

Animal Science

About the 4-H Science Toolkit Series: Animal Science

This series of activities will help children discover a variety of interesting facts about animals and learn of the characteristics we have in common, as well as the ways we are different.

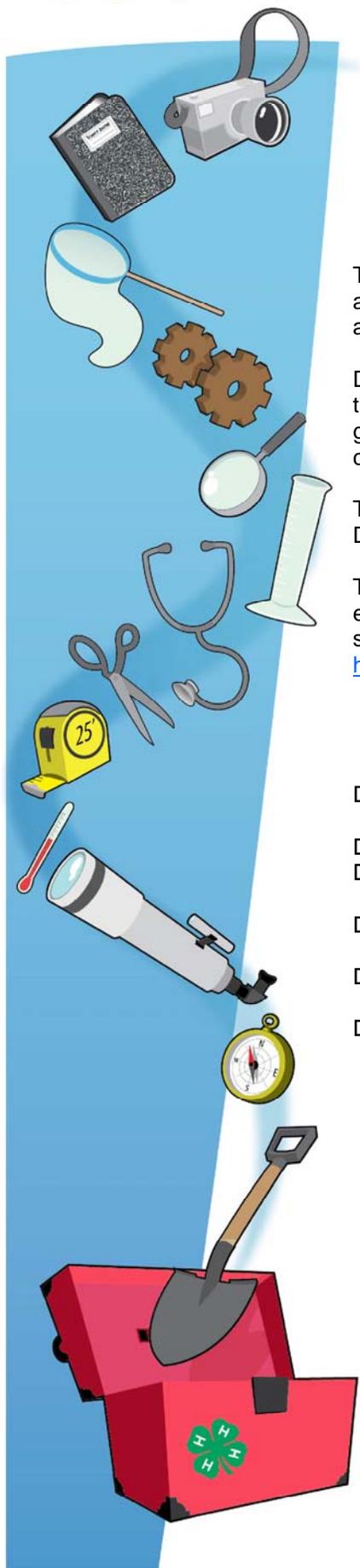
During all of these hands-on activities, students will predict what will happen, test their theories, then share their results. They'll be introduced to animal science vocabulary, gain an understanding of animals and our role in caring for domestic animals and discover fascinating facts about how animals and humans are alike.

The lessons in this unit were developed in cooperation with the Cornell University Department of Animal Science.

To find out more about animal science activities, visit the Department of Animal Science Web site at www.ansci.cornell.edu/4H/index.html and to find numerous resources related to animal science, check out the national 4-H Resource Directory at <http://www.4-hdirectory.org>.

Animal Science Table of Contents

- So You Think You are Hot?** Explore animal body temperatures and ways animals regulate their temperature.
- Got Immunity?** Learn how animals protect themselves from disease and illness.
- Basic Behavior Instincts:** Learn to read behavioral signals from animals and discover why they behave the way they do in the wild.
- Respiration:** Discover the basic parts of the respiratory system in animals and in humans and learn about respiration rates for different animals.
- Animal Sense-Stations:** Experiment with various activities to help increase understanding about how animals use their senses to survive.
- People Pellets:** Examine animal foods to find out what nutrients are important for animal health and human health.



Animal Science: So You Think You Are Hot?

Activity Series:

Animal Science

Grade: 3-6

Time: 45 min.

Main Idea

Animals respond to changes in their environment.

Motivator

Does every person have the same temperature? What can we do to find out? Do animals have different temperatures than humans?

Pre-Activity Questions

Before you start the activity, ask students:

- Who has ever been asked “do you have a temperature?” What are you really being asked?
- What tool do we use to measure temperature?
- Is your body temperature much higher when you have a fever?
- What is it called when your temperature is too low?
- What is it called when your temperature is too high, but you are not sick?
- What behaviors do mother hens use to keep their young warm? Why do they need to be kept warm?

Activity One

- Forehead thermometer for each participant OR a digital thermometer with protective sleeve OR ear scan thermometer with disposable covers
- Paper and pencil for each participant
- Large poster size paper to record data
- Chart “Staying at right temperature” for each student (included here on last page)

Part 1: Temperature Taking

1. Have the participants work in pairs so that they can read and record each other’s temperature.
2. Distribute the forehead or digital thermometers and explain how to use them OR have everyone prepare their record sheets as you walk to each participant to use the ear scan thermometer to take a reading.

Discussion:

- Who had the highest temperature and who had the lowest? There is a small range of “normal” temperature.
- Record everyone’s data.
- Calculate the average temperature. (Optional: Calculate the mean and mode.)
- Discuss a “fever” and how numerically a fever is not that much higher than “normal.” Tenths of a degree have a large effect.

Supplies

Objectives

- Identify the parameters of body temperature
- Extend understanding of self and animal care

Learning Standards

(See Matrix)

Common SET Abilities 4-H projects address:

Predict
Hypothesize
Evaluate
State a Problem
Research Problem
Test
Problem Solve
Design Solutions
Develop Solutions
Measure
Collect Data
Draw/Design
Build/Construct
Use tools
Observe
Communicate
Organize
Infer
Question
Plan Investigation
Summarize
Invent
Interpret
Categorize
Model/Graph
Troubleshoot
Redesign
Optimize
Collaborate

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Animal Science: So You Think You Are Hot?

Extended discussion:

Now the discussion will center around maintaining a body temperature since everyone has a range for good health.

- How do animals maintain their body temperature? Most people dress in clothes appropriate to the season (less in summer and more in winter), drink cold water, have hot soup, go swimming, soak in a hot bath, eat more, eat less, sit by a fire or sweat to help maintain their body temperature.
- What do animals do to keep from losing body heat or to keep from getting too hot? (Most animals grow a winter coat and then shed it in the spring.) Do most animals sweat?
- How are we the same or different?
- Use the chart to list ways animals can be protected from temperature extremes.

Now that you have this information, what do you know about caring for an animal in very hot or very cold conditions?

For instance, rabbits and guinea pigs do not cool themselves very well. In extremely hot and humid weather, we need to take some actions to assist rabbits and guinea pigs. We need to recognize the signs of heat prostration in them.

When a goat has a fever you must take care to avoid letting the goat become dehydrated.

Should you make your dog run a lot in the hot sun? Do you know the signs of heat exhaustion in a dog and what to do about that?

Hypothermia is a serious problem in newborn lambs and steps must be taken to assist them. Can anyone share what you do to take care of animals in extreme weather?

Activity Two- Build a Nest

Supplies

- Two “cold cups” (plastic or paper, just make sure they aren’t insulated)
- Two round cardboard oatmeal containers, cut so they are about 2 inches taller than cups
- Source of warm water (100 degrees F)
- Two thermometers
- Wood shavings (used for chicken nests)
- Feathers (can buy sterilized at craft stores)
- Hay or straw (be aware of student allergies)

1. You are a mother hen and your job will be to keep your chicks warm. You will receive two cups of warm water. One chick you will leave unprotected. The other you can protect by building a nest.
2. In one oatmeal container, build a nest for your “chick.” You may use one material or a combination of materials.
3. Get your “chicks” (cups of warm water) from your instructor. Put one chick in the nest and leave one out. Put a thermometer in each cup and write down the temperature at the start.
4. Take temperature readings every two minutes. How are you doing at keeping your chick warm? How fast is the other chick getting cold?
5. Try to make a better nest. Recycle/reuse materials to improve your first nest and build a new one in that same container. Get two new chicks and start over.

Find this activity and more at: <http://nys4h.cce.cornell.edu>

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Animal Science: So You Think You Are Hot?

Science Checkup - Questions to ask to evaluate what was learned

- What did you learn about temperature?
- How does your temperature compare to the temperature of other animals?
- What did you learn about caring for animals in the heat?
- Were you surprised that animals may need help from you in very hot weather?
- How would you teach someone else about these ideas?
- Describe a time when you might need the skills/knowledge you learned today.

Extensions

- Participants could compare their own temperature and heart rates with the rates taken after mild exercise such as jumping rope or jumping jacks. Young children may notice that their temperature and heart rate rises with exercise.
- Try incubating eggs. An incubator is regulated to a temperature approximately 5 degrees lower than a female bird's body.

Vocabulary

Temperature - The measure of how much heat is in the body.

Pulse - The number of heartbeats per minute. Count for 15 seconds then multiply by 4.

Respiration rate - The number of breaths taken per minute. Count each breath in and out as one. Count for 15 seconds then multiply by 4.

Hypothermia - When a body has a temperature below the normal range.

Heat prostration - A condition brought on by not being able to cool the body back down to a normal temperature.

Background Resources

- Temperature, respiration and heart rate data found on www.peteducation.com.
- Temperature for sheep, heart rate for guinea pig from Merck Veterinary Manual, <http://www.merckvetmanual.com/mvm/index.jsp>
- Goat information found at <http://www.4-hcurriculum.org> from the Dairy Goat Project Book online, Getting Your Goat. Published: 2006
- Taking Your Goat's Temperature – Article by Dr. Virgil Fleming on Goat World Web site, <http://www.goatworld.com/articles/health/temperature.shtml>
- Sheep and lamb information found on Cornell University Sheep Program Pages, <http://www.sheep.cornell.edu/sheep/index.html>
- Caring for Rabbits During Extreme Weather from Rabbits, Level I, Kansas State University, Kansas 4-H Rabbit Curriculum.
- Guinea Pig Reference: Wikipedia, http://en.wikipedia.org/wiki/Guinea_pig
- Penn State Department of Poultry Science Program, <http://pa4h.poultry.psu.edu>

Animal	Temperature (degrees F)	Average Resting Heart rate beats/minute
Human (child)	97-100	70 (58-104)
Dog	99.5-102.5	115 (60-140) Depends on age and size
Cat	100-102.5	120 (110-140)
Rabbit	102.5	205 (123-304)
Chicken	105	400
Guinea Pig	101-104	280 (260-400)
Goat	102-103	75 (70-80)
Sheep	102.3	75 (70-80)
Cow	101.5	65 (60-70)
Pig	101.5-102.5	110 (100-150) Depends on size

Animal Science:
So You Think You Are Hot?
Staying at right temperature

Animal	How it keeps cool	How it stays warm	Extra care needed when hot	Extra care needed when cold
Human				
Dog				
Cat				
Rabbit				
Chicken				
Goat				
Sheep				
Cow				
Pig				

Animal Science: Got Immunity?

Activity Series:
Animal Science
Grade: 3-6
Time: 45 min.

Main Idea

The spread of disease can be controlled if we understand how transmission happens.

Motivator

We know to wash our hands and take other precautions to avoid catching a cold. But how do animals protect themselves against diseases?

Pre-Activity Questions

Before you start the activity, ask students:

- What makes disease spread through a group of animals?

Activity

- One disease card per student: One-third of the group should have airborne cards, one-third contact/touch and one-third insect/vector
- Bandanas — at least one per student
- Balls: either tennis, plastic, foam or 3-inch inflated balloons - all the same size, three to five balls per student

Part One:

1. Explain that you will be playing a game about how disease spreads. There are many ways, but in this game participants are going to focus on transmission by contact with the animal (touch), droplets in the air (air) or through insect bites (insect).
2. Divide into two groups. One group will be diseases and the other will be animals. Have each person in the disease group draw one card from the disease pile and keep it a secret.
3. Have the prevention group get together and decide on one tactic to prevent the spread of each mode of disease (i.e. for diseases spread by touch, you could wash your hands). Have the group develop a hand signal for each preventative measure.
4. Have the disease group spread out across the room. Have the animals walk around the diseases until you say stop.
5. When you say stop, the animals must go to the closest disease. One animal per disease.
6. On the count of three, the students with disease cards reveal their cards. At the same time, the animal shows its preventative sign. If the preventative measure is good against that disease, then the animal moves on to the next round. If the preventative measure is not for that disease, then the animal gets sick and sits out the next round.
7. Play until everyone gets sick! Switch animals and diseases.
8. Talk about how an animal could get immunity from the different diseases (immunization, antibodies, etc.).

Objectives

- To learn three modes of disease transmission
- To learn the role of immunization in disease

Learning Standards

(See Matrix)

Common SET Abilities 4-H projects address:

Predict
Hypothesize
Evaluate
State a Problem
Research Problem
Test
Problem Solve
Design Solutions
Develop Solutions
Measure
Collect Data
Draw/Design
Build/Construct
Use tools
Observe
Communicate
Organize
Infer
Question
Plan Investigation
Summarize
Invent
Interpret
Categorize
Model/Graph
Troubleshoot
Redesign
Optimize
Collaborate
Compare

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Animal Science: Got Immunity?

Part Two: The Immunity Challenge

1. Establish boundaries for the play area with sufficient space for students to escape the disease agents. At one end of the playing field, set up the Vet Clinic by placing bandanas in a box. On the sidelines, somewhere mid-field, scatter the balls. The bandanas are the vaccinations, the balls are the antibodies. Select one or two students per 10 players to be diseases.
2. Tell the animals they must avoid the diseases on their way to the Vet Clinic for vaccination. Vaccinated animals should tie a bandana around their arm. Once an animal has been vaccinated, it can begin to collect antibodies. An animal can collect as many antibodies as it can carry.
3. At the same time, the diseases are trying to tag the animals. Animals who have not been vaccinated and are tagged by a disease must sit out (be quarantined) because they are now contagious. Animals who have been vaccinated can have antibodies knocked away by diseases. Diseases MAY NOT carry antibodies.
4. Once a vaccinated animal has lost all its antibodies, it must return to the Vet Clinic for a booster. A vaccinated animal that gets tagged when it has no antibodies must sit out for a 2-minute penalty.

Science Checkup - Questions to ask to evaluate what was learned

- What does it mean if an animal is immune to a disease?
- What do vaccines protect animals from?

Extensions

- Learn more about the kinds of vaccines that are available to protect your favorite domestic animal by visiting with a veterinarian.
- Simulate a disease outbreak in your town. What would you do and where would you go to learn more?

Vocabulary

Antibody: A blood protein, made by cells of the immune system to fight infection.

Antigen: A substance that when introduced into the body stimulates the production of an antibody.

Disease: An abnormal condition of an animal's body that causes it to function improperly. Rabies is an example of a serious disease that affects animals and humans. If animals are not protected with a vaccination, they can die.

Infection: The damaging growth of an invading organism. In an infection, the infecting organism uses its host to live and multiply. The infecting organism is also called a pathogen.

Immunity: A medical term that describes having sufficient biological defenses to prevent disease or infection.

Pathogen: Typically a microscopic organism or germ. Types of pathogens include bacteria, parasites, fungi, viruses, prions and viroids.

Vaccine: Injection of a live, weakened or killed microbe into a human or animal to stimulate the immune system against the microbe, preventing disease. Vaccinations are also called immunizations.

Virus: Ultramicroscopic infectious agents that replicate themselves only within cells of living hosts; many cause disease.

Animal Science: Got Immunity?

Background Resources

- University of Nebraska 4-H Vet Science curriculum, Unit II, Animal Disease 4-H Veterinary Science 4H48, <http://4hcurriculum.unl.edu/index.html>
- PAWSitively Youth: A Guidebook about Dogs for Community Outreach Leaders, 2008 <http://www.nraes.org>
- Scientific explanation of vaccines: <http://en.wikipedia.org/wiki/Vaccine>
- Scientific explanation of antibody: <http://en.wikipedia.org/wiki/Antibody>
- Methods of disease transmission: From the Department of Microbiology, Mount Sinai Hospital, Toronto, Canada, <http://microbiology.mtsinai.on.ca/faq/transmission.shtml>
- Further lesson plan ideas: Ebola—The Plague Fighters, NOVA Teachers Classroom Activity, 2004, http://www.pbs.org/wgbh/nova/teachers/activities/2304_ebola.html

Animal Science: Basic Behavior Instincts

Activity Series:

Animal Science

Grade: 3-6

Time: 45 min.

Main Idea

Youth will compare basic behavioral instincts found in animals such as fight, flight, pack and herd drive. Youth will learn basic body language of animals and how to read or anticipate different animal behaviors.

Motivator

What are you more likely to do, fight or flee when faced with danger?
What do you think a lion would do?

Pre-Activity Questions

Before you start the activity, ask the students:

- What would be an advantage of herding or flocking together?
- What would be an advantage of a group scattering?
- What is a prey animal and what is a predator?
- Name some differences between wild and domestic animal behaviors.

Activity

- Note cards
- Pack leader and pack follower instructions (shown below), already cut out
- Safe space large enough to move around without obstacles – ideally a gym, playground or large hallway

1. Break into two groups.
2. The first group will act out behavioral signs of dogs as PREDATORS. For example, act aggressive, fearful, relaxed, playful or curious.
3. Second group acts out behavior signs of sheep as PREY. For example, act as if you were flocking/(herding), fearful, playful or relaxed.
4. Play the game Predator vs. Prey using the same rules as Freeze Tag. Modify rules as needed for age and abilities.
5. After the game, choose three students to act as the predator pack. The rest of the class will be sheep.
6. Meet with the predator pack separately from the sheep. Randomly choose a pack leader. Review the pack leader instructions with the group. Encourage the group to develop a strategy to lull the sheep into a comfort zone before hunting. Leave the group to develop behavior signs for each behavior listed on the leader card.
7. Meet with the sheep. Explain that when the predators enter the room, each sheep has the choice of staying scattered or herding with the group. Explain that members of the predator pack will be giving different behavior signs, including one sign for hunting. If they are away from the herd when the pack hunts, they may become dinner.

Supplies

Objectives

- To understand basic animal behavior factors
- To learn to read and interpret body language

Learning Standards

(See Matrix)

Common SET Abilities 4-H projects address:

Predict
Hypothesize
Evaluate
State a Problem
Research Problem
Test
Problem Solve
Design Solutions
Develop Solutions
Measure
Collect Data
Draw/Design
Build/Construct
Use tools
Observe
Communicate
Organize
Infer
Question
Plan Investigation
Summarize
Invent
Interpret
Categorize
Model/Graph
Troubleshoot
Redesign
Optimize
Collaborate
Compare

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Animal Science: Basic Behavior Instincts

8. To herd, a sheep stomps its foot. Sheep may herd when there are at least two other sheep stomping their feet to herd.
9. Play several rounds. When the hunting sign is given, give the sheep a minute or so to react and then shout “freeze.” All the sheep will stay in place and the predators may each select a “prey” from the sheep farthest from the herd. These three prey will become the new pack of predators. This new pack will need to develop their own behavior signs. The old pack of predators will now become sheep.

PACK LEADER INSTRUCTIONS

You are the leader. You will lead your pack around the classroom (or space) one time each round. Each round, you can display one of the following behavior signs. The rest of the pack **MUST** do the same sign as you. Work with your pack to develop a sign for each of these behaviors:

AGGRESSION: This is hunting mode. When you show this sign, the sheep that are the most scattered will be your prey. You cannot HUNT on the first round.

FEAR: This means you are scared of something.

RELAXING: You are not interested in the sheep at all.

BEING CURIOUS: You are interested in the sheep, but are not sure if the time is right. If more than four sheep begin to herd, you can switch to AGGRESSION and hunt.

PLAY: You are paying attention to your fellow dogs and not to the sheep.

PACK FOLLOWER INSTRUCTIONS

You must follow the behavior of the pack leader. Help the pack leader develop signs for each behavior.

Science Checkup - Questions to ask to evaluate what was learned

- What did you notice about the behavior of the sheep or of the dog pack or pack leader?
- What influences animal behavior?
- Can you describe similar behaviors you have noticed with other animals?

Extensions

- Add a group of guardian animals to the herd of sheep (dogs, llamas, donkeys, etc.) Have this group develop protective behaviors and reactions to the pack.
- Research behavior signs for other types of predators, companion and farm animals.

Find this activity and more at: <http://nys4h.cce.cornell.edu>

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Animal Science: Basic Behavior Instincts

Vocabulary

Aggression – Actions that lead to a struggle or battle.

Domestic animal – Animals that have been bred/selected to serve humans in some way.

Fight – A struggle or battle.

Flight – To flee quickly.

Instinct – An inherited natural impulse to physically respond to an environmental condition. For instance, this is how a sheep knows what to do when a predator is in their surroundings.

Herd drive – An instinct of animals to stay in groups with other animals of their type.

Pack – A dog's (canine) version of a family. A group of dogs that has a clear leader and has established specific roles for each dog in the family. They work together to supply their pack the basic needs of food, water and shelter.

Pack drive – The instincts dogs have to follow their pack and pack leader.

Play – Actions that are not threatening, but mimic mild forms of aggression, hunting and dominance.

Predator animals – Animals that hunt or prey on other animals for survival.

Prey animals – Animals that are hunted by other animals.

Background Resources

- PAWSitively Youth: A Guidebook about Dogs for Community Outreach Leaders, Published: 2008
<http://www.nraes.org>
- Wonderwise 4-H, Women In Science Learning Series <http://wonderwise.unl.edu>
- Skills for Life – Wiggles and Wags, 4-H Dog Activity Guide Level 1. Published: 2005
- Skills for Life – From Airedales to Zebras, All Systems Go, and The Cutting Edge, 4-H Veterinary Science Activity Guides. Published: 2004
- Freeze Tag Rules can be found on Wikipedia <http://en.wikipedia.org>

Animal Science: Respiration

Activity Series:

Animal Science

Grade: 3-6

Time: 45 min.

Main Idea

Students will explore the basics of the respiratory system and breathing rates in a variety of different types of animals and find out about the parts of the body involved in respiration.

Motivator

Are you full of hot air? Have you ever noticed the changes in your breathing after you've been running around? Did you know that your goldfish breathes five times as fast as you do?

Pre-Activity Questions

Before you start the activity, ask the students:

- What body parts make up the respiratory system?
- Are these the same in all types of animals? Which ones are different?
- Do creatures who live in water have a respiratory system?
- What does respiration do for the body?

Respiration Rates (breaths per minute)

Horse	8-16	Pig	20-40
Cattle	10-30	Dog	10-30
Sheep/Goat	12-20	Cat	15-30
Chicken	15-30	Goldfish	80-90

Activity 1– Build a respiratory system

Have cutouts of the following body parts available in craft foam, felt or colored paper. Use the attached drawings. Label each part:

- Dog:** Mouth and nose/nasal cavity, pharynx and epiglottis, trachea, lungs
- Fish:** Mouth, gill filaments/gills, gill openings.
- Bird:** Beak/nostril/mouth, lungs, trachea, bronchial tubes, 9 air sacs, abdominal muscles

1. Create a respiratory puzzle of comparative anatomy among animals. Explain the body part/s and the function they play in respiration.

Activity 2– Respiratory rate relay

- Large clock with second hand, or stopwatches
- Copy of attached worksheet for each participant

1. Have youth partner up and teach participants how to count their number of breaths in 1 minute. One partner can watch the clock 20 seconds, while the other person counts the breaths of the partner watching the clock. Then, multiply the number of breaths by 3 to determine their respiration rate per minute. Switch and count the other person's respiration rate.

Objectives

- Increase understanding of respiration
- Recognize body parts involved in respiration and compare respiration rates of different animals

Learning Standards

(See Matrix)

Common SET Abilities 4-H projects address:

Predict
Hypothesize
Evaluate
State a Problem
Research Problem
Test
Problem Solve
Design Solutions
Develop Solutions
Measure
Collect Data
Draw/Design
Build/Construct
Use tools
Observe
Communicate
Organize
Infer
Question
Plan Investigation
Summarize
Invent
Interpret
Categorize
Model/Graph
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Animal Science: Respiration

- Then, have one person from each pair walk briskly in place or do laps for 2 minutes. Have them watch the clock while their partner counts their breathing for 20 seconds. Switch and have the other person jog, then count their rate. Have youth share their results and explain why their respiration rate goes up with increased physical activity.
- Repeat with jogging in place or jogging laps for 2 minutes.

Activity 3– Respiration game

- Red yarn cut to tie around wrists, enough for 1/3 of your group (carbon)
- Blue yarn cut to tie around wrists, enough for 2/3 of your group (oxygen)
- Masking tape or chalk if outside

- Give 1/3 of the group a piece of red yarn, which represents carbon. Give the other 2/3 of participants a piece of blue yarn, which represents oxygen. Assist in tying the yarn around their wrists.
- Ask each student with a blue yarn to partner up another person with blue yarn by linking arms. The blue pairs of students become an oxygen molecule (O₂). (Hint: molecular structure of CO₂ is...O-----C-----O)
- Use tape/chalk and make a large upside down “Y” on the floor/ground so that the top of the “Y” is equal to the sides of the Y” (like three equal pieces of pie). Place the oxygen pairs in one section of the “Y” and the carbons in another.
- Have the pairs of students representing oxygen molecules pass into the carbon area one at a time and ask them to join with a carbon by linking arms to become carbon dioxide. Have them stay connected and move into the third section of the “Y,” the empty section.
- When all the conversions have occurred and everyone is linked together as carbon dioxide, repeat the process, asking “how would this change if the animal’s physical activity increased?” (They would move faster.) Urge each (oxygen) to go one pair at a time across into the carbon section and then into the carbon dioxide section as fast as they can. Repeat until everyone has paired with each other at least once.

Supplies

Science Checkup - Questions to ask to evaluate what was learned

- At higher altitudes, there is lower air pressure. What affect can this have on athletes visiting from lower altitudes? How about animals living at higher altitudes?
- What happens to a person’s respiration rate when they exercise? Why do you think this happens?
- Do you think a person with asthma might have a different respiration rate than someone without asthma? Why or why not?

Extensions

- Look into the respiratory process of worms and other animals.
- Research the size of the lung versus function.
- Compare respiration rates across species.
- Learn about other ways carbon dioxide impacts our planet. For example, carbon dioxide is used to carbonate soft drinks.

Find this activity and more at: <http://nys4h.cce.cornell.edu>

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Animal Science: Respiration

Vocabulary

Alveoli: Tiny air sacs within the lungs where the exchange of oxygen and carbon dioxide takes place.

Bronchial tubes: Air passages to and within the lungs.

Carbon: An element found in numerous living and nonliving objects, as well as gases and liquids. It connects with oxygen to form carbon dioxide.

Carbon dioxide: A colorless gas in the atmosphere, this is the connection of carbon and oxygen and is a waste product of the respiration cycle.

Epiglottis: A flap of cartilage that covers the opening to the air passages when swallowing, preventing food or liquids from entering the trachea.

Esophagus: The passage down which food moves between the throat and the stomach.

Gills: The paired respiratory organ of most aquatic animals that allows oxygen to be extracted from water.

Gill arch: A curved structure on each side of the pharynx in a fish that supports the gills.

Gill filaments: The soft red fleshy part inside the gills where oxygen is transferred into the blood from the water passing through the gills.

Gill rakers: Bony-like projections on a gill arch that prevent food particles from passing through the gills.

Glottis: The long opening between the vocal cords at the upper part of a vertebrate's windpipe.

Larynx: Also called the voice box, is an organ in the neck of mammals (including humans) and many other vertebrates.

Molecule: The smallest particle of substance that maintains a consistent set of properties. This is the foundation of all objects, gases and liquids.

Oxygen: A key element found in many objects, gases and liquids. Oxygen constitutes roughly 20 percent of the atmosphere, providing fuel for sustaining life. An essential element in the respiration cycle.

Pharynx: The part of the throat leading from the mouth and nasal cavity to the esophagus.

Respiration rate: The number of breaths in one minute.

Respiratory system: In mammals, this system consists of the airways, the lungs and the muscles that initiate movement of air into and from the body. Within the lungs, oxygen and carbon dioxide are exchanged through tissues to and from the blood. The respiratory system causes oxygenation of the blood and allows for the elimination of waste products like carbon dioxide, which are exhaled from the lungs to the mouth.

Trachea: Also known as the windpipe and directs air to and from the lungs.

Vertebrate: An animal with a segmented spinal column and a well-developed brain. Mammals, reptiles, birds and fish are all vertebrate animals.

Background Resources

- Sturkie's Avian Physiology (Fifth Edition) by G. Causey Whittow, Editor; ISBN: 127476059: 1999
- The Normal Animal, Unit 1, 4-H Veterinary Science Guide – University of Nebraska
- PAWSitively Youth: A Guidebook about Dogs for Community Outreach Leaders Published: March 2008 <http://www.nraes.org>
- Diagram of the Respiratory System of a dog – Washington State University College of Veterinary Medicine http://www.vetmed.wsu.edu/cliented/anatomy/dog_resp.aspx
- The Respiratory System of a fish <http://en.wikipedia.org/wiki/Gill>
- Diagram of the Respiratory System of a bird from the University of Illinois <http://chickscope.itg.uiuc.edu/explore/embryology/day15/how.html>
- The Respiratory System of a bird from Eastern Kentucky University <http://people.eku.edu/ritchisong/birdrespiration.html>
- Human Respiration, http://www.righthealth.com/topic/Respiratory_system
- Poultry anatomy, www.fsis.usda.gov/pdf/psit_anatomy.pdf

Animal Science: Respiration Worksheet

With a partner:

1. Count the respiratory rate of your partner while at rest or in a seated position. The respiratory rate is the number of times your partner takes a breath in. Count the breaths for 20 seconds and then multiply by three. Record your data in the charts found below.
2. Have your partner engage in light activity or brisk walking and then count the respiratory rate. Record your data in the charts found below.
3. Have your partner engage in heavy activity or running and then count the respiratory rate. Record your data in the charts found below.

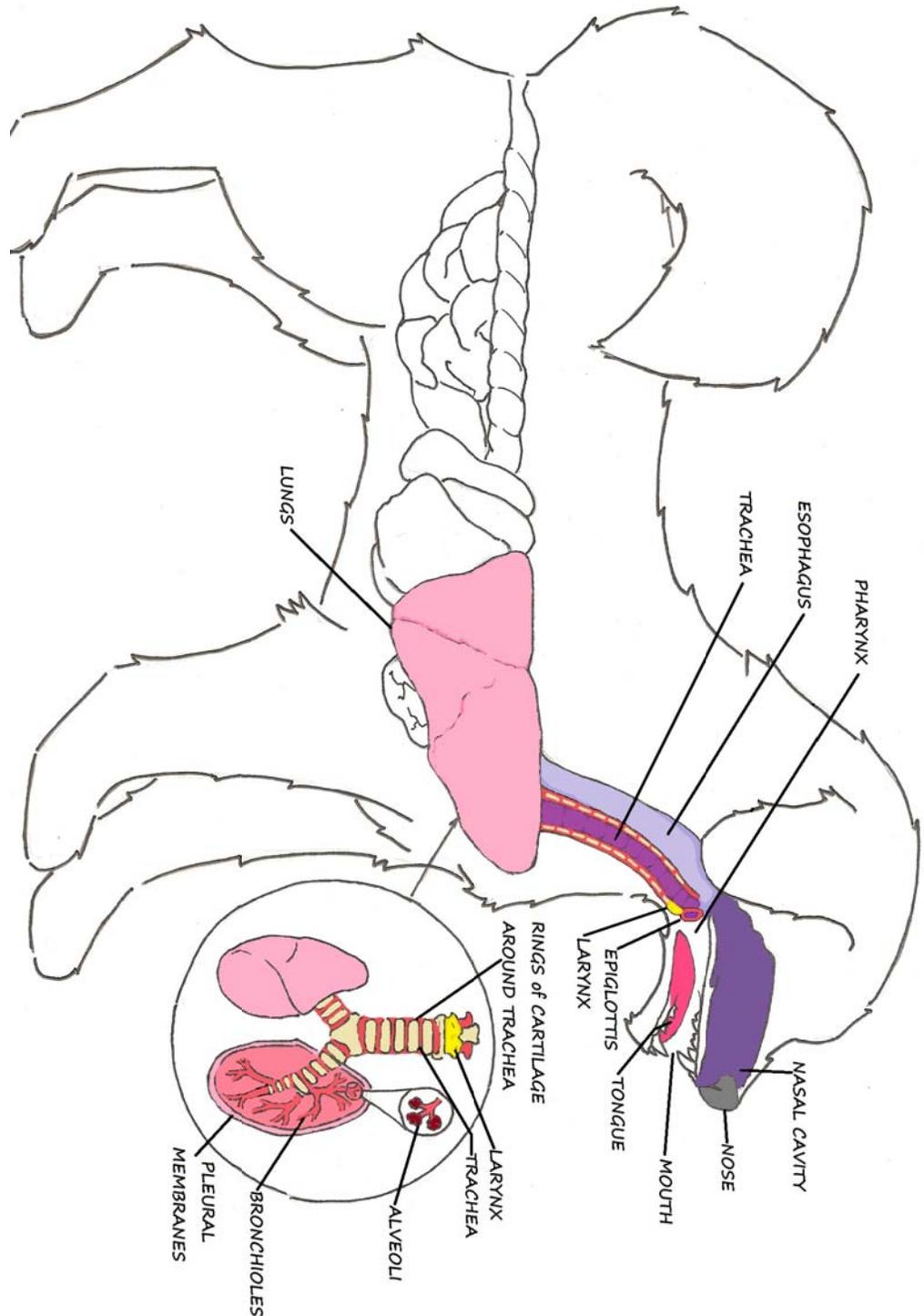
Your Name:	Breaths in 20 seconds (count the number of breaths taken in)	Respiration Rate/(minute (multiply the first number by three)
At Rest (Sitting)		
After Light Exercise (Walking)		
After Heavy Exercise (Running)		

Your Partner's Name:	Breaths in 20 seconds (count the number of breaths taken in)	Respiration Rate/(minute (multiply the first number by three)
At Rest (Sitting)		
After Light Exercise (Walking)		
After Heavy Exercise (Running)		

Your Partner's Name:	Breaths in 20 seconds (count the number of breaths taken in)	Respiration Rate/(minute (multiply the first number by three)
At Rest (Sitting)		
After Light Exercise (Walking)		
After Heavy Exercise (Running)		

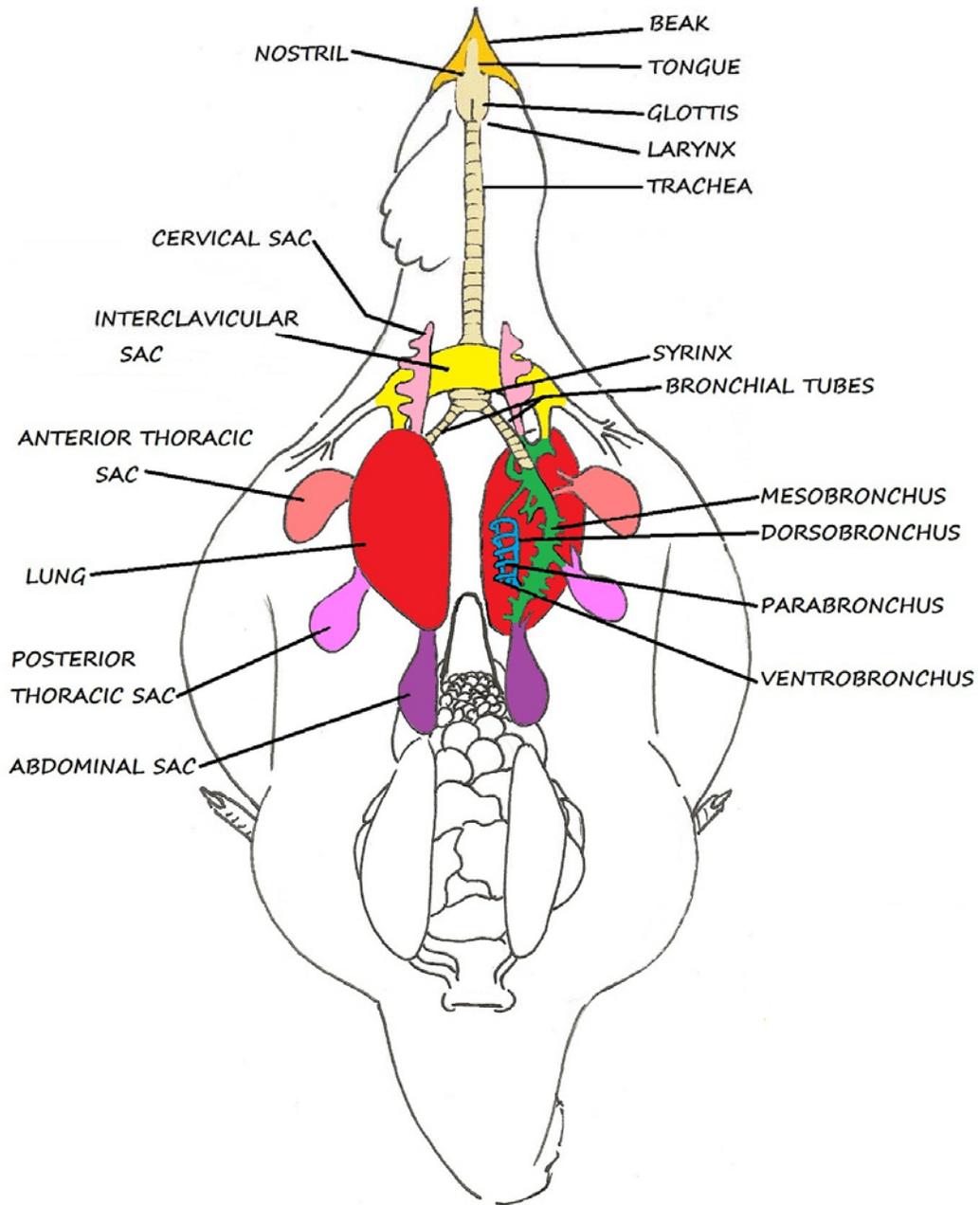
Animal Science: Respiration — Animal drawings

DOG



Animal Science: Respiration — Animal drawings

CHICKEN



Find this activity and more at: <http://nys4h.cce.cornell.edu>

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Animal Science: Animal Sense Stations

Activity Series:
Animal Science
Grade: 3-6
Time: 45-60 min

Main Idea

Animals have different structures that serve different functions for growth, survival and reproduction.

Motivator

Today you will be asked to solve some mysteries. At each of four stations, you will complete an activity and unravel clues to determine which animal the activity relates to, just like investigators who use clues to solve crimes or figure out what happened at an accident scene.

Pre-Activity Questions

Before you start the activity, ask the students:

- Do you think all animals have the same senses? Do they hear the same, smell the same and see the same?
- What differences have you noticed in animal's eyes? ears? tongues? noses?

Note: *This can be done with a large group that is split into smaller groups. Recruit a teen helper to facilitate each station, and give each group about 10 minutes per station. OR with a small group, do each activity in succession.*

Objective

- To explore animal physiology by using skills of observation and inference.

Learning Standards

(See Matrix)

Common SET Abilities 4-H projects address:

Predict
Hypothesize
Evaluate
State a Problem
Research Problem
Test
Problem Solve
Design Solutions
Develop Solutions
Measure
Collect Data
Draw/Design
Build/Construct
Use tools
Observe
Communicate
Organize
Infer
Question
Plan Investigation
Summarize
Invent
Interpret
Categorize
Model/Graph
Troubleshoot
Redesign
Optimize
Collaborate
Compare

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Supplies

Activity 1– Touch

- Box with a hand-sized hole on one side
 - Cloth large enough to cover box
 - Three items, two with similar textures, one different (I used an orange, a golf ball, and a banana)
1. Place your hand through the opening in the covered box.
 2. Using only the most sensitive tips of your fingers, gently brush against the items in the box. There are three.
 3. Think about what the items could be. Do not reveal your guesses until everyone has had a turn.
 4. Once everyone has had a turn, place your hand in the box and touch the items again, using different parts of your hand. Which movements of your hand helped you learn more about the items?

Activity 2– Smell

- Film canisters or other small opaque containers (one per student)
- Cotton balls
- Extracts (almond, banana, peppermint, vanilla, etc.)
- Water

Before the meeting, divide the canisters into groups so that you have at least two for each scent. Use water as the scent

for one set of canisters. Code the canisters so you know which ones contain which scent, but students won't know. If you have an odd number of students, make one set of three.

1. Pick a canister from those available at the table. Remove the lid and carefully sniff what's inside. Do not touch what is in the canister.
2. Try to find another student with the same scent. Be sure to check everyone else's scents. There may be more than one match for you!
3. As a group, discuss the different scents. What do you think the scents are? Could one of the scents be something that humans can't smell but animals can?

Activity 3– Hearing

Supplies

- Wire coat hanger with rubber band tied to each corner (one per two students)
- Plastic coat hanger with rubber band tied to each corner (one per two students)

1. Work with a partner. While your partner holds the wire coat hanger by the hook, pick up the end of each rubber band, one end in each hand.
2. Have your partner tap the straight edge of the hanger, while you hold the rubber ends to your ear. Does it make a difference if you hold the rubber band loosely or stretch it tight? Try this again with the plastic hanger. Why do think the results were different?

Activity 4– Sight

Supplies

- Pirate eye patch (or you can use a large dark plastic spoon)
- Party blower for each student — try to find ones that don't make noise
- Lightweight plastic fly or picture of a fly on a small wad of paper
- Flower made by turning a paper cup upside down and drawing petals on the bottom
- 10-inch tall thin column made of cardboard, paper or wood, anchored to a base.

Note: You will need to do a little estimating on this station. Read through the activity, try it first with the flower on the ground and fly on top, then with the column with the fly on top, make a mark on the floor with a piece of masking tape and place the flower and column far enough away that it will be a challenge to aim for the fly. Try it yourself before students arrive to make sure you have the appropriate distance.

1. Use the pirate patch to cover one eye. Stand at the mark and bend (not lean) so that you can use the party blower to knock the fly off the flower.
2. Try it again with the other eye covered.
3. Try it with both eyes uncovered. Which way was the easiest for you?
4. Use your **least** successful strategy and try to knock the fly off the tall and skinny column. Was it easier or harder than the flower? Why?

Science Checkup—Questions to ask to evaluate what was learned

Bring the group back together. Remind them that each station represented a different animal. List the potential answers on a blackboard or poster (dog, cat, turtle, lizard, fish).

- Have the group pair up and decide which animal best matches which station (there can be multiple answers). Once discussion dies down, bring the group back together and discuss each station. What were the results? Which animals represented which stations and why?

Extensions

- Dogs and scents: Place three similarly scented items in three separate lunch bags (strawberry candle, soap and shampoo for example). Challenge the group to guess what the items are by smelling them. Share that a dog could tell the difference between the items just by scent. OR ... Find two of the exact same heavily-scented items. Hide one in a confined area (a classroom, one section of the playground, etc). Place the other one in a lunch bag. Have the students “scent” the item by sniffing (but not looking into) the bag. Have them use their noses to try and locate the item on the playground or other area.
- Hearing: Have the group sit in a circle and cover their eyes. Make noises in various areas around them and have them point toward the noise. Now have them cover one ear and try it again.

Vocabulary

Senses: The method animals use to detect what is going on in their environment, including seeing, hearing, touching, smelling and tasting.

Physiology: How living bodies function; how organs, tissues, cells and body parts work together.

Background Resources

- PAWSitively Youth: A Guidebook about Dogs for Community Outreach Leaders published March 2008 <http://www.nraes.org>
- Animal Senses by Pamela Hickman, 1999
- National 4-H Skills for Life: Pet Series, 2001
- Neuroscience for Kids – Washington State University <http://faculty.washington.edu/chudler/neurok.html>

Animal Science: People Pellets

Activity Series:
Animal Science
Grade: 3-6
Time: 45 min

Main Idea

Pelleted pet foods need to meet all of the animal's nutritional requirements.

Motivator

Did you realize that when you feed your pet their pelleted food, they are getting almost all of their nutrient requirements in one bite?

Pre-Activity Question

- What would a version of pelleted food look like for people?

Activity

- Samples of various types of pelleted pet food with nutritional label (choose gourmet offerings that contain "people food" like fruits and vegetables).
- Pre-made bingo cards with fruits and vegetables (make your own or use pre-fab)
- Scissors
- Rolling pins (one per group)
- Spoons
- Food service gloves
- Sandwich sized plastic bags that zip closed
- Grains: Pre-measured ½ cup bags of: corn, rice and oat cereal - will need two bags of each grain per group
- Proteins: Bowls of powdered milk, soy nuts or sunflower seeds – will need two of each per group
- Energy: Squirt bottles of honey and maple syrup
- Flavors: Raisins and chopped dried apples
- Index cards labeled "Energy" "Protein" "Flavor" and "Grains" (one per group)
- Ingredient label from a human meal replacement bar or drink

Part 1: Investigate!

1. Have the students work in small teams. Give each team a bingo card, an unopened bag of pet food and a marker.
2. Instruct the teams to read the label of the pet food and seek out the "people food" ingredients. *(Note: You may need to help the students interpret some of the ingredients. Have them focus on the easy ones first.)*
3. Have them locate a picture of that food on their bingo card and "x" it with their marker.

Objectives

- Investigate the ingredients found in pet foods
- Design a nutrition-packed "people pellet"

Learning Standards

(See Matrix)

Common SET Abilities 4-H projects address:

Predict
Hypothesize
Evaluate
State a Problem
Research Problem
Test
Problem Solve
Design Solutions
Develop Solutions
Measure
Collect Data
Draw/Design
Build/Construct
Use tools
Observe
Communicate
Organize
Infer
Question
Plan Investigation
Summarize
Invent
Interpret
Categorize
Model/Graph
Troubleshoot
Redesign
Optimize
Collaborate
Compare

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4. If the teams do not get bingo with their own bag of food, have the groups rotate stations, leaving the food and marker. Each team will have a chance to use a new bag of food and marker. Continue to rotate until team gets bingo (or you run out of time.)
5. The team that gets the first bingo will be the first to select their ingredients in Part Three.

Part 2: Taste Test!

1. Before the group meets, prepare a trail mix from the cereals listed in the grain group above. Have the students sample it. (Be sure to check for food allergies first!)
2. Now place a small amount of the trail mix in a double plastic bag and let them roll it into powder. Ask the students if they think it will taste the same or different? Will the nutrition have changed? Let a few volunteers sample the powder.
3. Ask the group what would be the benefit in “powderizing” the food?
4. Show the group an energy bar and a pellet of pet food. Ask them what they have in common.

Part 3: Create!

1. Form new teams. Demonstrate the techniques below to make “people pellets.”
2. Give each team one of each card: (protein, energy or grain)
3. Have each team shop for their grains. Each group gets a “free” bag of corn cereal plus whichever they select.
4. Have them “powderize” their cereal by rolling it out in two plastic bags.
5. Now have them shop for their protein, flavor and their energy.
6. Have the students add two spoons each of the protein and flavor to their bag with the cereal, zip it closed, and take turns mixing by shaking the bag.
7. Have an adult add the energy ingredient. Use your discretion on how much will be needed to make a dough. Have the students work the ingredients into a pellet shape. If needed, a small amount of water can be added as well.
8. Survey the group for taste testers. Have them taste only one bite and give their opinion on whether they would like to eat it every day for every meal!
9. Review the contents of each pellet and talk about the nutrition. Ask the group how many more ingredients they think they would need for their pellet to really meet all of their nutritional needs. Share a list of ingredients from a meal replacement drink or bar.

Science Checkup - Questions to ask to evaluate what was learned

- What nutrients or ingredients were in the pet food?
- What would be the benefit of making the ingredients into a powder?
- What challenges did you have with making your pellets?

Extensions

- Have each group use the nutrition labels from their pellet ingredients to make a chart of protein, fat and calories. Have the entire group rate the recipes as high energy, low fat, high protein etc.
- Have each team come up with a name and package label for their product.

Vocabulary

Protein: Any of a large group of nitrogenous organic compounds that are essential constituents of living cells; consist of polymers of amino acids; essential in the diet of animals for growth and for repair of tissues; can be obtained from meat, eggs, milk and legumes.

Carbohydrate: Any of a group of organic compounds that includes sugars, starches, celluloses and gums and serves as a major energy source in foods.

Fat: Organic compounds that are made up of carbon, hydrogen and oxygen. They are a source of energy in foods. Fats belong to a group of substances called lipids, and come in liquid or solid form. All fats are combinations of saturated and unsaturated fatty acids.

Nutrients: A chemical that an organism needs to live and grow or a substance used in an organism's metabolism which must be taken in from its environment. Essential *nutrients* - proteins, carbohydrates, fats and oils, minerals, vitamins and water.

Background Resources

- FDA information about pet food: <http://www.fda.gov/AnimalVeterinary/ResourcesforYou/ucm047111.htm>
- Product label ingredient samples: www.kaytee.com/products/animal/small-animals.php?page=0
- "Small Animal Nutrition," by Sandie Agar, 2001