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Tuberculosis in the middle ages: epidemics, beliefs and treatments

Abstract

This paper offers a historical overview of tuberculosis, from its earliest descriptions in antiquity to the scientific advances that gave rise to modern microbiology. It reviews the classical interpretations of Hippocrates, Aristotle, and Lucretius, who attributed the disease to hereditary, contagious, or humoral causes. During the Middle Ages, magico- religious explanations prevailed, such as the "King's Touch" ritual for curing scrofula.

With the development of the microscope in the 17th and 18th centuries, new scientific approaches emerged, notably the contributions of Leeuwenhoek and Hooke. The practice of inoculation and the creation of the smallpox vaccine by Edward Jenner marked a turning point in disease prevention. Finally, the work of Pasteur and Koch consolidated the germ theory of disease, enabling the identification of pathogens and the establishment of experimental methods that transformed the study and control of tuberculosis. This journey highlights the transition from empirical and ritual interpretations to a scientific understanding based on biology and experimentation.

Keywords: tuberculosis, age, average, infectious diseases, scrofula, inoculation

Volume 13 Issue 3 - 2025

Aurora Farfán Márquez
Faculty of Medicine, National Autonomous University of Mexico, Mexico

Correspondence: Aurora Farfán Márquez, Faculty of Medicine, National Autonomous University of Mexico, Faculty of Medicine, School Circuit 411A, Copilco Universidad, Coyoacán, 04360 Mexico

Received: November 11, 2025 | **Published:** December 16, 2025

Development

Although records of possible tuberculosis cases exist from 3000 BC, this disease was not explicitly identified until the time of Hippocrates (460-370 BC), who popularized the term phthisis (consumption) as a condition characterized by a consuming fever, pulmonary suppuration, and subsequent ulceration.[1] The sudden onset of the disease and the limited knowledge about it meant that For a long time, it was confused with other pathologies with similar symptoms. However, the increase in infections and the rise in mortality made it necessary to take an interest in describing, analyzing, and treating the disease.

During classical times, tuberculosis was subject to various interpretations. Hippocrates characterized it primarily by a type of fever known as*hemitritea.* He noted that patients with diarrhea, attributed to intestinal tuberculosis, generally died. According to his observations, the disease primarily affected young people between the ages of 18 and 38, and he deduced that it followed a hereditary pattern, as it was common between parents and children.

On the other hand, Aristotle (384 BC-322 BC) rejected this hereditary theory and proposed that tuberculosis had an infectious origin and a contagious nature, transmitted through breathing.

Finally, the Roman poet Lucretius Titus (94 BC–55 BC) disseminated, through his writings, the prevailing idea of his time that tuberculosis was caused by an excess of phlegm in the lungs, which subsequently formed tuberculous abscesses and was associated with certain physical temperaments. Lucretius summarized the complexity of this disease in the phrase:

""Phthisis is difficult to diagnose and easy to treat in its early stages, while it is easy to diagnose and difficult to treat in its final stage, expressing the complexity of the disease during the classical period, in which the idea prevailed that it was caused by an excess of phlegm in the lungs that would later form tuberculous abscesses and that it corresponded to certain temperaments".

Thus, the symptoms identified in several patients were low-grade fever, diaphoresis (excessive sweating), asthenia (decreased muscle strength), anorexia, and expectoration (expulsion of phlegm or other secretions through coughing or (throat clearing). Treatment was limited to recommending rest, good nutrition, abundant milk intake, the use of antitussives (medicines used to suppress or relieve cough) mainly opium, lily ointment (composed of ammonia, wax, bull's tallow) and astringents such as gargling with tannic acid and honey for hemoptysis (expulsion of blood through expectoration).

Advances in the study of this disease were not significant during the Middle Ages, as physicians of that era only managed to identify that it could manifest in arteries, tendons, and especially glandular regions. However, numerous records in historical documents and chronicles of the time highlight scrofula or scrofulosis, which was later identified as infectious tuberculous lymphadenitis. In the 5th century, the physician Cassius Felix described it as follows:

"Scrofula are rounded bodies implanted in the tendons, arteries, veins, and muscle membranes [...] When they develop in the glandular areas on both sides of the throat, they are painful and protrude like the bulging neck of a sow: that is why they are called scro-fae."[2]

In countries like France and England, it was believed that scrofula could be cured through the "King's Touch" ritual, a ceremony initially used for various ailments but later restricted to scrofula. The belief in the healing (or miraculous) power of kings began in France around 1060 and persisted until the late 18th century, while in England it continued until the early 19th century. The ritual was performed on specific dates or during ceremonies such as the King's Coronation, Easter, Christmas, and the Feast of Saint Michael the Archangel, among others. The nobleman's physician would select in advance the patients whom the King could cure, usually those who suffered only from scrofula and no other condition.

The ceremony began with the King's preparation, which consisted of fasting for a day. Before the event, a mass was celebrated the following day. Afterward, the king would approach each patient, touch their neck or face, make the sign of the cross, and say a short prayer or a few words. Finally, passages from the Gospel were read, particularly the one in which Jesus told his disciples, "They will place their hands on the sick, and they will recover" (Ibid.), or the phrase, "The King touches you,

God heals you.". Finally, the ceremony concluded with the delivery of a coin or medal that they were to keep to maintain the cure.

This disease particularly affected children and adolescents and was thought to be caused by poor nutrition and the cold, damp climate. Records of these ceremonies indicate a high degree of contagion. In France, Louis XIII touched 450 sick people in one session, Louis XVI touched 2,400 three days after his coronation, while in England Edward II touched 885 in two years and Charles II touched 92,102 in 22 years.

Furthermore, towards the end of the Middle Ages, more scientific studies on various pathologies, including tuberculosis, began to emerge. Among these new perspectives, the contributions of [names of authors] stand out. *Giovani Battista Morgagni (1682-1771)*, who through the practice of autopsy described the manifestation of this disease in various organs.

During the Renaissance, the ritual of the ceremony of the*King's Touch*"It lost credibility with access to education, as did the conception that diseases were caused by supernatural entities, evil spirits and other metaphysical causes and, therefore, the possibility of being cured through magical rituals.[3]

The evolution of studies based on autopsies made it possible to identify various nodules in different tissues and to create new pathological structures. The disease progressed throughout the 18th century without any certainty about its origin, its high contagiousness, and its ineffective treatment, which consisted mainly of ingesting cod liver oil, massages with vinegar, and inhaling hemlock or turpentine.

Scientific advances and key discoveries in the fight against tuberculosis

At the end of the 18th and beginning of the 19th centuries, a series of advances took place in the world of science, from the establishment of diverse fields of knowledge and the conceptual, theoretical, and methodological development characteristic of the positivist paradigm, to the dissemination of research findings. The technological development of the compound microscope in the 18th century represented a crucial moment for the establishment of microbiology, immunology, virology, bacteriology, physiology, biochemistry, and genetics—advances that form the foundation of modern medicine.

Although the invention of the microscope[1]Although Zacharias Janssen's work dates back to 1590, it wasn't until later technological advances that the observation of microorganisms became possible.[4] This is the case of the Dutchman Leeuwenhoek who in 1675 called them "animalcules", described their various morphological types, drew their structures and differentiated bacteria and microbes.[5]

Dr. Robert Hooke *(1635-1703)* Considered the father of cell theory; he managed to establish the conceptual and methodological foundations of this area of knowledge thanks to *"He designed small biconvex lenses mounted on metal plates that were held close to the eye. With these, objects placed on the head of a pin could be magnified three hundred times, allowing him to observe living cells in moss samples for the first time.[6] The structure of a thin sheet of cork formed by small cavities, like the cells of a honeycomb, was the idea for naming it "Celula" (small cell)".*[5]

[1]It is done Based on two sliding concentric tubes and a lens at each end with a magnification of 10 times the actual size, they were a version of the astronomical telescope (Ford, 2002).

Inoculation as an early strategy in tuberculosis control

The revolutionary advances in biology, the composition of matter, and the laws that govern it allowed the fathers of microbiology, Louis Pasteur and Robert Koch, to understand the close relationship of microorganisms as the cause of various persistent diseases of the time, as well as the development of techniques focused on their cure, such as the inoculation technique.[2]

Although various inoculation practices existed in different cultures, the population was unaware of the causes of diseases, how they were transmitted, and lacked an understanding of how inoculations worked. Among the recorded techniques are the following: In India during the 7th century, people bitten by snakes ingested the venom to avoid dying; in China during the 11th century, inoculation was practiced. the pus[3]To prevent the spread of smallpox, they would dry the scabs and insert them into the nose using a silver or bamboo tube, or they would insert a cotton ball moistened with the pustules.[4] They would take the clothes of sick people and place them on their noses; finally, another practice was to put the clothes of a sick child on a healthy one.[7]

It can be deduced that the Silk Road facilitated the spread of this knowledge. Thus, in 1715, Lady Mary, during her stay in Constantinople, observed the practice of inoculation and, despite the prejudices of the time, decided to have it done to her children. It was in Great Britain in 1721 that this practice spread throughout Europe; however, the lack of hygiene and the ignorance of other microorganisms led to the spread of syphilis.

It wasn't until 1768 that physician Edward Jenner (1749-1823), credited with initiating the "Vaccine Era," observed that cowpox, or cowpox, caused a rash on the udder similar to that of human smallpox. He began a series of investigations with women who milked cows and remained healthy. In Berkeley, Scotland, he took pus (attenuated virus) from a woman infected with cowpox and inoculated a child, who only experienced minor discomfort. He then inoculated the child with the pathogen, and the child became ill.

Based on these findings, he developed the smallpox vaccine in 1796 (Ibid.).

Contributions of Pasteur, Koch and the discovery of microorganisms

Louis Pasteur *(1822-1895)*[5] In mid-19th century France, a pioneer in research initiated the scientific understanding of biological sciences, asserting that decomposing food carries disease-causing microorganisms. This was made possible by technological advancements in optics and

[2]Inoculation: The act of introducing into an organism a substance containing the germs of a disease (Sillis, 1979).

[3]Pus: Accumulation of fluids, live and dead white blood cells, dead tissue, as well as bacteria or other foreign substances (Sillis, 1979).

[4]Pustules are small, pus-filled, inflamed, blister-like sores that appear on the surface of the skin.(Sillis, 1979).

[5]Louis Pasteur (1822-1895), a French chemist and bacteriologist, is renowned for transforming science and medicine in the 19th century. Born in Dole, France, he spent much of his career at prestigious institutions such as the University of Strasbourg, the École Normale Supérieure, and the French Academy of Sciences. At these institutions, he solidified his reputation as a visionary researcher. His germ theory of disease refuted spontaneous generation, laying the foundations of modern microbiology. He also developed the pasteurization process, which revolutionized the preservation of food and beverages. In collaboration with the Pasteur Institute, which he founded in 1887, he developed vaccines against rabies and anthrax, marking milestones in the prevention of infectious diseases.

Citation: Márquez AF. Tuberculosis in the middle ages: epidemics, beliefs and treatments. *J Microbiol Exp.* 2025;13(3):127–129.
DOI: 10.15406/jmen.2025.13.00444

their application in the development of microscopes. In 1856, Ernest Abbe and C. Zeiss laid the foundations of high-performance optics with the design of lenses that eliminated some chromatic aberrations and achieved magnifications of up to 2000x, producing bright and clear images.

Thus, in 1859, he was able to observe the contamination of a broth with microorganisms that spread upon contact with the environment, and he discovered that this did not happen if he placed filters.

He later developed the serial dissolution technique, which consisted of separating microorganisms from a liquid medium using ten test tubes: in the first tube he placed the liquid medium contaminated with microorganisms, the next day he placed a drop from the first test tube into the second tube; the following day he took a drop from the second tube and placed it into the third test tube. Each day he performed the same action until the microorganisms were separated.

Alongside these investigations, Dr. Robert Koch *(1843-1910)*[6] In Germany, he reached the same conclusions as Pasteur regarding the existence of microorganisms; his training in medicine allowed him to associate these microscopic beings with anthrax, a disease that caused the death of thousands of head of cattle in Europe. His work on anthrax, which affected both humans and animals, led him to conclude that this and other diseases were caused and transmitted by microbes.[8]

The techniques developed by Koch were: the use of dyes for the study, identification, and classification of bacteria; adaptation of the microscope to take photomicrographs; the use of solid cultures to produce homogeneous (pure) bacterial colonies; he created the taxonomic classification of microorganisms; finally, the contribution of his assistant Julius Richard Petri stands out with the creation of the Petri dish (used to this day), a round glass container with a slightly larger lid of the same material, designed to reduce contamination by airborne microorganisms and to seal the cultures in a non-hermetic manner.[9]

Conclusions

The historical overview of tuberculosis reveals how the understanding of this disease evolved from empirical, magical-religious, and humoral interpretations to a scientific explanation based on observation, experimentation, and technological development. From the earliest descriptions of the*phthisis.* From classical times to the ritual practices of the Middle Ages, the quest to explain and treat disease was marked by the conceptual limitations of each period. With the Renaissance and, later, with the advancement of the microscope, the conditions were created for the establishment of scientific thought, which allowed for the identification of pathological structures and the questioning of traditional explanations. Finally, the contributions of Jenner, Pasteur, and Koch consolidated the germ theory and enabled effective strategies for controlling infectious diseases. Thus, the history of tuberculosis not only reflects the evolution of medical knowledge but also the cultural and epistemological transformation that gave rise to modern medicine.

[6]Robert Koch (1843-1910): Pioneer of Medical Microbiology, A German physician and microbiologist, he was a pioneer of modern bacteriology by discovering the causative agents of diseases such as tuberculosis, cholera, and anthrax. His "Koch Postulates" established key principles for identifying pathogens, and his work, recognized with the Nobel Prize in Medicine in 1905, laid the foundations for medical microbiology and the fight against infectious diseases.

Acknowledgements

None.

Conflicts of interest

We declare that there is no conflict of interest of any kind.

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Citation: Márquez AF. Tuberculosis in the middle ages: epidemics, beliefs and treatments. *J Microbiol Exp*. 2025;13(3):127–129.
DOI: 10.15406/jmen.2025.13.00444