

Louis Pasteur

Introduction



Figure 1: Louis Pasteur.

(1822–95). The French chemist Louis Pasteur devoted his life to solving practical problems of industry, agriculture, and medicine. His discoveries have saved countless lives and created new wealth for the world. Among his discoveries are the pasteurization process and ways of preventing silkworm diseases, anthrax, chicken cholera, and rabies.

Pasteur sought no profits from his discoveries, and he supported his family on his professor's salary or on a modest government allowance. In the laboratory he was a calm and exact worker; but once sure of his findings, he vigorously defended them. Pasteur was an ardent patriot, zealous in his ambition to make France great through science.

Scholar and Scientist

Louis Pasteur was born on Dec. 27, 1822, in Dôle, France. His father was a tanner. In 1827 the family moved to nearby Arbois, where Louis went to school. He was a hard-working pupil but not an especially brilliant one.

When he was 17 he received a degree of bachelor of letters at the Collège Royal de Besançon. For the next three years he tutored younger students and prepared for the École Normale Supérieure, a noted teacher-training college in Paris. As part of his studies he investigated the crystallographic, chemical, and optical properties of various forms of tartaric acid. His work laid the foundations for later study of the geometry of chemical bonds. Pasteur's investigations soon brought him recognition and also an appointment as assistant to a professor of chemistry.

Pasteur received a doctor of science degree in 1847 and was appointed professor of chemistry at the University of Strasbourg. Here he met Marie Laurent, daughter of the rector of the university. They were married in 1849. Pasteur's wife shared his love for science. They had five children; three died in childhood.

Research in Fermentation and Souring

In 1854 Pasteur became professor of chemistry and dean of the school of science (Faculté des Sciences) at the University of Lille. Hearing of Pasteur's ability, a local distiller came to him for help in controlling the process of making alcohol by fermenting beet sugar. Pasteur saw that fermentation was not a simple chemical reaction but took place only in the presence of living organisms. He learned that fermentation, putrefaction, infection, and souring are caused by germs, or microbes.

Pasteur published his first paper on the formation of lactic acid and its function in souring milk in 1857. Further studies developed the valuable technique of pasteurization. The same year he was appointed manager and director of scientific studies at his old school, the École Normale Supérieure. During the next several years he extended his studies into the germ theory. He spent much time proving to doubting scientists that germs do not originate spontaneously in matter but enter from the outside.

Developing Cures for Agricultural Diseases

In 1865 Pasteur was asked to help the French silk industry, which was near ruin as a result of a mysterious disease that attacked the silkworms. After intensive research, he discovered that two diseases were involved, both caused by bacteria on the mulberry leaves that provided food for the worms. The diseases were transmitted through the eggs to the next generation of worms. Pasteur showed the silkworm breeders how to identify healthy eggs under the microscope, how to destroy diseased eggs and worms, and how to prevent formation of disease bacteria on the mulberry leaves.

At 45 Pasteur was struck by paralysis. For a time recovery was uncertain, and he was confined to bed for months. The attack left its mark; for the rest of his life, one foot dragged a little as he walked.

In 1877 Pasteur began to seek a cure for anthrax, a disease that killed cattle, sheep, and other farm animals. He drew on research he was conducting on another animal disease, chicken cholera. When he inoculated healthy chickens with weakened cultures of the cholera microbes, the chickens suffered only a mild sickness and were thereafter immune to the disease. Pasteur successfully applied this technique of immunization to the prevention of anthrax.

Many scientists challenged Pasteur's anthrax prevention claims, and Pasteur agreed to a dramatic test. Forty-eight sheep and a few cows and goats were gathered

in a pasture near the town of Melun. Half the animals were first immunized with cultures of weakened anthrax microbes; then all were injected with strong cultures.

Within a few days, the untreated animals were dead; but the immunized animals showed no effect of the disease. The test verified Pasteur's results beyond all doubt. Later he proposed that all inoculation cultures be called vaccines and the inoculating technique, vaccination

Treatment for Rabies

Human beings contract rabies (or hydrophobia) when they are bitten by a dog or another animal that is suffering from the disease. Rabies slowly destroys the central nervous system by attacking the spinal cord.

Pasteur reasoned that it might be possible to immunize people after they had been bitten but before destruction of the spinal cord began. He took spinal cord tissues of animals that had died of rabies and dried them for varying periods of time. He then made inoculations of the tissues and injected them into another stricken animal. The first inoculation was from the driest, weakest culture, and each successive inoculation was stronger. After repeated failures, he finally succeeded in halting the development of rabies in an infected dog. The treatment required 14 inoculations.

Pasteur hesitated to try the remedy on humans. The decision was forced on him in 1885 when the mother of 9-year-old Joseph Meister begged Pasteur to save her son. The boy had been bitten 14 times by a rabid dog. Pasteur treated the child. The wounds healed and no trace of rabies appeared. Thus Joseph became the first person saved by Pasteur's treatment.

Pasteur had won many honors for his previous discoveries; now the world united to do him special homage. Thousands of people contributed funds to establish a great laboratory, the Pasteur Institute, where scientists conduct research on various diseases. Pasteur died near St-Cloud on Sept. 28, 1895.

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