Laboratory Exercise # 10: Parasitology

Purpose:

The purpose of this laboratory exercise is to expose the students to a sampling of different parasitic infections.

Introduction:

What is parasitology? The study of a parasite, but what is a parasite? It is an organism feeding on live organic material such as another organism. This is a symbiosis (close permanent association) between the two organisms, in which one organism feeds on the other may cause damage to the host organism.

Parasites have a wide range of sizes and structures. They include unicellular organisms that are a part of the lowest levels of our food chain. They may be a member of the fungus group and aid in decomposition. They may use flagella to take them from place to place such as Giardia migration through our intestinal tract and Trypanosoma movement through our blood stream. They may require a vector (transporter) to carry them to their potential host like Plasmodium that cause of malaria. They may be multicellular organisms such as helminthes (round worms or flat worms) that use larger animals or man to complete their life cycle.

In this laboratory exercise the student will be introduced to several parasitic organisms through observation of the organism and its eggs or offspring. The parasites to be studied are important due to their ability to cause disease in man. This exercise will not include the study of fungus, as it will be covered in another laboratory exercise.

Materials: Prepared Slides of:

Blood parasites:

- Plasmodium vivax
- Trypanosoma cruzi
- Borrelia burgdorferi

Fluke parasites:

- Schistosoma mansoni - worm and eggs
- Fasciola hepatica - flukes and eggs

Round worm parasites

- Enterobius vermicularis - worm and eggs
- Trichinella spiralis - Worm and encysted larvae in muscle
- Necator americanus - adult, larvae and eggs
Procedure:

The students will observe a series of slides and demonstrations during this exercise, answer questions and draw their observations. Most of the parasites in this exercise are colorless. For ease of viewing, the student should close down the iris diaphragm, lower the condenser, and turn down the rheostat.

The Study of Blood parasites

1. **Plasmodium vivax** is the parasitic causative agent of one type of malaria.
   a. Observe the blood smear under 100X, use the laboratory atlas as a reference. Make a small drawing of at least two stages you observe.

   ![Drawing](image)

   b. Define the function of each of the following stages within the Malaria cycle.

   1. Sporozoites -
   2. Merozoites -
   3. Trophozoites -
   4. Gametocytes -

   c. This disease in man has the symptoms of cyclic chills and fevers. What is happening within the life cycle of Plasmodium when a person with malaria infection experiences chills and fever?

   d. What specific mosquito is the vector for malaria?

2. **Trypanosoma cruzi** is a pathogenic microorganism is also transmitted by the vector. Reduviid bugs that live in cracked walls of mud and adobe houses bite humans during the evening hours and then defecate on the site thus transmitting the pathogen and causing Chagas disease.

   a. Observe the slide using 100X magnification and make a sketch of the microorganism in the space provided.

   ![Drawing](image)

   b. This microorganism causes what disease in man?

   c. What are the symptoms of the disease?
3. **Borrelia burgdorferi** is a spirochete that causes Lyme disease. Observe the blood smear using 100X magnification. Look closely at the background of the smear; it is there you will find the microorganism.

   a. What is the vector for Lyme disease and how is it spread to man?

   b. What is the initial sign of the infection that maybe seen on the skin?

   c. What symptoms appear later?

**The Study of Flukes**

1. **Schistosoma mansoni** is one of three species that cause the disease called Schistosomiasis. Although these worms look cylindrical they are placed in the Fluke group as they have a flattened leaf-like stage (**Cercaria**) that is able to penetrate the skin and invade the blood stream of man.

   a. Observe the smear of the male and female worms using 4X magnification. Notice how the worms seem to be nestled together. The male has a longitudinal **copulatory groove** where the female resides for fertilization of her eggs. Make a diagram of the two worms and label which is male and which is the female. *** Hint ovaries within the female are stained dark.

   b. Where in the human body do the adult flukes reside and what symptoms can it cause?

   c. Observe the slide of the **Schistosoma mansoni** eggs using 4X magnification. Make a sketch of this large egg that has a spine at one end.

   d. When the fertilized eggs are released from the female they travel through the intestines and are released with feces. They develop into miracidia when they enter what environment?

   e. What hosts do the miracidia then enter?

   f. How does man initially become infected?
2. **Fasciola hepatica** is a rare human pathogen, but is an important parasite of sheep. This microorganism after being ingested from drinking contaminated water or aquatic plants (such as watercress) finds its way to the liver where the movement of the flukes through the tissue is very damaging.

   a. Observe the slide using the dissecting scope provided. Make a sketch of the fluke and label the following parts: oral sucker, posterior sucker (for attachment), and uterus.

   b. This fluke is hermaphroditic. What does that mean?

   c. Observe the egg of *Fasciola hepatica* using 4x magnification. Make a sketch of it in the space provided below.

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**The Study of Roundworms**

1. **Enterobius vermicularis** is the most common roundworm parasite in the United States. An estimated 30% of the children and 16% of adults have had this disease called a Pinworm infection at one time in their lives.

   a. Observe the slide of the pinworm female using 4X magnification. The long pointed tails on the end of the worm give it its name. Sketch the worm and label the following parts: anterior end, esophageal bulb and pointed tail. The point at the end of the worm indicates that is a female worm.

   b. Observe the slide of the pinworm male using 4X magnification and notice the lack of the pin at the posterior end. How does the female use the pin when she is laying her eggs?
c. What is the source of pinworm in our environment?

d. What is an easy way for a baby to become infected with this parasite?

e. Observe the eggs of *Enterobius vermicularis* using 4 X magnification. Make a sketch of the eggs in the space provided below.

f. Where do the adult worms live within the human host?

g. Where does the female lay its eggs and what symptoms does it cause?

h. Why is the whole family treated for pinworm when one person in the family is infected?

2. *Necator americanus* is one of two known types of hookworm parasites. This worm attaches to the walls of the intestine where they suck blood from the tissues causing anemia and malnutrition.

   a. Observe the adult worm slide using 4X magnification. Sketch the worm and label the following parts: cutting plates (used for attachment), and copulatory bursa (found on ends of males). Since plates, not hooks are used for attachment where does this worm get its name from? The front end of the worm is curved!

   b. How does a person pick up a hookworm infection?

   c. Observe the larval form (filariform) that actually infects man, using 4X magnification. How does the larval form look different from the adult worm?

   d. Where does the larval form migrate to first, during infection of man?
e. How do the larvae then get to the intestine where it matures into an adult worm?

f. Observe the egg of *Necator americanus* using 4X magnification. How would you describe its appearance? Make a sketch of it.

3. *Trichinella spiralis* is a parasite whose entire life cycle is within the same animal host, the pig. Man only becomes an accidental host when ingesting undercooked pork.

   a. Observe the *Trichinella* worm using 4X magnification. Make a sketch of it.

   b. Explain the life cycle of this parasite in the space provided below.

   c. Observe the slide of encysted *Trichinella* using 4X magnification. Sketch the microorganism as it appears within muscle.

   d. What are some of symptoms of Trichinosis?

   e. If man is only an accidental host, then where does a pig get this parasite from if not from man?