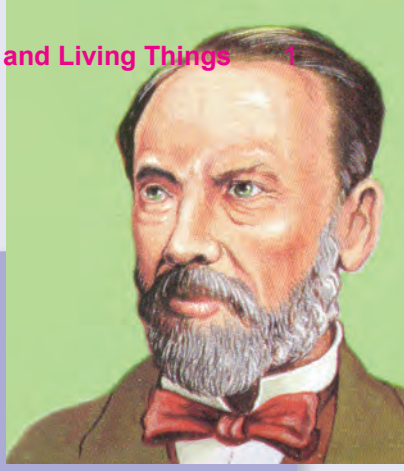
Sour Milk and Surgery



Louis Pasteur, 1822-1895

When you think about milk going off and forming those smelly lumps, there doesn't seem to be an obvious link to surgery and saving lives. But it is exactly this that an influential scientist discovered in order to reduce food spoilage and lead another scientist to create techniques that saved human lives.

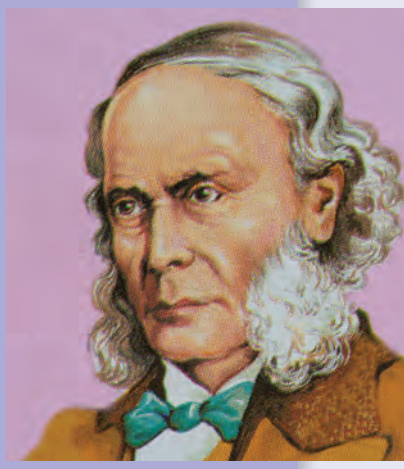
The father of microbiology is a French chemist and microbiologist called Louis Pasteur, who lived from 1822-1895. He made important advances and discoveries in the areas of:

- Vaccination – using small amounts or weakened disease to build immunity by infecting healthy individuals with it.
- Microbial Fermentation – that fermentation that produces alcohol (used in beer and wine making) was due to microbes.
- Pasteurization – heating food products to kill any microbes and so increase the shelf life of the food.

Pasteur discovered that microorganisms exist and that they cause disease and rotting. He used sterilised jars (jars that had been heated) to show that no microbes would grow, then once he opened them and exposed them to the air, microbes grew. These findings destroyed the previously accepted idea that living things like maggots, mould, bacteria, diseases and even fleas came from non-living things like dust. It was thought that these 'bad' things came from nowhere and especially not from a living source.

While experimenting with wine and the yeast responsible for making the wine, he discovered the reason as to why the wine went off and became vinegary over time. Again it was due to other microorganisms like bacteria. He performed many tests and experiments and found that by heating the wine to between 60-100°C before bottling it, then putting it into sterile bottles, it stopped the wine going sour. This process became known as pasteurisation and is still used for a wide range of food products today such as beer, juice, eggs and water. The most common use of this technique is to prolong the life of milk. An unwanted bacterium in milk produces lactic acid which curdles it and makes it sour. After heating the milk, it killed the bacteria and allowed the milk to last longer. Based on these findings, he deduced that microbes must be the cause of human disease also and that we should attempt to prevent their entry into the human body. After his discoveries, he published several papers and reports that outlined his findings.

A British surgeon called Joseph Lister saw Pasteur's work and found it enlightening. It led him to develop techniques in medicine that saved hundreds of lives. Lister lived from 1827-1912 in Kent, England. He studied mathematics, natural science and languages at school then went on to get a degree in the arts and botany. From here he enrolled in medical school and trained to be a surgeon. Before Lister made his world changing discoveries, people thought that infections obtained during and after surgery were from bad air. To prevent infection, hospitals would open their windows and doors to allow clean air to enter rather than washing hands, bedding and wounds. Even surgeons didn't wash their hands before performing surgery and they boasted about the number of stains on their surgical gowns. Lister read Pasteur's work and made the assumption that if microbes caused food to spoil then perhaps they also caused infections in human tissue. Pasteur had suggested three ways of killing the microbes and reducing infection:



Joseph Lister, 1827-1912

- Filtering the air and fluids.
- Heating to a temperature over 60°C.
- Exposure to chemicals like acids.

Lister felt that the only acceptable method for treating humans was with chemicals. He experimented with carbolic acid and tested its effectiveness. He firstly used the carbolic acid to spray surgical instruments, wounds and dressings. From this he saw a massive decrease in gangrene and other infections. In fact the death rate after surgery before he introduced his new techniques was 46%. This decreased to just 15%. From his personal findings he proposed that all surgeons:

- Wear clean gloves.
- Wash their hands before and after surgery with weak carbolic acid solution.
- Wash their instruments in carbolic acid.
- Spray the operating theatre with the solution.

This use of chemicals to reduce disease and prevent microbial growth became known as 'using antiseptic'. Lister also gave lectures about the need for sterilisation, using antiseptics and the 'germ theory of disease'. He even gave advice to the surgeons of King Edward VII who needed his appendix removed. The King credited him with saving his life . In 1879, Joseph Lawrence created a liquid that was used to rinse the mouth in order to reduce the number of bacteria and prevent tooth decay and bad breath. This liquid contained antiseptic and he named it Listerine in honour of Joseph Lister.

Even though these two scientists worked in very different areas of science they were both able to advance human technology and both contributed massively to the modern world. It just goes to show the importance that scientists keep an open mind and have a diverse understanding of all areas of science across the world.