



Figure 1 A fungus and a green algae form a composite organism (a lichen) through symbiosis.

LEARNING TIP •

Periodically stop reading to recall what you have read. Ask yourself, “What are some examples of mutualism, commensalism, and parasitism?”

Symbiosis refers to any close relationship between two different species. Symbiotic relationships are the most specialized form of species interaction and each species often develops very specialized behaviours, life cycles, or structures. There are three types of symbiotic relationships: mutualism, commensalism, and parasitism.

Mutualism is a relationship in which both species obtain some benefit from the interaction. For example, lichens are made up of a fungus and a photosynthetic organism, usually a green algae. The fungus grows around the algae, protecting the algae which then makes food for the fungus through the process of photosynthesis (Figure 1).

Commensalism is an interaction in which one organism benefits while the other is unaffected. Relationships of this type often are difficult to detect and the term is usually applied to situations where there is no obvious cost or benefit to one of the organisms. For example, the relationship between barnacles and grey whales is usually classified as commensalism. The barnacles live on the hide of the whale and feed passively from the water passing by, while there is no apparent benefit or harm to the grey whale (Figure 2).



Figure 2 The whale barnacle has a commensal relationship with the grey whale.

Parasitism occurs when one organism lives and feeds on, or in, the body of another organism called the **host**. The **parasite** benefits from the relationship by getting its nutrients from the host. The host is harmed by the relationship, but the death of the host means the loss of a habitat for the parasite, so the host's death usually comes slowly, if at all. From the perspective of any host, the parasite is harmful. The host is often starved for

nutrients, and may be unable to reproduce or carry out some basic life functions. However, parasites can have a positive role, because they control species' population growth and prevent them from becoming too abundant. In this way, parasites ensure the survival of the strongest and healthiest members of a population. Nevertheless, parasites are responsible for many serious diseases.

Biologists estimate that as many as 25 % of all animal species may be parasites. Parasites often have hooks or suckers for attaching to the host. In some parasitic species, only the reproductive system is well developed. Tapeworms that live in the intestine of their host can absorb nutrients directly through their skin. Tapeworms, ticks, and fleas, as well as many bacteria and protozoa, are among the parasites that are responsible for widespread disease among animals and humans (Figure 3).

Many plant parasites gain nutrients from a host plant instead of producing their own food through photosynthesis. Some plant parasites cannot photosynthesize at all, and must gain nutrients from a host plant instead. Mistletoe is a common parasite of lodgepole pine and Douglas fir trees in British Columbia (Figure 4). [GO](http://www.science.nelson.com)

STUDY TIP

A summary answers the question, "What is the writer really saying?" Create a summary card for the three types of symbiosis. Ask yourself, "What are the main ideas in each paragraph? How would I explain them in my own words?"

To learn more about
parasitism, go to

www.science.nelson.com

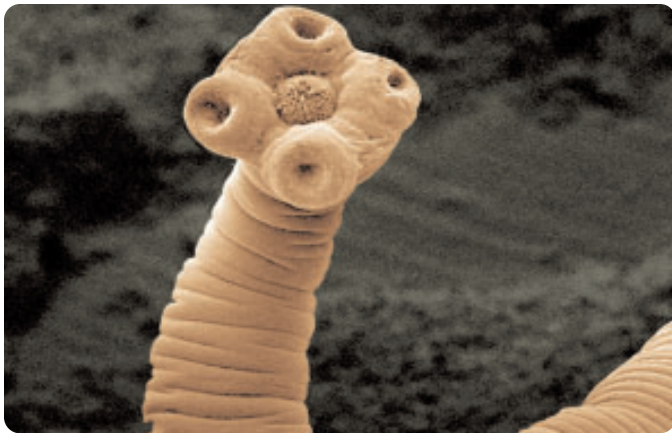


Figure 3 The tapeworm is highly specialized for survival in the mammalian digestive system.



Figure 4 Parasites like mistletoe can cause damage to trees in British Columbia's forests.

TRY THIS: Host Sweet Host

Skills Focus: recording, communicating, researching

Parasites are not usually the primary cause of the death of the host organism. Instead, the host organism dies from a secondary cause due to its weakened condition. Parasites often have very complex life cycles that help them to move to a new host body on a regular basis.

Materials: research materials

1. Choose an internal parasite to study, such as a fluke, a tapeworm, a roundworm, or a species of *Plasmodium* or *Trypanosome*.

2. Research the methods by which it gets from one host body to the next.

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- A. Draw the life cycle of your chosen parasite, indicating how it moves between hosts.
- B. How does the parasite get its nutrients?
- C. Describe the effect of the parasite on the host's body.

1. What characteristics of parasitism would lead some scientists to classify it as a form of predation? What characteristics of parasitism suggest that it is not a form of predation?
2. Why is it often difficult to distinguish between mutualism and commensalism?
3. Give an example of a situation in which humans are involved in symbiotic relationships, including commensalism, parasitism, and mutualism.
4. Suggest several reasons why it is beneficial for a parasite to be small.
5. Create a graphic organizer to compare the different types of symbiosis.
6. Which type of relationship is illustrated by each of the following situations?
 - (a) a small tick that slowly sucks the blood from a black tail deer
 - (b) a grizzly bear that leaves the bodies of salmon as food for birds and small mammals
 - (c) a bat that pollinates a plant as it feeds on nectar from a flower
7. In which of the following situations do both organisms benefit?
 - A. predation
 - B. parasitism
 - C. mutualism
 - D. commensalism
8. *Streptococcus* bacteria in the human mouth digest sugars and produce lactic acid that dissolves tooth enamel, causing cavities. Which of the following types of interactions is represented by this example?
 - A. predation
 - B. parasitism
 - C. mutualism
 - D. commensalism
9. *Corynebacterium* are microscopic bacteria that live on the surface of the human eye. They feed off the secretions and discarded cells and do not seem to affect the human they are living on. Which of the following types of interactions is represented by this example?
 - A. predation
 - B. parasitism
 - C. mutualism
 - D. commensalism
10. *Helicobacter pylori* is a bacteria that can thrive in stomach acid, where they are known to cause stomach ulcers. Which of the following types of interactions is represented by this example?
 - A. predation
 - B. parasitism
 - C. mutualism
 - D. commensalism
11. Biologists estimate that as many as 25 % of all living things are parasites. Suggest several characteristics that may allow them to be so successful.
11. Many parasites have complex life cycles involving two or more host species. How does this fact ensure the survival of the parasite?
12. Explain how parasites may actually improve the survival of many animal populations.
13. Some plant species have a mutualistic relationship with a single species of pollinator. Explain how this might be an advantage to the plant. Explain how this might lead to the extinction of the plant species.