

Interactions Between Unicellular and Multicellular Organisms

You see and interact with many multicellular organisms every day—trees, flowers, cats, birds, and other humans, just to name a few. You may not see unicellular organisms, but many of them affect your life every day! You would not have most types of bread to eat without unicellular organisms, nor would you be able to digest certain foods. Some unicellular organisms also cause disease, while some help you fight disease. Cells are an important part of your life.

The Importance of Unicellular Organisms

Unicellular organisms can be found in nearly every environment on Earth. Some are dangerous to humans, but many are important to human health and the environment.

Many unicellular organisms play an important role in recycling nutrients. Fungi and bacteria, for example, are decomposers (Figure 1). They break down dead plant and animal material, releasing usable nutrients and carbon dioxide back into the environment. Some bacteria are able to change nitrogen in the air into a material that acts as a plant fertilizer.

Other micro-organisms are used in the food industry. Yeast, for example, is used to produce breads and pastries (Figure 2). Yogurt is produced by bacterial action on milk. Some micro-organisms produce antibiotics that we use to treat infections. For example, penicillin, a common antibiotic used to treat bacterial infections, is made from a fungus.

LINKING TO LITERACY

Compare and Contrast

You can use compare and contrast to identify how things are alike and different. To compare, look for similarities. To contrast, look for differences. As you read, compare and contrast several different unicellular organisms.

To learn more about bacteria, why we study them, and their applications in biological and medical research,

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Figure 1 Fungi decompose this fallen tree, releasing usable nutrients back into the environment.



Figure 2 Yeast convert sugars in bread dough into carbon dioxide. This creates bubbles in the dough, which helps the bread rise.



TRY THIS: Observing the Action of Yeast

SKILLS MENU: performing, observing, analyzing, communicating



SKILLS HANDBOOK
2.B.6., 2.B.7.

In this activity, you will observe the action of yeasts on sugar.

Equipment and Materials: 2 beakers (250 mL); teaspoon; warm water; sugar; dry yeast

1. Pour 200 mL of warm water into each beaker.
2. Add a small amount (1 tsp) of sugar to one of the beakers and stir to dissolve.
3. Add a small amount of yeast to each beaker and stir.
4. After 10 min have passed, make observations using your senses of smell, sight, and hearing. Write a description of the contents of both beakers.
 - A. What did you observe in each beaker when you added the yeast?
 - B. Explain any differences you observed between the two beakers.
 - C. What conclusion can you make about yeast?

Some micro-organisms live in the digestive systems of multicellular organisms. Here, they feed on food particles that pass through the intestines. In humans, this relationship is an important part of digestion. Micro-organisms that live in the intestines contribute to the health of your intestines, produce vitamins, and help break down foods that would otherwise be indigestible (Figure 3).

Micro-organisms and Disease

Some micro-organisms can cause health problems, such as acne, strep throat, and diarrhea, in humans. Some micro-organisms can make people temporarily ill, while others can cause serious diseases. Several bacterial diseases have killed millions of people throughout history. For example, in the 1300s, the Black Plague killed more than 75 million people worldwide. This disease is caused by a bacterium called *Yersinia pestis*. Although the Black Plague is no longer common, other diseases caused by micro-organisms still have an impact on society today.

Malaria is an example of a disease caused by a micro-organism that exists today. Approximately 40 % of the world's population is at risk of malaria, a disease caused by the unicellular protist *Plasmodium falciparum* (Figure 4). Malaria is common in tropical regions of Africa, Asia, and parts of the Americas. In countries like Africa, where poverty is widespread, malaria is a serious problem. A particular mosquito transmits the protist from one person to another person. Preventative treatments are available, but these are expensive and unavailable to most people in third world countries. However, these medications are very inexpensive in the rest of the world. An understanding of bacterial cell activity may enable us to produce cures for diseases like malaria. Researchers in cell biology continue to look for treatments for diseases caused by micro-organisms. 🌍



Figure 3 *Bifidobacteria* in the colon of humans aid in digestion.



Figure 4 This coloured SEM shows *Plasmodium falciparum* (yellowish cells on top right) among red blood cells in the bloodstream.

To test your knowledge of the role micro-organisms play in daily life,

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Cells Gone Wrong

Sometimes, cells are not able to function properly. This may happen for several reasons. An organism may inherit damaged genes that cause cells to fail, or environmental factors may damage cells.

Diabetes

In the chapter narrative, we met Keiko. Keiko has diabetes, a disease caused by dysfunctional cells. Cells in the pancreas normally produce insulin, a chemical that helps other cells in the body absorb sugars from the blood. There are two types of diabetes, type 1 and type 2. In a person with type 1 diabetes, cells in the pancreas do not produce insulin (or do not produce enough insulin). Insulin must be injected into the body. In type 2 diabetes, cells in the body do not respond to insulin, and sugar cannot be absorbed. People with type 2 diabetes must regulate their blood sugar with exercise and diet.

In the past, this disease was rarely seen in people under the age of 40. Recently, there have been a growing number of cases reported in teens and children in Canada. These cases appear to be caused by obesity and lack of physical activity. Many health care professionals consider type 2 diabetes an epidemic in developed countries.

Fortunately, it may be prevented by eating a healthy diet and leading an active lifestyle. Both types of diabetes, if uncontrolled, can lead to heart disease, blindness, and kidney failure.

To view an animation that follows the growth of a malignant cancer,

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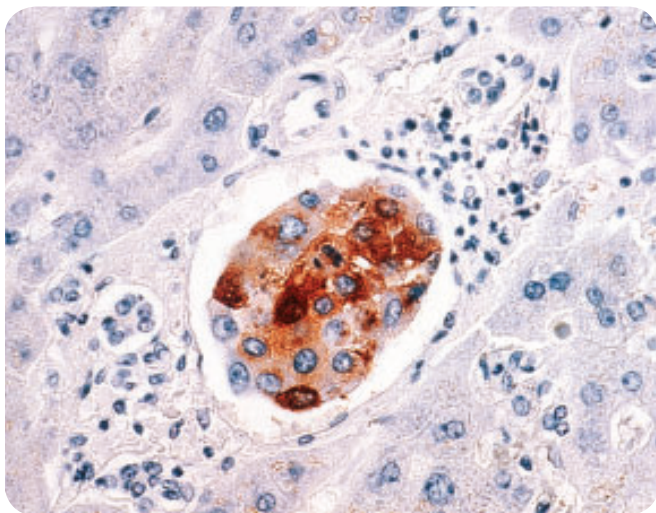


Figure 5 This light micrograph shows cancer cells (stained brown) forming among healthy liver cells (light-coloured).

Cancer

Cancer is caused by dysfunctional cells (Figure 5). Cancerous cells divide quickly and uncontrollably and form masses called tumours. However, not all tumours are cancerous. Benign tumours, for example, stay in one place and do not normally affect the function of tissues and organs. In malignant tumours, cancerous cells break away from the tumour, enter the bloodstream, and move to other parts of the body. Malignant tumours interfere with blood supply to healthy cells, causing the healthy cells around the tumour to die. Cancer can be caused by chemicals (such as those found in cigarette smoke) or by infectious diseases, or it can be inherited.



CHECK YOUR LEARNING

1. Many people believe that all micro-organisms are harmful. Give two examples of how unicellular organisms, such as bacteria and fungi, are useful to humans and the environment.
2. Name three human diseases and identify the organisms that cause each disease.
3. What kind of infections can be treated with antibiotics?
4. Give an example of a disease caused by cells that have “gone wrong” or become dysfunctional. Explain how this disease is caused.
5. Explain the cause of a malignant tumour.