



National 4-H Curriculum
BU-08049

All Systems Go!

Level 2



Veterinary Science Project Activity Guide Grades 6-8

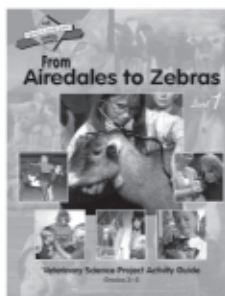
Name _____

County _____



For more on Veterinary Science, check these other guides in this series.

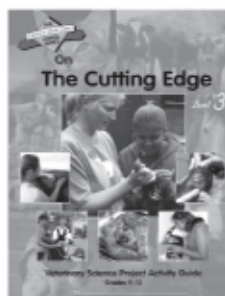
From Airedales to Zebras



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- Chapter 1 The Normal Animal**
 - A Breed Apart
 - Basic Needs
 - Fur and Feathers as Friends—and More Get Growin’
 - Systems Check
 - Body Language, Animal Style
 - What’s for Lunch?
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 - Not a Shot in the Dark
 - Better Safe Than Sick
- Chapter 3 Investigating Careers**
 - Jack of All Trades
 - Cool Tools!
 - Furry Friends in Fact, Fiction and Film
 - Here’s the Story

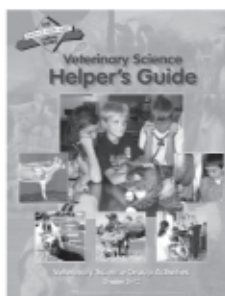
On the Cutting Edge



Level 3 BU-08030

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 - Bond, Animal Bond
 - TherioWHAT?
 - May the Best Gene Win
 - Swell Cell Organelles
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 - Heroes of the Clinics
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 - Getting Technical
 - Your Future Is in Your Hands

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Helper’s Guide BU-08051

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- Developing Life Skills
- Teaching and Learning Experientially
- Evaluating the Impact
- Chapter 1 Mastering Project Skills**
 - Show What You Know!
 - For the Record
 - Demonstration Derby Day
- Chapter 2 Developing Character**
 - Vets Helping Pets...and More
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 - The Truth about Cats and Dogs
- Chapter 3 Investigating the Profession**
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All Systems Go!

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The Normal Animal

Files for the Future

Project Skill: Keeping health records

Life Skill: Record keeping

Educational Standard: NS.5–8.1
Science as Inquiry: Abilities necessary to do scientific inquiry

Success Indicator: Complete a health record on an animal.

When you go to the doctor, a nurse usually begins your checkup by looking at your health chart and taking your vital signs. Your records tell the health care workers who you are, when your last visit was, what your health history is and what your current vital signs are. This information is important to your doctor for proper treatment. During this activity you will assess and record your animal's health information.

Caution!

Make sure you have adult assistance when performing these procedures, especially taking your animal's temperature. Do not do something if you will be in danger. Always be extra careful around animals you don't know.

Hop To It!

Observe a healthy animal at rest for five days in a row. Record your observations on the chart below.



A healthy animal's gums are pink.

_____ 's Health Record

	Day 1	Day 2	Day 3	Day 4	Day 5
Heart rate					
Respiration rate					
Temperature					
Appetite					
Feces					
Coat					
Gait					
Attitude					
Parasites					
Gums					



Scope this out!

The first records were probably kept on the walls of caves.



Vital Signs

Discuss these questions with your helper.

Speak! (share what you did)

- What did you observe over the five days?
- What was the hardest thing to observe and measure?

Ferret it Out (process what's important)

- Why is it important to know your animal's normal vital signs?

Bare Bones (generalize to your life)

- What are some illnesses, injuries or treatments that appear in your health records?

Mooving Ahead (apply what you learned)

- What other health information about your animal could you record?
- How can you teach others about the importance of keeping proper records?

Respiratory rate • Vital signs • Heart rate



There are many different things to look for to determine whether your animal is healthy or ill. As an owner, it is your responsibility to know what is normal for your animal, recognize signs of illness and get help for your animal when needed. Make sure you know the normal temperature, heart rate and respiratory rate for your animal's species.

Here are some general things to look for in healthy and sick animals. Any sign of illness could be an indication of something serious, so wash your hands well and tell an adult what you found. Call your veterinarian, too.

Vital Signs

Characteristics	Healthy animal	Sick animal
General appearance and attitude	Bright, active, curious, alert, playful; neither too fat or too thin	Dull, depressed, inactive, standing standing alone, lying down; too thin or too fat
Temperature	Normal	Higher or lower than normal
Appetite	Good	Eating too much, too little or not at all
Hair coat	Smooth and glossy, no parasites	Dull, dry, falling out, bare patches, discolored, parasites
Eyes	Bright and moist, no discharge	Dull, dry, sunken, discharge
Nose	No abnormal discharge	Watery, snotty or bloody discharge
Breathing	No abnormal sounds; normal rate	Coughing, wheezing, gasping; rate increased or decreased from normal
Skin	Pliable, hydrated, no parasites, no wounds or sores	Parasites, dehydrated, sores, wounds, scars
Abdomen	No abnormal shape	Bloated or shrunken
Mucous membranes	Normal pink color	Pale, yellow, white, blue or extremely red
Feet and legs	No swellings or lameness	Lame, abnormal smell, swelling
Udder	Glands are symmetrical, teats normal, normal milk color and character	Swollen or uneven glands, abnormal color or temperature, milk off color or with odd smell
Testicles	Normal size and shape	Shrunken or enlarged; painful
Feces	Normal amount, color, smell and consistency	Increased or decreased amount; abnormally hard or watery; abnormal color or smell



Booster Shots

1. Accompany a veterinarian on farm calls or in a clinic and observe how he/she keeps and uses animal health records.
2. Create a chart comparing different animals' normal heart rates, body temperatures and respiration rates. Share this information with your group.

All For One and One For All!

Is one body organ most important for life? In this activity you will discover that every body system has an affect on the other organs and systems, and all must function properly for optimal health of the animal. You'll also discover how important—and fun!—it is to be a member of a team.

Hop To It!

Working with other youth, create a presentation or skit that depicts various body systems and how they work together. Be sure to make the skit educational and have it accurately portray the true functions of body systems. In the space below, outline your skit or presentation or paste a photo of your group giving your presentation.

R

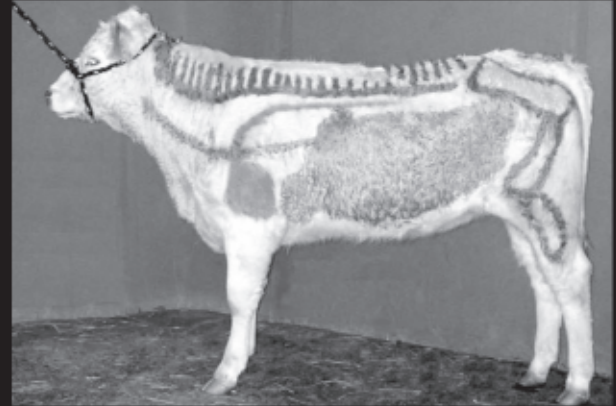
Project Skill: Recognizing the interrelationships of body systems

Life Skill: Teamwork

Educational Standard: NS.5–8.3

Life Science: Structure and function in living systems

Success Indicator: Demonstrate the value of teamwork.



This would be a fun way to learn about body systems!

Cat Nips



One vertebra said to the next "I'll be back in a minute." The next one replied "Don't go out!"

Take the Pulse

Discuss these questions with your helper.

Speak! (share what you did)

- How did you feel when you were working as a team?
- Where did you find the information you needed?

Ferret it Out (process what's important)

- How do body systems work together to support life?
-
-
-

Bare Bones (generalize to your life)

- What are some other times you have been a member of a team?
-
-
-

Mooving Ahead (apply what you learned)

- How can you assess the function of your animal's body systems?
 - What careers involve working as a member of a team?
-
-
-



Scope this out! One-celled organisms (bacteria) and some simple organisms (jellyfish) do not have circulatory systems—all of their cells are able to absorb nutrients, expel wastes and exchange gases.

An open circulatory system lacks capillaries; tissues and cells are bathed in blood (starfish and crabs). In a closed system, blood is confined to vessels (octopus).

Vertebrate animals have closed systems but the number of chambers in their heart may vary. Fish have two-chambered hearts, frogs have three, and mammals, birds and crocodiles have four.



Vital Information

A Well-Oiled Machine

The body is an amazing “machine” with many complex systems that coordinate and keep the organism alive. Recall that cells are the foundation of life. A group of cells working together makes up tissues and organs. Organs work together in body systems. Let's investigate two systems in more depth.

Muscle Tissue

A myofiber (muscle cell) is the basic unit of the musculoskeletal system. These cells contain energy stores, contractile proteins and signaling mechanisms. There are three main types of muscle tissue, each with a different ability: skeletal (or striated) muscles are voluntary muscles that help the body move; cardiac muscle is found only in the heart and is involuntary; smooth muscles are found within blood vessels or organs (such as the stomach and intestines) and are involuntary. Nerve cells determine the function of muscle cells. When the brain receives information from sensory neurons (such as those in the eyes and ears), it sends out nerve impulses to muscles to create appropriate movement.

Circulatory System

The circulatory system pumps blood throughout the body to carry oxygen and nutrients to cells and remove wastes. It also transports hormones, antibodies, clotting factors and white blood cells. Blood is made up of plasma (a protein-rich fluid), Red Blood Cells (RBCs), White Blood Cells (WBCs) and platelets. RBCs transport oxygen to the cells and carbon dioxide away from cells. WBCs help the body fight off diseases. Platelets are essential for the blood-clotting process.

Examples of How the Body Systems Work Together

- The circulatory system transports carbon dioxide to the lungs, where it is exhaled through the respiratory system.
- The circulatory system delivers blood to the kidneys, which filter out wastes and eliminate them through the urogenital system as urine.
- The circulatory system carries hormones produced by the endocrine system to cells throughout the body, causing various effects on cell function.



Booster Shots

1. Pick a disease process and research it and its effects on various body systems. Discuss or share your information with other youth.
2. Observe a necropsy of an animal and identify the different organs. Draw what you observed and share it with your helper.

All Stressed Up with No Place to Go

Crowded, stressful and unsanitary conditions cause health problems for humans. The same is true for animals! If a crowded, stressful and filthy environment makes you uncomfortable, it will do the same for your animals. This activity will increase your awareness of the role environment and stress play in health and disease.

Hop To It!

With your helper, friends or family, discuss all the things that make up your environment. Also talk about the things that cause stress in your life and about the daily sanitary procedures that help keep you healthy. Now apply all these same discussion points to your animals. Record key points in the area below.

My Animals

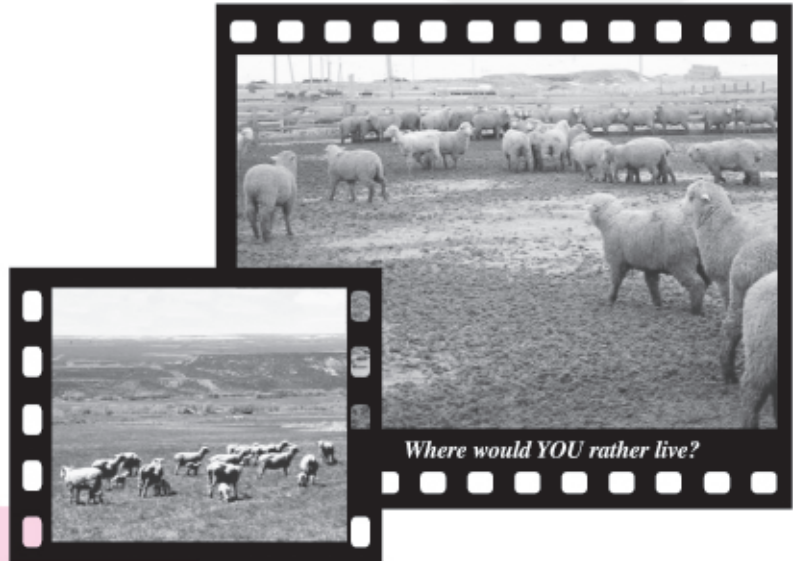
Things and activities in my animals' environment.

Things that are stressful.

What I do to keep my animals' environment clean.

What I do to reduce my animals' stress.

P*Project Skill: Improving sanitation and reducing stress*
Life Skill: Disease prevention
Educational Standard: NS.5-8.6
Personal and Social Perspectives: Populations, resources and environments
Success Indicator: Name three ways to reduce animal stress and improve sanitation.



Discuss these questions with your helper.

Speak! (share what you did)

- What is in your environment? What things are stressful? What do you do to keep your environment clean?
- What is in your animal's environment? What are its sources of stress?

Ferret it Out (process what's important)

- How are environment and stress connected to health and disease?

Bare Bones (generalize to your life)

- What illnesses have your animals had that were connected to stress or poor sanitation?

Mooving Ahead (apply what you learned)

- What changes can you make in your animal's environment to reduce stress and improve sanitation?

Additional Resources:

The Magic Schoolbus Inside the Human Body
—Joanna Cole, Bruce Degan

Acknowledgement: Activity written by Geri Parsons and Cleon Kimberling.



Sanitation • Stress • Environment

Environmental Stress

You are exposed to many different environments—home, school, church, outdoors, public places, etc. Your animal may also have many different environments. There are sources of stress and health risks in each environment; some have greater risks than others. Stress weakens the body's defenses against diseases and reduces animal performance and comfort, so animal caretakers must do everything they can to minimize the stress in their animal's environment.

Sources of stress:

- | | |
|--------------------|---------------------------|
| • Crowding | • Loud noises |
| • Poor air quality | • Dirty environments |
| • Drafts | • Buildup of wastes |
| • Transportation | • Rough handling |
| • Excessive heat | • Exposure to new animals |
| • Excessive cold | • High humidity |
| • Wet environments | • Feed changes |



Booster Shots

1. Make three changes in your animal's environment that will reduce stress and improve sanitation. Monitor your animal's growth or performance afterward and note any changes you observed. Share the results with your helper.
2. Interview a farm manager, zookeeper, animal breeder or someone else directly involved with animal care. Ask them what steps they take to reduce stress in their animals and maintain sanitation.

The Defense Department

As a young child, you were vaccinated several times to protect you against important diseases. Animals need vaccinations, too. How do vaccinations help protect humans and animals against sickness? How does the immune system respond to disease-causing agents? You will learn the answers to these questions as you discover how animals' own personal security systems work.

Project Skill: Investigate how the immune system works

Life Skill: Learning to learn—analyzes application of learning tools

Educational Standard: NS.5–8.3
Life Science: Structure and function in living systems

Success Indicator: Describe how the immune system protects animals against diseases.

Hop To It!

1. On your own or in a group, investigate an immune system and blood cells and learn what they do. When you are done, complete the matching exercise below to test your knowledge.

2. Get a bag of M&Ms® or another multi-colored candy. You will need seven different colors. Open the bag(s) and sort the pieces according to color. Put the group with the most pieces of one color at the top of your working area; put the group with the second most pieces of one color below this, and continue until the group with the fewest pieces of one color is at the bottom of your working area. Assign a blood cell type name from the list in the matching activity to each color of candy.*

Results of My M & M "Complete Blood Count"

Color of candy	Cell type assigned	Number counted	Percent of total

Finish performing your "Complete Blood Count" by counting the number of each color, then calculating the percent of each type of "cell" (color of candy). The total of all candy percentages should total 100. Record your results in the table above. **Note:** if you wash your hands before starting this activity and work on a clean surface, the M&Ms can be your reward for a job well done!

Blood Cell Matching Activity

___1. Erythrocyte (ee-RITH-row-site)	A. A type of white blood cell; circulates in bloodstream and present in thymus, lymph nodes and spleen; produces antibodies when activated by invading pathogens
___2. Eosinophil (ee-oh-SIN-oh-fill)	B. Also known as platelets; important in blood clotting process
___3. Lymphocyte (LIMF-oh-site)	C. A type of white blood cell; derived from monocytes; found in tissues; engulfs invaders and destroys them with enzymes
___4. Basophil (BAZE-oh-fill)	D. A type of white blood cell; precursors of macrophages; circulate in bloodstream; leaves vessels and enters tissues in response to disease-causing agents; engulf invaders and kills them with enzymes
___5. Neutrophil (NEW-trow-fill)	E. Also known as red blood cells; contains hemoglobin and carries oxygen from the lungs to the tissues
___6. Macrophage (MAK-row-faj)	F. A type of white blood cell; rare; function poorly understood
___7. Thrombocyte (THROM-bow-site)	G. A type of white blood cell; numbers increase in response to allergic or parasitic conditions; circulates in blood stream
___8. Monocyte (MON-oh-site)	H. A type of white blood cell; circulates in bloodstream; contains granules full of enzymes; engulfs invading organisms and destroys them with enzymes



Discuss these questions with your helper.

Speak! (share what you did)

- What types of cells did you learn about?

Ferret it Out (process what's important)

- How did the M&M® and matching activities help you learn about the immune system?
- How does the immune system protect us against diseases?

Bare Bones (generalize to your life)

- What diseases have you been vaccinated against?

Mooving Ahead (apply what you learned)

- How can you now better protect yourself and your animals against diseases?

Colostrum • Humoral immunity • Cell-mediated immunity • Antibodies • Immunoglobulins • Chronic • Antigen

The Body's Security System

An animal's immune system helps protect it against diseases. There are two main ways the immune system works: one is through the production of antibodies that respond to antigens (humoral immunity) and the other is by special cells that respond directly to pathogens (cell-mediated immunity).

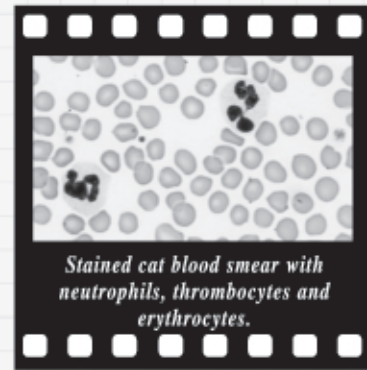
Active and Passive Immunity

Active immunity is when an animal mounts its own response to a pathogen by producing antibodies against that pathogen; an example is protection that develops after an animal is vaccinated against a disease. Passive immunity is when an animal receives antibodies that were produced by another animal; an example is protection that results from an animal ingesting its mother's colostrum.

Antibodies

Antibodies are large protein molecules that are also known as immunoglobulins. Lymphocytes produce antibodies against specific pathogens after they encounter the pathogen and become activated.

In addition to antibodies, some cells help protect animals against invaders. Monocytes, macrophages and neutrophils engulf invaders and kill them by discharging powerful enzymes. A Complete Blood Count (CBC) reports the number of red blood cells and each type of white blood cell in a blood sample. Results from a CBC can help diagnose diseases.



Stained cat blood smear with neutrophils, thrombocytes and erythrocytes.

Normal Blood Cell Counts of Various Species

	Cat	Dog	Cattle	Horse	Pig	Hamster	Rabbit
White blood cells x 1000	5.5–19.5	6–17	4–12	6–12	11–22	5–10.6	5.2–12.5
% Neutrophil	35–78	60–80	15–47	30–76	28–51	17–35	17–59
% Lymphocyte	20–55	12–30	45–75	25–60	39–62	51–92	31–80
% Monocyte	0–14	3–14	2–7	1–8	2–10	.4–4.4	0–13
% Eosinophil	2–12	2–10	2–20	1–10	1–11	.2–1.5	0–3.4
% Basophil	0–2.5	0–2.5	0–2	0–3	0–2	0–5	0–5.6
Red blood cells x 1,000,000	5–11	5.5–8.5	5–10	6–12	5–8	4–10.3	5.1–8
Platelets x 1,000	150–500	200–500	100–800	100–600	325–715	300–573	270–656

• Many species not included. Normal values vary with age, gender, breed and use. From multiple sources.



Scope this out!

Some reasons for anemia: Iron deficiency, auto-immune destruction of cells, chronic blood loss, parasitism or bone marrow suppression

Some reasons for elevated White Blood Cell count: infection, leukemia, allergic responses



Resources:

Veterinary Laboratory Medicine: Clinical Pathology, Duncan and Prasse.

Veterinary Clinical Pathology, Coles.

Acknowledgement: Activity written by Susan Kerr.



Booster Shots

1. Visit a veterinary clinic and observe how a complete blood count is performed. Look at prepared white blood cells under a microscope slide. Draw what you see.
2. Investigate the importance of colostrum for newborn livestock. Make an educational poster about what you learned.



Diseases, Pests and Problems

Biosecurity Blanket

Project Skill: Investigating the importance of biosecurity

Life Skill: Disease prevention

Educational Standard: NS.5–8.6

Personal and Social Perspectives: Natural hazards

Success Indicator: Describe how diseases can spread between animals.

Are you worried when you stand next to someone with a cold or the flu? If not, you should be! Diseases are often spread between people who are in close contact; the same is true with animals. This fun activity will help you grasp important concepts about disease transmission and biosecurity.

Hop To It!

Place 20 to 30 dominos onto a table in a space about the size of a checkerboard. Arrange the dominos in different arrays so that 1) they all fall down when the first domino is knocked over, 2) one particular domino is protected from falling down and 3) no dominos fall down. In the space below, diagram, describe or attach a photo of how you arranged the dominos to achieve each objective. Now imagine that the standing dominos represent healthy animals and the fallen dominos represent diseased animals. Relate what happened with the dominos to how diseases are spread between animals. Describe below how what happened with the dominos relates to how diseases can be spread between animals.



Discuss these questions with your helper.

Speak! (share what you did)

- How did you arrange the dominos to achieve each objective?
- What part of the activity was the most challenging? Why?

Ferret it Out (process what's important)

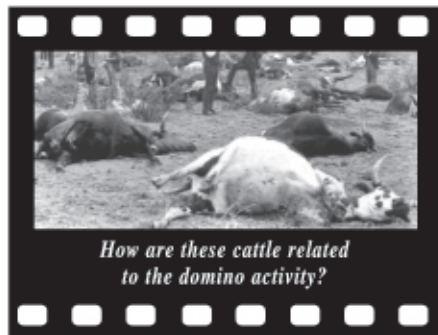
- How are dominos a model for disease transmission between animals?
- Why is it important to control the spread of diseases between animals?

Bare Bones (generalize to your life)

- What types of diseases have you seen spread through groups of animals or people?
- What do you currently do to prevent disease transmission to your animals?

Mooving Ahead (apply what you learned)

- How can you use what you learned to prevent disease transmission in your animals?



Explore more at
www.4-hcurriculum.org
 National 4-H Curriculum



Acknowledgement: Activity written by David Smith.

Mission: Prevent Transmission

Contagious diseases are transmitted between animals or from place to place. Animals might be exposed to contagious disease agents in a variety of ways. Disease agents may be carried by animals that are infected but not showing signs of illness. These carrier animals are called reservoirs. Insect vectors may simply transport the agent between hosts. Inanimate objects such as boots, brushes and tires may also transport the agent from place to place; these agents are called fomites.

Biosecurity

Biosecurity is the action taken to prevent disease transmission. Trying to prevent transmission from animal to animal, from animal to human, from herd to herd or from one region to another is the goal. A contact that results in disease transmission is called an effective contact. Some of the ways to prevent effective contacts are by physical separation of animals, reducing the dose-load of disease agent or minimizing contact time with the agent. Other methods of biosecurity are to keep the agent from entering the herd (e.g., controlling reservoirs, vectors and fomites), increasing immunity (e.g., with vaccines), isolating new animals, quarantining sick animals and using disinfectants.



Scope this out!

Mosquitoes are the vectors for many important diseases of humans and/or animals, including West Nile Virus, malaria and heartworms.



Booster Shots

1. Repeat the activities with the dominos, but keep increasing the number of dominos within the square. What happens? Share the results with your helper.
2. Visit a place where animals are cared for. Identify ways contagious diseases could be spread at this facility. List actions that are taken or could be taken to prevent transmission of contagious diseases.
3. Choose a variety of species and design vaccination programs to protect them against their most common diseases.

Vector • Fomite • Reservoir • Carrier • Biosecurity • Effective contact



What's Eating You?

Tapeworms, roundworms, hookworms, lungworms heartworms—the animal world is full of parasites! Some cause very little trouble and others are deadly; some are even transmissible to humans. This activity will guide you through an investigation of parasite life cycles and help you understand the steps you can take to control parasites in your animals.

Project Skill: Recognizing the impact of parasites on animal health

Life Skill: Disease prevention

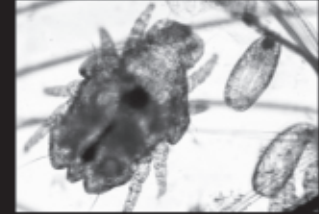
Educational Standard: NS.5–8.3

Life Science: Diversity and adaptations of organisms

Success Indicator: Describe parasite life cycles, their effects on health and how to disrupt them.

Hop To It!

Explore the life cycles of some parasites of the species of your choice. In the space below, draw one of these life cycles. Label parts of the cycle that can be broken by management steps and name what these steps are.



Parasites are a major threat to animal health.



Scope this out!

Cats can get heartworm, too!

Discuss these questions with your helper.

Speak! (share what you did)

- What new information did you discover in this activity?

Ferret it Out (process what's important)

- How can you control parasites in your animals?

Bare Bones (generalize to your life)

- What parasite control steps have you taken?

Mooving Ahead (apply what you learned)

- How can you change how you manage your animals to control their parasites?
- How can you teach others about the importance of parasite control?

Transmissible • Parasite • Vermin • Life cycle



Parasites and Animal Health

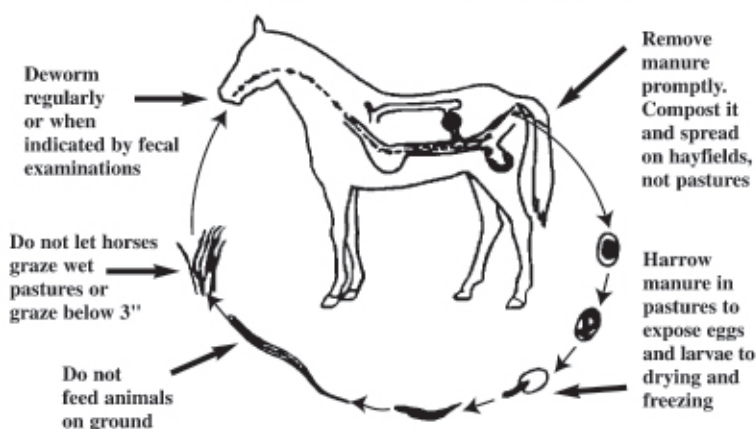
Parasites can affect animal health in a variety of ways. Flies irritate animals and cause stress; biting flies can transmit diseases. Lice and mites cause itching and blood loss. Intestinal parasites cause blood loss, compete for nutrients and make digestion less efficient. Heartworms can impair cardiac function and even kill. Toxoplasmosis can cause miscarriages and brain damage. Great masses of roundworms can rupture intestines. Lungworms make animals more susceptible to pneumonia. Coccidia cause diarrhea and poor growth.

The best-adapted parasites do not kill their hosts because if the host dies, the parasite dies, too. Sometimes parasites get into the wrong host and cause even more serious problems than in the correct host.

Control Measures

Parasite control measures include prompt removal of feces, using fly sprays, keeping animals away from wet areas, feeding animals above the ground, using parasite prevention or treatment medications, having fecal examinations done, buying healthy animals, quarantining new animals and controlling vermin and birds.

Life Cycle of *Strongylus vulgaris* in the Horse, with Appropriate Control Measures



Booster Shots

1. Investigate the life cycle and prevention measures for parasite of another animal species.
2. Ask a veterinarian to show you actual animal parasites such as heartworms, bots, tapeworms, roundworms, grubs and so on. Make drawings or take photos of them and share these with your group.



Explore more at

www.4-hcurriculum.org

National 4-H Curriculum

