

No Chance for Bacteria

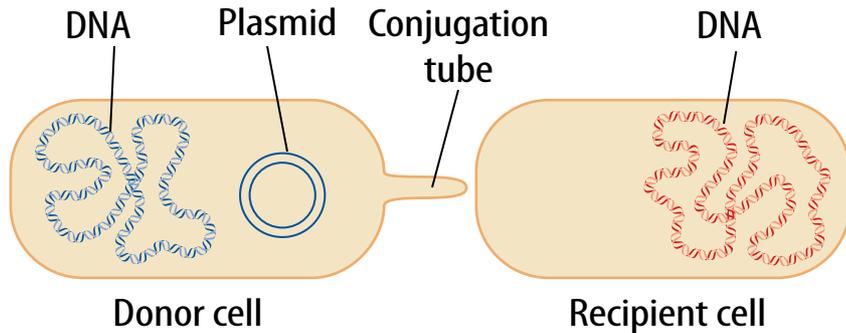
Before an operation, these surgeons and nurses wash their hands thoroughly with strong soap. They also put on clean gowns, gloves, masks, and caps.

These precautions are important for one reason: to keep bacteria and other germs from infecting the patient. Many bacteria live harmlessly on people's skin, hair, and clothes. But if certain bacteria invaded the body, they could cause much damage.

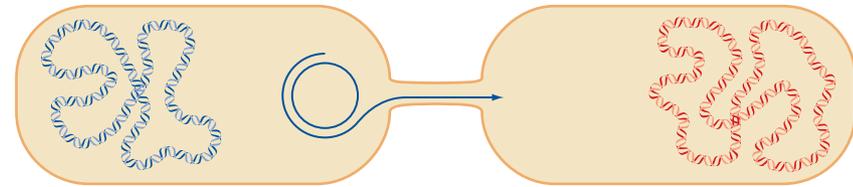
- ➊ During an operation, why must surgeons keep their hands away from their faces?
- ➋ Who else wears gloves or masks to stop the spread of germs?
- ➌ When is it important for you to wash your hands? Discuss.



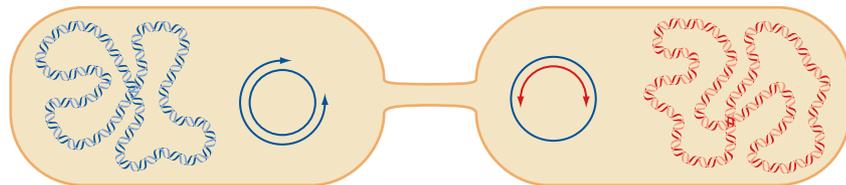
Conjugation



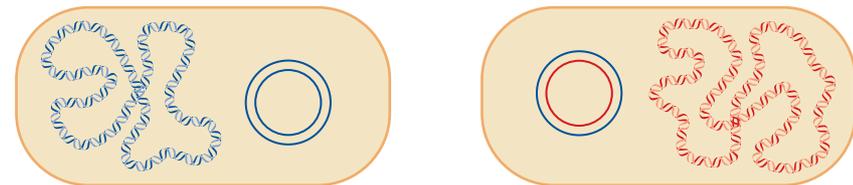
- 1 The donor cell and the recipient cell both have circular chromosomal DNA. The donor cell also has DNA as a plasmid. The donor cell forms a conjugation tube and connects to the recipient cell.



- 2 The conjugation tube connects both cells. The plasmid splits in two, and one plasmid strand moves through the conjugation tube into the recipient cell.



- 3 The complimentary strands of the plasmids are completed in both bacteria.



- 4 With the new plasmids complete, the bacteria separate from each other. The recipient cell now contains DNA from the donor cell as well as its own chromosomal DNA.

Action on the Forest Floor

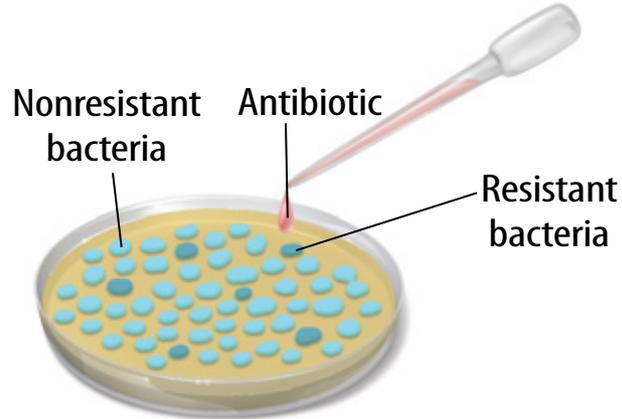
A fallen tree doesn't last long in the rainforest. Mosses grow on the wood and bark, as do fungi and lichens. However, most of the decomposition, is accomplished by bacteria.

Bacteria can decompose wood, grass, animal tissues, and almost any other substance made by living things. Without bacteria and other decomposers, the remains of dead organisms would build up over time. Life would slowly grind to a halt.

- 1 How does a freshly cut log compare to a log that has been lying on the forest floor for many months or years?
- 2 Why would a log decompose more rapidly in a rainforest than in a desert or a prairie?



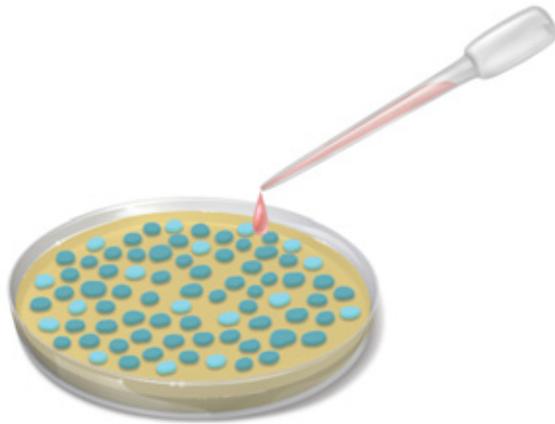
How Resistance Develops



1 An antibiotic is added to a colony of bacteria.



2 The antibiotic kills most of the nonresistant bacteria.



3 Surviving bacteria are added to another plate containing more of the same antibiotic.



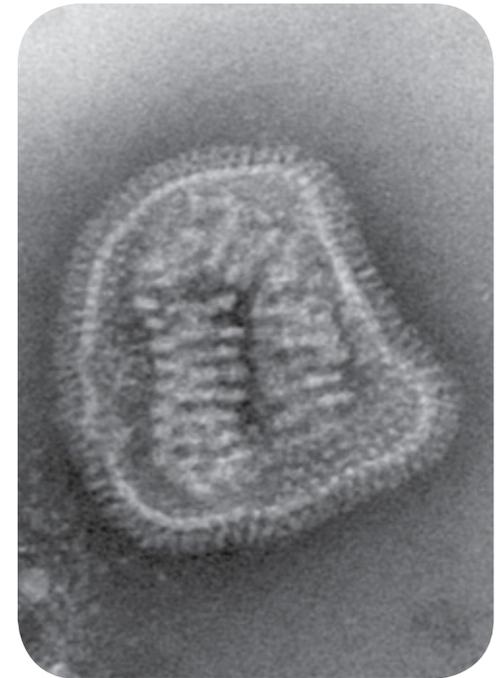
4 The antibiotic now affects only a small percentage of the bacteria. Most of the bacteria are resistant to the antibiotic.

Very, Very Small

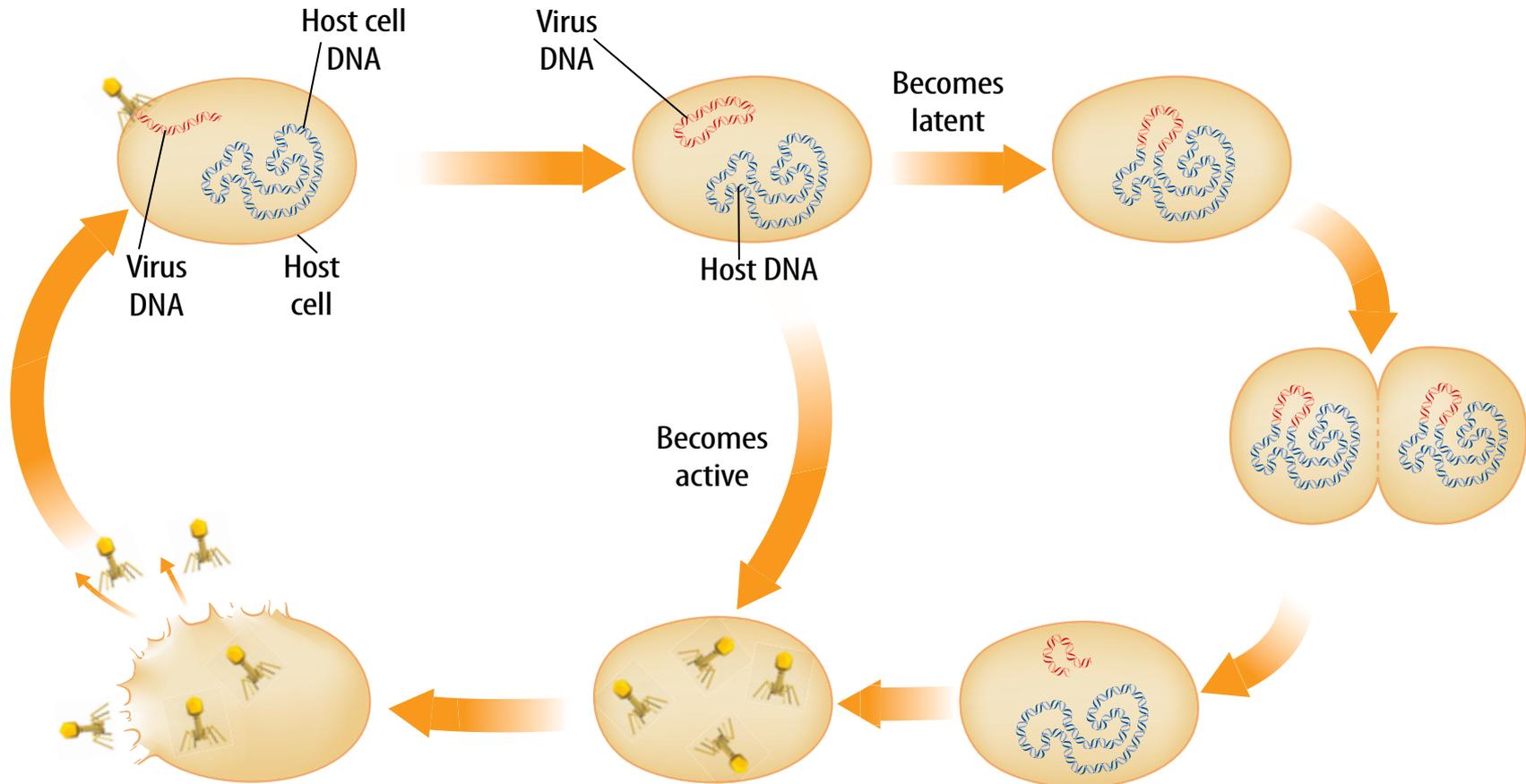
A typical human cell is quite small. Its width is about one thousandth of a centimeter. But bacteria are even smaller, and viruses are smaller still. Most viruses can be observed only with powerful microscopes, such as the electron microscope shown here.

Viruses cause many diseases, including colds and the flu. While some viral diseases are mild, others are more serious, or even deadly. Viruses might be tiny, but some can cause a lot of trouble.

- 1 Describe the virus shown in the photo. Compare its structure to that of cells you have studied.
- 2 Have you had a cold or the flu recently? What was it like? How long did it last?



Viral Replication



Teacher Guide

Bacteria and Viruses

Lesson 1 Bellringer

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No Chance for Bacteria

- In the 1860s, English surgeon Joseph Lister began urging his colleagues to wash their hands before surgery and to use chemicals to sterilize their equipment. To sterilize means to kill or remove all bacteria and other germs from a surface or an object. In later years, an antiseptic mouthwash was named in Lister's honor.
- Today, hospital staff and surgical teams take great care to maintain sterile (germ-free) conditions near the open wound of a patient. Metal instruments are cleaned chemically and exposed to high heat, processes that kill bacteria and other germs. Other items, such as gowns and gloves, are used once and discarded.

Answers to Questions

- 1 Touching the face could transfer bacteria to the surgeon's glove and then to the patient's body.
- 2 Possible answers include those who prepare or handle food, dentists and dental hygienists, doctors and nurses who conduct physical exams, and sanitation workers.
- 3 It is important to wash your hands before eating, after playing or working outdoors, and after using the toilet. Bacteria can easily transfer from hands to food or to another person. Washing with warm water and soap removes or kills most bacteria.

Lesson 1 Focus on Content

Conjugation

- Students often mistake conjugation in bacteria for a form of sexual reproduction. Sexual reproduction involves two parents that produce genetically different offspring. However, like sexual reproduction, conjugation serves to increase genetic diversity among the population.

Lesson 2 Bellringer

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Action on the Forest Floor

- Have students read the title, and then ask them to explain what "action" is taking place in the photo. Along with the growth of the trees and other plants, the fallen tree is decomposing. These actions might be slow in comparison to animal movements, but they are actions nevertheless. They also are essential to the health of the forest.

Answers to Questions

- 1 A freshly cut log has wood that is hard and dense. Much of the wood in a log that has been lying on the forest floor for months or years has been broken down into a soft, wet material that breaks or crumbles easily.
- 2 The rainforest supports the rapid growth of decomposers because it is hot and wet. Like other organisms, decomposers need water to survive. They also grow more rapidly in a warm environment.

Lesson 2 Focus on Content

How Resistance Develops

- After students study the transparency, ask them to imagine human bodies in place of the petri dishes. Antibiotics have been used to treat human illnesses and disease for over 60 years. After continued exposure to the same antibiotic, the population of bacteria becomes increasingly resistant to it. Eventually, the antibiotic is no longer effective in fighting the infection.

Lesson 3 Bellringer

(l)Centers for Disease Control/James Gathany; (r)Centers for Disease Control/Cynthia Goldsmith; Dr. Erskine; L. Palmer; Dr. M.L. Martin

Very, Very Small

- Electron microscopes use a beam of electrons to form an image of an object. This technique allows for a much greater resolution than is possible with light microscopes. Some electron microscopes can magnify an image up to 2 million times.
- The photo shows the protein shell, or capsid, that makes up the outer border of the virus. The lined structure inside the capsid is the viral DNA.

Answers to Questions

- 1 The photo shows that the virus has an outer border and material inside. Unlike many cells, however, it lacks a nucleus and organelles.
- 2 Accept all reasonable answers. Students should report symptoms such as a cough, fever, runny nose, and sore throat. Colds and mild cases of the flu typically last from a few days to a week. Other viral illnesses, such as viral meningitis, often last longer and have more serious symptoms.

Lesson 3 Focus on Content

Viral Replication

- Ask students to imagine the viral DNA as a message that reads: "Stop what you're doing and make more of me!" When this message becomes active, the host cell follows the instruction and makes more of the virus. It does not receive an instruction to stop, so it continues making more viruses until it bursts apart.