grain Sorghum	9.2	0.22	37	—

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