19TH CENTURY MEDICINE – LOUIS PASTEUR AND ROBERT KOCH

Before we begin to look at these individuals...

What did people think caused disease at the start of the 19th century?

- Miasma - bad air, poisonous fumes were given off from rubbish and decaying matter
- Contagion - being close to someone who had a disease meant that they could give you it
- God - people still saw disease as a punishment from god
- Spontaneous Generation - decay creates germs

Louis Pasteur - he was a French scientist

- Microbes had been seen through 18th century microscopes, but scientists thought they were caused by disease and appeared because of illness. This was the theory of spontaneous generation. Instead of blaming the microbes, people looked for noxious gases called miasmata.

- Louis Pasteur was employed in 1857 to find the explanation for the souring of sugar beet used in fermenting industrial alcohol. His answer was to blame germs in the air. Employed by a brewery. Swan Nest Flash Experiment

- Pasteur proved there were germs in the air by sterilising some water and keeping it in a flask that didn’t allow airborne particles to enter. This stayed sterile - but sterilised water kept in an open flask bred microbes.

What is Spontaneous Generation? Before Pasteur.

The old theory - spontaneous generation. The living organisms in the air and living matter fall from the air and cause more.

The old theory - spontaneous generation. The organisms are the result of decay. Decaying matter must have living microorganisms on it producing the new organisms. This theory suggested that some of the flies and maggots that were seen on decaying matter were created by it.

Louis Pasteur’s Germ Theory

- In 1861 Louis Pasteur published his germ theory
- In 1864 he devised a series of public experiments to prove that his theories were correct

Pasteur thought that disease could be caused by the same process as wine going sour or material decaying. He proved that microbes seemed to be causing the silkworm's disease.
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**The Significance of Louis Pasteur**
- Proved that germs cause matter to decay
- Proved that spontaneous generation was wrong
- Proved that disease is not caused by miasma
- Set up a series of public experiments in 1864 to show that germs cause decay and that sterile air does not decay
- Linked decay being caused by germs to the causes of disease
- He realised that germs cause disease

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**Robert Koch - Identifying**
- Robert Koch was a German doctor, he developed an interested in Louis Pasteur’s germ theory which was published in 1861
- Koch investigated anthrax, a disease affecting animals and humans. In 1875 he managed to discover the specific bacterium that causes anthrax
- This was the first time the specific germ that caused a specific disease had been identified and it was the final proof of Pasteur’s germ theory
- He identified bacteria that cause septicemia, tuberculosis and cholera
- Koch also developed a method of proving which particular bacterium was causing a disease through experiments with mice

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**Robert Koch - Studying Bacteria**
- Koch developed a solid medium as an easier way to study bacteria rather than using liquid mediums. He actually grew bacteria on potatoes!
- He also developed new ways of staining the bacteria, he stained them using a purple colouring
- Robert Koch also developed ways of staining bacteria so they could be photographed using a new high quality photographic lens and then studied in further detail

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**What have we got so far?**

**Individual 1 - Edward Jenner**
- Discovers that cowpox vaccinates people against smallpox
- However, he doesn’t know what causes smallpox or how vaccination actually works

**Individual 2 - Louis Pasteur**
- Discovers that germs cause decay (make things rot)
- Develops his germ theory
- Links germs with disease
- However, he does not identify specific germs with disease

**Individual 3 - Robert Koch**
- Identifies microbes which causes a specific disease (TB, cholera, septicemia)
- Develops new ways of identifying bacteria (solid medium, petri dishes, photography techniques, dyeing techniques)
- However, he does not develop cures to kill these bacteria
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**What happened next?**

- Hearing of Koch's work, Pasteur came out of retirement in 1877 and started to compete in the race to find new microbes and combat them.
- Many other scientists joined this new field of bacteriology.
- Pasteur looked for cures to anthrax and chicken cholera.
- Both Pasteur and Koch worked with large teams of scientists in this Franco-German competition for national prestige.
- Charles Chamberland was in Pasteur’s team.

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**The Chicken Cholera Vaccine**

- One day Chamberland was told to inject some chickens with chicken cholera, but it was the day before his holiday and he forgot.
- Chamberland left the chicken cholera germs on his desk and injected the chickens when he returned.
- The chickens survived! They tried again with some newly cultured cholera, but the chickens still survived.
- Pasteur and Chamberland worked out that the cholera had been weakened by being left on the desk for a few days, and that the weakened cholera had made the chickens immune. They wouldn’t catch it.
- This was in the same way that Jenner’s cowpox vaccine had worked for smallpox.
- Chamberland’s error had made a chance discovery.

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**Further Vaccinations**

- Pasteur’s team managed to produce a weakened version of the anthrax spore that would make sheep immune to the disease. They demonstrated this in a public experiment in 1881.

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**Do you know your stuff?**

1. What four different things did people think caused disease at the start of the 19th century?
   - Miasma
   - Contagion
   - God
   - Spontaneous generation

2. Describe the idea of Pasteur’s germ theory.
   - Germs are in the air and they cause decay and disease

3. Give two techniques developed by Robert Koch for studying bacterial disease.
   - Solid medium
   - Staining technique

4. What factor led to the discovery of the chicken cholera vaccine?
   - Chance