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# REVISE EDEXCEL GCSE (9–1)

# History

## MEDICINE IN BRITAIN

### c1250–present

# REVISION

## GUIDE AND WORKBOOK

For the 9–1 exams

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# History

## MEDICINE IN BRITAIN, c1250–present

# REVISION

## GUIDE AND WORKBOOK

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# Ideas: supernatural and religious

The Christian Church was dominant in medieval society. Supernatural ideas were common. This impacted on people's beliefs about the causes of illness.

## God and the cause of disease

The Church taught and people believed that God made them ill because He was either displeased with them or was testing their faith. This meant that people believed that there was no need to search for other, rational explanations for disease, which held back medical research and meant that few new ideas about the causes of disease appeared in medieval times.

### Astrology

- ✓ The alignment of planets and stars was thought to cause some diseases.
- ✓ Astrology was used to help diagnose what was wrong with a patient.
- ✓ Use of astrology wasn't new in 1250 but it increased through this period, especially after the Black Death when the Church became more accepting.

## The Church's control of ideas

- Most of what ordinary people learned was taught by the Church. The Church was also the centre of formal learning; it set up and ran universities where physicians were trained.
- The Church discouraged dissection and in general did not approve of people challenging ideas and authority.
- Unlike most people, monks and priests could read and write. Most large collections of books were in monasteries. This meant the Church was effectively in charge of what books were read.
- The Church approved of traditional, rational explanations for disease. In particular, it promoted the ideas of Galen as his theories fitted Christian beliefs that the body had a soul and that all parts had been created by God to work together.
- The Church also taught that people should follow Jesus' example and care for the sick. Many hospitals were housed in monasteries and nunneries.

Abbeys and monasteries were increasingly important during the Middle Ages and dominated many aspects of life including medicine.

See page 2 for details on Galen's theories and page 4 for details on medieval hospitals.

## Now try this

In what ways did the Christian Church **(a)** help and **(b)** hinder medicine in the Middle Ages?

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# Rational explanations for disease

Rational explanations for disease in Medieval England were still based on ideas from the Ancient world, in particular those of Hippocrates and Galen.

## The Four Humours

The Ancient Greeks thought everyone had a mix of four humours in their body. They believed people became ill when this mix was unbalanced, so to make people better they tried to put this balance right. These ideas continued well into the Middle Ages.

## Theory of Opposites

In the 2nd century AD, a doctor called Galen developed the idea of the Four Humours further. Besides bleeding and purging to get rid of excess humours, treatment based on his Theory of Opposites aimed to balance the humours by giving the patient the 'opposite' of their symptoms. For example, if you had too much phlegm (linked to water and cold) you should eat hot peppers.

The Four Humours

### Galen

Claudius Galen was a Greek doctor who worked in Ancient Rome. He wrote many books and his ideas were the basis of medical training in the Middle Ages. He developed Hippocrates' ideas and mainly used bloodletting, or purging, to prevent and treat illness, as well as his own treatments based on his Theory of Opposites. He also drew detailed diagrams of human anatomy using knowledge he gained from operating on wounded gladiators and carrying out dissections on dead (mostly animals') bodies.

### Hippocrates

Hippocrates was an Ancient Greek doctor. His ideas and books were very influential well into medieval times and beyond. He dismissed the idea that gods caused disease – he believed there was a physical reason for illness, which needed a physical cure. Most of his treatments were based on diet, exercise and rest but he also used bleeding and purging to get rid of excess humours. He wrote the Hippocratic Oath, where doctors swore to respect life and prevent harm. His method of clinical observation – studying symptoms, making notes, comparing with similar cases, then diagnosing and treating – is the basis of the approach used today.

## Miasma

Another theory about the cause of disease was that it was transmitted by 'bad air'. This was related to God because bad smells indicated sin. The theory originated in the Ancient world but continued into the Middle Ages and well into the 19th century.

## Now try this

Give **four** reasons why Ancient explanations and ideas for disease dominated medicine in the Middle Ages.

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# Approaches to prevention and treatment

Prevention and treatment of disease in the Middle Ages was based on rational and religious methods as well as traditional remedies.

## Rational treatments in connection with the Four Humours

1. Bloodletting was the most common treatment for an imbalance of humours. It was either done by cutting a vein, using leeches or by cupping. Different points in the body were used for different illnesses. Occasionally bloodletting was performed by physicians but, more usually, it was done by barber-surgeons or non-medical persons.

2. Purging was another treatment used to re-balance the humours. It either involved making a patient vomit or go to the toilet to remove food from the body. Emetics and laxatives were mixed by apothecaries, wise women or, at the patient's home, physicians prescribed treatments and sometimes gave enemas themselves.

## Methods to prevent illness

**Religious and supernatural methods**

- Living a Christian life – e.g. praying, going to church, and obeying the Commandments
- Carrying lucky charms or amulets
- Chanting incantations
- Self-punishment, such as flagellation – punishing yourself so God wouldn't

**Rational methods**

- Trying to keep streets clean
- Bathing and washing
- Purifying the air
- Exercising
- Bleeding and purging
- Not overeating

### Traditional remedies

The most common remedies were traditional ones made with herbs, which were drunk, sniffed or bathed in. Remedies also included different foods to rebalance the humours and ointments to apply to the skin. They were made at home or mixed and sold by an apothecary.

### Religious treatments

- ✓ Praying
- ✓ Fasting
- ✓ Going on pilgrimage
- ✓ Paying for a special Mass to be said

### Supernatural treatments

Supernatural treatments included specific ideas for certain illnesses, such as hanging a magpie's beak around your neck to cure toothache.

## Now try this

For each of the six rational prevention methods above, explain why people believed each method would help them stay healthy.

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Had a look ☐ Nearly there ☐ Nailed it! ☐

# Approaches to caring for the sick

There were different people who treated the sick in the Middle Ages.

## Who treated the sick?

**Barber-surgeons**
- No training.
- Carried out bloodletting, pulling teeth and lancing boils. Also cut hair!
- Did basic surgery such as amputating limbs (very low success rate).
- Cost less than a physician.

**Care in the home**
- Most ill people throughout this period were treated at home by a female family member.
- The village 'wise woman', often the Lady of the Manor, would also tend to people in their homes for free.

**Apothecaries**
- Received training but no medical qualifications.
- Mixed medicines and ointments based on their own knowledge or directions of a physician.
- Cost money (but less than a physician).

**Physicians**
- Medically trained at university and passed exams.
- Diagnosed illnesses and gave treatments, or sent patients to the apothecary or barber-surgeon.
- Expensive, so mainly used by the wealthy.
- Very few of them, with women physicians incredibly rare.

## What physicians did

1. Commonly, physicians observed a patient's symptoms and checked their pulse, skin colour and urine (for both colour and taste!).
2. They consulted urine charts in their vademecum (handbook).
3. They then consulted zodiac charts to help diagnose the illness and to work out the best time to treat the patient.
4. They then either treated patients themselves (though this was rare), or sent them to a barber-surgeon or apothecary.

## Hospitals

Usually, people with infectious diseases or incurable conditions were not admitted.

Many hospitals were places where travellers and pilgrims stayed on their journeys.

Patients and their surroundings were kept very clean.

Hospitals were places of recuperation rather than places where patients were treated for disease.

The number increased during the Middle Ages.

Patients were given fresh food and plenty of rest.

Many were run by the Church, so the emphasis was on God and healing souls.

Some hospitals were built for specific infectious diseases.

## Now try this

List examples of people and conditions that would have been treated by each of the following: physicians, barber-surgeons, apothecaries, hospitals and the home.

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# The Black Death, 1348–9

Case study

The Black Death reached Britain in 1348, killing about one-third of the population. Ideas about what caused the Black Death and how it could be treated tell us a lot about how people in Late Medieval England thought about illness and disease.

## What was it?

Most historians today think this disease was bubonic plague, carried by fleas living on black rats, which brought the disease to different countries on trading ships. Bubonic plague is passed to humans when an infected flea bites them and the disease enters their blood.

## Causes and avoidance

| How people thought the Black Death was caused | How people tried to avoid catching it |
|---|---|
| • Religion: God sent the plague as a punishment for people's sins.<br>• Astrology: the position of Mars, Jupiter and Saturn was unusual at this time.<br>• Miasma: bad air or smells caused by decaying rubbish.<br>• Volcanoes: poisonous gases from European volcanoes and earthquakes carried in the air.<br>• Four Humours: most physicians believed that disease was caused by an imbalance in the Four Humours.<br>• Outsiders: strangers or witches had caused the disease. | • Praying and fasting: because people believed that God had sent the disease, it made sense to show God they were sorry by punishing themselves.<br>• Clearing up rubbish in the streets.<br>• Smelling their toilets or other bad smells, in the belief this would overcome the plague.<br>• Lighting a fire in the room, ringing bells or having birds flying around the room to keep air moving.<br>• Carrying herbs and spices to avoid breathing in 'bad air'.<br>• Not letting unknown people enter the town or village. |

## Symptoms

Symptoms of the Black Death included:

- swelling of the lymph glands into large lumps filled with pus (known as buboes)
- fever and chills
- headache
- vomiting, diarrhoea and abdominal pain.

## Treatments

Treatments for the Black Death included:

- praying and holding lucky charms
- cutting open buboes to drain the pus
- holding bread against the buboes, then burying it in the ground
- eating cool things and taking cold baths.

## Now try this

Medieval people tried to prevent and cure the Black Death in many different ways. What does this tell us about what they thought caused disease?

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# Ideas: a scientific approach

'Renaissance' means rebirth and this period in European history saw a 'rebirth' of old ideas from Ancient Greece and Rome. People began to question, challenge and test assumptions. However, some things stayed the same.

## Change in ideas on causes of disease

Gradually, throughout the Renaissance period, fewer people believed in supernatural or religious causes of disease. Various new rational explanations for disease were suggested, such as seeds in the air spreading disease. The real change in this period was the reduced influence of the Church and a scientific approach to diagnosing illness.

## Continuity in ideas on causes of disease

- The theory of **miasma** continued to be believed by many to be the cause of disease. It was a particularly popular theory during epidemics.
- The Theory of the Four Humours continued to be an accepted explanation for disease, although by 1700 very few physicians still believed in it.

## The changing influence of the Church

During this time new religious ideas challenged the authority of the Catholic Church, making it more difficult for the Catholic Church to promote its ideas about science. People were still very religious but they began to look for new explanations for the cause of disease, rather than believing that disease was caused by God.

## Change in the work of physicians and scientists

During this period, as a new scientific approach was adopted, the way in which disease was diagnosed by physicians gradually began to improve. This was largely influenced by people like Thomas Sydenham.

- As fewer people believed that astrology caused disease, physicians stopped using astrology charts for diagnosis and timing treatment.
- Due to improved knowledge of digestion, physicians realised that urine was not a good indicator of disease and stopped using urine charts for diagnosis.
- Physicians carried out more direct observations and examinations of their patients, rather than relying on the patient explaining their symptoms.

## Thomas Sydenham

Sydenham worked as a doctor in London during the 1660s and 70s. His book *Observationes Medicae* (1676) outlined his theories and observations.

- ✓ He didn't rely on medical books when making a diagnosis, but observed patients and recorded symptoms in detail.
- ✓ He was instrumental in the 'new' idea that a disease had nothing to do with the nature of the person who had it.
- ✓ He based treatment on the disease as a whole and didn't treat individual symptoms.

He became known as the 'English Hippocrates' due to his influence on doctors (mostly after his death).

## Now try this

Write a sentence explaining what happened to belief in each of the following as a cause of disease during the Renaissance: Miasma, Theory of the Four Humours, God.

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# Transmission of ideas

One of the major changes in the Renaissance period was in the communication and transmission of medical ideas.

## The development of the printing press

The printing press, invented in 1440.

The printing press was invented around 1440 by Gutenberg. By the start of the Renaissance in 1500 there were hundreds of printing presses across Europe.

It meant that many exact copies of texts could be produced in a short amount of time.

It helped reduce the Church's control of ideas, as it could no longer prevent the publication of ideas it did not approve of.

The books, and therefore the ideas and discoveries of scientists and doctors contained within those books, could be shared more effectively and much faster across a wider area.

## The setting up of the Royal Society

The Royal Society aimed to further scientific understanding by carrying out and recording the results of experiments, sharing scientific knowledge and encouraging new theories and ideas. Most significantly, it sponsored scientists to enable them to carry out research.

From 1665 the Royal Society published a journal called *Philosophical Transactions*, in which scientists could share their work and ideas. This meant that doctors and scientists could study, challenge and build on each other's research. In this way, theories could be confirmed or dismissed and news of the findings could spread through the medical community quickly.

King Charles II granted a Royal Charter to the society. He was very interested in science and his approval of the society helped it to gain credibility.

**Now try this**

Explain how the invention of the printing press led to developments in medicine.

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# Continuity in prevention, treatment and care

Although there were some changes in hospital care, most treatment and preventions during the Renaissance remained the same.

## Hospitals

1. By 1500, hospitals were treating more sick people and were being used less by travellers and pilgrims. Most had their own apothecary to mix medicines and physicians frequently visited patients.
2. In 1536, the dissolution of the monasteries in England by Henry VIII caused most hospitals to close.
3. Some free, charity-funded hospitals were set up but it wasn't until well into the 1700s that the number of hospitals returned to pre-dissolution levels.
4. More pest houses began to appear, where people suffering from a particular contagious disease could go for care.
5. When hospitals did re-appear, they were run by physicians focused on treating the sick rather than by religion.

St Bartholomew's Hospital

## Community care

As in medieval times, most people who became ill were cared for at home, usually by a female relative. Physicians were still too expensive for the majority. Members of the community (again, usually women) helped with advice and remedies. Some were paid for their services.

**Continuing treatments and preventions**

- Traditional herbal remedies
- Healthy living
- Bleeding and purging
- Superstitions and prayer
- Cleanliness

## Changes in prevention and treatments

- More emphasis on removing miasma through draining swamps, and removing sewage and rubbish.
- People regularly changed their clothes to keep clean rather than just bathing.
- New herbal remedies from newly discovered countries appeared in England, and some were effective.
- The theory of transference led people to try and rub objects on themselves to transfer the disease to the object.
- Alchemy caused chemical cures using metals or minerals to become popular.

### Lack of change

The improved knowledge and discoveries of the Renaissance had a limited impact at the time because:

- ✓ the ideas were slow to be accepted
- ✓ they had no direct use in improving treatment or preventing disease
- ✓ their discoveries did not improve understanding of the cause of disease.

### Now try this

Explain why there were few totally new treatments for disease in the period 1500–1700.

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# Change in care and treatment

Although there was little practical change in medicine during the Renaissance, there were important changes in medical training and new discoveries made by Vesalius that led to changes in care and treatment after 1700.

## Training for apothecaries, surgeons and physicians

| | Apothecaries and surgeons | Physicians |
|---|---|---|
| **Continuity** | • They were still not given university training and were still considered inferior to physicians and they were cheaper. | • They were still trained at universities and the training lasted for many years.<br>• Training was still based on learning from textbooks rather than practical experience. |
| **Change** | • Both were better trained through being in guild systems, where they were apprentices, then journeymen, before becoming masters.<br>• A licence was now needed to work as an apothecary or surgeon and these were only issued after completing training. | • There was better access to a wider variety of medical books and detailed drawings due to the printing press.<br>• Gradually, new ideas about anatomy (led by Vesalius) and causes of disease inspired some physicians to become more practical and experimental.<br>• Dissection was legalised but took time to become commonplace. |

## Vesalius

Andreas Vesalius studied medicine in Paris in 1533, then became a professor of surgery in Padua, Italy. He carried out a large number of dissections on human bodies and many discoveries on how the body worked.

This drawing is taken from his most famous book, *On the Fabric of the Human Body*, which was published in 1543.

## The importance of Vesalius

- He improved understanding of the human body.
- He made the study of anatomy fashionable. It became central to the study of medicine.
- He proved that some of Galen's work was incorrect, which helped encourage others to question Galen's theories.
- He encouraged and inspired other medical professionals to carry out dissections and make further discoveries.
- His work was widely published in England and throughout Europe, and included detailed illustrations of the human body, which were copied into other medical textbooks.

## Now try this

List ways in which the work of Vesalius shows the differences between medicine in the Renaissance and Medieval times.

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# The Great Plague, 1665

Case study

The Great Plague of 1665 was the first serious outbreak of plague in England since the Black Death. There were many similarities and some differences in how people tried to treat and prevent it.

## Causes

People's beliefs about the causes of the Great Plague were mostly the same as their beliefs about the causes of the Black Death. There were a few differences:

- miasma was by far the most commonly believed cause
- far fewer people believed it was caused by an imbalance in the Four Humours
- people knew that disease could be passed from person to person.

See page 5 for more details about the disease and its symptoms.

### The Black Death and Great Plague

These two diseases were the same, so comparing the methods used to treat and prevent them is a useful guide to understanding what changed and what stayed the same in over 300 years of medicine. Remember to use examples from both outbreaks to show how much or how little change there had been in understanding and treating disease.

## Treatments

Like its causes, many treatments for the Great Plague were similar to those for the Black Death. As most people with the disease were quarantined, little is known about treatments, though many used herbal remedies, either mixed in the home or by apothecaries, and 'quack' doctors. There were some new treatments for disease that had an impact:

- The theory of transference meant that people tried to 'transfer' the disease to something else, especially birds, such as chickens.
- It was thought that people could sweat disease out, so sufferers were wrapped up in thick blankets and put by a fire.

## Government action

A real difference between 1665 and 1348 was a far greater reaction by local councils, who were ordered by the King to try and stop the plague from spreading.

- Theatres were closed and large gatherings were banned.
- Dogs and cats were killed.
- Streets were regularly cleaned.
- Barrels of tar were burned in the streets.
- Every day, carts collected the dead who were then buried in deep mass graves.
- A household was boarded into its home for 28 days or taken to the pest house if a member caught the plague.
- Days of fasting and public prayers were ordered.

Plague doctors wore costumes to prevent them catching the disease. The masks included sweet-smelling herbs to ward off miasma and the cloak was waxed so that nothing from the patient could be absorbed into it. Birds were believed to attract disease so the mask was in the shape of a bird's beak in the hope that it would cause the plague to leave the patient.

## Now try this

List **six** prevention methods used to try and stop people from catching the Great Plague. For each one, explain why they did this.

Use the image to help you remember prevention methods.

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# William Harvey

Case study

William Harvey was one of the most important individuals of the Medical Renaissance. He was influenced by Vesalius and went on to influence many others, including Sydenham.

## William Harvey

William Harvey, 1578-1657

- Studied medicine at Cambridge, then Padua.
- Became a lecturer of anatomy in London at the College of Physicians.
- Was one of James I's doctors.
- Carried out public dissections.
- Taught the importance of doctors observing and recording patients' symptoms, rather than relying on textbooks for diagnosis and treatment.
- Discovered the process of blood circulation.

Harvey published his findings in *An Anatomical Account of the Motion of the Heart and Blood in Animals* in 1628, which contained detailed diagrams like this one.

## Discovering the circulation of the blood

- Harvey researched Vesalius' theory that blood flowed towards the heart, which contradicted Galen's theory. He proved Vesalius was right using dissected bodies and pumps that showed blood only flowed one way.
- He then proved that blood could not be produced by the liver and absorbed into the body, as Galen had thought.
- He was influenced by new technology, such as mechanical water pumps, which made him think the human body worked in the same way.
- He discovered that arteries and veins were part of one system and that blood was pumped around the body by the heart.

## The importance of Harvey

- He proved that some of Galen's theories were wrong, bringing into question Galen's other theories.
- He improved knowledge about how the body worked and passed this knowledge on. By 1700 his work was being taught in medical schools.
- As a royal physician, Harvey's work gained publicity and credibility, and inspired others to find out more.
- His scientific methods of observation and use of dissection had brought results, and so were copied by others.
- His discoveries left many unanswered questions, which encouraged further experiments.

## Now try this

List the factors that were important in leading Harvey to make his discovery.

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# Germ Theory and microbes

Although this period began with little change in ideas about the cause of disease, by 1900, huge breakthroughs had been made in the discovery of the true cause of many diseases.

## Continuity in theory of causes of disease

There were few new ideas about the cause of disease in the 18th century, though some scientists thought that germs were produced by decaying matter – this was called spontaneous generation. Most people still thought miasma was a cause of disease, but this was becoming a less popular theory than it was in the Renaissance.

## Microscopes

By 1700, microscopes had developed so that cloudy images of what would become known as bacteria or germs could be seen. By 1850, microscopes had further improved so that extremely tiny images could be seen clearly. This was essential in enabling the scientific breakthroughs of the later 19th century.

Social attitudes towards science were changing – there was an increasing awareness of the need for rational explanations for the cause of disease.

## Change in theory of causes of disease: Germ Theory

In 1861, Louis Pasteur (a French chemist) published his Germ Theory, which showed that spontaneous generation was incorrect. He proved that microbes (bacteria or germs) in the air cause decay (he discovered this when investigating why liquids turned sour for the brewing industry). He theorised that germs also caused disease but was unable to prove this.

Robert Koch (a German doctor and scientist) read Pasteur's work and began to study microbes himself. He proved that Pasteur's theory was right, that microbes caused disease as well as decay. He identified the specific microbes that caused TB in 1882, and cholera in 1883.

Koch developed a new, easier way of growing bacteria on agar jelly, and also discovered that chemical dyes stained bacteria, which made them easier to see under a microscope. Other scientists used these methods to identify the microbes that caused other diseases.

Eventually, these discoveries were to have a direct impact on the prevention and cure of many diseases.

## The influence of Pasteur and Koch

Pasteur's Germ Theory had very little impact on medicine in Britain to begin with as he was not a doctor and his work focused on food and drink, not disease. Most doctors still believed in the spontaneous generation theory, but there were some (e.g. Joseph Lister) who did make the link between microbes and disease.

Koch's work had more of an impact in Britain than Pasteur's had, and he inspired others to research other microbes. However, it took time for most doctors and the British government to accept the Germ Theory of disease. Even though the real cause of many diseases had been discovered, it didn't yet have an impact on their medical treatment and prevention.

## Now try this

Explain **three** factors that led to the development of the Germ Theory.

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# Improvements in hospital care

Florence Nightingale was significant in influencing improvements in hospital care. Reports of her changes to hospital conditions after witnessing high death rates in military hospitals in the field had a significant impact on public opinion.

## Florence Nightingale

1. Nursing wasn't seen as a respectable job for women and there was little training.
2. Florence Nightingale attended the first nurses' training school in Kaiserwerth hospital, Germany.
3. She was asked to lead a team of nurses at the military hospital in Scutari during the Crimean War (1854–56).

4. She believed that miasma caused disease, so emphasised hygiene, fresh air, good supplies and training for nurses. Her approach greatly improved conditions in the hospital.
5. Her work was widely reported in newspapers in Britain. She published books on nursing and hospital organisation and set up a training school for nurses / midwives.

## Changes in hospital care

New hospitals (financed by charities and local councils) opened during the 19th century to look after the sick.

First cottage hospital (small buildings where nurses gave care and GPs prescribed to create a home treatment) opened in 1859.

Middle and upper classes could afford doctors to treat them at home.

Great Ormond Street Hospital, 1856

The elderly, sick or disabled poor were forced to enter workhouses.

Most hospitals tried to create a home atmosphere. Parents and visitors had to help nurses look after the patients.

Due to the work of reformers like Florence Nightingale, hospital cleanliness and organisation improved, and nurses were better trained. Pasteur's germ theory led to improved hygiene.

Nurses were given a more central role caring for patients and assisting doctors.

Great Ormond Street Hospital, 1875

Public pressure led to infirmaries (separate from workhouses) being set up for the poorest in society.

Specialist hospitals (such as asylums for the mentally ill and fever houses for infectious diseases) developed.

## Now try this

Give **three** examples of ways in which hospitals had improved by the end of the 19th century.

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# Anaesthetics and antiseptics

The three main problems that made surgery so dangerous were blood loss, pain and infection. The 19th century saw important developments in the management of pain and the reduction in infection.

## Search for an anaesthetic

**Before 1800, alcohol and opium** had little success in easing pain during operations.

**Laughing gas was used in 1844** in dentistry in the USA, but failed to ease all pain and patients remained conscious.

**Ether (used from 1846)** made patients totally unconscious and lasted a long time. However, it could make patients cough during operations and sick afterwards. It was highly flammable and was transported in heavy glass bottles.

**Chloroform (used from 1847)** was very effective with few side effects. However, it was difficult to get the dose right and could kill some people because of the effect on their heart. An inhaler helped to regulate the dosage.

**Cocaine** was used as the first local anaesthetic in 1884. In 1905 a less addictive version – novocaine – was used as a general anaesthetic.

James Simpson discovered chloroform when he was looking for solutions to pain during surgery. He gave lectures and wrote articles to promote its use for surgery and for childbirth. He was the first person to be knighted for services to medicine.

## Development of antiseptics

Joseph Lister was a surgeon who worked at Glasgow Royal Infirmary.

### Timeline

**1861** Half the patients in surgery die from postoperative infections. Lister starts work as a surgeon.

**1864** Lister reads Pasteur's Germ Theory and learns that carbolic acid kills parasites in sewage.

**1865** Lister soaks bandages in carbolic acid to avoid wounds getting infected.

**1866** Lister uses carbolic acid to clean wounds and equipment and invents a spray to kill germs in the air.

**1867** Lister states that his wards have been free from infection (sepsis) for 9 months. He publishes his ideas.

**1877** Lister becomes Professor of Surgery at King's College Hospital, London.

## Aseptic surgery

Lister's work inspired others to search for methods to prevent the spread of infection in hospitals. By 1900, operating theatres and wards were thoroughly cleaned using aseptic techniques, and surgeons and nurses wore sterilised clothing and used sterilised instruments.

## Opposition

People worried about the long-term effects of using anaesthetics and thought that being unconscious made patients more likely to die. The Victorians were very religious and thought that God inflicted pain for a reason, so it was wrong to interfere with His plan. Also, it took a long time for doctors and surgeons to believe in the Germ Theory and therefore accept Lister's discoveries.

## The impact of anaesthetics and antiseptics

Surgery became pain free and patients didn't struggle, so surgeons could take more time and be more careful. Deeper, more complex surgery became possible and the death rate dramatically decreased as surgery was more successful. Aseptic surgery was possible because antiseptics were used to clean wounds and operating theatres.

### Now try this

Give **three** reasons why surgery was more successful by 1900.

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# Approaches to prevention of disease

The 19th century saw some important developments in disease prevention as the Germ Theory was used to create vaccines for some diseases. Also, the government began to play more of a role in public health and increased prevention rates by reducing the conditions that fostered disease.

## The development of vaccinations

1. Pasteur carried out experiments to observe microbes and published his results in 1861. He called his discovery Germ Theory.
2. Pasteur's team of scientists discovered that a weakened version of a disease-causing microbe could be used to create immunity from that disease.
3. Pasteur admired Jenner and called his new discovery 'vaccination' in tribute to Jenner.
4. Pasteur developed vaccines against anthrax and chicken cholera for animals, and against rabies for humans.
5. Pasteur's work inspired other scientists to develop vaccines for human diseases.

For more on Jenner see page 16.

## Reasons for the 1875 Public Health Act

Previously the government did not believe it was its role to improve living conditions and saw it as interfering in people's lives. It preferred a 'hands off', *laissez-faire* policy. During the 19th century, the attitude of government began to change due to several epidemics (especially cholera) and the increasing scientific evidence that these diseases were caused by poor living conditions. Also, the increasing number of men who could vote influenced politicians. By 1875, people recognised that it was the government's responsibility to improve living conditions in the cities.

**Public Health Act, 1875**

City authorities must provide:

1. clean water
2. sewers
3. public toilets
4. street lighting
5. public parks.

As well as:

1. inspect lodging houses for cleanliness
2. monitor the building of new houses to prevent damp and overcrowding
3. check the quality of food sold in shops
4. employ a public officer of health to monitor disease.

**Now try this**

Explain **two** reasons why the Public Health Act of 1875 was important.

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Had a look ☐ Nearly there ☐ Nailed it! ☐

# Jenner and vaccination

Case study

Edward Jenner was the first to make a discovery that successfully prevented people from catching the deadly disease, smallpox.

## Smallpox

In the 18th century, smallpox killed more children than any other disease. Thousands of adults died, too, and survivors were often left with terrible scars. The disease spread quickly and easily from person to person.

## Jenner

Edward Jenner was born in 1749. He trained in London as a surgeon and apothecary before working at St George's Hospital. He then returned to his birthplace in Gloucestershire to work as a GP, where he made his great discovery.

## Vaccination and smallpox

Since the 1720s, doctors had been inoculating people against smallpox by infecting them with a mild version of the disease. This could still kill and only the very rich could afford it.

Jenner collected evidence of the success and failure of smallpox inoculations. He regularly treated people for the mild disease, cowpox, and noticed that these people never caught smallpox.

In the 1790s, Jenner used scientific methods for carrying out experiments to test his theory and observe and record the results. He infected local people with cowpox and then tried to infect them with smallpox. None of them caught smallpox.

In 1798, the Royal Society refused to publish Jenner's ideas, so he paid to print his findings in *An Enquiry into the Causes and Effects of the Variola Vaccinae*. He included detailed instructions so that others could follow them.

By 1800, around 100 000 people worldwide had been vaccinated, but the practice took time to become popular in Britain.

In 1802, the Royal Jennerian Society was set up to promote vaccination and, by 1804, over 12 000 British people had been vaccinated.

In 1840, vaccinations were provided free of charge for the poor. Vaccinations were made compulsory in 1853.

In 1979, WHO, the World Health Organisation, announced that smallpox had been wiped out.

## Jenner's importance

Jenner's work proved that scientific methods could lead to a disease being wiped out. He saved the lives of millions! However:

- he didn't know why it worked
- the link between cowpox and smallpox was unique, so it didn't lead to other vaccinations
- other diseases were still killing people.

## Opposition to Jenner

Many people opposed Jenner's work because:

- they thought it was wrong to give people an animal's disease
- it interfered with God's plan
- doctors lost money when the government offered vaccination free
- some doctors didn't vaccinate people properly so it didn't work.

## Now try this

Explain the factors that led to the success of the smallpox vaccination in reducing cases of the disease.

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# Fighting cholera in London, 1854

Case study

The first cholera epidemic in Britain occurred in 1831 and was followed by another in 1848–49, and another in 1854. Then a London doctor, John Snow, found what was causing the disease.

## Attempts to prevent the spread of cholera

Most people, including the government, believed cholera was caused by miasma and spontaneous generation. Therefore, people tried to keep their homes as clean as possible and some local councils tried to clean the streets and clear away rubbish. The government's Public Health Act of 1848 suggested that cities should provide clean water supplies, but the Act was not compulsory so few complied.

## What do we know about cholera?

- It was known as the 'blue death' as dehydration turns the skin blue.
- It mostly affected the poorest, slum areas of cities, although wealthier parts were affected too.
- It causes severe diarrhoea and vomiting leading to dehydration.
- In the early 19th century there was no treatment and most people who caught it died.

## The work of John Snow

- Snow was a popular and well-respected doctor and surgeon in London. He observed the cholera epidemic of 1848–49 and began work on his theory that cholera was spread through contaminated drinking water, not by miasma.
- When cholera broke out again in 1854 in Soho, where Snow lived, he mapped all the deaths and found a strong link to one water pump on Broad Street.
- He removed the handle from the pump so people couldn't collect water from it and the number of deaths fell dramatically.
- Later it was discovered that a cesspit close by was leaking waste into the well.
- In 1855, Snow presented his findings to the government.

## The significance of John Snow's work

- Many cholera deaths in Soho were prevented after Snow stopped people using the Broad Street pump.
- Many did not believe Snow's theory. He had no scientific evidence to prove cholera was transmitted in water – the Germ Theory wouldn't emerge until 1861. Therefore, the government didn't act on Snow's recommendation to build a new sewer system for London.
- In the longer-term, Snow's work combined with other evidence (e.g. The Great Stink) and a new London sewer system was completed in 1875.
- Also, in the longer-term, Snow's work helped make the link between dirty water and disease, leading to the Public Health Act in 1875 when cities' authorities were finally forced to provide clean water.

## Now try this

Give **two** ways in which John Snow was significant and **two** ways in which his significance was limited.

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Had a look ☐ Nearly there ☐ Nailed it! ☐

# Ideas: genetics and life styles

By 1900, the correct cause of many diseases had been discovered and the knowledge had been used to produce effective vaccines to prevent certain diseases. The 20th century witnessed a search for the cause of other conditions and greater understanding of other reasons for poor health.

## Understanding genetics

During the 19th century, Mendel showed how human characteristics could be passed between generations.

↓

In the 20th century new technology (electron microscopes, X-rays) let scientists analyse human cells in greater detail. They found that every cell in the body contains DNA – codes controlling the genes of each person.

↓

James Watson and Francis Crick worked together on how the genetic codes of DNA fitted together.

↓

They analysed X-ray crystallography by Maurice Wilkins and Rosalind Franklin at King's College Hospital (London) and eventually worked out the double helix structure of DNA (1953).

↓

In 1990 James Watson led the Human Genome Project and started identifying and mapping every gene in human DNA.

## New possibilities

Discovering the structure of DNA and the work of the Human Genome Project has led to:

- 👍 a better understanding of some genetic conditions, such as Down's syndrome
- 👍 predicting whether individuals are at higher risk of developing some cancers
- 👍 the discovery that stem cells can be grown into different cells.

However, there is not yet a:

- 👎 cure or effective treatment for most genetic conditions
- 👎 way of preventing most genetic diseases.

## Understanding of lifestyle factors

Since 1900, people have discovered that some lifestyle factors can negatively affect health and increase the chance of contracting disease.

**Smoking**
Research now links smoking with many diseases, such as emphysema, high blood pressure, heart disease and many cancers.

**Drinking alcohol**
Research now links drinking too much alcohol to many cancers, as well as liver and kidney disease.

**Diet**
Scientific research has confirmed that eating a balance of different foods and limiting sugar and fat reduces the chances of getting certain types of cancer or heart disease.

## Now try this

The discovery of DNA is important for medicine. Give **three** reasons why.

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# Improvements in diagnosis

Developments in science and technology in the 20th century have improved the diagnosis of illness and the cause of disease.

## Improvements in diagnosis

The 20th century saw huge changes in the ways that doctors diagnosed illness. Although doctors today still use their own knowledge and medical books, they combine this with medical testing, using science and technology to discover what is wrong. This includes the use of:

- laboratories to test skin or blood
- x-rays, scans and endoscopes to 'see' inside the body with more clarity than ever before
- monitors to see what is going on over a period of time.

Improved scientific understanding and technology has made diagnosing disease far more accurate.

Blood samples are taken and tested by a pathologist in a laboratory. Analysing blood means that a huge number of diseases are now diagnosed and monitored without the need for surgical investigation.

## Medical technological advances

## Now try this

Give **three** methods used to diagnose illness in the period 1900 to the present day.

Copyrighted Material

Had a look ☐ Nearly there ☐ Nailed it! ☐

# Change in care and treatment

The 20th century saw major advances in treatments from new 'miracle' drugs that cured diseases to advanced surgical treatments, which solved other problems.

## Magic bullets

Koch discovered that different chemical dyes stained specific microbes.

Behring discovered the body manufactures antitoxins that only attack the microbe causing a disease.

Paul Ehrlich and his team of researchers searched for a 'magic bullet' – a chemical compound that would attack and kill the microbe causing a specific disease.

The team, helped by German government funding, worked for many years. They tested many compounds of Salvarsan to find one to cure syphilis.

In 1909, Dr Hata joined the team and discovered they had rejected a compound that worked – the 606th!

In 1932, Gerhard Domagk developed the second magic bullet, Prontosil, which cured some types of blood poisoning.

Other scientists checking Domagk's work found that the key ingredient in Prontosil, sulphonamide, also cured pneumonia, scarlet fever and meningitis.

## Antibiotics

- Antibiotics destroy bacteria or prevent its growth. The first to be discovered was penicillin.

See page 22 for more about penicillin.

- Scientists, inspired by the discovery of penicillin, experimented with other moulds and found more antibiotics that were effective against different diseases throughout the 1940s, 50s and 60s.
- Once the chemical structure of different antibiotics was discovered, scientists were able to make antibiotics, which solved the problem of having to grow them first in order to amend them to treat further diseases.
- Antibiotics have saved and extended millions of lives but due to overuse, super-bacteria, which are resistant to antibiotics, have evolved.

### Using examples

Where possible, always use specific examples to demonstrate your knowledge. Examples of high-tech medical and surgical treatments include:

- ✓ radiotherapy and chemotherapy
- ✓ kidney dialysis
- ✓ fitting pacemakers
- ✓ organ transplants.

## Advances: keyhole and microsurgery

With the development of tiny cameras and surgical instruments, surgeons can use small incisions instead of large cuts to access the body, which reduces patients' recovery time. The small instruments also make it possible to reattach nerves and blood vessels.

## Advances: robotic surgery

Some surgery can now be carried out remotely, with surgeons controlling robots through computers. This has also made surgery more precise.

The final major problem of surgery, blood loss, had also been solved, which led to successful blood transfusions. See page 27 for more on blood transfusions.

### Now try this

Describe the factors that made the advances in treatments since 1900 possible.