

History, Medicine through time

Lesson 10 of 30

Worksheet:

How did ideas about the cause of disease change between 1700-1900?

Miss Holland



Spontaneous Generation Theory

As you saw in the previous lesson, there were no new ideas about the cause of disease up until 1700. Although the theory of the Four Humours and God had become less popular as explanations about the cause of disease, miasma was still in use.

As microscopes continued to develop in the 1700s, a new theory came about called the spontaneous generation theory. In the early 1700s, scientists were able to see **microbes** when observing rotting matter with microscopes. This theory said that the decaying matter produced the microbes. The theory of spontaneous generation was also closely linked to **miasmata**. Scientists were not able to prove this theory correct and it took until 1861 for **Pasteur** to prove it wrong.



Louis Pasteur

Louis Pasteur was a French chemist who was actually working to understand why liquids turned sour in the brewing industry.

Pasteur heated the liquid and found that it killed the bacteria - this process became known as **pasteurisation**. Pasteur theorised that microbes in the air caused the liquid to go sour (which was the opposite of the spontaneous generation theory).

To prove his theory, Pasteur conducted the swan neck flask experiment. Both flasks were filled with liquid and then heated. One flask had its neck bent which Pasteur said would prevent air from reaching the liquid. On observation, Pasteur showed that the liquid in the flask with the bend had no microbes growing in it (which he named germs) but the liquid which had been in contact with the air did go off and had microbes growing in it.



Louis Pasteur

Pasteur had proved that germs were in the air and caused matter to go off and decay. He published his theory in **1861** but also suggested that germs in the air could be the cause of disease in humans too.

Later, Pasteur carried out experiments whilst working to help the French silk industry, investigating a disease killing silkworms, which he was able to prove was being caused by a microbe in the air. In 1878, Pasteur then published his germ theory of infection, thereby linking the Germ Theory to human illness.



Germ Theory in Britain

Pasteur's Germ Theory did not lead to change immediately. Many scientists and doctors refused to believe the microbes in the air could cause disease and discredited Pasteur's work as he was not a doctor. Pasteur's theory had not explained how microbes made people ill or which microbes caused specific illnesses, which made it more difficult for people to accept his ideas (even the British government refused to believe it)!

Dr Henry Bastian was a well known and powerful influence in medicine in Britain. He criticised Pasteur's theory and refused to accept it all the way up to his death. Bastian continued to promote the theory of spontaneous generation which meant there was little change in the understanding of the cause of disease in Britain until the late 1870s at least.

However, not everyone criticised Pasteur. Two key individuals accepted and took up the Germ Theory in their work. **Joseph Lister** applied the Germ Theory to his work on infection following surgery. Although Lister's applications were successful in reducing infection, he still had little proof behind his ideas. **John Tyndall** also promoted Pasteur's work in 1870 and supported the ideas that there were microbes in the air.



Robert Koch

Robert Koch was a German microbiologist. He developed Pasteur's work and was able to successfully identify and isolate the microbes causing specific diseases. For example:

- In 1876, he discovered the microbe causing anthrax in cattle.
- In 1882, he discovered the bacteria causing tuberculosis.
- In 1883, he discovered the microbe causing cholera which he provided further proof for in 1884.

Koch was able to do this using the following method: He would isolate a microbe present in different cases of a singular disease. Then the microbe could be grown in a controlled environment and tested on animals to reproduce the disease. The microbe would then be taken from the diseased animal and grown again, being identical to the original **culture**.



Robert Koch

Koch also developed ways to make it easier for scientists to identify and isolate the microbes causing specific diseases:

- He developed **agar jelly** to grow bacteria in a more controlled way and it was also an easier medium to observe under a microscope.
- He developed a dye to stain the disease-causing microbe, again making it easier to study.



Impact of Pasteur and Koch in Britain

In 1883, the microbe that caused **diphtheria** was discovered thanks to Koch's work. Scientists were able to begin to discover ways of trying to kill the microbe causing diphtheria and other diseases rather than trying to treat the symptoms of it. By 1900, it was accepted that germs were a cause of disease.

However, the work of Pasteur and Koch took a long time to be accepted, even by the British government. In 1884 (in India), Koch proved that cholera was caused by microbes in the water. The British government refused to believe it and still reverted back to miasma.

Koch's work influenced Pasteur and he began to work on creating **vaccinations** for chicken cholera and **anthrax** using weakened strains of the microbe causing the disease. Both individuals inspired other scientists to study microbes and develop vaccinations.



Glossary

- **Agar jelly** - A substance used to feed and grow bacteria on
- **Culture** - Bacteria grown in a controlled environment
- **Microbes** - A living organism, invisible to the naked eye e.g. bacteria
- **Pasteurisation** - Treating a product with heat to sterilize it
- **Vaccination** - When a mild form of a disease is given to give immunity and prevent you from catching the more harmful version



Comprehension Questions

1. Why do you think it took so long for somebody to disprove the theory of spontaneous generation?
2. Explain why the Germ Theory was not accepted until Koch's work in the 1880s.
3. Why was the Germ Theory a 'turning point' in the understanding of the cause of disease?
4. Can you describe the process used by Koch to identify disease-causing microbes?
5. Challenge question: How far do you agree that the work of Pasteur was more significant than the work of Koch in changing ideas about the cause of disease 1700-1900?

You may want to use the following sentence starters:

- *To some extent I agree that the work of Pasteur was more significant because....*
- *However to some extent it could be argued that the work of Koch was more significant because....*

