Impact of Parasites on Animal Health

**Unit:** Animal Science and the Industry

**Problem Area:** Animal Health and Administering Veterinary Care

**Lesson:** Impact of Parasites on Animal Health

**Student Learning Objectives.** Instruction in this lesson should result in students achieving the following objectives:

1. Identify common internal and external parasites that affect livestock and companion animals, and describe the diseases that they may spread or cause.
2. Diagram and describe the complete life cycle of common parasites that affect animals.
3. Recognize the importance of controlling parasites, and describe methods used to control parasites in disease management.

**List of Resources.** The following resources may be useful in teaching this lesson:

- Corresponding E-unit(s). Danville, IL: CAERT, Inc. www.mycaert.com

**List of Equipment, Tools, Supplies, and Facilities**

- Copies of sample test
- Visuals from accompanying masters
- Copies of student lab sheet
**Terms.** The following terms are presented in this lesson (shown in bold italics):

- companion animals
- complete metamorphosis
- external parasites
- gradual metamorphosis
- incomplete metamorphosis
- internal parasites
- life cycle
- livestock
- metamorphosis
- non-existent metamorphosis

**Interest Approach.** Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situation. A possible approach is included here.

Obtain a few preserved internal parasites, and pass them around so the students can see them. (The preserved specimens can be purchased at a biological supply company.) While the students are passing around the parasites, lead a discussion on where the parasites would be located in the animals’ bodies. Ask the students to list what body functions would be impacted and what symptoms may result.

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**SUMMARY OF CONTENT AND TEACHING STRATEGIES**

**Objective 1:** Identify common internal and external parasites that affect livestock and companion animals, and describe the diseases that they may spread or cause.

**Anticipated Problem:** What are the common internal and external parasites that affect livestock and companion animals, and what diseases might they spread or cause?

I. Internal parasites and external parasites

A. **Internal parasites** live within the host’s body or organs.

1. **Livestock** refers to domestic animals that are owned and raised as stock (e.g., cattle, sheep, and swine).
   a. Several species of stomach worms affect livestock. The most common stomach worms are barber pole worms (*Haemonchus spp.*), brown
stomach worms (*Ostertagia ostertagi*), and small stomach worms (*Trichostrongylus axei*). Each species affects herds differently based on climate, nutrition, immune status, rainfall, and conditions (e.g., overcrowding and overgrazing, which increase the harmfulness).

b. Animals infected with an average number of worms can reduce weight gains by 10 to 20 percent. The economic losses are greatest in growing calves, yet the sheep and goat industry is severely threatened by barber pole worms because they are resistant to almost every available de-wormer. These infections cause severe blood loss, resulting in death loss on many farms. Treatment is difficult after the sheep or goats have become anemic (a deficiency in red blood cells).

2. **Companion animals** (e.g., dogs, cats, and rabbits) have special bonds with humans, known as the human-animal bond. A mutual affection is present.

a. Heartworms are thin, string-like parasites that reach the adult stage in the chambers of the host’s heart and obstruct major arteries, causing heart failure and death in the host, if untreated.

b. Heartworms are transmitted from an infected host to an uninfected host by mosquitoes that carry the parasite.

B. **External parasites** are found on the outside of the host (e.g., on the skin or in the hair).

1. Livestock

a. Horn flies (*Haematobia irritans*) are blood feeders that primarily target cattle kept on pasture. The flies pierce the skin with their short, tube-like mouthparts approximately 20 to 30 times per day to ingest small amounts of blood.

b. Horn flies can be annoying to the cattle and the farmer. Every year, horn flies cause great economic losses due to reductions in weight gain.

2. Companion animals

a. Fleas are a common external parasite of pets, specifically the cat flea (*Ctenocephalides felis*) and the dog flea (*Ctenocephalides canis*).

b. Cat fleas can be irritating when they bite humans and pets. They can cause pets to develop flea allergies. Female cat fleas feed on the animal’s blood and live on the host until they die, are consumed during grooming, or are killed by insecticides.

c. Fleas can live anywhere (inside or outside), but they prefer to avoid direct light by hiding in the carpet, under furniture, under leaves, or in the soil.

d. In addition to causing irritation to pets, fleas can carry diseases (e.g., the Black Plaque was transmitted by the rat flea in the 1300s). Cat scratch fever (*Bartonella henselae*) is a disease that is carried by fleas today.

C. Diseases caused by parasites

1. Stomach worms

a. If stomach worms are not adequately treated, they can lead to the disease called bottlejaw. This occurs when animals have heavy worm burdens and
start to lose protein from their intestines, causing fluid to build up in the skin under their jaws and lower abdomen. Other signs of stomach worms are weight loss, rough hair coat, weakness, and anorexia (a loss of appetite).

b. Cattle that are overcrowded will have a lower immune system, making them more susceptible to bottlejaw.

2. Heartworms
   a. If preventative measures are not taken, animals can eventually die from heartworm disease.
   b. Heartworm disease can be detected, in most cases, by a blood test performed in the vet clinic. Evidence of heart damage can be observed on X-rays if it is severe and chronic.
   c. Signs of a heartworm infection are blood vessel obstruction, coughing (resulting from fluid build-up due to heart failure), shortness of breath, and lethargy. However, some dogs do not show signs until the disease is advanced. While dogs can tolerate many heartworms, cats can die instantly from a single heartworm becoming lodged in a heart vessel.

3. Horn flies
   a. Horn flies do not specifically cause a disease, but a large amount of horn flies can cause weight loss due to aggravation. They cause extreme discomfort, irritation, and itching.
   b. Horn flies serve as the intermediate host for a parasite called *Stephanofilariasis*, which causes common plaque-like lesions on the underside of the abdomen.

4. Fleas
   a. If pets ingest fleas while grooming, they can develop tapeworms. These pests can cause weight loss, if left untreated.
   b. In addition, some pets become allergic to flea saliva, causing them to scratch continuously. As a result, they may lose all of their hair over time. Fleas can also cause skin infections called “hot spots.”
   c. Extreme flea infestations on young animals can cause them to develop anemia.

*Divide the students into four groups. Give each group a scenario that involves a pet having symptoms of an illness. Have the groups try to determine the cause. They must explain their reasoning in a role play.*
Objective 2: Diagram and describe the complete life cycle of common parasites that affect animals.

Anticipated Problem: How do you diagram the complete life cycle of common parasites that affect animals? What are the life cycles of common parasites that affect animals?

II. The life cycle refers to the changes in form that an organism goes through from birth to death.

A. Stomach worms
   1. Stomach worms go through complete metamorphosis: egg, pupa, larva, and adult.
   2. Egg are passed to the ground in the form of manure. The eggs hatch in the manure, and they are washed into the grass by the rain. The livestock eat the grass and accidentally ingest the larvae.
   3. While in the intestinal tract and stomach, the larvae develop into adults and lay eggs in the stomach lining.

B. Heartworms
   1. A mosquito bites an animal already infected with heartworm microfilaria in its blood. As a result, the mosquito becomes infected. Microfilaria are basically baby worms.
   2. The microfilaria enter the larval stage while in the mosquito.
   3. The mosquito passes the larvae to a healthy dog while ingesting blood during a meal. The larvae then migrate through the tissues of the animal, eventually reaching the heart.
   4. Heartworms can grow up to 12 inches long during the adult stage.

C. Horn flies
   1. Female horn flies lay their eggs in manure. Within a few minutes after the eggs have been deposited, the pupae stage begins. Then they develop into larvae. Finally, wings develop during the adult stage, and horn flies begin to irritate the livestock.
   2. The horn fly life cycle is completed in approximately 10 to 14 days, and each female can lay up to 500 eggs.

D. Fleas
   1. The female flea mates soon after consuming a blood meal. She can lay 40 to 50 eggs per day on the host.
   2. The eggs fall off the host onto the carpet or ground and hatch in one to six days. The larvae feed on dead skin cells, other organic debris, and the feces from the adult fleas. The larvae become mature in 5 to 11 days and then form cocoons as they enter the pupae stage. In one to two weeks, the pupae hatch and adult fleas emerge. The adult fleas start feeding as soon as they find hosts.
3. The flea life cycle is usually completed in an average of three to six weeks, in average household conditions. However, the life cycle can be as quick as 12 to 14 days or as long as 350 days, depending on temperature and humidity.

Encourage students to relate their experiences with parasites. Fleas are a good example to use since most students have had some experience with dog or cat fleas. Discuss how difficult it is to control parasites and explain why. Use VM–A and VM–B to explain life cycles. Have students select a common parasite and research the life cycle. Have students diagram the life cycle of the parasite they select.

Objective 3: Recognize the importance of controlling parasites, and describe methods used to control parasites in disease management.

Anticipated Problem: Why is it important to control parasites? What methods are used to control them?

III. Parasite control refers to the preventative measures taken to reduce parasite numbers and to reduce the further spread of parasites.

A. Livestock parasites
   1. The best way to control stomach worm populations is through regular de-worming and good nutrition. Reducing overcrowding, minimizing overgrazing, and boosting immunity by having proper food additives, vitamins, and vaccinations will also help.
   2. Horn flies
      a. One of the best ways to control horn flies throughout the season is to use self-treatment insecticides or routinely apply sprays or dust with insecticides.
      b. Ear tags (pyrethroid tags) that contain insecticide are also useful. These tags will successfully reduce the numbers of horn flies if the tags are used properly. Rotating the types of tags used every other year can help prevent resistance from developing.

B. Companion animals
   1. Heartworms
      a. Heartworms are easily prevented, if the proper measures are taken. Pets need a monthly heartworm pill.
      b. Most puppies are started on monthly heartworm treatments by the time they are eight weeks old.
   2. Fleas
      a. Fleas can be controlled by topical insecticides (that help kill fleas) applied once per month to the skin. These insecticides stop the life cycle and repel fleas. In addition, treating the environment (e.g., the yard, the pet’s bedding, and the household carpet and furniture) is important.
b. Flea dips and baths are not very effective. They were once popular. However, as soon as the pets are dry, the adult fleas in the environment can immediately reinfect the pets.

Have students create posters to encourage parasite control in animals. Then use a game show approach to review the main concepts of this objective.

**Review/Summary.** Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used to determine which objectives need to be reviewed or taught from a different angle. The anticipated problems in this lesson and “Checking Your Knowledge” in the corresponding E-unit(s) may also be used in the review/summary.

**Application.** Use the included visual masters and lab sheet to apply the information presented in the lesson.

**Evaluation.** Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. The sample written test can also be used.

**Answers to Sample Test:**

**Part One: Matching**
1. e
2. a
3. b
4. c
5. d

**Part Two: Short Answer**
1. Complete metamorphosis involves the following life stages (in this order): (1) egg, (2) pupa, (3) larva, (4) adult.
2. One of the best ways to control horn flies is to use self-treatment insecticides or routinely apply sprays or dust on insecticides. A preventative measure is to use an ear tag containing an insecticide.

**Part Three: Completion**
1. heartworm
2. pyrethroid tag
3. barber pole worm
4. black plague
5. Heartworm
Impact of Parasites on Animal Health

Part One: Matching

Instructions: Match the term with the correct definition.

a. horn fly  
b. external parasite  
c. heartworm  
d. stomach worm  
e. internal parasite

1. An internal worm that affects animals  
2. A pest that can cause a significant amount of blood loss in livestock (when present in large numbers)  
3. A parasite that attacks from the outside of an animal’s body  
4. A parasite that can cause heart failure  
5. A parasite that is found in the digestive system

Part Two: Short Answer

Instructions: Complete the following.

1. Briefly explain the steps of complete metamorphosis.

2. Explain some methods of controlling horn flies.
Part Three: Completion

Instructions: Provide the word or words to complete the following statements.

1. A mosquito bite may lead to a(n) _________________________ infection.

2. An ear tag containing an insecticide is called a(n) _________________________.

3. The _________________________ worm is a major problem for the goat and sheep industry.

4. The rat flea spread the _________________________.

5. _________________________ can be detected in most cases by a blood test or an X-ray.
THE LIFE CYCLE OF COMMON ANIMAL PARASITES

LIFE CYCLE OF FLUKE
- Young fluke emerges from snail.
- Young fluke hatches from egg and penetrates snail.
- Fluke attaches itself to grass and is swallowed by grazing cattle.
- Fluke eggs in feces passed on to pasture.
- Larvae crawl up grass and are swallowed by grazing cattle.
- Fluke eggs in feces passed to pasture.

LIFE CYCLE OF TAPEWORM
- Eggs are eaten by mites in pasture.
- Infested mites are swallowed by grazing cattle.
- Tapeworm segments passed in feces to pasture.
- Segments contain large numbers of eggs.
- Young worm develops from egg in pasture.

LIFE CYCLE OF ROUNDWORM
- Young worm or larva hatches.
- Eggs are eaten by mites in pasture.
- Infested mites are swallowed by grazing cattle.
- Larva develops to infective stage.
- Tapeworm segments passed in feces to pasture.
- Roundworm eggs passed in feces to pasture.

Lesson: Impact of Parasites on Animal Health
SAMPLE LIFE CYCLE OF AN INSECT

Sample Life Cycle of an Insect

- Eggs
- Larva (mealworm)
- Pupa
- Adult (beetle)
Mealworm Life Cycle

Purpose

The purpose of this activity is to observe the life cycle of a mealworm so a comparison can be made between it and the life cycle of a typical parasite.

Objectives

1. Differentiate and observe each stage in the metamorphosis of a mealworm.
2. Compare the life cycle of a mealworm to that of a parasite.

Materials

♦ one pound of chick started mash or wheat bran
♦ two whole, medium-size potatoes
♦ one gallon plastic container with lid
♦ one nail
♦ knife
♦ paper towel

Procedure

1. Punch 15 to 20 holes in the container lid with the nail.
2. Put the pound of chick starter mash or wheat bran into the container.
3. Cut the potatoes in half, and place the potatoes cut side down in the bran.
4. Place a mixture of adults and larvae mealworms in the bran mixture, and cover the entire surface with a paper towel.
5. Place the lid on the container, and then place the container in an area of the classroom where the worms will not receive direct sunlight. Leave the container undisturbed for two weeks.
6. Observe the colony for life cycle changes. Record these changes. At the end of the two weeks, the class should have a discussion on the changes they have observed.