Flatworms and Roundworms

Section 3

Flatworms

When you think of a worm, you probably visualize a creature with a long, tubular body, such as an earthworm. You might be less familiar with flatworms and roundworms. The flatworms are the largest group of acoelomate worms. Although the flatworm body plan is relatively simple, it is a great deal more complex than that of a sponge or cnidarian. Flatworms have a middle tissue layer, the mesoderm. And unlike sponges and cnidarians, the flatworm has tissues that are organized into organs. 1 2

The flatworm's body is bilaterally symmetrical and flat, like a piece of tape or ribbon. As a result, each cell in the animal's body lies very close to the exterior environment. This permits dissolved substances, such as oxygen and carbon dioxide, to pass efficiently through the flatworm's solid body by diffusion. In addition, portions of the flatworm's highly-branched gastrovascular cavity run close to practically all of its tissues. This gives each cell ready access to food molecules. Most flatworms have no respiratory or circulatory system. 1 2

Flatworms belong to phylum Platyhelminthes, which contains three major classes: Turbellaria, Cestoda, and Trematoda. They range in size from free-living forms less than 1 mm (0.04 in.) in length to parasitic intestinal tapeworms several meters long. 1 2

Objectives

- **Compare** the three classes of flatworms. 8B 8C TAKS 2
- **Summarize** the life cycle of a blood fluke. 8C TAKS 2
- **Describe** the body plan of a roundworm. 8C TAKS 2
- **Summarize** the life cycle of the roundworm *Ascaris*. 8C TAKS 2

Key Terms

proglottid
fluke
tegument

Turbellaria

Almost all members of class Turbellaria are free-living marine flatworms, such as the one shown in **Figure 14.** However, marine flatworms are rarely studied by students because they are difficult to raise in captivity. Instead, students usually study a freshwater turbellarian such as *Dugesia,* one of a group of flatworms commonly called planarians. *Dugesia* is shown in *Up Close: Planarian,* on the following page. 1 2

Figure 14 Marine flatworm. Most free-living flatworms are marine species that swim with graceful wavelike movements.

Evolutionary Milestone

3 **Bilateral Symmetry**

Flatworms were likely the first bilaterally symmetrical animals, with left and right halves that mirror each other. Like all bilaterally symmetrical animals, flatworms have a distinct anterior (cephalic) end.

Up Close

Planarian TAKS 2; TAKS 3

- **Scientific name:** *Dugesia* sp.
- **Size:** Average length of 3–15 mm (0.1–0.6 in.)
- **Range:** Worldwide
- **Habitat:** Cool, clear, permanent lakes and streams
- **Diet:** Protozoans and dead and dying animals

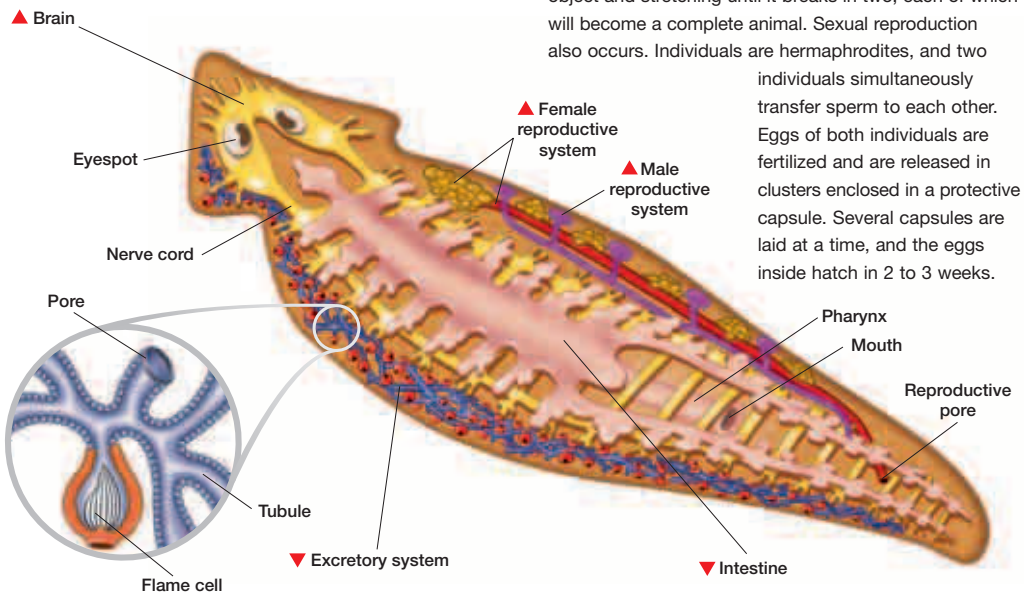
Dugesia feeding

Characteristics

Nervous System Sensory information gathered by the brain is sent to the muscles by two main nerve cords that are connected by cross branches. Light-sensitive structures called eyespots are connected to the brain. The eyespots are close to each other, giving *Dugesia* a cross-eyed appearance.

Feeding *Dugesia,* a free-living flatworm, must extend its muscular pharynx out of its centrally located mouth in order to feed.

Reproduction *Dugesia* reproduces asexually in the summer by attaching its posterior end to a stationary object and stretching until it breaks in two, each of which will become a complete animal. Sexual reproduction also occurs. Individuals are hermaphrodites, and two individuals simultaneously transfer sperm to each other. Eggs of both individuals are fertilized and are released in clusters enclosed in a protective capsule. Several capsules are laid at a time, and the eggs inside hatch in 2 to 3 weeks.



Water Balance Because *Dugesia*'s body cells contain more solutes than fresh water does, water continually enters its body by osmosis. Excess water moves into a network of tiny tubules that run the length of *Dugesia*'s body. Side branches are lined with many flame cells, specialized cells with beating tufts of cilia that resemble a candle flame. The beating cilia draw water through pores to the outside of the worm's body.

Digestion The highly branched intestine enables nutrients to pass close to all of the flatworm's tissues. Nutrients are absorbed through the intestinal wall. Undigested food is expelled through the mouth.

Observing Planarian Behavior

QUICK LAB

Most bilaterally symmetrical organisms have sense organs concentrated in one end of the animal. You can observe how this arrangement affects the way they explore their environment.

Materials 2B 2C TAKS 1

eyedropper, live culture of planaria, small culture dish with pond water, hand lens or dissecting microscope, forceps, and small piece of raw liver (3–7 cm)

Procedure

1. Using the tip of the eyedropper, place a planarian in the culture dish with pond water.
2. Using the hand lens or dissecting microscope, observe the planarian as it adjusts to its environment. Determine which end of the planarian contains sensory apparatus for exploring the environment.
3. Using forceps, place the liver in the pond water about 1 cm behind the planarian.
4. Observe the planarian's response. If the planarian approaches the liver, move the liver to a different position.
5. Continue observing the planarian for 5 minutes, moving the liver frequently.

Analysis

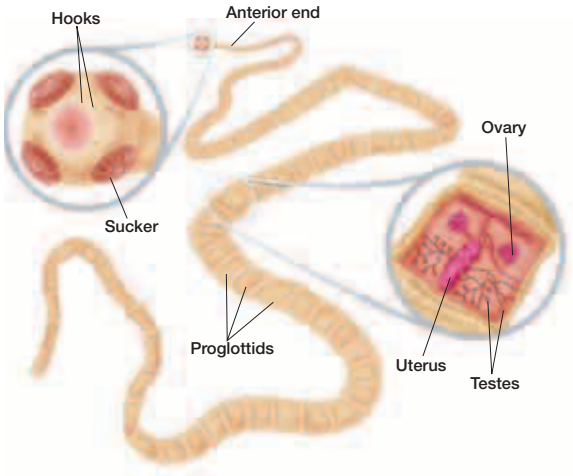
1. **Describe** the planarian's means of locomotion.
2. **Describe** how the planarian responded to the liver.
3. **Contrast** the feeding behavior of planarians with that of hydras, described earlier in this chapter.
4. **Critical Thinking Evaluating an Argument** Evaluate this statement: Bilateral symmetry gives planaria an advantage when feeding because sensory organs are concentrated in one end. Support your opinion with the observations you made on planaria.

Cestoda

Class Cestoda is made up of a group of parasitic flatworms commonly called tapeworms. Tapeworms use their suckers and a few hooklike structures, shown in **Figure 15,** to permanently attach themselves to the inner wall of their host's intestines. Food is then absorbed from the host's intestine directly through the tapeworm's skin. Tapeworms grow by producing a string of rectangular body sections called **proglottids** *(proh GLAHT ihds)* immediately behind their head. (Each proglottid is a complete reproductive unit, a fact that makes it difficult to eliminate tapeworms once a person is infected.) These sections are added continually during the life of the tapeworm. The long, ribbonlike body of a tapeworm may grow up to 12 m (40 ft) long. 1 2

Figure 15 **Tapeworm**

A tapeworm's body consists of a head and a series of proglottids.



Most tapeworm infections occur in vertebrates, and about a dozen different kinds of tapeworms commonly infect humans. One of the tapeworms that infects humans is the beef tapeworm, *Taenia saginata*. Beef tapeworm larvae live in the muscle tissue of infected cattle, where they form enclosed fluid-filled sacs called cysts. Humans become infected when they eat infected beef that has not been cooked to a temperature high enough to kill the larvae. 1 2

Trematoda

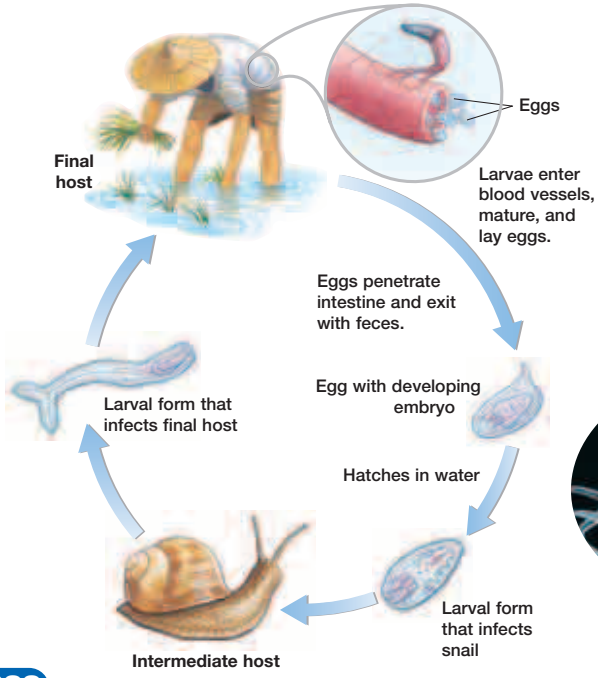
The largest flatworm class, Trematoda, consists of parasitic worms called **flukes.** Some flukes are endoparasites, or parasites that live *inside* their hosts. Endoparasites have a thick protective covering of cells called a **tegument** that prevents them from being digested by their host. Other flukes are ectoparasites, or parasites that live on the *outside* of their hosts. 1 2

Flukes have very simple bodies with few organs. Flukes do not have well-developed digestive systems. Rather, they take their nourishment directly from their hosts. Flukes have one or more suckers that they use to attach themselves to their host. They use their muscular pharynx to suck in nourishment from the host's body fluids. 3

Most flukes have complex life cycles involving more than one host, one of which may be a human. Blood flukes of the genus *Schistosoma* are responsible for the disease schistosomiasis *(shihs tuh soh MIE uh sihs)*, a major public health problem in the tropics. Infection occurs when people use or wade in water contaminated with *Schistosoma* larvae. The larval parasites bore through a person's skin and make their way to blood vessels in the intestinal wall. They block blood vessels, resulting in bleeding of the intestinal wall and damage to the liver. As shown in **Figure 16,** the life cycle of blood flukes includes a particular species of snail as an intermediate host. 2 3

Figure 16 ***Schistosoma*** **life cycle**

In the life cycle of blood flukes, snails are intermediate hosts and humans are final hosts.



Adult male blood flukes are thick-bodied, while adult females are threadlike.