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Title

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YOUTH DEVELOPMENT THROUGH VETERINARY SCIENCE 6

Food In, Waste Out

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Subject Overview and Background Information

Animals consume food for energy and the nutrients necessary to grow, fight disease, and reproduce. Major nutrients—proteins, carbohydrates, and fats—are found in the foods that animals eat through the process of **ingestion**, and through the process of **digestion** foods are broken down into particles small enough to be absorbed and used by the animal. Major structures of animals' digestive systems include mouth and teeth (chewing food breaks it into pieces that are more easily digested); esophagus (a "tube" that receives food from the mouth and transfers it to the stomach); stomach (a "container" that holds and mixes food as chemicals from the stomach help break down the food further); small intestine (receives food from the stomach, continues to break down food into smaller particles, and is the site of most nutrient **absorption** into the blood stream for **transport** throughout the body); and the large intestine (the site where food wastes are processed for removal from the body).



Not everything that animals consume in their diets can be used by the body; some becomes waste and must be removed from the body through a process called **excretion**. Two major ways that wastes are removed are in the form of solids (**stool** or **feces**) and liquids (**urine**).

Solid waste is made up of materials left over from digestion. In order to exit the body, solid waste is passed through the large intestine into the rectum and then **eliminated** by passing through the anus. The stool is comprised mostly of food debris and water.

Wastes that are found in an animal's blood are removed through the urinary system. The blood is filtered through the kidneys, where wastes from activities in cells are removed, dissolved in water, and eliminated from the body in the form of urine.

The processes of digestion and excretion are important in helping veterinarians assess the health of animals. Changes in appetite, vomiting, loose stools, constipation, and problems associated with urination may provide veterinarians with critical information when diagnosing an illness. Whenever a caretaker notices these or other changes in their animal's digestion or waste removal processes, it is important to consider consulting a veterinarian.

◆ Activity Concepts and Vocabulary

- **Absorption:** The uptake of substances by tissues within the body.
- **Digestion:** The process in which ingested food is broken down in the body and converted to substances that the body can then absorb.
- **Elimination:** The removal of substances from the body.
- **Excretion:** The discharging of waste matter from the body.
- **Ingestion:** The taking of food into the body.
- **Liquid waste (urine):** Waste matter from the blood that leaves the kidneys.
- **Solid waste (feces or stool):** Waste matter from digestion that leaves the intestines through the anus.
- **Transport:** To move substances from one place to another via the blood.

◆ Life Skills

- **Head:** Critical thinking, record keeping, problem solving
- **Heart:** Communication, Sharing
- **Hands:** Teamwork
- **Health:** Disease prevention

◆ Subject Links

Science and Language Arts

◆ State Science Content Standards Supported

Science

- Fourth Grade
 - *Investigation and Experimentation: 6d, 6f*
- Fifth Grade
 - *Life Sciences: 2c*
- Sixth Grade
 - *Investigation and Experimentation: 7e*

Language Arts

- Grade 3
 - *Listening and Speaking Strategies: 1.5, 1.8*
- Grade 4
 - *Listening and Speaking Strategies: 1.7, 1.8*
- Grade 5
 - *Listening and Speaking Strategies: 1.5*
- Grade 6
 - *Listening and Speaking Strategies: 1.5*

◆ Purpose of Activity

The purpose of this activity is to explore and understand what happens to the food we eat when it enters our body.

ACTIVITY

Food In, Waste Out



Overview of the Activity

In this activity, youth will simulate what happens in the body when we eat food.

The activity consists of two trials. For both trials, youth are given a piece of Hot Tamale candy, a food container, a receiving container, and a waste container. In the first trial, youth are given a set of instructions to follow to simulate the process of digestion with the Hot Tamale. Then the youth will try to come up with ways to “digest” the Hot Tamale more effectively. They will test their ideas in the second trial.

◆ Time Required

45 to 60 minutes

◆ Suggested Grouping

Pairs or small groups of 3 to 4 individuals

◆ Materials Needed for Each Group

(*Materials provided in curriculum)

- 2 plastic vials or jars with lids
- 4 clear plastic drinking cups
- 2 pieces of Hot Tamale candy
- 1 drinking straw
- 2 paper towels to be used as filters
- Water
- One piece of flip chart paper
- Assorted colored markers
- *Human digestive system diagram
- *Animal food intake and waste elimination chart
- *Diagram of Kidney and Urinary System

◆ Getting Ready

- Make sure you have enough materials for each group.
- Make one copy of the Human Digestive System handout for each pair or group.
- Make enough copies of the animal food intake and waste elimination chart so each youth can have at least one copy (concept application).
- Divide the youth into pairs or small groups.
- Make one copy of the “Kidney and Urinary System” handout for each pair or group.

Opening Questions

Ask the youth to respond to each question below by sharing their ideas verbally and/or by recording them on the flip chart paper provided.

1. What do you know about the different types of foods humans or other animals eat?
2. Why do you think humans and other animals need to eat?
3. What do you know or wonder about the types of waste products humans or other animals produce and remove from their bodies?
4. What do you know about how an animal’s feeding habits might change if it is unhealthy?
5. What do you know about how an animal’s waste products (solid and liquid) might change if it is unhealthy?

Procedure (Experiencing)

1. Provide each group with the necessary materials.
2. Explain to the youth that they are going to be doing this activity two times: Trial 1 and Trial 2.
3. Ask them to label the following with a marker:
 - *2 vials or jars with lids: Food Container 1 and Food Container 2.*
 - *2 clear plastic cups: Receiving Container 1 and Receiving Container 2.*
 - *2 clear plastic cups: Waste Container 1 and Waste Container 2.*
 - **(Note: Once the youth have finished labeling their containers, have them place all the “2” containers in an area away from the “1” containers.)**

4. Explain the following procedure to the youth.

(Note: Do not have them begin yet!)

 - *Have each group fill Food Container 1 approximately three-quarters full with water.*
 - *The youth will add one piece of the Hot Tamales candy to the water in Food Container 1. (Note: Have all the groups add the candy at the same time and start the timer).*
 - *At this point, the clock will begin. The goal is to dissolve as much of the candy as possible during the **90 seconds** provided.*
 - *After the 90-second duration, tell the youth that they have only **30 seconds** to transfer as much of the fluid into Receiving Container 1 using a straw. Start the timer when everyone is ready. (Note: Use a finger tip over one end of the straw. No pouring is allowed!)*
 - *After transferring fluid to Receiving Container 1, the groups will filter the remaining materials from Food Container 1 into Waste Container 1 using the paper towel filter.*
5. Before starting, clarify the activity guidelines:
 - *No eating the candy.*
 - *No sucking on the straws with mouths.*
 - *No pouring of liquid from the food containers to the receiving containers.*
6. Explain to the youth that they are going to have a total of **2 minutes** to complete Trial 1.
7. **Volunteer:** Make certain that all groups are ready. Once everyone is ready, begin! After **90 seconds**, tell them to stop. Provide an additional **30 seconds** to transfer fluid to the receiving container. After the 30 seconds, have them begin the filtering process.
8. At the end of the activity, ask them to observe (e.g., color; quantity) the liquid they transferred into Receiving Container 1, the liquid they filtered into Waste Container 1 (e.g., color; quantity), and what remains of the candy (e.g., color; size; shape). Have them record their observations and comparisons on the flip chart paper.
9. Ask the groups to discuss how they might modify their procedures so they are able to dissolve more of the candy during the 90 seconds. They will try their modifications in Trial 2.

- **Volunteer Tip:** *If the youth do not have any ideas about modifying the procedures, ask them to think about how they eat. Do they swallow their food whole? What happens when we chew our food?*
- 10. When the groups are ready, repeat steps 4 through 9 (Trial 2). Explain that this time they may modify the procedures to dissolve more candy during the 90 seconds.
 - **Volunteer Tip:** *The water becomes a darker shade of red.*
- 11. Compare the results from Trials 1 and 2. What happened? How did Trial 2 differ from Trial 1? Discuss your observations with the other groups.

Sharing, Processing, and Generalizing

Follow the lines of thinking developed by youth as they share and compare their thoughts and observations. If necessary, use more targeted questions as prompts to get to particular points, such as:

1. How, if at all, might this activity relate to animals and the food that they eat? Ask them to explain their thoughts verbally and/or record them on the flip chart paper.
2. The candy represents an animal's food. What parts or processes in this activity might be related to animals eating food? Have them explain their thoughts using what they have already written on the flip chart paper as an aid.
3. What are the waste products produced in this activity? How does it relate to the waste products humans produce? Have them explain their thoughts using what they have already written on the flip chart paper as an aid.
 - **Volunteer Tip:** *Breaking the candy up into smaller pieces represents chewing; dissolving the candy in the water represents digestion; transferring the dissolved food to the receiving container simulates the transport of digested food via the bloodstream; filtering liquid waste represents the function of kidneys; and the remaining solid waste imitates the formation of solid waste, or feces.*

5. Looking at the handout "Human Digestive System," what parts of an animal's digestive system might represent the food containers and receiving containers? The straw?
 - **Volunteer Tip:** *Stomach; blood vessel. Ask them to explain their ideas and/or record their thoughts on the flip chart paper.*
6. How, if at all, were the activity's processes changed from Trial 1 to Trial 2 in order to dissolve more of the candy? How might this relate to animal digestion? Have them explain their thoughts using the flip chart paper.
 - **Volunteer Tip:** *It is important to encourage the youth to explain the reasons behind their thoughts. Have them present their evidence (lines of thinking) and make clear their reasoning.*

Concept and Term Discovery/Introduction

Volunteers need to ensure that the concepts **ingestion**, **digestion**, **absorption**, **transport**, **elimination**, and **solid** and **liquid waste** have been introduced. Specific terms associated with these concepts may need to be introduced.

- **Note:** *The goal is to have the youth develop these concepts through their exploration and define the terms using their own words.*

Concept Application

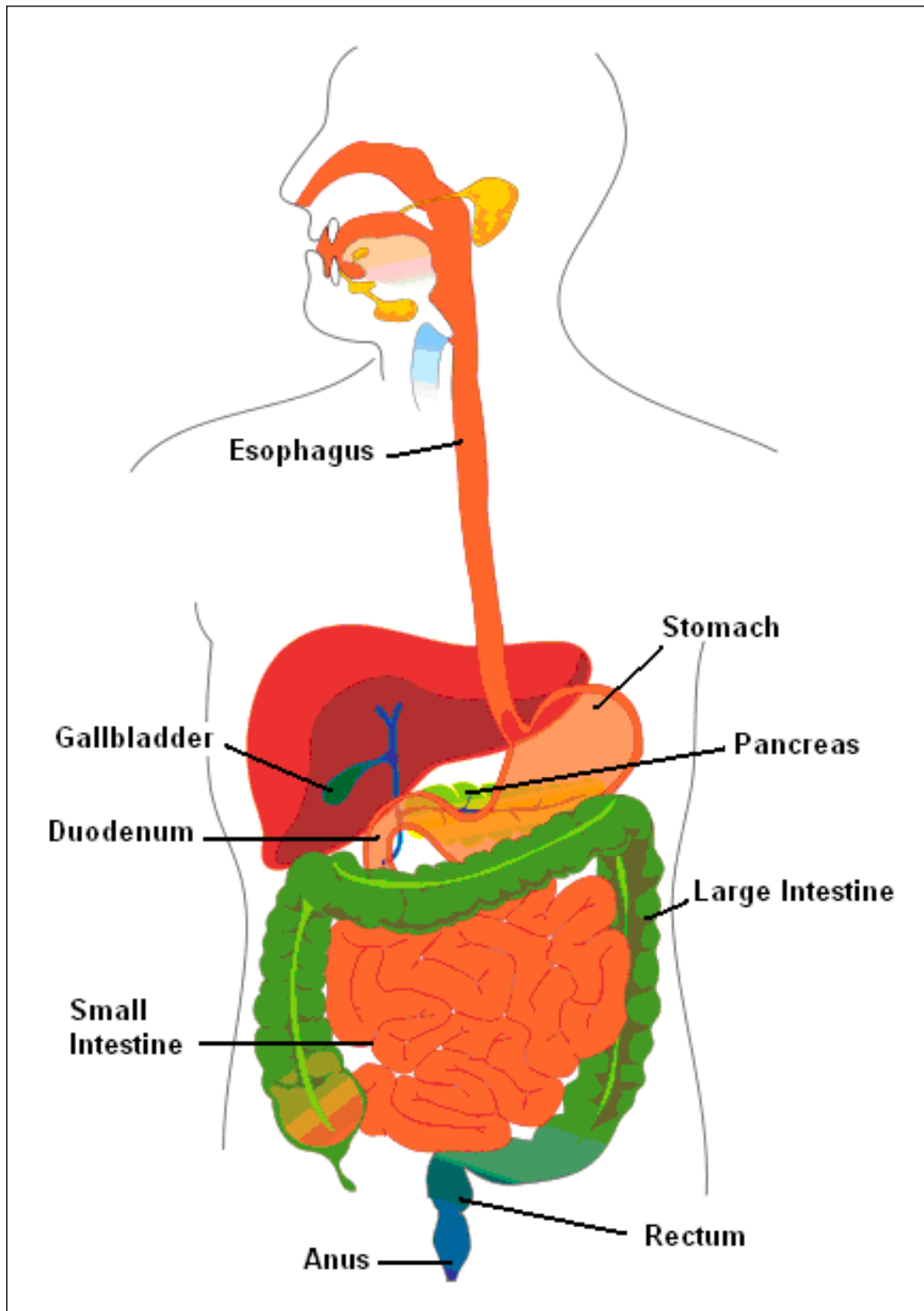
If the youth have pets or agricultural animals at home, have them record the digestive and waste removal behavior of one or more animals over a 3- to 5-day period on the chart "Animal Food Intake and Waste Elimination."

References

- Colorado State University Hypertexts for Biomedical Sciences. Pathophysiology of the digestive system. CSU Web site, <http://www.vivo.colostate.edu/hbooks/pathphys/digestion/index.html>.
- KidsHealth. Your digestive system. KidsHealth Web site, http://www.kidshealth.org/kid/body/digest_noSW.html.
- National Digestive Diseases Information Clearinghouse. Your digestive system and how it works. NDDIC Web site, <http://digestive.niddk.nih.gov/ddiseases/pubs/yrdd/>.



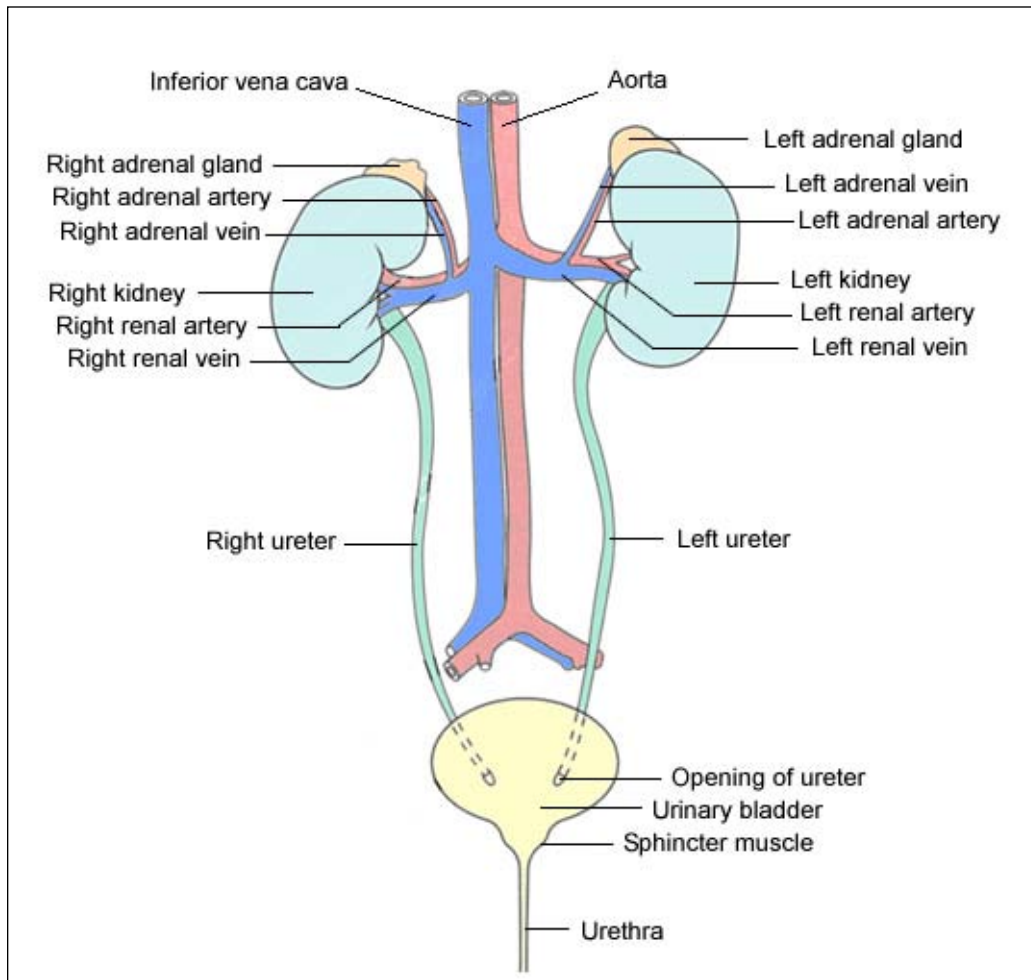
Human Digestive System



Source: National Digestive Diseases Information Clearinghouse.



Kidney and Urinary System



einavdogan

<http://www.flickr.com/photos/29119102@N05/2729335314/>

ANIMAL FOOD INTAKE AND WASTE ELIMINATION

Animal: _____

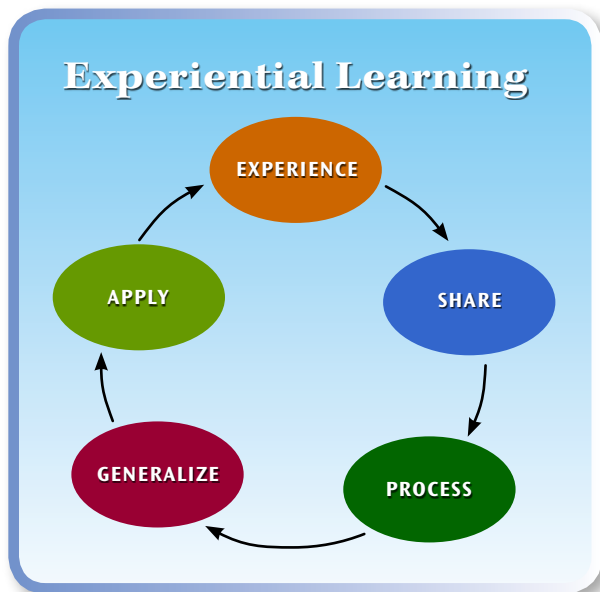
Day	Appetite description	Stool frequency	Stool description	Urination frequency	Comments

KEY

- **Day:** Day of week and date.
- **Appetite:** Did your pet eat the food provided; eat some of the food provided; or show little or no interest in food provided?
- **Stool Frequency:** How often and when during the day did your pet eliminate solid waste?
- **Stool Description:** Was your pet’s stool solid, semisolid, soft, or more liquid?
- **Urination Frequency:** How often and when during the day did your pet urinate?
- **Comments:** Include any additional comments relative to your pet’s digestive and waste removal behavior? *For example:* Difficulties eliminating solid waste (constipation); apparent pain or discomfort; vomiting.

APPENDIX

The activity in this curriculum is 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 5-step learning cycle is most commonly used. These five steps—Exploration, Sharing, Processing, Generalizing, and Application—are part of a recurring process that helps build learner understanding over time.



For more information on inquiry, EL and the 5-step learning cycle, please visit the University of California's Science, Technology, Environmental Literacy Workgroup's Experiential Learning Web site, <http://www.experientiallearning.ucdavis.edu/default.shtml>.

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