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## Vocabulary Words

**bacteria** (bak tir' ē ə): one-celled microscopic organisms; some cause disease

**immunity** (i myü' nə tē): a protection against or resistance to a disease

**injection** (in jek' shən): a shot; a dose of fluid given through a needle

**microorganism** (mī' krō ör' gə nī' zəm): a microscopic organism such as bacteria, viruses, or fungi

**vaccine** (vak sēn'): a substance injected into the body to protect it from a certain disease

### △ Pronounce these words to someone.

Remember the little “animalcules” Leeuwenhoek found with his microscope? In 1878, Louis Pasteur realized those **microorganisms** were **bacteria** that could cause sickness and disease.

Up until Pasteur’s lifetime, scientists had the theory that life came from things that were not alive—such as dirt. They did not realize dirt contains life. They did not understand that the microbes, which could only be seen with a microscope, carried death as well as life in them. In France, where Pasteur was born and lived, there was a problem with rabies. Dogs often got rabies and bit people. Rabies always caused death. Whenever people saw a dog acting strangely, they would cry out, “Mad dog!” and try to kill the dog.

Pasteur became interested in rabies because of his concern and love for children. Too many children were dying from dog bites. He must do something.

Pasteur had a problem. How could he prevent or cure rabies? Pasteur already knew bacteria caused disease. He thought rabies might be caused by some microorganism that he could not see with his microscope. This hypothesis

was never proved by Pasteur because he never found out exactly what caused rabies.

His first problem was to find out where the disease was located in the dog’s body. Since dogs usually were the cause, he used dogs to conduct experiments. After many experiments, he discovered that rabies attacks the dog’s brain and nervous system.

Pasteur made another important discovery concerning rabies. He learned how to prevent the disease. He guessed that rabies germs could be found in the brain and nervous system of a sick animal. To prove this hypothesis, Pasteur took pieces of the spinal cord from a dog that had died of rabies. He placed pieces of spinal cord into a liquid. Next he injected some of the liquid into rabbits. The rabbits got rabies and died.

Then Pasteur formed another hypothesis. He thought that the rabies germs could be weakened by drying the spinal cord of a diseased animal. To test his hypothesis, he placed dried spinal cord in a liquid. He injected some of this liquid into rabbits, and they did not get the disease.

Pasteur continued his experiment by injecting a little more of the dried cord liquid into the same



Louis Pasteur

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## Lesson 9

animal each time. By gradually increasing the amount, Pasteur found he was able to make the animals resist the disease. He called the liquid he injected a **vaccine**. By actually putting the weakened disease germs into an animal little by little, he was able to build up the animal's **immunity** to rabies.

Pasteur refused to use the vaccine on people, but one day he gave in. A boy had been bitten by

a mad dog, and the parents begged Pasteur to save their child. Finally he gave the boy an **injection** of his vaccine.

Pasteur hardly slept as he watched the boy. Each day for ten days Pasteur gave him an injection like he had given the rabbit. The boy never showed any signs of having rabies. From that time on, anyone suspected of having rabies was brought to Pasteur for treatment.

## Study Exercises



### Answer the questions.

1. Why did Pasteur use pieces of the nervous system of infected dogs in his vaccine?

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2. What hypothesis did Pasteur have that made him decide to dry out the pieces of spinal cord before he made his vaccine with it? \_\_\_\_\_

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### Complete the statements.

3. Pasteur discovered that microorganisms were \_\_\_\_\_ that could cause disease.
4. People were scared of dogs that acted strangely because they were afraid they might have \_\_\_\_\_.
5. People were frightened of rabies because it always caused \_\_\_\_\_.
6. Pasteur made a guess, or \_\_\_\_\_, that rabies was caused by bacteria.
7. Pasteur first tested his rabies vaccine by injecting it into \_\_\_\_\_.
8. A shot with a needle is called a(n) \_\_\_\_\_.
9. Pasteur developed a(n) \_\_\_\_\_ that protected against rabies.
10. After several injections, Pasteur's patients developed a(n) \_\_\_\_\_ against the disease.

## Looking Back



Circle the letter(s) of the answer(s).

11. What is Newton *most* known for?
  - a. discovering why objects appear colored
  - b. discovering that white light is made up of colors
  - c. building a telescope that uses mirrors instead of lenses
  - d. discovering the force that pulls all objects toward the earth
12. Which of the following scientists made discoveries and observations that Newton used to test his hypothesis?
  - a. Robert Hooke
  - b. Galileo Galilei
  - c. Johannes Kepler
  - d. Nicolas Copernicus
13. Which three observations did Newton make that showed his theory of gravity was correct?
  - a. predicted the return of a comet
  - b. calculated the orbit of the moon
  - c. calculated the rotation of the earth
  - d. predicted the eclipses of the moon
14. What made Newton's predictions possible?
  - a. better telescopes
  - b. God's orderly universe
  - c. other scientists' discoveries
  - d. white light is composed of colors
15. What is the force that pulls objects toward the earth?
  - a. gravity
  - b. friction
  - c. interaction
  - d. air pressure

### Did You Know?

- ▶ Pasteur once said, "The more I study nature, the more I stand amazed at the work of the Creator."
- ▶ Louis Pasteur discovered that if milk is heated and then cooled down, it greatly reduced sicknesses from drinking spoiled milk. This process is now called "pasteurization" in his honor.