MODERN MEDICAL DISCOVERIES

Background

In pre-historic times, it was thought that illness was caused by evil spirits entering the body, that the illness could be cured through chants and spells, and that charms could be worn to keep the evil spirits away. Herbs and plants were used to treat illnesses.

The Ancient Egyptians believed that illnesses were caused by the Gods and spirits. Doctors thought that diseases were caused by blockages in the body, so herbs and plants, which could unblock these, were given.

Beliefs were similar in Ancient Greece. Natural cures were also used.
**Hippocrates of Cos** (460 BC – 370 BC), who is considered the ‘*Father of Medicine*’, developed the ‘*Four Humour Theory*’. He identified 4 liquids (humours) which he believed caused disease, because either too much or too little were present in the body. These four humours (which matched the four seasons) were:

- blood (spring)
- yellow bile (summer)
- black bile (autumn)
- phlegm (winter)

Treatments were developed to either increase or decrease one of the humours.

Hippocrates wrote down the symptoms of various illnesses and believed in the importance of diet, exercise and body temperature.

Hippocrates (or one of his students) wrote the ‘*Hippocratic Oath*’. This was a rite of passage for doctors for many centuries. The modern day version of the Hippocratic Oath was written by **Louis Lasagna**. These days it is not compulsory, so is not taken up by all medical practitioners.
Galen (130 AD - 200 AD) was the most famous physician in the Roman Empire and his ideas were practised for over 1,500 years. He dissected animals to find out how the body functions and he identified that urine was formed in the bladder. He also discovered that arteries carry blood, although he did not find out about circulation.
The Romans believed that disease could be spread by contaminated drinking water and poor disposal of sewerage. They developed a public health system using ‘aqueducts’ to supply fresh water, as well as latrines and sewers.

During the Middle Ages, many people still believed that illness was caused by the spirits. The Church had an influence on medicine and the Greek and Romans’ ideas were accepted and still practised.

In 1348, the ‘Black Death’ hit England and killed half of the population.

In 1665, the ‘Great Plague of Europe’ killed thousands of people. The cause of the plague was thought to be because of the position of the planets (Saturn, Jupiter and Mars), bad smells or, a punishment from God.
In the Renaissance times, despite medical progress being made, doctors still did not understand what caused disease.

An important breakthrough was made by William Harvey (1578 - 1657) about the circulation of blood in the body.

In 1747, James Lind (1716 - 1794) proved that scurvy, which affected sailors on long journeys, was caused by lack of Vitamin C and that it could be cured by eating citrus fruits such as oranges and lemons.
The Fight Against Infectious Diseases

The most famous names in medical history and their discoveries are described below.

Edward Jenner (1749 – 1823)

Jenner was born in England and at the age of 14, worked as an apprentice for the local surgeon. He furthered his studies and became a qualified doctor. Jenner is regarded as the pioneer of the smallpox vaccination and the father of immunology.

What He Discovered

In 1796, Jenner found a way of stopping people catching smallpox by giving them cowpox. At the time, smallpox killed 1 in 3 people who caught it and badly disfigured those who survived. His experiment was based on an old wive’s tale that milkmaids never got smallpox. Jenner injected cowpox into an 8 year old boy, James Phipps. Jenner discovered that having inoculated Phipps with cowpox, he was immune to smallpox. Jenner’s experiment was successful and he called it ‘vaccine’, from the Latin ‘vacca’ for cow.

In 1840, the government banned all other treatment for smallpox, except Jenner’s. However, as treatment was very expensive, it took many years for smallpox to be completely wiped out, despite Jenner giving his cure away for free, instead of making money for himself by patenting it.
**Louis Pasteur (1822-1895)**

Pasteur was a chemist and biologist who proved the germ theory of disease. He invented the process of ‘*pasteurisation*’ in 1864.

Pasteur suspected that microbes (germs) caused decay and illness. He conducted various experiments and found out that microbes floating in dust in the air could make things go bad.

He showed that bacteria could make wine, beer and milk go sour and that this could be prevented by boiling and cooling the liquid in a process known as ‘*pasteurisation*’.

Pasteur strongly believed that germs attack the body from the outside. Many could not believe that these tiny organisms could attack something as large as humans.

He used his theory to explain the cause of many diseases, such as Tuberculosis (TB), cholera and smallpox and their prevention by vaccination.

Pasteur is best known for his work on a vaccine for rabies. He also built on Jenner’s work and developed new vaccines.
Robert Koch (1843 - 1910)

Robert Koch was born in Germany and came from a poor family, but was determined to go to university, where he studied Maths, Natural Science and Medicine.

In 1872, he began his research on microbes (germs). Koch worked on anthrax and tuberculosis (TB), as well as working on Pasteur’s theories.

The first disease Koch investigated was ‘anthrax’. Anthrax was a disease that affected herds of cattle. Koch discovered that anthrax microbes produced spores that lived for a long time after the animal had died. He proved that the spores could develop into the anthrax germ.

After these findings, Koch researched germs that affected humans. Koch believed that microbes caused blood poisoning. He proved that germs cause infections and that infected blood contained the septicimia germ.
Thereafter, he began working on TB and found the germ in 1882. He also developed new medical techniques that were adopted throughout the world.

**Tuberculosis**

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**Alexander Fleming (1881 - 1955)**

Fleming was born in England and moved to London at the age of 13 to study medicine. Fleming was a great bacteriologist, but is best known for his discovery of ‘**penicillin**’, the most powerful antibiotic. In 1945, Fleming, Florey and Chain shared the Noble Prize in Medicine.

**Alexander Fleming**

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In 1928, whilst studying influenza, Fleming discovered a mould growing in a culture of staphylococcus bacteria. The mould had created a bacteria-free circle around itself. He believed that the mould was killing the germs. He conducted various experiments by planting colonies of various germs around the mould and found that they killed many of these germs. He named the active substance ‘**penicillin**’.
However, he could not turn it into a long-lasting drug, but he did document everything that he found and published his findings 10 years later. Two scientists, Florey and Chain, were able to further develop penicillin, so that it could be produced as a drug.

Penicillin started being mass-produced in the 1940s by the American pharmaceutical industry. It changed the way that disease was treated. It was nicknamed ‘the wonder drug’ and was used to treat the bacterial infections that broke out amongst the troops in World War II.

**Discoveries That Made Surgery Possible**

Before 1840, operations were only attempted if it was a matter of life or death. The success rate was extremely low. Surgeons faced four major problems when carrying out surgery: pain, infection, bleeding and replacing the lost blood.

During this time, doctors did not know much about germs and did not sterilise their instruments. Often, boiling water was poured over the wound to make it stop bleeding. The surgeon had to work very quickly, so that the patient did not bleed to death, or die from shock.

There were no anaesthetics, so operations were performed while patients were awake.

As time progressed, various discoveries were made that improved how surgeons operated. This included the discovery of anaesthetics, avoiding infection, blood transfusions and x-rays.
Anaesthetic

Surgeons needed a way to reduce the pain of their patients and to make their muscles relax during surgery. Various things were tried.

1799
Sir Humphrey Davy discovered that nitrous oxide or ‘laughing gas’ helped to take the patient’s pain away. When nitrous oxide was inhaled, the patient would go to sleep for a short time.

1840
Michael Faraday found that the chemical ether had the same effect as nitrous oxide.

1847
Sir James Young Simpson discovered that chloroform gas worked extremely well. He first used it to ease a woman’s pain during childbirth.
Avoiding Infection

Even though surgeons could now carry out surgery for a longer period of time, because of the discovery of anaesthetics, many patients were still dying. A lot of women died in childbirth. Then a surgeon by the name of Joseph Lister heard about the work done by Pasteur on germs. Lister began to sterilise and clean his equipment, sewing thread, the patient’s skin, and the surgeon’s hands. This simple act of sterilisation meant that a lot less patients died from infections.

Blood Transfusions

Before 1840, doctors tried various ways to replace lost blood. This included getting the patients to drink blood and even putting animal blood into human veins. All of these experiments failed. In 1901, doctors realised that there are 4 main blood groups and only some of these could be given to someone with a different blood group. A National Blood Transfusion service was set up in the United Kingdom.

X-Rays

In 1895, a German Professor, called Wilhelm Conrad Roentgen (1845 – 1923) accidentally discovered x-rays. This was an important advance, which made it possible to see things that were previously invisible.

Whilst conducting an experiment with cathode rays, he noticed a greenish glow coming from a chemically-coated screen. He did not know what this fluorescent light was and so called it an ‘x-ray’. Eventually he found that x-rays could pass through human tissues, but not through higher density substances such as bone, lead or metal. This meant that x-rays could be used to take images of bones.
Rontgen received the Nobel Prize for Medicine in 1901 and never patented his discovery.

![Chest X-Ray](image1)

Other scientists quickly began to use x-rays, but did not understand the harmful effects of radiation until the 1950s.

Only 6 months after discovery, x-rays were used by the battlefield doctors to locate bullets in wounded soldiers.

These days, x-rays are used in medicine, dentistry, material analysis and security devices, such as airport scanners.

![Skull X-Ray](image2)
Case Study: A Breakthrough in Surgery: The First Heart Transplant

The first open heart transplant took place in December 1967, performed by a surgeon called Christiaan Barnard, in South Africa. Such a surgery had never taken place before, due to the complications and high risk of death.

Christiaan Barnard (1922 – 2001)

Christian Barnard was born in South Africa and worked for many years as a surgeon at Groote Schuur Hospital in Cape Town.

Barnard then went to America to further his studies. He studied heart surgery at the University of Minnesota in the United States. After completion, he returned to South Africa to set up a cardiac unit in Cape Town.
Surgery

The first ever heart transplant took place on December 1967. Barnard transported the heart of a road accident victim into a 59 year old man, Louis Washkansky. Unfortunately Washkansky died from pneumonia 18 days later. The drugs that were used to prevent Washkansky’s body from rejecting his new heart had weakened his immune system, which made him susceptible to infections.

Many patients after Washkansky who had heart transplants, did not survive. The drugs that were used to stop the body rejecting the new heart, left them open to infection. However, one patient lived for over a year after the surgery. After a while, all of these operations stopped, due to the high risk of death.

In 1974, a researcher in Norway discovered a new drug called *cyclosporine*. The drug helped overcome the body’s rejection of the donor organ and protected against infection. The survival rate of heart transplant patients increased with the new drug and in 1974 Barnard carried out his first double heart transplant.

Barnard also designed artificial heart valves and was a pioneer in organ transplants. He was known as an anti-apartheid activist and caused a political stir when he transplanted the heart of a mixed race man into a white man, in 1968.

Barnard retired due to arthritis and passed away in 2001.

When Barnard was asked what is his greatest achievement in life, he said,

“It’s difficult to say. If you ask me what I would like to be remembered for, I would not say the transplants, but the surgery I have performed on children with abnormal hearts. It is much more difficult than transplantation and much more satisfying. With the surgery, we give a child the chance to lead a normal life.”
Nowadays, as medical research is being undertaken all over the world, many new vaccines and treatments are being discovered. Medical treatment, in most countries has come a long way in the last century.