

c1250–c1500: Medicine in medieval England

Part one: Medicine stands still

Medieval medicine: approaches including natural, supernatural, ideas of Hippocratic and Galenic methods and treatments; the medieval doctor; training, beliefs about cause of illness.

Medical progress: the contribution of Christianity to medical progress and treatment; hospitals; the nature and importance of Islamic medicine and surgery; surgery in medieval times, ideas and techniques.

Public health in the Middle Ages: towns and monasteries; the Black Death in Britain, beliefs about its causes, treatment and prevention.



Medicine stands still: Theories of illness

Miasma

A miasma was bad air that was believed to be filled with harmful fumes. Hippocrates and Galen (see case study) both wrote that swamps, corpses and other rotting matter could transmit disease.

Smells and vapours were also associated with God - a sweet smelling home was a sign of spiritual cleanliness.

Medieval physicians called it 'corruption of the air'.

Astrology and the supernatural

The alignment of the planets and stars was important in **diagnosing** illness. Star charts would be used by **physicians**. This was a supernatural explanation for disease. Witchcraft was also feared and many believed the world was full of demons trying to cause trouble and death. Any sudden diseases that spread quickly were blamed on evil.



Religion

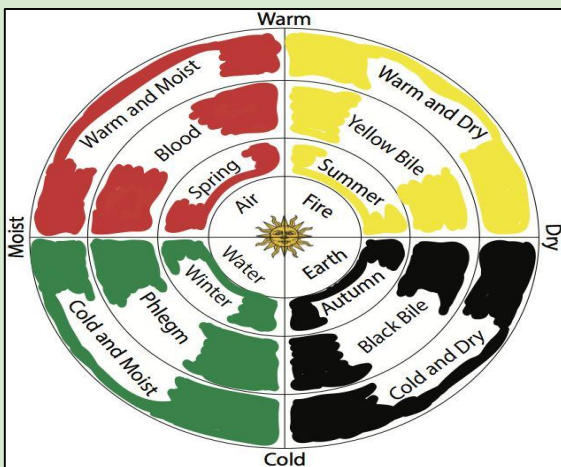
People in medieval England were very religious and followed the Catholic religion. Illness was very common (**malnutrition** was very common) and remained a mystery so the Church used religion to provide the answers (**see case study**). They taught that sins would be punished by God and that the God or the devil could send disease. The church also declared that a miracle had happened when they recovered, thanks to prayer. **Leprosy** was a disease believed to have been sent by God.

The Four Humours Theory

This was an idea from Ancient Greek times. It stated that, as the world was made up of four different elements, the body was made up of four different humours:

- Blood
- Phlegm
- Black bile (clotted blood – could be in excrement or vomit)
- Yellow bile (pus or vomit)

The theory was created by Ancient Greek physician **Hippocrates (see case study)** – he observed patients carefully and recorded his findings. The idea of the humours fitted what he saw. In Ancient Rome, **Galen**, another famous doctor, developed the theory further. He created the **Theory of Opposites**, for example he said that an excess of phlegm could be cured by eating hot peppers, a fever could be cured by cucumbers to cool the patient down. He also said that blood was created in the liver and circulated around the body.



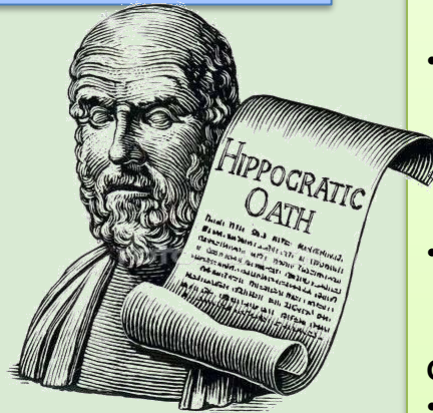
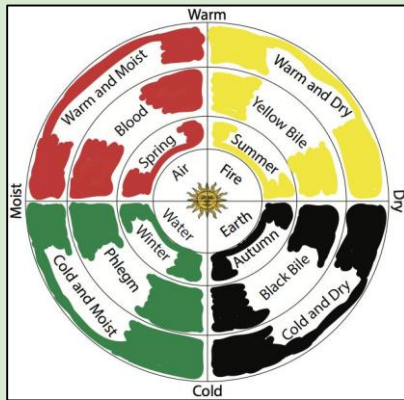
The belief was that the humours needed to be balanced and equal – if they were not then a person became ill. The theory said each humour was linked to certain characteristics e.g. a fever was caused by too much blood. The humours were linked to the seasons e.g. phlegm was linked to winter. Astrology was an important part of this as the humours were connected to star signs as well as personality traits. The theory could be used to explain almost any kind of illness – physical or mental. There was no other scientific explanation for the cause of disease.

Medicine stands still: Hippocrates and Galen

Two men, perhaps more than any others, contributed to the Western view of medicine and health at this time. They were Hippocrates and Galen.

THE THEORY OF THE FOUR HUMOURS

Hippocrates wrote: The human body contains blood, phlegm, yellow bile and black bile. These are the things that make up its constitution and cause its pains and health. Health is primarily that state in which these constituent substances are in the correct proportion to each other, both in strength and quantity, and are well mixed. Pain occurs when one of the substances presents either a deficiency or an excess, or is separated in the body and not mixed with others.



HIPPOCRATES, 460-370 BC

- Born in Greece 460 BC
- Based his thinking around the Four Humours. These were to be kept in balance if people were to be kept healthy.
- He believed doctors should observe symptoms.
- He believed diet and rest were important to patient's recovery. Regarded as the father of modern medicine
- Even today doctors take the HIPPOCRATIC OATH

GALEN AD130 – C210

- Born in what is now Turkey in AD130
- Took Hippocrates' ideas further
- He dissected animals to help him understand the human body
- He worked in a gladiator school treating fighters
- He based his medical ideas around the Four Humours

Hippocrates had theorised that illnesses were not a curse from God. They were due to an in balance in the body. This was important because people now realised that illnesses could be prevented – as opposed to being religious punishments whereby nothing could be done to cure oneself.

Galen's work arrived in Europe via Islamic texts and beliefs. Church leaders looked carefully at Galen's works and decided that they fitted Christian ideas because he had always referred to the "Creator". Doctors believed his ideas were correct and that nothing could prove them wrong. Even dissection (on human bodies) was taught from Galen's book while an assistant would point to the relevant part of the body – remember Galen had only dissected animals!



Medicine stands still: Being ill in Medieval times

Life for many people in medieval times was tough...and short! The rich were more likely to be able to afford treatment by a doctor than the poor and you were more likely to find a doctor in the towns compared to villages. The young were more at risk than adults.

MEDIEVAL DISEASES

Famine and war were perhaps the main killers of this period. A bad harvest also meant **malnourishment** for many. When people were malnourished it was easier to catch a disease.

SAINT ANTHONY'S DISEASE was a disease caused by fungus growing on the grains of rye. Those who ate it died.

DYSENTERY, TYPHOID, SMALLPOX AND MEASLES were widespread. Some historians believe 10% of Britain's population died of these diseases.

CHILDBIRTH was a dangerous time for women, and it is also likely that **30%** of children died before the age of **7**

Leprosy a contagious disease that affects the skin, mucous membranes, and nerves, causing discoloration and lumps on the skin and, in severe cases, disfigurement and deformities. Leprosy is now mainly confined to tropical Africa and Asia.

Smallpox an acute contagious viral disease, with fever and pustules that usually leave permanent scars. It was effectively eradicated through vaccination by **1979**.

Medieval people didn't really understand the causes of most diseases so they focused on trying to cure symptoms instead. The best practitioners tried following **Hippocrates**, to do no harm to their patients. Ironically treatments were brutal and dangerous. For example a treatment for rheumatism was to wear a donkey skin and a treatment for asthma was to eat baby frogs.



Medicine stands still: Treatment and Prevention Summary (continued)

How could disease be prevented?

The Church said to live a life free from sin. Regular prayers and confessions were needed

Diet

The humours were produced by digestion therefore what you ate was very important. Many medieval kings died of eating too much. People purged themselves regularly

Bathing was important as bad smells indicated a miasma. Public baths were available for a fee and poor people swam in rivers. Everyone washed their hands before every meal.

Purifying the air

Sweet herbs were spread such as Lavender. Some people carried **pomanders** which were large lockets containing bunches of flowers

Local authorities tried to keep towns clean by cleaning particularly smelly areas and public toilets.

Hygiene

A set of instructions known as *regimen sanitatis* told people how to keep the body healthy.

Homes were also kept clean with fresh smelling rushes and regular sweeping. Lavender was used to remove any bad smells

Physicians

New universities were set up across Europe making medicine more professional. A degree took between 7 and ten years to complete.

Medieval doctors were known as physicians and their main role was to diagnose and recommend treatment. They rarely actually treated the patients themselves and often did not examine the patient in person

The physician would take a sample of urine, faeces and blood. He would then consult the astrological charts and humoral charts. Many doctors were also priests so were forbidden to bleed a patient.

They were expensive as there weren't many of them because training took so long

Cost: £££££ (expensive!)

Apothecaries

They mainly mixed herbal remedies and had a good amount of knowledge, usually passed down through family. They were not as skilled or knowledgeable as physicians – they just mixed the prescribed medicines. Lots of people would see an apothecary as they were cheaper than a doctor.

They could also prescribe poisons which went against the Hippocratic Oath that doctors should do no harm. They did not have to have a formal education and could not be trusted to do no harm. Some also provided amulets and charms.

Cost: £££ (reasonable)

Barber Surgeons

The least qualified medical professionals. They had sharp knives and a steady hand so could perform small surgeries such as extracting teeth and bleeding.

They would advertise their services by putting a bowl of blood in the shop window until 1309, after that they displayed a sign of a bandaged, bloody arm.

Some were highly trained, in Europe some doctors were surgically trained alongside medicine. They learned from practical experience instead of books.

Cost: ££ (good)

Women

Most people were treated by women at home; this involved making the patient comfortable, preparing food and mixing herbal remedies.

Women would also grow plants known for their healing properties. There is some evidence that they also carried out minor surgery and bleeding but the records are patchy.

Cost: Free (better!)

Medicine stands still: What treatments did medieval practitioners use?

How about a treatment for a medieval headache? Drink warm camomile tea and then lie down on rosemary and lavender-scented pillows for 15 minutes.



Aching joints: take equal amounts of radish, bishopwort, garlic, wormwood, helenium, cropleek and hollowleek. Pound them up, and boil in butter with celandine and red nettle. Keep the mixture in a brass pot until the colour is dark red. Spread on to aching joints.



Toothache was thought to be caused by teeth worms. Here is a cure for the illness.

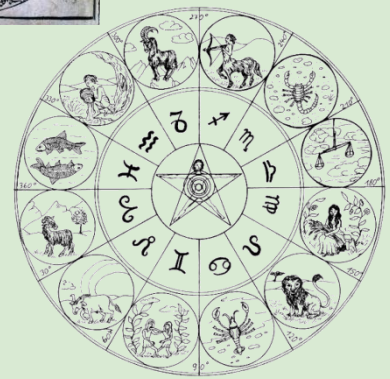
Take a candle of sheep suet, some eringo (sea holly *Eryngium maritimum*) seed being mixed therewith, and burn it as near the tooth as possible, some cold water being held under the candle. The worms (destroying the tooth) will drop into the water, in order to escape from the heat of the candle.



Diagnosing illness

Urine Charts: Doctors had two other indispensable tools for diagnosing sickness and putting it right: urine and the zodiac chart. Urine was a vital diagnostic tool. The physician would look carefully at the colour and compare it to a chart (see the picture). He also might smell it and, in some circumstances, taste it to help him decide what was wrong with the patient. Again, many patients today still submit a urine sample to help doctors diagnose their illness.

Zodiac Charts: Physicians believed that body parts were linked to astrological signs. Something might work for an Aries, but not for a Pisces. Zodiac charts might also tell the Physicians the best time to carry out treatments.



Medicine stands still: Who would treat the sick in medieval times?

Most people who had the money would go to a **barber surgeon**, who would carry out minor operations, set broken bones or pull teeth. To become a barber surgeon you had to serve an apprenticeship before becoming qualified.

These practitioners were mostly found in towns and cities, although some made a living travelling around the countryside. They usually travelled with visiting fairs.

Ordinary people would almost certainly depend on an **apothecary** (like a pharmacist that used herbs to cure illnesses). Apothecaries would sell medicines and mixtures from their shops in towns. Apothecaries would sell “singles” which would be a treatment made from a single herb or spice. They might also sell “compounds” which would be a mixture of herbs and spices used to cure various illnesses. One compound was red rose, ground fine and mixed with bamboo juice. This would be used for treating smallpox.

Wise women would also treat illnesses and act as midwives. They would have knowledge passed down to them from family members. They would treat family members in their homes and friends. On large farms you might receive treatment from the “lady of the house” who would look after farm hands and labourers if they were sick or injured.



Barber Surgeon



Apothecary Bottles

Medicine stands still: Treatment and Prevention Summary

Supernatural

If the cause of illness was God, then logically God could also cure the illness. People could cure illness by:

- Prayers and spells
- Paying for mass to be said
- Fasting (going without food)
- Pilgrimages (journeys to religious places)
- Charms and amulets
- Doing nothing – if God had sent the disease to clean the soul then it was important to let it run its course.



Herbal remedies & Bathing

Common ingredients included mint, camomile, almonds, saffron, absinthe and turpentine. Some of these were expensive and difficult to find.

Another common remedy was **theriaca**. This was a spice based mixture that could contain up to 70 ingredients. Galen (see case study) had written a book on the use of these particularly looking at treating snake bites and poisons.

Different foods were prescribed to balance the humours, e.g. chicken and almonds as the ingredients were warm and moist.

Warm baths were often prescribed to dissolve blockages in the humours. Plants and herbs were added to the bath water. Sometimes they were less pleasant – for paralysis patients were advised to boil a fox in the water and bathe in it – foxes have quick and nimble properties.

Four Humours - Bleeding

Phlebotomy (bloodletting) was the most common treatment, bad humours could be removed by removing some of the blood. It was usually carried out by Barber Surgeons or Wise Women. It could be done in different ways

- **Cutting a vein:** a vein was cut open with a sharp instrument. Phlebotomy charts were used to show points in the body where bleeding was recommended for specific illness
- **Leeches** were collected for those where traditional bleeding was too dangerous
- **Cupping:** the skin was pierced until it bled, a heated cup was then placed over the cut to draw out the blood.

Some patients died from blood loss but physicians were not held responsible.



Medicine stands still: Medical Progress

In Medieval society the **Church** was the most important thing in people's lives so its attitude to medicine also affected medieval societies. The church encouraged people to **pray for deliverance** and hope that they would not get sick. As well as prayer, the Church would sell **INDULGENCES** (a product that was supposed to keep you safe and free from illness.) **Pilgrimages** (a journey to a holy place) were also encouraged.

Helping progress

It was regarded as a central part of Christian duty to look after the poor and the sick, so the Church played a large part in developing hospitals and over **160** were set up in the **twelfth and thirteenth centuries**. Some of these were very small, many were attached to monasteries and some refused to take in very sick people or women, but there were at least some places for the sick to be treated.

The Church

The Church also set up **university schools** of medicine throughout Europe where physicians could be trained using the texts of **Hippocrates and Galen**.

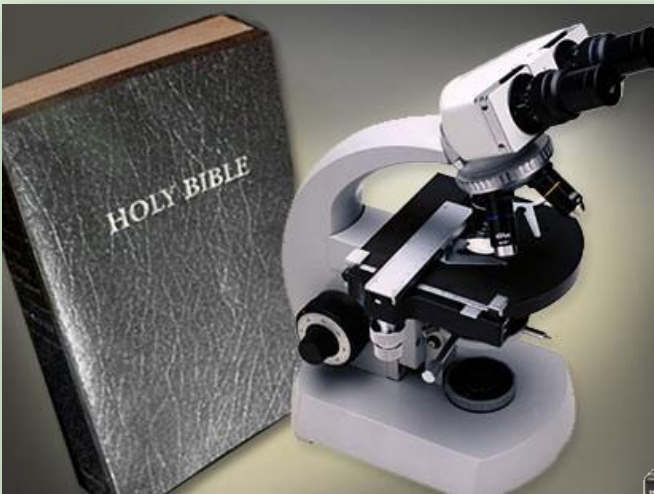
Limiting Progress

The church also **limited medical progress**. It made it very difficult for scholars to dissect human bodies, although there is evidence of **autopsies** taking place. Most studies of dissection were still based on **Galen's** writings, but his work on dissection was based on working on animals.

Other Factors for progress

War was everywhere in medieval times, and led to advances in surgery and the treatment of wounds. **CAUTERISATION** of wounds (applying extreme heat to create a scab and stop blood flow) was common but it was also fatal (people died). This led some surgeons to use wine as an **ANTISEPTIC** to clean wounds, others, like **John Arderne**, developed opium based pain killers. However, if a patient was given too much **opium** and **hemlock** they would die.

Army surgeons became very effective at carrying out amputations with a saw and a knife. This was extremely painful and there was no anaesthetic. Finally, there were new tools such as the **arrow-cup**. This was a tool designed to slide around the head of an arrow and then allow the surgeon to pull the arrow out with ease and much less pain. Manuals spread from surgeon to surgeon offering advice on the best way to perform military surgery. These manuals would show typical knife, sword and arrow wounds.

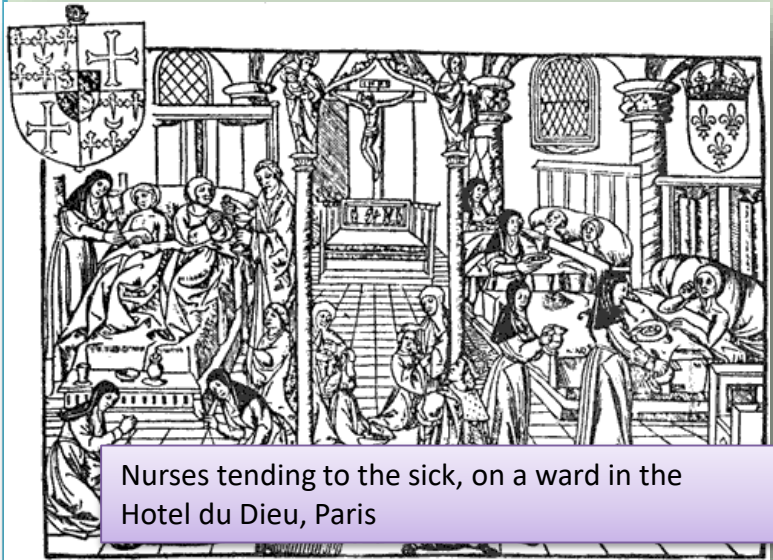


SCIENCE: Science did play a part. **Robert Grosseteste** from Oxford and Lincolnshire University helped develop **spectacles**. But the Church opposed the use of science and continued to push their ideas of using Hippocrates and Galen's theories.



Medicine stands still: How safe were you in a hospital?

St Bartholomew's Hospital in London was set up in **1123**, at first it specialised in the treatment of poor, pregnant women. **St Mary of Bethlehem**, established in **1247**, specialised in the treatment of “**poor and silly**” persons. Many towns had **leper houses** outside their walls, or “**hospitality**” places for travellers. Many small hospitals were **ALMSHOUSES** set up to provide a home for the old and those unable to work, who might otherwise have had to live on streets and beg for a living: not at all like a hospital today.



Nurses tending to the sick, on a ward in the Hotel du Dieu, Paris



Care within a hospital: The first thing that happened to you when you rang the doorbell in medieval hospital was that you went to chapel. The next stop was the bath, and the nuns or sisters took your clothes, boiled them and baked them in the oven. You then went into clean sheets overnight. Very few hospitals employed either **physicians or surgeons**. Most care was carried out by **nuns or elderly women**. The main treatment however was a prayers. Most nuns or monks in the hospitals had an excellent knowledge of **herbal remedies**.

Medicine stands still: Who would you visit for treatment?

Medieval Hospitals

The term Hospital comes from the Latin word “**hospes**” meaning stranger or guest. In **medieval Europe** they were originally hostels for travellers. They varied in size but usually catered for small numbers.

- The term **Hospital** comes from the Latin word “**hospes**” meaning stranger or guest. In medieval Europe they were originally hostels for travellers. They varied in size but usually catered for small numbers.
- •Some hospitals specialised. **Lanfranc**, the **Archbishop of Canterbury**, founded a hospital for the sufferers of **leprosy**. Some specialist hospitals e.g. St Mary of Bethlehem in London which looked after “poor or silly persons” (**later called Bedlam**).
- •Most were set up by the church with care provided by monks or nuns after **1100**. Nearly **1200** in **Medieval England** and Wales. However most did not even have a doctor .
- •Patients were given food and a bed although they often had to share; treatments included herbal remedies but prayer was also central. Prayers were also said for souls of people who sponsored hospital. Church services held throughout day with as many as **7** in some places.

Medical schools were opened up as well as hospitals run by monks and nuns

Some hospitals specialised in certain types of patients i.e. maternity

Did Medieval Hospitals help the sick?

Nearly 1200 hospitals existed but only 10% cared for the sick

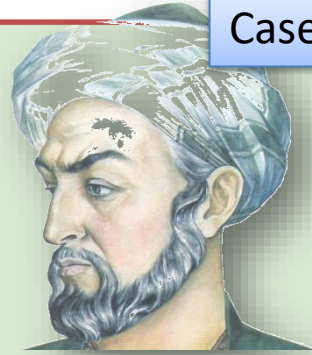
Doctors only treated the wealthy

Hospitals were new in Britain but much more common in other places, especially the Middle East

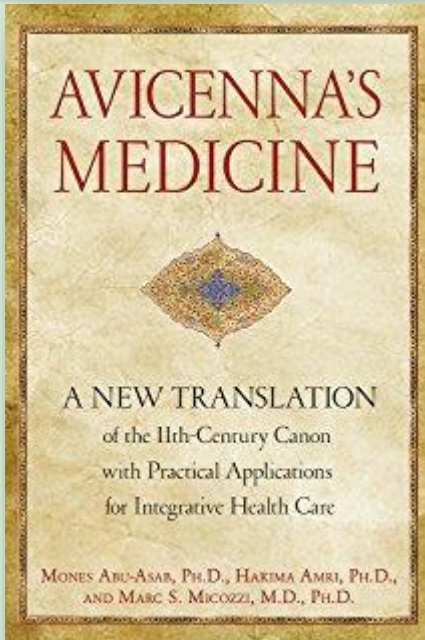
The influence of Arab medicine

Case Study

Muslim writers like **Avicenna** played a very important role in preserving earlier medical knowledge from the Egyptians. He translated this information into Arabic. This information was passed on to western Europe.



Arabic medicine was more advanced when compared to European medicine. **Avicenna** wrote many influential texts - *The Book of Healing* and the *Canon of Medicine*. This book was printed **60** times in Europe until well into the **1700s**.



An Arab Doctor, **Rhazes**, who lived from approximately **AD 860** to **932** wrote the first description of small symptoms.



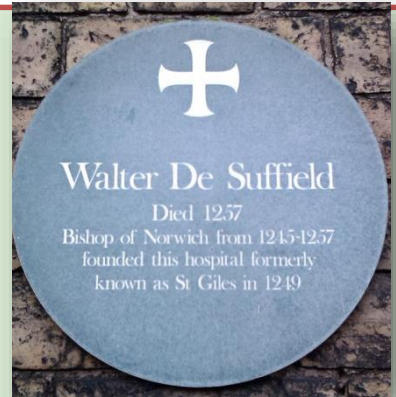
Hospitals were well established in Islamic nations, this was from **AD 900s** onwards. There were lecture theatres, pharmacies and libraries.



Cleanliness was encouraged and clean, cool air circulated the buildings.

Medicine stands still: St Giles Hospital

St Giles Hospital in Norwich is a good example of a medieval hospital, set up by **Bishop Walter de Suffield** in **1249**, and still in use today as a care home. It was named after **St Giles**, who was the patron saint of lepers, cripples and nursing mothers. It was established to care for the sick, but also for the remission of the bishop's sins so that when he died he would spend less time in purgatory and get into Heaven quicker!



A priest was to say a prayer for his soul every day, and to make the patients pray for him too. The bishop set up the hospital on about **ten acres of land** in Norwich and funded it with the income from **several churches** around **Norwich**.

Other local people – rich and not so rich – left money and land to the hospital to cover its running costs. There were strict rules as to who could and could not be admitted, and how they were to be looked after.



St Giles Hospital Rules

There shall be a master to take good care of the hospital, and to work for the remission of Bishop Suffield's sins.

There shall be at least three or four women, aged over fifty, who are to change the sheets and take care of the sick.

Everyone must rise at the crack of dawn to say prayers.

There will be a weekly mass in honour St Giles.


There will be thirty beds or more.


There will be a poor box from which poor people passing by can receive alms and charitable assistance.

The sisters are to sleep in a separate dormitory.

No women are allowed to stay in the hospital as patients.

Medicine stands still: Public Health in the Middle Ages.

 = causes

 = treatments

A certain cure for the pestilence? A holy remedy made from the finest herb and dust from the true Holy Cross on which Christ was crucified. Only one silver penny!

We need more rakers to clean the streets – they are filthy!

Pray to God for forgiveness. God sends Plague as punishment for our sins.

Some houses had toilets overhanging streams providing water for washing, cleaning and drinking.

Wells for drinking water were often close to cesspools for dumping sewage.

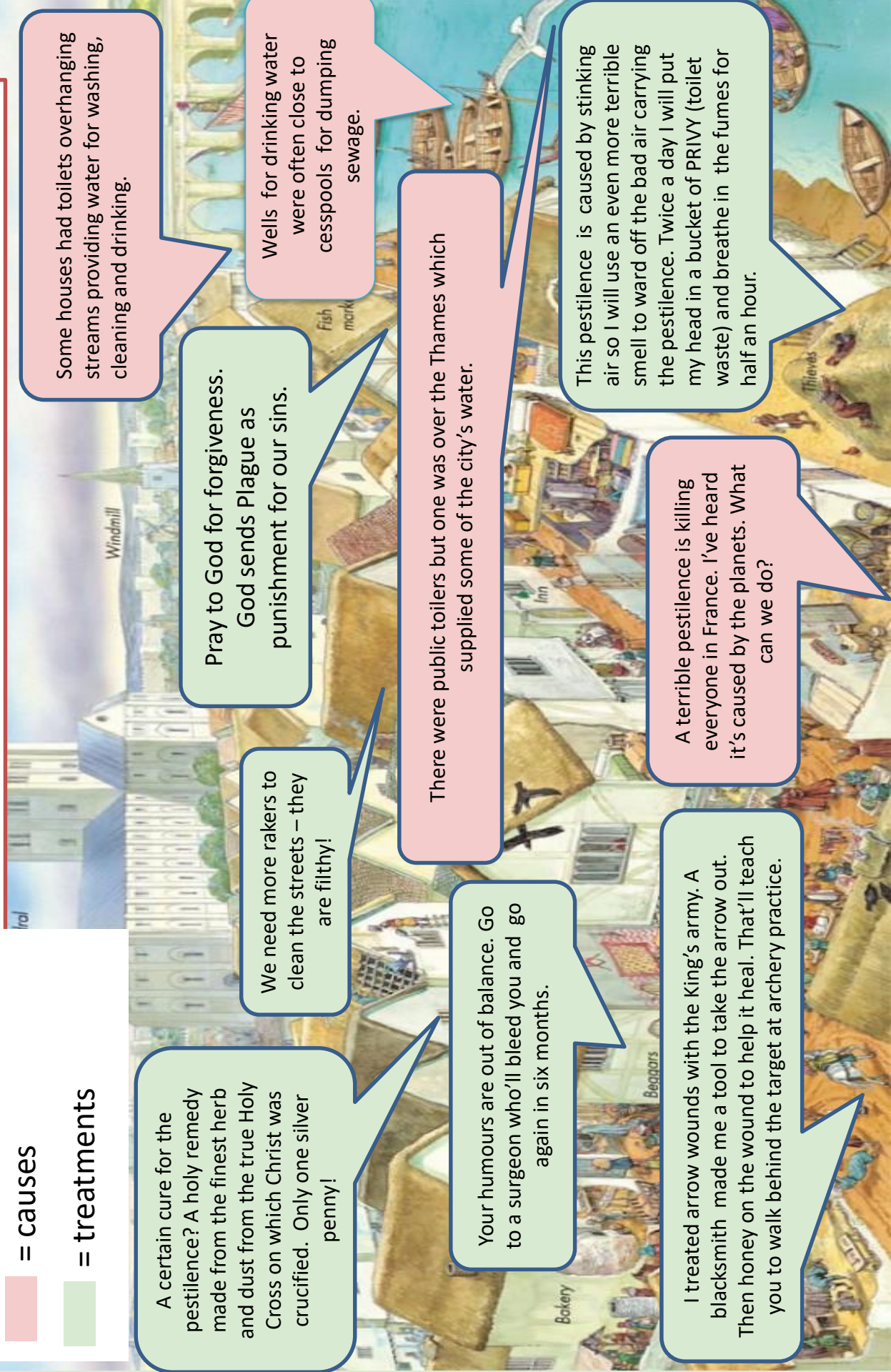
There were public toilets but one was over the Thames which supplied some of the city's water.

Your humours are out of balance. Go to a surgeon who'll bleed you and go again in six months.

I treated arrow wounds with the King's army. A blacksmith made me a tool to take the arrow out. Then honey on the wound to help it heal. That'll teach you to walk behind the target at archery practice.

A terrible pestilence is killing everyone in France. I've heard it's caused by the planets. What can we do?

This pestilence is caused by stinking air so I will use an even more terrible smell to ward off the bad air carrying the pestilence. Twice a day I will put my head in a bucket of PRIVY (toilet waste) and breathe in the fumes for half an hour.



Medicine stands still: Why was living in towns and cities so unhealthy?

- **Towns were unhealthy:** Clean water was hard to come by. Water was usually taken from rivers and streams that were contaminated with **human waste**. Butchers also brought animals into cities and would slaughter them in the streets. This meant it was difficult to get rid of the animal's body.
- Industries like **tanning** also caused a lot of problems. Leather was usually treated with dog poo. If you were unlucky the **overnight piss-pot** might be chucked out of an upstairs window as you were passing below.
- **Keeping food fresh was difficult**, so you had to shop for food every day. Shopkeepers would try to sell food that was going off rather than throw it away. Water for drinking was also rare, hence most people would drink "**small beer**" rather than risk the water.
- Sewage in the streets in the countryside or small villages were not really a problem, but they became deadly in towns. **Disease spread quickly**. No wonder medical people thought disease was spread by bad smells!
- **How did Monasteries help?**
- **Monasteries knew of the dangers of dirt and filth.** Most monasteries carefully extracted water for drinking, washing, cooking and brewing upstream of the privies, and then used the waste water to flush away the waste and clean the toilets. Monks were probably the only skilled medical personal available to people.
- **Bath houses**
- Archaeological evidence shows that many towns in the Middle Ages had **bath houses** where people could pay to have a bath. People were, despite all the difficulties, not quite as dirty or as smelly as some textbooks suggest.



Case Study: The Black Death 1349

What was it?

- The Plague first arrived in England in **1348**; today it is treated by antibiotics but people in the Middle Ages treatments like this did not exist. People were totally unprepared and did not know how to prevent or treat the '**Scourge**'.
- The Black Death was Bubonic Plague that was spread by fleas who lived on the rats travelling in merchant ships. It was probably spread by flea bites although though there is some evidence that some forms were spread through the air. The disease would last about **3-5 days** and we think **1/3** of the population of England died.
- The plague returned every **10-20** years after **1348** although it was never as severe.

What did people think caused it?

Supernatural

- Black death was a punishment from God for the sins of man
- Mars, Jupiter and Saturn aligned in a strange way

Natural

- Miasma caused corruption to the body's humours
- People believed that impure air came from poisonous fumes released by earthquakes or volcanoes

Common beliefs

- The Jews had poisoned the wells (only in Europe as the Jews had been expelled from England in the 13th century)

What treatments were available?

Supernatural

- Confess sins and ask God for forgiveness through prayer

Natural

- Bleeding and purging
- Strong smelling herbs such as aloe and myrrh
- Lighting a fire and boiling vinegar
- Lancing the buboes
- Apothecaries sold remedies and herbs

What were the symptoms of the plague?



Day 1 Painful swellings called buboes appeared in the victim's armpits and groin. These were usually about the size of an egg, but could sometimes be as big as an apple.



Day 4 The disease attacked the nervous system. This caused the victim to suffer spasms. The victim was in terrible pain.



Day 2 The victim vomited and developed a fever.



Day 5 Sometimes the buboes burst and a foul-smelling black liquid oozed from the open boils. When this happened the victim usually lived. However, in most cases the victim suffered a painful death.



Day 3 Bleeding under the skin caused dark blotches all over the body.



How did people try to prevent it?

Supernatural

- Pray to God and fast
- Go on a pilgrimage and make offerings to God
- Flagellants** who went around whipping themselves to punish themselves and prove to God that they were sorry

Natural

- Run away
- Carry fragrant flowers and herbs to avoid breathing in miasma
- Avoid bathing (water would open the pores to the infected air)
- Avoid those with the disease

Government Action

Quarantine

- laws were put in place to stop people moving around
- Houses were also quarantined
- Large crowds of people were discouraged
- But they could not enforce these laws
- They also stopped cleaning the streets as they believed that the foul smell of rubbish and rotting bodies would drive away the Plague

c1250–c1500: Medicine in medieval England

Q1 - Which disease/illness was not common in medieval England? a) Dysentery b) Cholera c) Leprosy d) Smallpox	Q2 - What was the miasma theory? a) That bad smells led to disease/illness b) That god was punishing the planet c) That the body needed purging of blood d) That the stars were causing illness	Q3 - Which person was responsible for the "Four Humours" theory? a) Galen b) Barber surgeons c) St Bartholomew d) Hippocrates
Q4 - Which person had worked with Gladiators? a) Galen b) Barber surgeons c) St Bartholomew d) Hippocrates	Q5 - which is the odd one out regarding medieval towns? a) clean water mixed with dirty water b) rotting meat in towns and cities c) disease spread quickly d) excellent sewage systems	Q6 - What words are not linked to super natural practices? a) Prayers and spells b) Paying for mass to be said c) Scientific research d) Charms and amulets
Q7 - What does "phlebotomy" mean? a) Bloodletting b) Praying c) Paying for mass d) Studying Urine	Q8 - what would an apothecary do? a) pray for your sins b) create "singles" and "compounds" c) practice blood letting d) delivered babies	Q9 - what would barber surgeons do? a) remove teeth and extract blood b) mix together remedies to treat illnesses c) pray for forgiveness d) hep labouring women give birth
Q10 - what foods were provided to balance the 4 humours? a) Cake b) Curries c) Chicken and almonds d) Foxes	Q11 - what was cupping? a) Using a leech to draw out infection b) Using a heated cup to draw out blood c) boiling a fox and bathing in the water d) Hiding on to charms and amulets	Q12 - other than Zodiac Charts, what other charts were used for diagnosing illnesses? a) Urine Charts b) Face charts c) Star charts d) Religious charts
Q13 - How did "Wise women" gain their knowledge? a) They would have information passed down through family members b) They would serve a 7 year apprenticeship c) They would go to fairs d) They would visit apothecaries	Q14 - Where would the "Lady of the House" usually be situated? a) With a travelling fair b) In an apothecary c) On a farm d) In a hospital?	Q15 - what were hospitals mostly like? a) an excellent place to receive medical treatment b) a place where doctors worked extremely hard c) a place where you would stay for rest d) a place where you would take baths
Q16 - who funded the churches? a) Monks b) Rich people c) Vagrants d) Travelling fairs	Q17 - who ran medical schools? a) Barber surgeons b) monks and nuns c) wise women d) Galen	Q18 - who did doctors treat in hospitals? a) The poor b) People with leprosy c) Monks d) The rich
Q19 - How many hospitals existed between 1250 -1500c a) 2000 b) 4000 c) 1200 d) 13000	Q20 - Where were the majority of Hospitals a) Britain b) Russia c) Middle East d) Australia	Q21 - what year does the case study of the plague occur in this module? a) 1348 b) 1349 c) 1350 d) 1351
Q22 - what did people think was causing the plague? a) rats with fleas b) a bacterial infection c) God and the supernatural d) Aborigines	Q23 - what treatments were there for the plague? a) take a course of antibiotics b) visit the doctor for Calpol c) lancing the buboes d) taking multivitamins	Q24 - what does quarantine mean? a) Run away b) cut open a bubo c) be put in a building and not allowed to meet others d) visiting an apothecary

Part two: The beginnings of change

- **The impact of the Renaissance on Britain:** challenge to medical authority in anatomy, physiology and surgery; the work of Vesalius, Paré, William Harvey; opposition to change.
- **Dealing with disease:** traditional and new methods of treatments; quackery; methods of treating disease; plague; the growth of hospitals; changes to the training and status of surgeons and physicians; the work of John Hunter.
- **Prevention of disease:** inoculation; Edward Jenner, vaccination and opposition to change.



Jenner



Vesalius



Harvey

Early Modern Britain

The Renaissance, or “rebirth” began in northern Europe in the **mid-fifteenth century**. The Renaissance was triggered by people’s interests in all things **CLASSICAL** (the study of culture linked to the Romans and the Greeks). At the same time, the **Reformation** (moving away from Catholic traditions to Protestant practices). These new ideas (and old ones) led to people challenging ideas and beliefs in science, technology and how the world was viewed. It was the beginning of what was known as the “**scientific method**.” Many physicians began to think more independently and started questioning the beliefs of **Galen**.

Andreas Vesalius, 1514 - 64

- Born in Brussels
- Studied medicine at Paris and Padua
- Became professor of surgery and anatomy at Padua.
- Carried out his own dissections.
- Believed anatomy was the key to understanding how the human body worked.
- Published *De Humani Corporis Fabrica* in 1543, which changed attitudes to medicine.

Ambroise Pare, 1510 - 90

- Apprenticed to his elder brother, a barber surgeon.
- Learned much of his skill as an army surgeon.
- Used Galen’s methods of ligatures to seal a wound.
- He is considered one of the “fathers of modern surgery.”

There were also new inventions: the **microscope** and **Caxton’s** Printing Press. **Caxton’s** printing press allowed new ideas spread across Britain rapidly.

Andreas Vesalius began challenging **Galen’s** work on the human body and developed much more accurate views of the inside of the human body by, unlike Galen, looking at dissecting human bodies instead of animals.

What has changed?

More scientific methods were adopted and used by more physicians. **Ambroise Pare** is a good example of someone who adopted new ways of treating diseases with scientific methods. He was a barber surgeon and trained at the **Hotel du Dieu** hospital in Paris before becoming a surgeon in the French army. In **Milan** in **1536** he ran out of hot oil for **cauterising wounds**. He made a mixture of egg yolk, turpentine and oil of roses to dress wounds. It was less painful and also better at healing wounds.

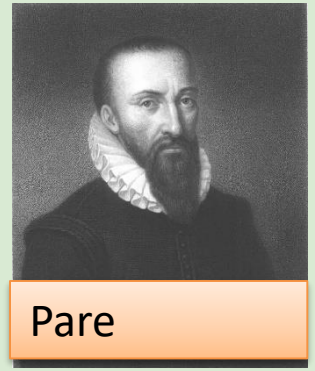
Ambroise Pare also used **LIGATURES** to tie-off wounds instead of cauterisation. This also helped wounds heal better. He also created artificial limbs. During his time as an army surgeon he was able to observe his patients. He published his book *Les Oeuvres* in 1575, his book became famous across Europe.



Early Italian Compound Microscope (circa late 1600s)



Vesalius



Pare

Printing Press and Microscope

Being ill in the seventeenth century

The biggest killer diseases in the 17th Century were “fever, consumption (tb), teeth, gripping in the guts and convulsions.” Physicians knew very little about the causes of disease, let alone cures. Treatments were, in general, not so very different from the Medieval period.

The impact of the Renaissance on Britain

What part did art play in improving people's health during the Renaissance?

Artists like **Leonardo da Vinci** went to great lengths to study the human body. They began to study **corpses** to help them draw humans. They were able to study how **muscles** worked. Artists also illustrated new medical books.

The Renaissance and Galen

During the Renaissance more artists began question **Galen's** work. During the Renaissance artists and physicians began seeing that **Galen** had been **wrong**. People thought the artists were wrong and Galen was right! But over time people began to accept that the new **anatomists** were in fact correct and Galen was wrong. The medical world seemed split in two. Many more physicians began exploring the human body to experiment new techniques. The **microscope** allowed people to look into the body in more detail.

William Harvey and the Circulation of blood

William Harvey wrote a book called ***On the Motion of the Heart***, it was published in **1628**. This book challenged Galen's work more than any other work at the time.

Harvey studied in **Padua**. Harvey learnt that **veins have valves** and pumped blood only one way around the body. Harvey found out that blood was pumped in a circular motion. This was the discovery of the **circulation of blood**.

Harvey proved that Galen's theory that the liver, not the heart, was the centre of the human body, was completely wrong. He also said that bleeding as a cure was wrong.

William Harvey

- Born in **Kent** in **1578** and educated at **Cambridge University**.
- Studied medicine at the **University of Padua**, Italy.
- Returned to England in **1602** and set himself up as a physician.
- He was married to the daughter of **Elizabeth I's** physician.
- He accepted a post a St **Bartholomew's** Hospital in **1609** and worked there for the rest of his life.
- He was appointed as a physician to both James I and **Charles I**.



How was Harvey's work greeted by others?

Many people said that Harvey was wrong because he could not see capillaries and therefore could not prove their existence. Some people also said that Harvey's experiments were wrong. Harvey also said that he lost many patients because people thought he was a crackpot.

Thomas Sydenham – the English Hippocrates

He was educated at both **Oxford** and **Cambridge** universities, before joining the **Parliamentary Army** during the **English Civil War**. He set up as a physician in **London** in **1663**, being licensed by the **College of Physicians**.



Sydenham distrusted people who based their finding on book learning. He insisted physicians must **observe** their patients and their symptoms before giving treatments. He believed in the scientific methods of treating ill-health. He believed diseases had different characteristics and thus each disease had a separate, unique treatment.

He was particularly interested in treating the **ague**, a form of **malaria**, and used **cinchona bark**, from the tropical rainforests of **South America**, to successfully treat the condition.



Sydenham was particularly interested in **smallpox** and diseases which struck London as epidemics nearly every year. He developed a successful treatment for smallpox that seemed the complete opposite of what physicians usually did. They usually tried to get patients to try and sweat out the illness, however Sydenham devised a **“cool therapy”** prescribing lots of fluids, very moderate bleeding and keeping the patients as cool as possible.

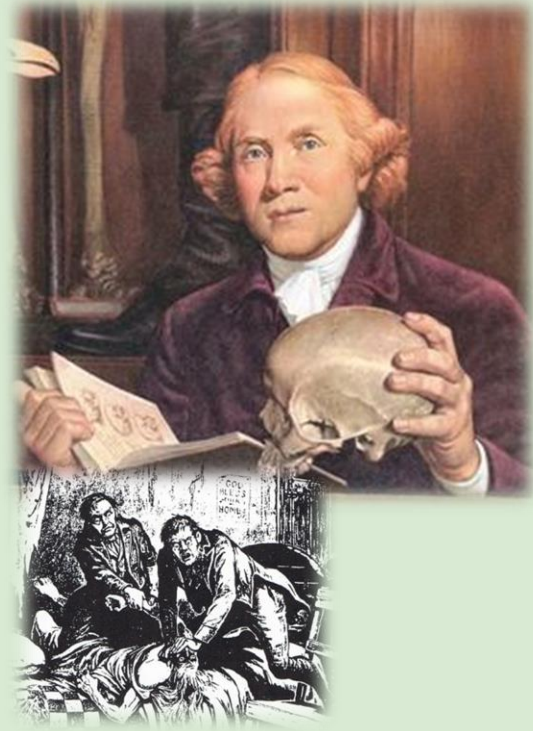


Some enlightened contemporaries hailed Sydenham and his treatments, but most people at the time thought he was crazy.

John Hunter

John Hunter was a famous surgeon and **anatomist**. He came to believe that the best way to heal deep wounds was to leave as much as possible to **nature**! He was most famous as a teacher of **anatomy**, training many of the best surgeons of the time, and spent hours **dissecting** bodies to learn about how they worked.

A recent newspaper article accused him of “**Burking**” (named after William Burke and William Hare who were accused of several murders.)



John Hunter engaged the public in his work in order to garner public support. Hunter was a **pioneer in surgery**, but he had developed his skills by using bodies that were legitimately obtained from **executions**, and also **illegally** from grave-robbing. This made him unpopular with members of the public. He founded a **museum** to display his work to the public in the belief that fear of his work was due to ignorance. This allowed members of the public to confront their moral objections to his work.

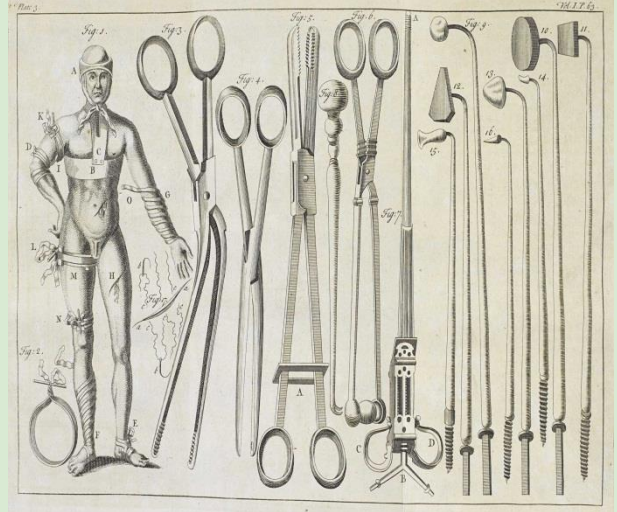
- **John Hunter 1728 - 93**
- Born in Scotland
- Moved to London as an assistant to his brother William, a successful physician.
- Served as an army surgeon during the **Seven Years War** where he dealt with gunshot wounds.
- Edward Jenner was one of his students
- He was known as the “father of scientific surgery.”



Dealing with disease

Ambroise Pare improved surgery. Surgeons' skills improved too. For example in the **1720s William Cheselden, of St Thomas' Hospital** in London could remove a stone from a bladder in less than a minute. There were still no reliable anaesthetics, opium was being used but the results were unpredictable and many died.

Surgery was very dangerous - Samuel Pepys, a famous writer, celebrated every year on the 26th March that he survived surgery.



Changes in the status and training of surgeons

In the eighteenth century more than half of all practising "doctors" seem to have been men who had served an apprenticeship. In **1856, 10,220** persons were listed in *The Medical Directory* with some sort of qualification. Only **4%** had a medical degree from an English University.

Many surgeons were members of the new Royal College of Surgeons and you could only practise with a license. No one could practise as a surgeon within 7 miles of the City of London without being examined by a college. In **1813** you could only do surgery if you had a minimum of one year's experience in a hospital. The world of surgery was now more regulated.





Quackery

In **seventeenth- and eighteenth-century** Britain there was a huge increase in people creating and selling medicines. People took advantage of the fact **society did not know** what caused or cured disease so made their own treatments.



Quacks, after the Dutch word “**quackslaver**” (someone who boasts loudly about his cures) sold medicines knowing full well what they were selling did not work. **Quack medicine** was sold both as a preventative and a cure, usually with a long list of unproven claims.

Daffy's Elixir was invented by a Leicestershire clergyman in **1647**. He claimed it cured: “Convulsion fits, consumption, agues, piles, fits, worms, gout, kidney stones and colic.” It was made from: aniseed, raisins, **rhubarb**, saffron and **Spanish liquorice** -it made people poo a lot. Quack medicines included mostly alcohol and opium.



Turlington's Balsam of Life - it was given a royal patent by King George II in **1744**, despite being completely useless in the treatment of “kidney and bladder stones, colic, and inward weakness’ as Turlington claimed. But the King's endorsement increased sales.

The growth of hospitals

Thomas Coram, a retired sea captain, was the driving force behind the **Foundling Hospital**, it opened in **1741** and it provided care for **abandoned children**. There were lots of children born out of **wedlock**. He spent over ten years collecting the funds to build new hospitals. But there were not enough places for babies. Other babies were put into **foster care**, they were brought back into the **Foundling Hospital until the age of 15**.

Voluntary Hospitals: Other voluntary hospitals began to spring up - these were usually paid for by rich people or **inheritances**. These voluntary hospitals replaced **monasteries**. These new hospitals didn't just give people a place to stay but they also provided **health care**.



Thomas Coram

New Discoveries

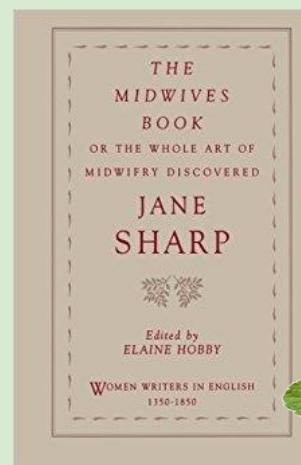
Robert Burton published a study of mental illness in **1621**. He said it was a lack of exercise, excessive pleasure, and too much studying. He recommended fresh air, music and laughter as a remedy.

George Cheyne wrote and published *An Essay on Health and Long Life* in **1724**. It was a very successful book. He said that obesity and nervous disorders were passed down from family members. He also said people should be responsible for their own health and prevent illness rather than relying on doctors to cure them.

In **1671 Jane Sharp** published *The Midwives Book* which combines the medical knowledge of the time with personal experiences. She advised that women should be midwives and not men.

Sir John Floyer published *A Treatise on Asthma* in **1698**. He was the first to identify the causes of asthma. He said people needed to exercise and improve their diets.

In **1753 James Lind** came up with a cure for scurvy; **Lime Juice**. Sailors who did not eat enough fruit or vegetables usually contracted scurvy.



Prevention of Disease

- **Smallpox** is an acute contagious disease caused by variola virus. It was one of the world's most devastating diseases. In **1980** it was declared eradicated following a worldwide vaccination programme.
- In earlier times it killed **60 per cent** of those who caught it. Others were left blind; disfigured by scars. Smallpox had been an endemic in Britain. **35,000** people died in **1796** and **42,000** between **1837** and **1840**. **Queen Mary** died of smallpox in **1694**. But people thought bad air caused it.



What can a visit to a cemetery tell us about disease prevention? Child-bed Fever

Alexander Gordon studied an outbreak of childbed fever and worked out the causes of these deaths - he noticed that women in villages who were treated by wise women and female midwives rarely caught the fever; whereas those patients treated by doctors moving from patient to patient were more likely to die. He said doctors should wash their clothes and their hands. Many people thought he was foolish and simply laughed at his ideas.

Inoculation had been used in far east Asia for centuries.

Lady Mary Montagu came across it in Istanbul and introduced it to England in **1721**. She had personally survived a smallpox outbreak. The **inoculation** involved putting a mild form of the disease into a small scratch. People became immune to stronger versions of the illness - but many also died.



Queen Mary II – Died from smallpox

A country doctor changed everything

Edward Jenner noticed that milkmaids would not contract smallpox, but sometimes their hands were covered in cowpox. He tested patients (**James Phipps**) by giving them a dosage of cowpox and then a dosage of smallpox. He noticed that the patients did not become ill and that the cowpox had **vaccinated** patients against the more deadly smallpox. By **1807** the Royal College of Physicians confirmed how effective the vaccine was.



Edward Jenner – what a lad!

What impact did vaccination have on smallpox?

Some people thought that it was too expensive to vaccinate patients (**£20**). Others thought it was bizarre to inject people with **cowpox**. Others thought that God was **punishing** people for their sins and therefore people should not interfere with what God wanted. Lastly, people thought the **government should not** help with medical matters.

- In **1840** (after an epidemic of smallpox in **1837**) the government made it free for all infants to get vaccinated. In **1853** the government said it was compulsory - which was bizarre because the government had a **Laissez Faire** approach to people's health.
- There was an anti-vaccine league set up in **1866**. In **1871** parents could be fined for not having children vaccinated. In **1887** (after the death rate had fallen) the government gave people the option to not have their children vaccinated.

By the twentieth century killers such as **polio**, **measles**, **diphtheria** and **whooping cough** had almost been eliminated through vaccination programmes. This was due to the work of **Koch** and **Erhlich**.

In **1998 Dr Wakefield** wrote a paper saying there was a link between the **MMR Vaccination** and people with autism. Fewer parents had their children vaccinated. This research has since been rejected.



Dr Wakefield

Pulling it all together

A case study of London in 1665 - In 1604, 30 per cent of the population of **York** died in an outbreak of plague. In **1665** around **100, 000** people died of plague in **London** - that was nearly **25%** of the population.

What did people think caused the Plague?

The truth is that people didn't really know much about the causes of the plague. People noticed that there were more plague victims in dirtier parts of London so they were beginning to make links between dirt and disease. The King of England and the Mayor London introduced measures to try and stop disease spreading.



To prevent the Plague:

- All public entertainment to be stopped.
- Pigs and other animals are not to be kept in the city.
- All dogs and cats are to be caught and killed.
- Rubbish must be cleared from the streets.
- Fires are to be lit in the streets to drive away bad air.
- Houses containing Plague victims are to be sealed up for 40 days and painted with a red cross.
- No strangers are to be let into the city without a certificate of health.
- Bodies are to be buried after dark, and not in churches or churchyards.
- Public prayers to be said on Wednesdays and Fridays
- Weekly fasts must be held



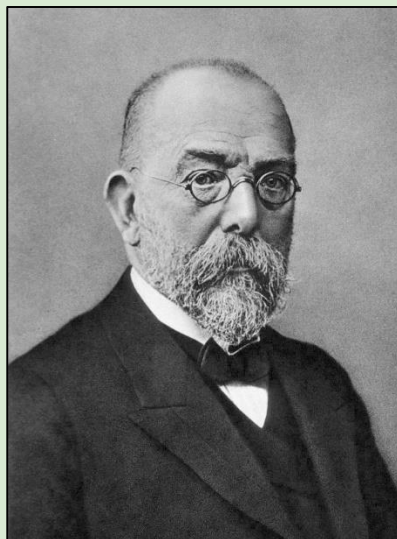
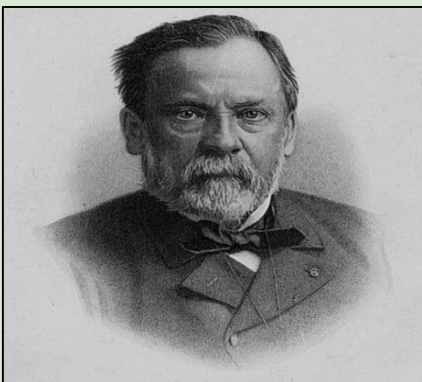
Part two: The beginnings of change

Q1 - What does "Renaissance" stand for? a) rebuild b) rebuy c) rebirth d) return	Q2 - what did Vesalius do that Galen had not done? a) Studied gladiators b) Dissecting bodies c) Made models out of clay d) Said the liver was the central part of the body	Q3 - what is a ligature? a) a way to prevent bleeding by tightening the skin and muscle b) burning the wound to create a large scab c) putting opium on a wound d) putting leaches on the wound
Q4 - What had Ambroise Pare done as one of his jobs? a) He had worked in an apothecary b) He had worked with gladiators c) He had written books on herbs d) He had been a military surgeon	Q5 - Which famous artist had did a lot to study the human body? a) Raphael b) Donatello c) Leonardo da Vinci d) Banksy	Q6 - Which person proved that blood circulated around the body? a) Leonardo da Vinci b) Galen c) Vesalius d) William Harvey
Q7 - What did Thomas Sydenham recommend for smallpox? a) To drink lots of fluids and keep the body cool b) To help patients sweat out the illness c) Put leaches on the pox d) Apply extreme heat to the pox	Q8 - What was John Hunter accused of? a) Taking bodies from doctors with permission b) Grave digging and dissecting bodies illegally c) Working with gladiators d) Dissecting animals	Q9 - How many persons were listed as having a medical qualification in 1856? a) 10 b) 1000 c) 10,200 d) 12, 000
Q10 - How many years did a person need to work in a hospital before being allowed to do surgery? a) 1 b) 2 c) 3 d) 4	Q11 - What did Lady Johanna St John do? a) Dissected bodies b) Applied heat to wounds c) Grew medicinal herbs and treated people with these herbs d) Worked as a war surgeon	Q12 - What book had Nicholas Culpeper written? a) Complete Dissection b) Completed Leaches c) Complete Herbal d) Complete Nonsense
Q13 - What plant was seen as a wonder drug from Asia? a) Opium b) Calpol c) Chinchona d) Rhubarb	Q14 - what does "Quackery" mean? a) The study of ducks b) Someone who boasts about their medicines c) A good doctor d) A good surgeon	Q15 - Which monarch endorsed Turlingston's Balsam of Life? a) Queen Mary b) Queen Elizabeth c) King George II d) King Charles I
Q16 - Who set up the Foundling Hospital for children? a) Thomas Coram b) Galen c) Vesalius d) Leonardo Da Vinci	Q17 - What did hospitals start doing which was different to the Medieval era? a) Give people X-Rays b) Perform key-hole surgery c) Did brain scans d) Start offering medical care as well as somewhere to stay	Q18 - Which lady wrote about midwifery? a) Jane Sharp b) Lady Johanna St John c) Florence Nightingale d) Elizabeth I
Q19 - What does inoculation mean? a) Giving someone a dosage of a slightly different illness b) Giving someone a weaker version of the illness c) Giving someone opium d) Giving someone rhubarb	Q20 - Who discovered the process of vaccination? a) Vesalius b) Galen c) Edward Jenner d) Leonardo Da Vinci	Q21 - Which little boy was given a dosage of cowpox and smallpox and survived? a) Edward Jenner b) Galen c) Vesalius d) James Phipps
Q22 - What does Laissez Fair mean? a) When a government does very little to help society b) when a government does everything to intervene in people's lives c) when a government goes to war d) when a government does a study on what makes people ill	Q23 - In what year did 100, 000 people die in London? a) 1662 b) 1663 c) 1664 d) 1665	Q24 - What had the authorities noticed about plague and members of society? a) Mostly rich people got the plague b) Mostly middle class people became ill c) Mostly poor people became ill d) Everyone was ill

A revolution in medicine – 1700 - 1900

Part three: A revolution in medicine

- The development of Germ Theory and its impact on the treatment of disease in Britain: the importance of Pasteur, Robert Koch and microbe hunting; Pasteur and vaccination; Paul Ehrlich and magic bullets; everyday medical treatments and remedies.
- A revolution in surgery: anaesthetics, including Simpson and chloroform; antiseptics, including Lister and carbolic acid; surgical procedures; aseptic surgery.
- Improvements in public health: public health problems in industrial Britain; cholera epidemics; the role of public health reformers; local and national government involvement in public health improvement, including the 1848 and 1875 Public Health Acts.



Part three: A revolution in medicine

Overview of changes to society c1700-c1900

In 1700, the influence of the *church* was not as great as it once was.

- Many people no longer believed that God was responsible for all worldly events.
- Instead they focused on developing scientific explanations.

Society was also changing with *cities* beginning to grow as people moved in search of jobs.

- The new cities were not planned and quickly became dirty and disease-ridden.
- Understanding the causes of disease and illness became more important.

The introduction of *democracy* meant that people believed that they had the right to good health.

- The right to health was one of the 'rights of man' claimed by working people during the French Revolution which is why the medical revolution of the 19th century started in France.

Intellectual movements such as *The Enlightenment* made it fashionable to seek answers to questions about the world – including disease and illness.

- The *Scientific Revolution* saw developments across all branches of science which completely changed the way people lived and the ways they understood the world around them.
- Advances in *technology* also meant that new medical machines were invented.

Growth of *industry* and advances in *technology* meant that Britain became increasingly wealthy and had lots of money to spend on medical research and public health.

- Improved *communications* also allowed medical knowledge to spread with doctors gaining information from all around the world.



Ideas about the cause of disease and illness

Continuity and Change

There was not a lot of new ideas about the causes of disease in the 18th century.

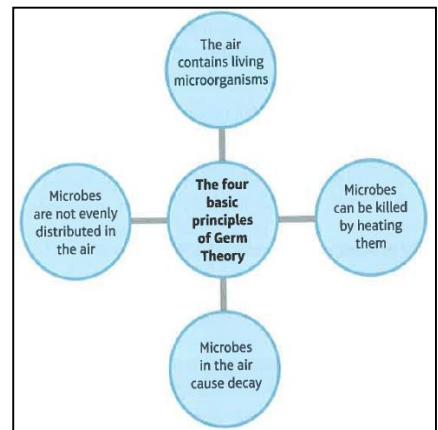
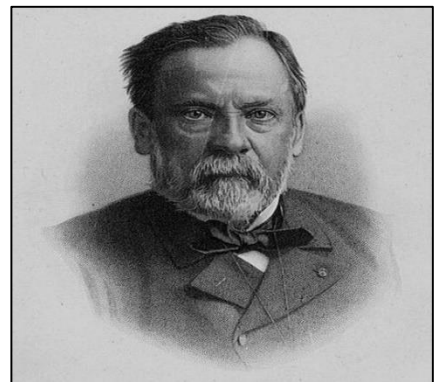
- Ideas such as the Theory of the Four Humours had been discarded.
- People still believed in **MIASMA**, although this theory was becoming less popular.
- Scientists in the early 18th century developed the theory of **SPONTANEOUS GENERATION** as an alternative to theories like the Four Humours. This was not proven though.
- Improvements in the quality of glass lenses used in microscopes meant that scientists could see **MICROBES** present on decaying matter. Most people believed these microbes were the product of decay, rather than the cause of it.
- In the 18th century, this was just a theory, and scientists were unable to prove that **SPONTANEOUS GENERATION** was correct. It took until the 19th century for scientists to make a solid link between these microbes.

Louis Pasteur and the development of Germ Theory

Louis Pasteur discovered that germs cause disease. Before he made this discovery, doctors had noticed bacteria, but they believed it was the disease that caused the bacteria rather than the other way around. This was known as **SPONTANEOUS GENERATION**.

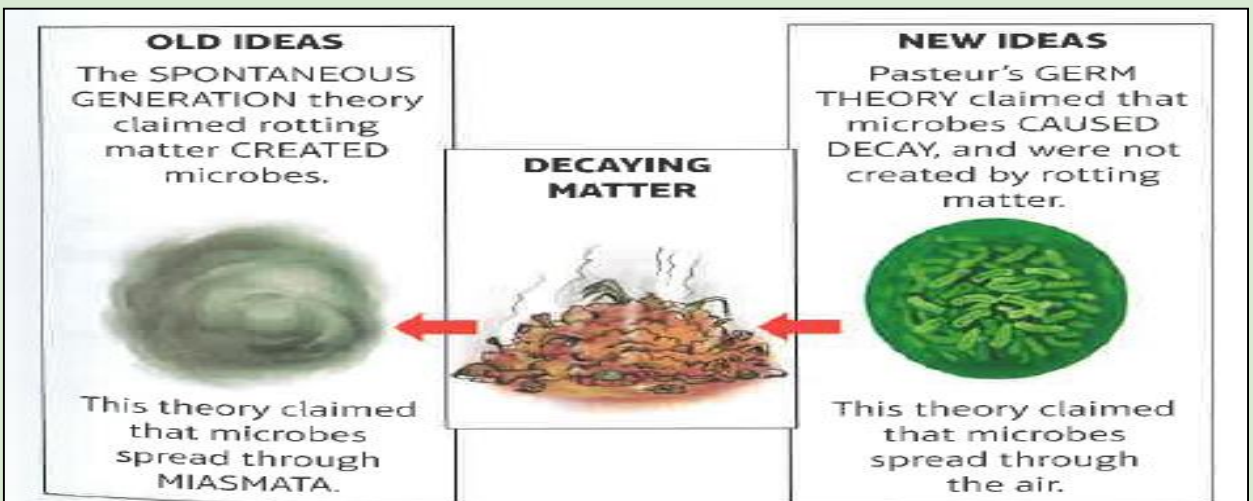
Pasteur published the results in 1861. He called his discovery **GERM THEORY**:

- Using improved microscopes which magnified substances to a much higher level, Pasteur was able to observe unwanted microbes in wine and vinegar, which turned both liquids 'bad'.
- He therefore proved the idea of **SPONTANEOUS GENERATION** was wrong because decay did not happen to sterilised matter that was left undisturbed.
- Pasteur also discovered the **PASTEURISATION** of milk, which prevented it from going sour by killing the germs and sealing it from the air.



Pasteur's influence in Britain

Had an impact	Did not have an impact
<p>Some scientists did start to look for a link between the <u>MICROBES</u> and disease.</p> <ul style="list-style-type: none">One of these was Joseph Lister, who read Pasteur's <u>GERM THEORY</u> and linked it to the infection problems his surgical patients had experienced	<p>The theory of <u>SPONTANEOUS GENERATION</u> continued to be important until 1870s.</p> <ul style="list-style-type: none">It was promoted by Dr Henry Bastian, who was one of the most powerful doctors in the country. Because he was so well respected, few people disagreed with him.
<p>Another scientist who promoted the link between <u>MICROBES</u> and disease was John Tyndall.</p> <ul style="list-style-type: none">He had discovered that there was small organic particles in the air.In January 1870 he gave a lecture, lining his discovery with Pasteur's <u>GERM THEORY</u> and Lister's work on wound infection. Tyndall theorised that dust particles carried the germs that caused disease.	<p>Many doctors refused to listen to Pasteur.</p> <ul style="list-style-type: none">Pasteur was not a doctor and his work focused on decay and spoiled food. not disease.Tyndall was also not a doctor: He was a physicist.The medical world trusted Bastian's beliefs rather than Pasteur's and Tyndall's theories.
Overall Impact	
<p>Pasteur's theory had limited impact in Britain, because attitudes among doctors meant people refused to recognise the link between germs and disease – even though the link was correct!</p>	

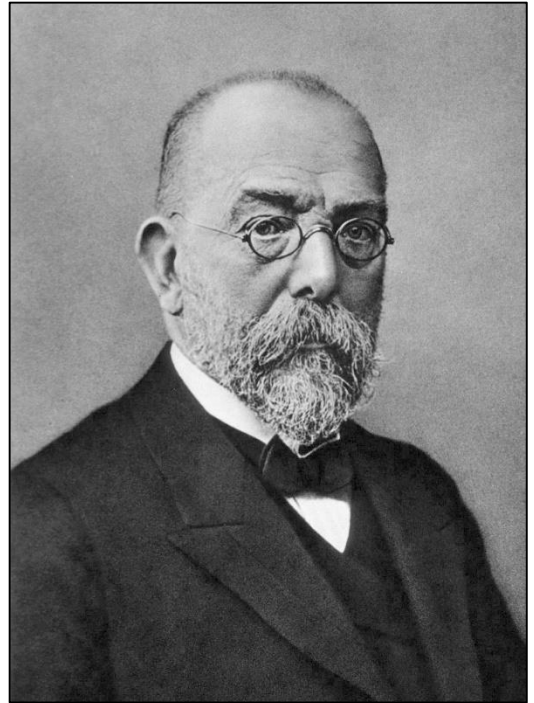


Robert Koch's work on microbes

Although Pasteur had been the first scientist to identify microbes and their role in decay, it was Robert Koch who successfully identified that different germs cause many common diseases.

Koch discovered the bacteria that caused tuberculosis, in 1882. He published his ideas on the methods that could be used to identify disease-causing microbes and continued to look for microbes causing different diseases.

- In 1883, he discovered **cholera**, and in 1884 he proved it was **spread in water supplies**.
- Koch made it easier for future scientists to study **bacteria** by developing a new method of growing them, using agar jelly in a petri dish. This made it easier to study bacteria under a microscope.



Koch's influence in Britain

- Before doctors had studied and treated symptoms, now they **studied the disease itself**. The medical profession had begun to recognise that the microbe created the symptoms of the disease, and it was the microbe that needed to be removed.
- In 1905, Koch received the **Nobel Peace Prize** for Medicine and is considered to be the father of **BACTERIOLOGY** (the study of bacteria).

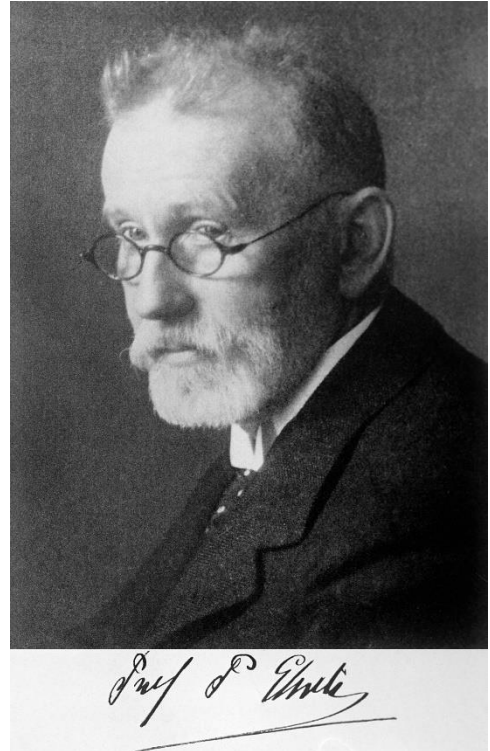
Overall Impact

Koch's had a huge impact in Britain. Koch's research inspired other scientists. Over the next two decades, they went on to discover the microbes responsible for other diseases such as diphtheria, pneumonia, meningitis, the plague, tetanus and various other infections.

Magic bullets: Paul Ehrlich

The physician Paul Ehrlich, who worked in Robert Koch's bacteriology lab, searched for chemicals that would stain specific germs to make them more visible under the microscope.

- **Paul Ehrlich** (Germany: 1890s) reasoned that, if certain dyes could stain bacteria, perhaps certain chemicals could kill them.
- He set up a private laboratory and a team of scientists.
- By 1914 they had discovered several 'magic bullets' - compounds that would have a specific attraction to disease-causing microorganisms in the body, and that would target and kill them.
- These were methylene blue (for malaria), trypan red (for sleeping sickness) and Salvarsan (for syphilis) - although Salvarsan was more effective than the other two.



- Ehrlich intended that his modern, chemical version of 'magic bullets' would hit the specific germ, but not damage anything else in the patient's body. Ehrlich and his co-workers tried hundreds of chemicals on the microbes that caused syphilis.
- In 1909, Ehrlich's new colleague Sahachiro Hata (1873-1938) brought with him a method of producing syphilis infections in laboratory rabbits, and discovered that drug no. 606 worked.

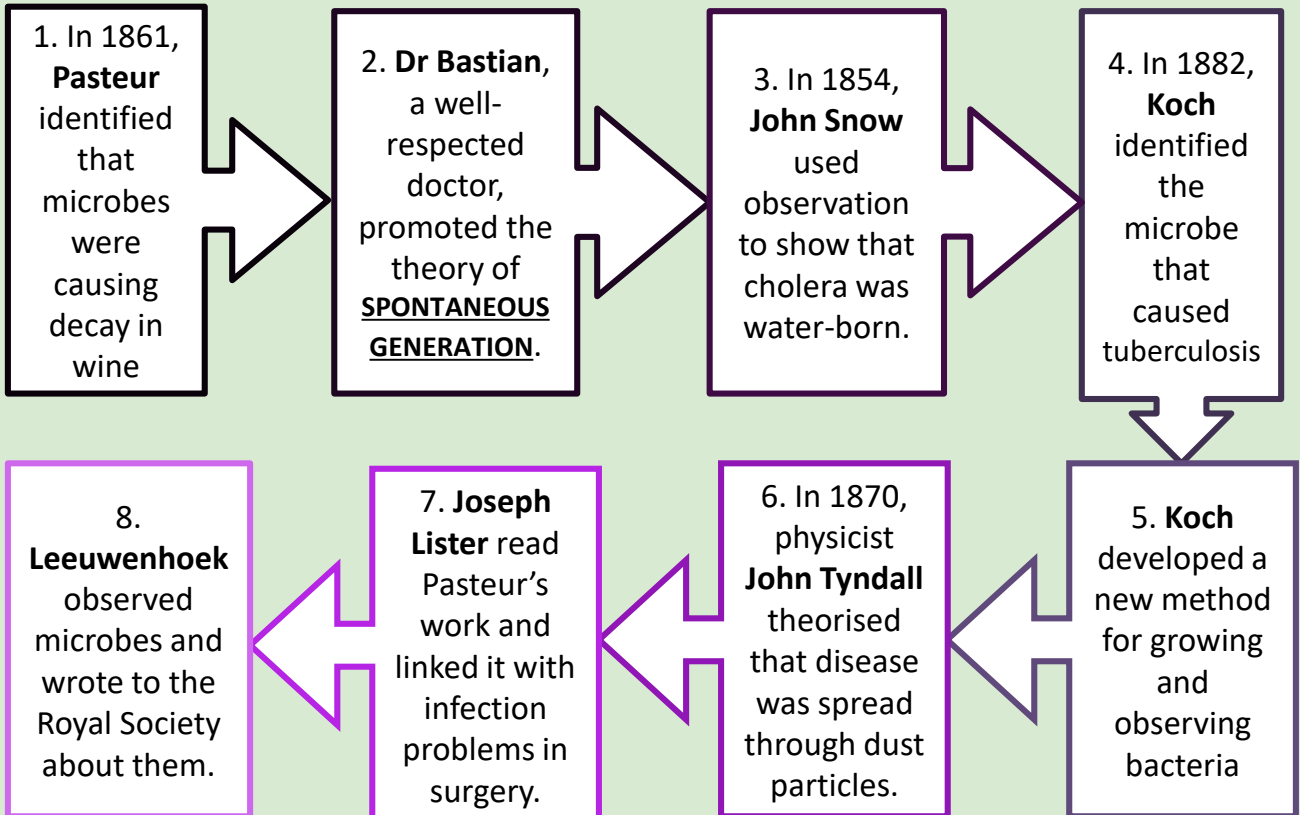
Overall Impact

The first 'magic bullet' had been found, and was marketed under the name Salvarsan. Encouraged by this success, Ehrlich and other scientists, such as the German physiologist Emil von Behring, proposed that researchers should develop specific drugs to target specific germs, attacking the cause of the disease directly, rather than treating the symptoms.

Summary of ideas about the cause of disease and illness

- In the 18th and 19th centuries, scientists started to theorise about germs being produced by decaying matter, a theory named SPONTANEOUS GENERATION.
- In 1861, **Louis Pasteur**, a French chemist, published GERM THEORY. This proved that microbes in the air caused decay in substances such as wine and vinegar.
- Pasteur's work was picked up by some medical professions, quite quickly, particularly in Britain where **Joseph Lister** began attempting to remove microbes from his operations theatre. However, many doctors resisted the ideas.
- **Robert Koch**, a German scientist, began to look for specific microbes that caused disease. He identified lots of these, including the microbe that caused cholera.
- By 1900, the mystery of what caused illnesses and diseases had been solved – it was just that not everybody believed the solution yet.

The development of GERM THEORY



Approaches to prevention and treatment

The extent of change in care and treatment

By 1900, the way that sick people were treated and cared for had changed almost completely since 1700.

- By 1900, most people accepted that **germs caused disease** and that treatment needed to be **focused on removing the germ**.
- **Herbal remedies continued to be popular until 1900**. This is because treatments for everyday diseases such as syphilis and tuberculosis were not developed until after 1900.
- By 1900, the old belief **that prevention was the most important aspect became even more widespread**. People began to realise that infection was everywhere and that avoiding disease by keeping clean and following a sanitary regime was the best way to protect themselves.
- The biggest change by 1900 was in the **willingness of the government and the population to take steps to prevent disease from spreading**.

Improvements in hospitals

Hospitals in the 18th century

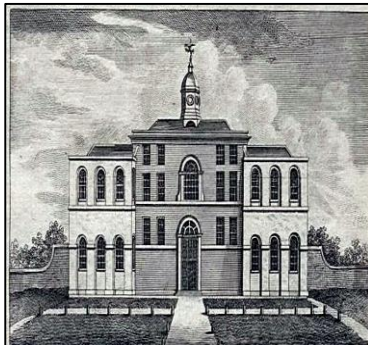
Between 1550-1700, the country did not invest in new hospitals and by 1700, there were only five hospitals left in the country – and they were all in London. However during the 18th century, attitudes to hospitals began to change.

1. Wealthy people began to donate money to create hospitals all across England.

- Some doctors also offered their services free of charge to these new hospitals.

2. Hospitals increasingly became places where sick people were treated, as opposed to places where people could rest and pray.

- Doctors visited patients regularly and there was a surgeon on site for daily treatments.



3. Hospitals were still not places that people chose to be treated.

- Patients in hospitals were generally the 'deserving poor'.
- Rich received medical treatment in their homes, which was much safer.




4. As more people started to attend hospitals, they became less sanitary.

- They became less strict at turning infectious patients away.
- Doctors went from patient to patient without washing their hands. This meant that disease spread quickly.

5. By the middle of the 19th century, there were a lot more hospitals. However hospital conditions were very poor.

The impact of Anaesthetics and antiseptics on surgery

In the 18th century, surgery was dangerous and usually fatal. The three big problems that surgeons faced were: ***bleeding, pain and infection***. In the 19th century, significant developments occurred that tackled two of the three problems of surgery.

	18 th Century problems	19 th Century solutions
Problem 1: Bleeding		
	Problem: As blood transfusions hadn't been invented yet, surgeries had to be performed quickly so patients didn't bleed to death on the operating table.	Not Solved: When William Harvey had discovered the circulation of the blood, the first blood transfusions were attempted. Early blood transfusions often ended disastrously because blood groups had not been discovered, they could not prevent the blood from clotting and infection could be passed on.
Problem 2: Pain		
	Problem: Although substances like opium had been used to calm patients with severe injuries, without <u>ANAESTHETIC</u> there was no way of preventing excruciating pain which sent patients into shock and stopped their heart.	Solved: <u>ANAESTHETICS</u> were developed to enable surgeons to put patients to sleep before operating on them which helped with the pain.
Problem 3: Infection		
	Problem: As operations were not performed in germ-free environments, infections quickly set in. Without cures for these infections, many patients died.	Solved: The development of <u>GERM THEORY</u> led to an understanding of the importance of cleanliness in the operating room, and <u>ANTISEPTIC SURGERY</u> was developed which helped to stop infection.

Problem - Tackling pain: the development of anaesthetic

Doctors had been experimenting with pain relief for their patients for centuries to try and keep them still and quiet long enough to perform operations.

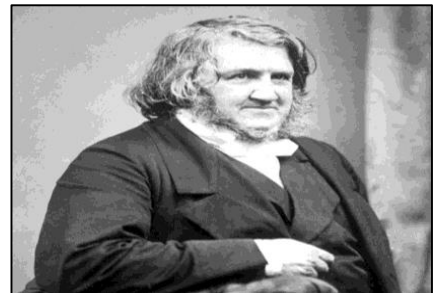
- **Laughing gas (1795)** and **ether (1842)** had been used as anaesthetics however neither of them were that effective:
- **Laughing gas wasn't strong enough** to make patients unconscious and **ether was so strong** it caused patients to vomit and was very flammable.

A more effective type of ANAESTHETIC was therefore needed.

James Simpson and chloroform

James Simpson was a British scientist who discovered that chloroform was an effective anaesthetic and the first person to be knighted for his services to medicine.

- He gathered a group of friends together and they inhaled the vapours of various chemicals to see what might work. After sniffing chloroform, the entire group passed out and were discovered some time later.



Simpson's influence in Britain

	Positive effects	Negative effects
Chloroform itself	<ul style="list-style-type: none">• Chloroform began to be used as a solution to pain in surgery.• After Queen Victoria used it during the birth of her son in 1853, chloroform became even more popular in Britain.	<ul style="list-style-type: none">• Chloroform could be fatal however. The dose had to be carefully controlled, as it was easy to overdose a patient and kill them.• The chemical also sometimes affected the heart, which caused some healthy and fit people to die shortly after inhaling it.
More surgeries	<ul style="list-style-type: none">• More surgeries could now take place because of chloroform.• Lengthier and more complex surgeries could also now be attempted.	<ul style="list-style-type: none">• Because chloroform allowed for deeper surgery to be attempted, infection and bleeding became even bigger problems.

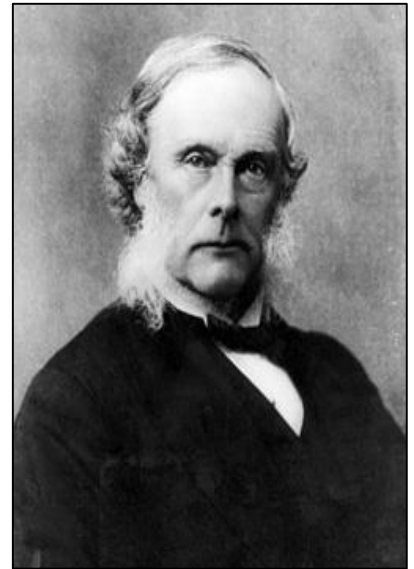
Problem - Tackling infection: the development of antiseptic surgery

Due to a lack of understanding about germs, surgeons did not make an effort to keep their surroundings, instruments or even themselves, clean when they operated on patients. Because of this, many patients survived operations but then died shortly afterwards from infections.

Joseph Lister and Carbolic acid

Joseph Lister was an English surgeon who discovered the use of CARBOLIC ACID as an antiseptic in 1865.

- Lister studied infected wounds and realised that the **flesh was rotting**. Basing his ideas on Pasteur's GERM THEORY who had identified **germs** as being responsible for decay, Lister found that MICROBES in the air was what caused flesh to rot.
- Lister started to look for a chemical that would clear bacteria from wounds. He found that the uses of CARBOLIC ACID during operations ensured that wounds did not become effective.
- Lister developed a **series of steps** to ensure that wounds did not become infected. These included spraying CARBOLIC ACID in the air during operations.



Lister's influence in Britain

Short Term	Long Term
<p>In the short term surgery did not change very much because of initial resistance from medical professionals:</p> <ul style="list-style-type: none">• Because lots of surgeons did not fully understand the science behind the new method they were not willing to use <u>CARBOLIC SPRAY</u>. They did not believe the air was full of germs.• <u>CARBOLIC SPRAY</u> dried out the skin and left behind an odd smell. Some surgeons argued that, since it made their hands sore, it would not do the patient any good.• Lister himself stopped using <u>CARBOLIC ACID</u> in 1890.	<p>In the long term attitudes changed. New antiseptic methods were developed and introduced to improve surgery.</p> <ul style="list-style-type: none">• The key change here wasn't that doctors started using <u>CARBOLIC ACID</u>, what was important was that surgeons finally understood that performing safe surgery was not only possible – it was their duty.• From 1890 onwards, the beginnings of <u>ASEPTIC SURGERY</u> began to be developed thanks to this change in attitude. Surgeons started to boil their instruments to sterilise them as well as wearing rubber gloves and face masks when performing operations.

New approaches to prevention: the development and use of vaccinations

By 1900, people still believed that the best way to avoid dying from a disease was not catching it at all. As cures for diseases were still not effective, scientists continued to focus on prevention and developed the idea of a VACCINATION.

Timeline of the development of VACCINATIONS

1700

In 1700, people knew about INNOCULATION (Giving people a mild dose of a disease to protect them from getting the disease badly) but scientists could not explain why this worked as they did not know about germs. Inoculation therefore worked sometimes but not always.

1700

1796

Edward Jenner was the first doctor to vaccinate people against smallpox. He found that if you inoculated a person with cowpox, they would not catch smallpox. In 1798 he published his findings and named the technique '**VACCINATION**' after the Latin word for cow '*vacca*'

1861

Pasteur publishes his GERM THEORY which identified germs as being responsible for disease.

1878

Pasteur presents his case for GERM THEORY of infection. He theorised that microorganisms were responsible for disease. Pasteur realised that that vaccines could only be developed once the germs causing that specific disease had been identified.

1879

Pasteur discovered that injecting chickens with a weakened form of chicken cholera gave them immunity to the disease. Pasteur could now explain how and why the vaccine worked and discovered the principle of INNOCULATION.

1884

Inspired by Pasteur's vaccinations of animals, **Koch's** work isolated MICROBES that caused specific diseases. This led to other scientists being able to develop vaccinations.

1890

Thanks to the work of Pasteur and Koch, **Emil von Behring** developed a vaccine for tetanus and diphtheria.

1900

The Public Health Act 1875

Alongside the new scientific methods of prevention, a great deal was being done to improve the living conditions in Britain, Particularly in larger cities.

Government attitudes to public health		
1700	1800	1860
<p>In 1700, the government had little interest in improving conditions in cities.</p> <p>They had a <u>LAISSEZ-FAIRE</u> attitude. This describes governments who do not get involved in the day-to-day lives of their population.</p> <p>The government believed it was not their responsibility to interfere in the way that people lived.</p>	<p>During the beginning of the 1800s, this attitude began to change. More men had the right to vote, so the government began passing laws that appealed to working class men so that they would vote for them to stay in power.</p> <p>Cholera also arrived in Britain during the 1800s. The epidemic led to the deaths of thousands of people. John Snow proved that cholera spread because of dirty drinking water.</p> <p>1848 Public Health Act The Central Board of Health was created and although it was abolished 10 years later, the Act also encouraged local Boards of Health to be set up to appoint a Medical Officer, provide sewers, inspect lodging houses and check food which was offered for sale.</p>	<p>From the 1860s, the government began to take more action to improve the living conditions for people in cities.</p> <ul style="list-style-type: none">• In London, 1,300 miles of sewers were built by 1865.• In Birmingham, slums were demolished.• In Leeds, a local business obtained a court order to prevent sewage from being drained into the river from which they got water,

By 1870, there had been a change in the way people felt about public health.

More people began to recognise that it was now everybody's responsibility. In the response to this change in attitude. The government passed the **Public Health Act in 1875.**

City authorities had to follow the rules it set out. The responsibilities included:

- Providing **clean water** to stop diseases that were spread in dirty water.
- **Disposing of sewage** to prevent drinking water and washing water becoming polluted.
- Employing a **public officer of health** to monitor outbreaks of diseases.
- Ensuring **new houses were of better quality**, to stop damp and overcrowding.
- Building **public toilets** to avoid pollution.
- Providing **public parks** for exercise.
- **Inspecting lodging houses** to make sure they were clean and healthy.
- Creating **street lighting** to prevent accidents.
- **Checking the quality of food** in shops to make sure that it didn't cause somebody harm.

The government had taken solid steps to prevent the spread of disease – and it worked.

Summary of approaches to prevention and treatment

By 1900, the treatment and prevention of disease had changed. This was due to an improved understanding of the cause of disease.

- More **hospitals were built**, making treatments more widely available.
- Hospitals were **cleaner** and built to provide space for recovery, thanks to the work of **Florence Nightingale**. Nursing had also become a respected profession.
- **Herbal and plant remedies were still popular** for common illnesses, because few new treatments had been developed.
- **Surgical procedures had become a more effective** method of treatment as a result of the development of anaesthetics and antiseptics. However, blood loss was still a problem, so surgeons still had to work quickly.
- Scientists had developed a **method for vaccinating people against diseases** and had begun to develop vaccines for particular illnesses.
- In the 19th century, the **government began to take action to improve public health in cities**. This was a result of a better understanding of the link between dirty conditions and disease and it led to a healthier population.

Developments in understanding...	Factors 1700-1900	Factor
CAUSE	<ul style="list-style-type: none"> • <u>GERM THEORY</u> • The development of work on identifying <u>MICROBES</u>. 	<ul style="list-style-type: none"> • Role of technology (microscopes). • Role of science of chemistry. • Role of individuals.
TREATMENT	<ul style="list-style-type: none"> • Better hospitals and nursing thanks to the work of Florence Nightingale • Improvements in surgical treatment, because of <u>ANAESTHETICS</u> and <u>ANTISEPTIC SURGERY</u>. 	<ul style="list-style-type: none"> • Role of individuals. • Role of science of chemistry.
PREVENTION	<ul style="list-style-type: none"> • Development of <u>VACCINATIONS</u>. • Improved water supply and drainage with the Public Health Act 1875. 	<ul style="list-style-type: none"> • Role of individuals. • Role of government

Fighting cholera in London, 1854

CHOLERA was a terrible disease that arrived in Britain in 1831. It spread quickly across the country. It arrived in London in 1832 and there were 5,275 deaths in the city by the end of the year. **CHOLERA** mainly affected the poorest people in the poorest areas, however wealthier districts were not immune.

Attempts to prevent the spread of cholera:

- Some steps were taken to try to **clean up the filthiest areas of the cities** and prevent the spread of cholera.
- The belief of **MIASMA** and rotting material caused disease was still widespread, so the government encouraged cities to set up boards of health.
- **This did not have a great effect on people's living conditions.**

CHOLERA:

A disease that caused diarrhoea and sickness that became so bad, the victim would not have enough water in their body to keep their organs working properly.

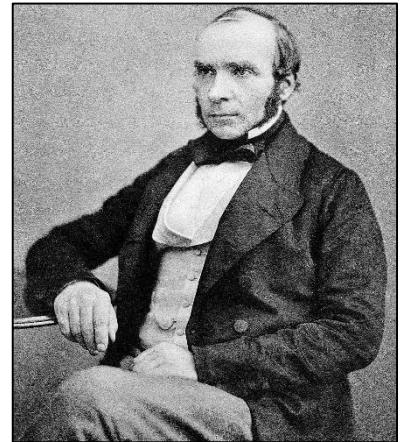
As the sufferer became dehydrated, the blood would become thicker, rupturing blood vessels under the skin.

John Snow

John Snow was a popular and well-respected surgeon who lived in London. He observed cholera during the epidemic of 1848-49 and concluded that cholera was transmitted by dirty drinking water.

The 1854 epidemic and the Broad Street Pump

- In August 1854, **cholera broke out in Soho**, where Snow lived. Snow decided to investigate 93 deaths in his local area.
- Snow created a **spot map** where he drew spots on a street map to **show where the deaths had occurred** in the area.
- After looking at the map, John Snow realised there was a pattern: the **number of deaths seemed to be centred around the water pump on Broad Street.**
- Snow believed that the **water pump was the source of the infection.** He removed the handle from the pump which stopped the locals from using it and the cholera outbreak went away.
- Later inspections of the well underneath the water pump revealed that it was **very close to a cesspit** and it was **leaking waste** into the well and **spreading cholera.**



Snow's influence in Britain

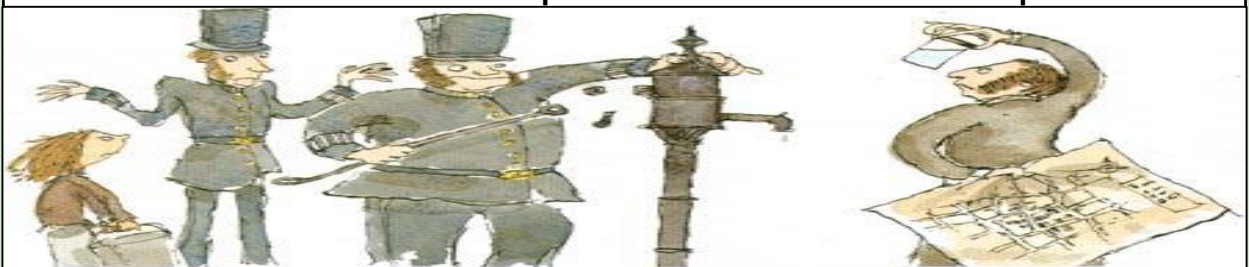
Had an impact	Did not have an impact
<p>Snow had a lot of practical evidence to show that Cholera was spread in water.</p> <ul style="list-style-type: none">His work had an immediate impact on the residents of Soho Square, many of whom avoided cholera thanks to his removal of the pump handle.	<p>Many people rejected Snow's work as he had no scientific evidence to show what caused Cholera.</p> <ul style="list-style-type: none">Other scientists pointed out that cases would still occur among people who lived further away from the pump.The General Board of Health rejected Snow's findings, instead still believing the theory of MIASMA.Admitting that cholera was present in the water would mean having to take steps to provide clean water which would be very expensive.
<p>In 1855, Snow presented his findings to a House of Commons Committee proving that cholera was transmitted by dirty water.</p> <ul style="list-style-type: none">The government agreed to follow his recommendation that a new sewer system should be built.It was begun in 1860 and completed in 1875.	<p>In 1858, an unusually hot summer had caused 'The Great Stink' in London.</p> <ul style="list-style-type: none">The Thames was low and the stench of the exposed sewage on the riverbank s heating up became terrible.This is what really forced the government to work on the new sewers in 1860.

Overall Impact

In the short term Snow's work meant that the spread of cholera in the Soho Square area was stopped, saving hundreds of peoples lives.

However his impact outside of the area was very limited.

- It would be another seven years before **Pasteur** published his **GERM THEORY** – three years after Snow died – and another 30 years until **Koch** finally isolated the **BACTERIUM** that caused the disease.
- It was not until later that the importance of clean water was accepted.**



3. Knowledge Organiser

SUMMARY OF THE PERIOD

Significant changes in medicine occur in this period.

- By 1900, there was a **better understanding of how germs cause disease** and work was being done to **develop new vaccines and treatments**.
- The **government**, which started out with a **laissez-faire** attitude to public health, began to **become more involved**, with compulsory small pox vaccinations and the Public Health Act 1875.
- **Hospitals developed into clean, modern institutions** thanks to the work of Florence Nightingale and more surgery became possible through the use of anaesthetics. Fewer people died as a result of Joseph Lister's pioneering work with antiseptics.

Key Events

1798	Edward Jenner developed the first vaccine for Smallpox
1847	James Simpson developed chloroform as an anaesthetic
1848	First Public Health Act (ineffective).
1848	Smallpox vaccination made compulsory
1854	Jon Snow proved cholera spread through water
1859	Florence Nightingale wrote her book Notes on Nursing.
1861	Louis Pasteur's germ theory was published
1867	Lister used antiseptic to prevent infection
1875	The Public Health Act. Local councils had to provide sewers, drainage and fresh water as well as medical officers(effective).
1881	Pasteur develops anthrax vaccine.
1882	Robert Koch identified bacteria that caused specific diseases.

Key People

Edward Jenner	Pioneered the smallpox vaccine
Louis Pasteur	Disproved spontaneous generation with his germ theory; developed vaccines for anthrax and rabies; pioneered pasteurisation.
Robert Koch	Using Pasteur's germ theory to identify which germs caused anthrax. He developed a way of dying germs to find out which diseases they were responsible for.
Florence Nightingale	Helped establish nursing as a respectable profession for women; improved sanitation and standard of care at military hospitals in the Crimea; founded the school of nursing at St Thomas hospital.
John Snow	Proved that cholera is spread by water, not miasma. Made chloroform and ether safer to use by working out correct dosage.
James Simpson	Discovered the anaesthetic properties of chloroform.
Joseph Lister	British surgeon who pioneered antiseptic surgery using Carbolic Acid spray.

3. Knowledge Organiser

Key Words

Anaesthetic	A substance that makes you unable to feel pain.
Antibodies	Particles that the body creates when it first encounters the germ, so that it can fight off the same disease more easily if it comes back.
Anti-septic surgery	Use of antiseptics in the performance of operations and dressing of wounds.
Aseptic surgery	Surgery where microbes are prevented from getting into a wound in the first place, as opposed to being killed off with an antiseptic
Bacteriology	The study of bacteria
Carbolic acid	A type of disinfectant.
Cowpox	A disease causing red blisters on the skin, similar to smallpox. It can be transmitted from cows to humans.
Germ Theory	Theory that diseases are caused by the presence of micro-organisms within the body.
Inoculation	Deliberately infecting oneself with a disease, in order to avoid a more severe case of it later on.
Laissez-faire	The French terms means 'leave be'. It is used to describe governments who do not get involved in the day-to-day lives of their population.
Miasmata	An unpleasant or unhealthy smell or vapour.
Microbes	A microbe is a tiny living organism that is too small to see without a microscope. Microbes include bacteria.
Pasteurisation	A way of preserving food or drink by heating to 55 degrees C and killing the bacteria.
Small pox	A highly contagious and fatal disease with fever and pustules that usually leave permanent scars.
Spontaneous generation	The theory that decaying matter turns into germs.

Q1 - Which person developed Germ Theory? a) Jenner b) Pasteur c) Snow d) Nightingale	Q2 - In what year was Germ Theory published? a) 1860 b) 1862 c) 1861 d) 1863	Q3 - What did Pasteur prove was wrong? a) Germ Theory b) Cholera c) Spontaneous Generation d) Pasteurisation
Q4 - What did Robert Koch discover? a) Cowpox b) That bacteria caused tuberculosis c) Germ Theory d) Spontaneous Generation	Q5 - What did Robert Koch prove in 1884? a) That cholera spread through water b) That spontaneous generation was incorrect c) Germ Theory d) Pasteurisation was wrong	Q6 - Which person discovered Magic Bullets? a) Paul Ehrlich b) Jenner c) Pasteur d) Koch
Q7 - what was the first Magic Bullet? a) Savlon 606 b) Saliva 607 c) Salvarson 606 d) Salty 606	Q8 - In what year had Ehrlich and his team discover several Magic Bullets? a) 1910 b) 1911 c) 1912 d) 1914	Q9 - Which illness did Ehrlich treat with Magic Bullets? a) Typhoid b) Cholera c) Syphilis d) Cowpox
Q10 - What did James Simpson discover? a) Vaccinations b) Chloroform c) Magic Bullets d) Cholera spread in water	Q11 - What were two positive effects of chloroform? a) It was used to prevent pain in surgery b) Chloroform could be fatal c) Bleeding became a big problem d) Longer surgeries could take place	Q12 - What did Joseph Lister discover? a) Chloroform b) Magic Bullets c) Carbolic Acid d) Syphilis
Q13 - What was a short term problem with Carbolic Acid? a) It killed people b) It killed the surgeon c) It made hands slippery d) It dried people's hands out and made them sore	Q14 - What type of approach to Public Health did Governments have in the 1700s? a) Laissez - Faire b) Communist c) Democratic d) Socialist	Q15 - What happened in the 1800s that meant the public had more say in government affairs? a) Women were given the vote b) Politicians were given less power c) More men were given the vote d) WW2
Q16 - In what year was the Public Health Act passed? a) 1785 b) 1875 c) 1975 d) 1695	Q17 - In what year was the Central Board of Health created? a) 1784 b) 1848 c) 1875 d) 1948	Q18 - From 1875 onward, what did council have to do? a) Provide an NHS service b) Provide X-Rays c) Provide clean water d) Provide public parks
Q19 - In what year did a cholera epidemic hit London? a) 1854 b) 1853 c) 1852 d) 1851	Q20 - which man discovered that Cholera was transmitted by dirty drinking water? a) Pasteur b) Snow c) Jenner d) Koch	Q21 - In what year was the Great Stink in London? a) 1854 b) 1860 c) 1858 d) 1859
Q22 - what is an anaesthetic? a) A substance that makes you unable to feel pain. b) Particles that the body creates when it first encounters the germ, so that it can fight off the same disease more easily if it comes back. c) Surgery where microbes are prevented from getting into a wound in the first place, as opposed to being killed off with an antiseptic d) A type of disinfectant.	Q23 - What is Germ Theory? a) The study of bacteria b) A disease causing red blisters on the skin, similar to smallpox. It can be transmitted from cows to humans. c) An unpleasant or unhealthy smell or vapour. d) Theory that diseases are caused by the presence of micro-organisms	Q24 - what is Pasteurisation? a) The theory that decaying matter turns into germs. b) A way of preserving food or drink by heating to 55 degrees C and killing the bacteria. c) A substance that makes you unable to feel pain. d) The study of bacteria

Part four: Modern medicine

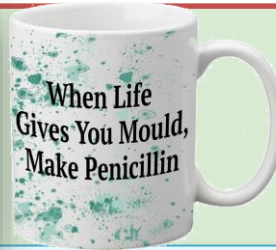
- **Modern treatment of disease:** the development of the pharmaceutical industry; penicillin, its discovery by Fleming, its development; new diseases and treatments, antibiotic resistance; alternative treatments.
- **The impact of war and technology on surgery:** plastic surgery; blood transfusions; X-rays; transplant surgery; modern surgical methods, including lasers, radiation therapy and keyhole surgery.
- **Modern public health:** the importance of Booth, Rowntree, and the Boer War; the Liberal social reforms; the impact of two world wars on public health, poverty and housing; the Beveridge Report and the Welfare State; creation and development of the National Health Service; costs, choices and the issues of healthcare in the 21st century.



Modern treatment of disease: Penicillin

Penicillin

Bacteria were discovered in the **19th Century** (1801-1900). But doctors were unable to treat **bacterial** diseases. By the **20th Century** (1901 - 2000) doctors were able to treat bacterial infections using **penicillin**, (the first ever antibiotic).



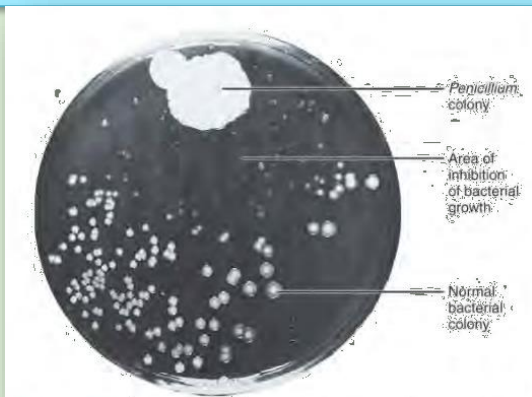
Fleming discovered penicillin

1. **Alexander Fleming** saw many soldiers die of **septic** wounds caused by **staphylococcal** bacteria when he was treating soldiers in an army hospital during **WWI**
2. **Fleming** searched tirelessly for a cure. He originally identified the **antiseptic** substance in tears **Lysozyme**, in **1922**. But this only worked on destroying some germs.
3. In **1928 Fleming** was cleaning away some old petri dishes where he had been growing **staphylococci** and noticed a **fungal spore** had also been developing.
4. **Fleming** noticed that the **staphylococci** had stopped growing around the mould. The **fungus** was identified as **Penicillium notatum**. It was producing a substance that was killing bacteria. The substance was given the name **penicillin**.
5. **Fleming** published his findings in articles between 1929 - 31. But nobody was willing to fund his further research. The **industrial** production of **penicillin** still needed to be developed.



Florey and Chain found a way to Purify Penicillin

1. **Penicillin** is a natural product and needs to be purified - **Howard Florey's** team in Oxford between **1938** and **1940** were able to purify the product by **freeze-drying** the **penicillin**. **Ernst Chain** was the gentleman who discovered this process. **Florey and Chain** struggled to grow large amounts of **penicillin**. They used every dish they could find. The patient used during **Florey and Chain's** first **clinical trial** died when the **penicillin** ran out.



Florey took penicillin to America for Mass production

1. **Florey** knew that **penicillin** could be used effectively to treat **WW2** soldiers. British **chemical firms** were too focused on making explosives so **Florey** went to **America**.
2. The **American government** were reluctant at first to mass produce penicillin. The USA had also joined the war in **1941**. But the US government gave out grants to business willing to produce **penicillin**.
3. By **1943** the **British Government** began to mass produce penicillin. **Mass production** was sufficient for **military medics** by 1944. After the war, the cost of **penicillin** fell, making it more available for **general use**. **Fleming, Florey and Chain** were awarded the **Nobel Prize** in 1945.

Modern treatment of disease: Pharmaceutical Industry

Penicillin is a mass produced drug. **Pharmaceutical industries** conduct **research** and **develop** new medicines.



1. **Chemotherapy** is the treatment of cancer using **drugs**. It began in WW2 and pharmaceutical companies developed these medicines from the **1960s** onwards.
2. In **1981** doctors discovered a new illness called **AIDS**, which is caused by the **HIV** virus. In **1987** pharmaceutical companies began producing AZT, the first approved medicine to treat HIV.
3. In **2002** there was an outbreak of a new virus called **SARS** in China. The virus quickly spread. **SARS** causes breathing difficulties. There is no cure but pharmaceutical companies are trying to develop a cure.

The Pharmaceutical Industry

1. In the late **1800s** **chemical industries** in **Britain, Germany, Switzerland** and the **United States** began to **boom** (make lots of money). In the late **19th** and early **20th century** there were discoveries of new drugs including **aspirin (1899)**, **insulin (1921)**, **sulphonamides (1932)** and **penicillin**.
2. Chemical Industries were the most suitable businesses to make drugs on a large scale. They had the money, technology and space to create drugs. The **pharmaceutical industry** began to take off on a huge scale.
3. Pharmaceutical companies have researched and developed new industries. They also **mass produce medicines** to be sold world wide.



The pharmaceutical industry has faced several problems

1. Drugs have to go through a lot of tests before they are given to patients. This is to make sure the drugs don't cause damaging **side effects**.
2. In the **1950s** the drug **thalidomide** was released as a sleeping pill. But it became very popular with **pregnant women** as reduced **morning sickness**. However, the **drug** damaged the unborn babies and many children were born with **underdeveloped limbs**.
3. The **thalidomide** tragedy forced **pharmaceutical industries** to begin testing drugs more thoroughly. In **1963** the **government** responded by setting up a **Committee on Safety of Drugs** to make sure also new drugs were **safe** before being given to patients.
4. **Pharmaceutical companies** have **high costs** for researching rare diseases. That's why they tend to focus on more common illnesses as they will be able to make a lot of money.
5. **Antibiotic resistance** is when a type of bacteria adapts so it isn't **affected** by antibiotics anymore. The resistance tends to happen when **doctors** and **patients** overuse antibiotics. Bacteria becomes more resistant to them.
6. Around **25,000** people in the European Union die every year as a result of infections caused by antibiotic-resistant bacteria.

Modern treatment of disease: Transplants

Transplants have been made more successful

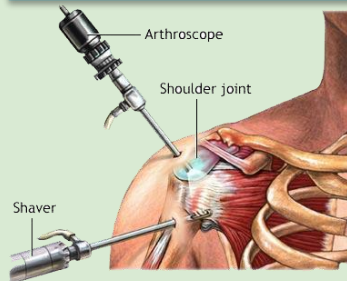
1. In **1905**, the first successful **transplant** of the **cornea of the eye** was performed.
2. The first complete organ to be successfully transplanted was the **kidney**. **Livers, lungs, pancreases and bone marrow** can now be transplanted.
3. The first successful **heart** transplant was carried out by a **South African** surgeon **Christiaan Barnard** in **1967**. The patient only survived for a further **18 days**. He died of pneumonia.



- The problem for transplants is the body rejecting the organ. The human body has an **immune system**. The **immune system** attacks the implant as if it was a disease.
- Early transplants operations were limited in success because doctors lacked **immunosuppressants** - these are drugs that stop the body attacking the transplants.
- Since the **1970s**, researchers have developed **more effective** immunosuppressants. These drugs make transplants safer and more successful.

Technology has improved modern surgery

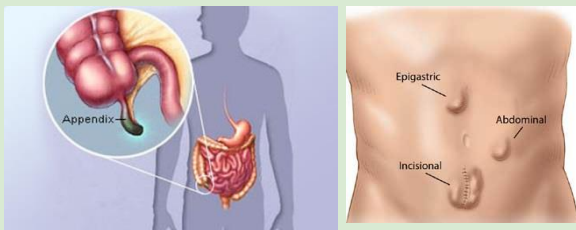
1. Technology and science have helped developed treatments for diseases e.g. like cancer. **Radiation** was discovered in **1896-1898**. This was discovered by **Antoine Henri Becquerel, Marie Curie** and **Pierre Curie** this discovery led to the creation of **radiation therapy**. Radiation is now used to cure cancerous cells.
2. **Lasers** were developed in the **1950s** led to their use in medicine in the **1980s**. **Laser surgery** is used to correct **eyesight issues, cancer** and also used in **dentistry**.
3. Advances in **video technology** led to the development of **Keyhole surgery** in the **1980s**.



Keyhole surgery relies on using an **endoscope**. This is a small camera that is fed through a small cut. Surgeons use these cameras to look inside bodies.

Keyhole surgery is useful for **investigating** causes of pain or infertility. It's also used for **vasectomies, removing cysts** or the **appendix, mending hernias** as well as other minor operations.

Keyhole surgery produces smaller scars, and allows them to recover more quickly.



ALTERNATIVE THERAPIES

Acupuncture: the method of placing needles in a patient's skin to relieve pain.
Homeopathy: using weak solutions of natural substances

Downsides: **little scientific evidence** that alternative methods actually work.

Positives: doctors are now trying to use modern medicines in conjunction with alternatives therapies.



Modern treatment of disease: The Liberal Social Reforms

The Liberal Social Reforms

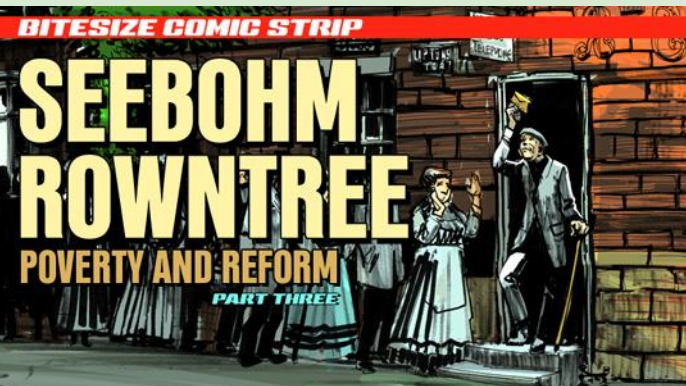
1. Up until the **19th Century**, people believed the government should have **little involvement** in public health. This began to **change** after **1900**, when the **Liberal social reforms** were introduced to deal with **poverty**.
2. The poor were working **long hours** for **low wages**. Many people **couldn't afford** doctors or medicine they could barely provide their children with **three decent meals** a day. Many people lived in **slums** or **overcrowded**.



Two reports showed how widespread poverty was:

Booth's report: Charles Booth was a wealthy researcher. He focused on reasons for people living in poverty. He wrote a book called **Life and Labour of the People in London**. 30% of Londoners were living in severe **poverty**, and that it was sometimes **impossible** for people to find work, however hard they tried. He showed that people were poor due to **low wages** and **lack of government support**.

Rowntree's Report: Seebohm Rowntree had a factory in York. He didn't believe the problem was as bad there as it was in London - so he did a survey of living conditions. His report, **Poverty, a Study of Town Life** - showed that 28% of people in York couldn't afford basic food and housing.



The lack of access to good health care meant that most people's health was **pretty poor**. When the **Boer War** broke out in **1899**, army officers found that **40%** of volunteers were **physically** not suitable for fighting in the military.

The Government realised that it needed to improve **basic healthcare** in order to have an **efficient army**.

The Liberal Reforms improved health by tackling Poverty

Booth, Rowntree and the Boer War showed that there was a link between **poverty** and **ill health**. The newly-elected **Liberal** government and its Chancellor, **David Lloyd George**, realised it had to take action.

- **1906: Free school meals:** were introduced, paid for by local council taxes.
- **1907:** Local Education Authorities started giving children at their schools **free medical inspections**.
- **1908: Old Age Pensions** were introduced for the first time - they were for people aged over 70. It was the first ever welfare scheme to be paid for by **national taxes**.
- **1909: Labour exchanges** were introduced to help unemployed people find work.
- **1911:** The **National Insurance Act** was passed

The **National Insurance Act** introduced **health insurance** for workers - the worker, their employer and the government all contributed to a central fund that the workers could use for **sick pay** or to pay for a **doctor**.

Modern treatment of disease: Public Health and the World Wars

After WW2 standards of housing began to improve. The **Beveridge Report** argued that the state should provide support to people, resulting in the creation of the **welfare state** and the **NHS**.



Housing and Health Improved after the Second World War

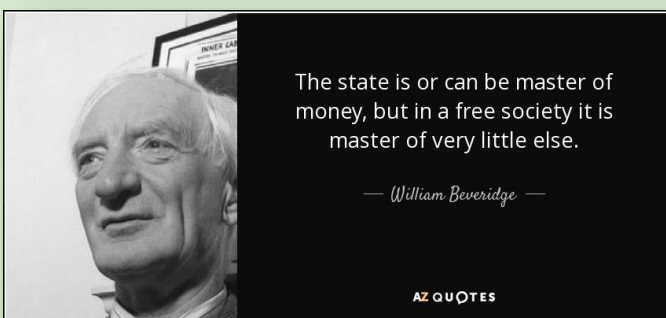
1. Towards the end of the **First World War**, Prime Minister **David Lloyd George** promised to tackle poor-quality housing by **homes fit for heroes** to tackle bad housing. Some **new council houses** were built in the **1920s** and **1930s**, but many of them were **too expensive** for the **poorest** families, who still lived in **slums**.
2. During the **Second World War**, destruction from **bombing** and **lack of construction** led to severe housing shortages, making the situation worse.
3. After the war, the **Labour** government built **800,000 homes** between **1945-51**. In **1946**, it passed the **1960s demolished over 900,000 old, cramped slums** - around **2 million** inhabitants were rehoused.
4. In **1961**, a report called **Homes for Today and Tomorrow** gave specific **standards** for new housing, including adequate **heating**, **a flushing toilet** and **enough space** inside and outside. This was the **final step** in tackling the issues of overcrowding, poor waste disposal that had caused major **public health problems**.

The World Wars created Pressure for Social Change

1. The **First World War** (1914 - 1918) and the **Second World War** (1939 - 1945) broke down **social distinctions** and brought people together whose lives had been very **separate**.
2. Raising mass armies constructed of people from different social groups meant **military officials** were more aware of the different health problems of the poor, because so many recruits were in **poor health**. More people were concerned about the public's health during **years of war** because they need to ensure that their military is as strong as possible.
3. The **evacuation** of children to rural areas during WW2 also made more wealthy individuals aware of the **disadvantaged lifestyles** many were leading in towns and cities.
4. After the **Second World War**, people looked for **improvements** in society. These feelings led to a **Labour Party** victory in **1945**. The **Labour Party** promised to introduce **healthcare** for **everyone** and **full employment**.

The Beveridge Report led to the Welfare State

1. In **1942**, during the Second World War, economist and social reformer **William Beveridge** published his famous report. The **Beveridge Report** became a bestseller - lots of people bought it and read it.
2. **Beveridge** said that the government had a **duty** to care for **all** its citizens, not just the poor or unemployed. To achieve this, Beveridge suggested the creation of a **welfare state** - a system of **grants** and **services** available to all British citizens.
3. The **1945 Labour Government** was elected with the promise to implement **Beveridge's proposals**. One of their first acts was to pass a new **National Insurance Act** in **1946** to support anyone who **couldn't work**, whether as a result of **sickness**, **pregnancy**, **unemployment** or **old age**.



The state is or can be master of money, but in a free society it is master of very little else.

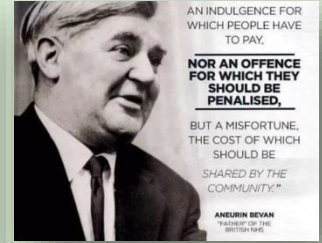
— William Beveridge —

Modern treatment of disease: NHS

One of the most important changes in modern British medicine was the creation of the **NHS**.

The National Health Service was established in 1948

In 1948, the **Labour government** implemented **Beveridge's** last proposal - a **National Health Service**. **Aneurin Bevan** was the **Labour Minister for Health** who introduced the **NHS**. The government **nationalised hospitals** and put them under local authority control. Treatment was made **free for ALL patients**.



Conservatives



Labour

ARGUMENTS FOR AND AGAINST THE NHS

FOR THE NHS:

- During World War Two the government took control of all hospitals, creating the **Emergency Medical Service**. Its success led to many **supporting** the NHS.
- The NHS would make medical care **free** so it was **accessible** to everyone.
- The NHS guaranteed that **hospitals** would receive **government money**, rather than having to rely on charities for money.

AGAINST THE NHS:

- Many **Conservatives** opposed the NHS (they didn't like it) as they believed the cost would be huge.
- **Doctors** saw themselves as **independent** professionals - they **didn't** want to be **controlled** by the government. They also worried they would lose a lot of **incomes**.
- Many doctors threatened to go on **strike** in protest against the NHS - the government finally **convinced doctors** by offering them a **payment** for each patient and letting them continue treating **free-paying patients**.

THE NHS WAS VERY POPULAR:

Although many **Conservatives** were **opposed** to the creation of the NHS, they **couldn't abolish it** - when they came back into power in **1951** it was too **popular**.

The NHS **increased** the number of people with access to healthcare - the number of doctors **doubled** between **1948** and **1973** to keep up with demand.

Today, the NHS provides a range of health services, most of which are **free** and **accessible** to everyone. They include **accident and emergency** care, **maternity** care and major **surgery**, as well as **pharmacies**, **dentists**, **mental health** services, **sexual health** services and general practitioners **GPs**.

TODAY THE NHS FACES SEVERAL CHALLENGES

1. The increase in **life expectancy** means there are many more **older people** in Britain today than there were in **1948**, who are more likely to suffer from **long-term conditions** like diabetes and heart disease. They need **regular medical attention** and require a lot of NHS times and resources.
2. Many people's **lifestyle choices** are putting strain on the NHS. **Smoking**, **obesity** and **alcohol consumption** can all harm people's health and may require expensive treatment - for example, smoking can cause **lung cancer** and drinking too much alcohol can cause **serious liver disease**.
3. Many modern treatments, equipment and medicines are very **expensive**, and the NHS has had to face **rising expectations** of what it can and should offer.
4. As a result of these factors, the **cost** of the NHS is rising **rapidly** - in 2015-16. The NHS budget **£116 billion** overall. In order to stay within the budget the **NHS** sometimes has to remove some of the services they offered.

Part four: Modern medicine

<p>Q1 - In what century was bacteria discovered?</p> <p>a) 17th b) 18th c) 19th d) 20th</p>	<p>Q2 - In what century was penicillin discovered?</p> <p>a) 17th b) 18th c) 19th d) 20th</p>	<p>Q3 - Which doctor first discovered penicillin?</p> <p>a) Fleming b) Florey c) Chains d) Bevan</p>
<p>Q4 - In what year was the Nobel Prize awarded for the production of penicillin?</p> <p>a) 1943 b) 1942 c) 1945 d) 1941</p>	<p>Q5 - During what event was Chemotherapy used to treat people?</p> <p>a) WW1 b) WW2 c) Boer War d) Cold War</p>	<p>Q6 - In which decade was HIV first discovered?</p> <p>a) 1980s b) 1990s c) 2000s d) 1970s</p>
<p>Q7 - what drug was taken by pregnant women to help with morning sickness?</p> <p>a) AZT b) Thalidomide c) penicillin d) aspirin</p>	<p>Q8 - what is antibiotic resistance?</p> <p>a) when antibiotics stop working b) when antibiotics always work c) when antibiotics don't go into a body d) when biotic tablets attack limbs</p>	<p>Q9 - In what year did the government set up the Committee on Safety of Drugs</p> <p>a) 1961 b) 1962 c) 1963 d) 1964</p>
<p>Q10 - How many people every year experience antibiotic-resistance?</p> <p>a) 15,000 b) 25, 000 c) 30, 000 d) 35, 000</p>	<p>Q11 - In what year did Christiaan Barnard carry out the first heart transplant?</p> <p>a) 1964 b) 1965 c) 1966 d) 1967</p>	<p>Q12 - When did lasers start being developed</p> <p>a) 1950s b) 1960s c) 1970s d) 1980s</p>
<p>Q13 - In what decade was keyhole surgery being developed as a treatment for illnesses?</p> <p>a) 1990s b) 1970s c) 1980s d) 1920s</p>	<p>Q14 - what is the name of the camera that is used during keyhole surgery?</p> <p>a) an indoscope b) an ondoscope c) an endoscope d) an infoscope</p>	<p>Q15 - where did many people live in industrial towns during the early stages of the 20th century?</p> <p>a) The countryside b) The suburbs c) The slums d) In skyscrapers</p>
<p>Q16 - which two men researched reasons for poverty in the UK?</p> <p>a) Roundtree and Boats b) Runtree and Boots c) Rowntree and Booth d) Roontree and Bootle</p>	<p>Q17 - which war had taken place which proved to many that men of Britain were unhealthy?</p> <p>a) The Boor War b) The Boom War c) The Bool War d) The Boer War</p>	<p>Q18 - In what year were free school meals introduced in Britain?</p> <p>a) 1911 b) 1908 c) 1906 d0 1909</p>
<p>Q19 - who wrote a report at the end of WW2 that stated there were problems in Britain?</p> <p>a) William Beveridge b) Charles Booth c) Seebohm Rowntree d) David Lloyd George</p>	<p>Q20 - Which political party took over Britain after WW2?</p> <p>a) The Liberal Party b) The conservatives c) The Labour Party d) UKIP</p>	<p>Q21 - which political party were against the NHS introduction?</p> <p>a) The Liberal Party b) The Labour Party c) The Conservative Party d) The Green Party</p>
<p>Q22 - How much money was budgeted for the NHS in 2015-16?</p> <p>a) £113 billion b) £114 billion c) £115 billion d) £116 billion</p>	<p>Q23- what happens if the NHS struggle to pay for certain treatments?</p> <p>a) They borrow more money b) They raise taxes c) They ignore the issue d) They have to close the service on offer</p>	<p>Q24 - what is the name of the treatment using many needles to treat pain?</p> <p>a) Homeopathy b) Acupuncture c) Keyhole surgery d) radiotherapy</p>