

# MEDICINE THROUGH TIME: MEDIEVAL MEDICINE (I)

## IDEAS ABOUT THE CAUSES OF DISEASE AND ILLNESS

### APPROACHES TO TREATMENT

#### Rational Treatments relating to the Four Humours

- **Bloodletting** was the most common treatment. It was done by either cutting a vein, using leeches or by cupping. Different points in the body were used for different illnesses. Blood-letting was mostly performed by **barber-surgeons**
- **Purging** was another treatment which involved either making a patient vomit or go to the toilet. Emetics and laxatives were mixed by **apothecaries, wise women** or sometimes **Physicians**.

#### 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 to humours and **ointments** to apply to the skin. They were made at home or mixed by an **apothecary**.

#### Religious Treatments

- Healing prayers and incantations (spells)
- Fasting (going without food)
- Going on a pilgrimage, especially to the tombs of people noted for their healing powers
- Praying for a special Mass to be said

#### Supernatural Treatments

- Supernatural treatments included specific ideas were certain illnesses, such as hanging a magpie's beak around your neck to cure toothache
- Treatments varied according to the horoscope of the patient. The alignment of the planets was then checked at every stage of the treatment prescribed

### SUPERNATURAL AND RELIGIOUS EXPLANATIONS

#### Religion and the Church

- The Church taught, and people believed, that God made them ill because He was either **displeased with them** or **was testing their faith**
- For most people this was an acceptable explanation for the cause of illness
- This belief, and trust in ancient medical practices, held back medical research and meant that few new ideas about the causes of illnesses appeared
- The Church had so much control over the ideas of what caused illness because many Medieval people could not read and write and were therefore reliant on the Church to teach them. The Church also controlled education and therefore what Physicians were taught

#### Astrology

- The **alignment of the 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 throughout the Medieval period, especially after the Black Death

### RATIONAL EXPLANATIONS

#### The Theory of the Four Humours

- The Ancient Greeks believed that the body was made up of four different elements. They believed people became ill it was because this mixture of elements, or humours, was unbalanced
- To make people better, they tried to rebalance the humours
- Greek Physician, **Hippocrates**, is credited with developing the theory
- In the 2<sup>nd</sup> Century AD, a doctor called **Galen** developed the theory further. Treatment of illness 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 (associated with being wet and cold), you were encouraged to eat hot peppers

#### Miasma

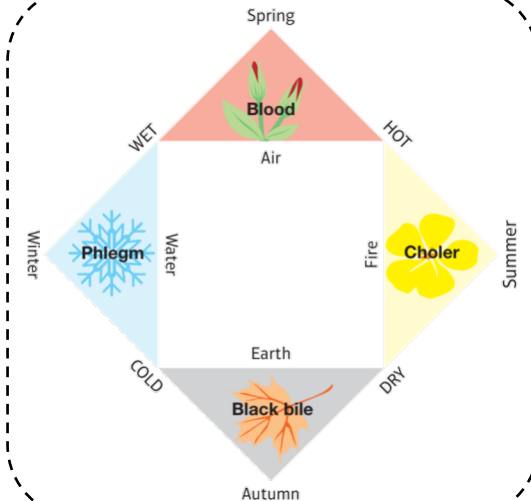
- Another idea was that disease was transmitted through '**bad**' or '**corrupt**' air. This was sometimes related to God because bad smells were thought to be a sign of sin
- The theory originated in the Ancient world but continued into the Medieval period and well into the 19<sup>th</sup> Century

### Hippocrates

Hippocrates was an Ancient Greek Doctor. His ideas and books were very influential. He dismissed the idea that God caused disease and instead believed that there was a physical reason for illness. Most of his treatments were based on bleeding and purging but also diet, exercise and rest. He wrote the Hippocratic Oath, where doctors swore to respect and prevent harm. He used the method of clinical observation – studying symptoms, making notes and comparing similar cases.

### Galen

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 Medieval period. 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 the knowledge he gained from operating on wounded gladiators and carrying out dissecting on dead (mostly animals) bodies.



# MEDICINE THROUGH TIME: MEDIEVAL MEDICINE (2)

## APPROACHES TO PREVENTION

### Religious and Supernatural Methods

- Living a Christian life by praying, going to church and obeying the Commandments.
- Chanting incantations (spells)
- Carrying lucky charms or amulets
- Self-punishment such as flagellation (whipping yourself) as a way of punishing yourself so God would not

### Rational Methods

- Bleeding and purging
- Trying to keep the streets clean
- Purifying the air by spreading sweet herbs or carrying bunch of flowers (posy)
- Bathing and washing
- Exercising and not overeating

Many of these prevention methods were recommended in the Regimen Sanitatis - a set of instructions provided by Physicians

## APPROACHES TO CARING FOR THE SICK: WHO TREATED THEM?

### Barber-Surgeons

- **No training** but could become an apprentice to learn.
- Carried out bloodletting, pulling teeth and lancing boils. Also cut hair!
- Did basic surgery such as amputating limbs (with a very low success rate)
- Was **cheaper** than visiting a physician.

### Apothecaries

- Received training but **no medical qualifications**
- Mixed medicines and ointments based on their own knowledge (often from *Materia Medica*) or directions of a physician.
- Cost money but was still **cheaper than a physician**
- Herbal remedies could sometimes be effective.

### Physicians

- **Medically trained** for 7-10 years 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.
- There were very **few of them** – less than 100 by 1300.
- Sometimes never even met the patient so there was limits to their effectiveness

### 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.

### Women

- Mostly acted as Midwives
- They offered a range of herbal remedies which they mixed or collected
- Not allowed to go to university although they **could be apprenticed** and paid.

### Hospitals

- Offered food, prayer and warmth for the elderly but rarely admitted the sick.
- By **1500, there were 1000 hospitals** with 30% being controlled by the Church. There were 500 hospitals for guild members (trade)
- Offered comfort but not real treatment

## HOSPITAL CARE IN THE MEDIEVAL PERIOD

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

The number increased during the Medieval period

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

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



Patients and their surroundings were kept very calm.

Hospitals were places of recuperation rather than places where people were treated for diseases.

Patients were given fresh food and plenty of rest.

Some hospitals were built for specific infectious diseases

# MEDICINE THROUGH TIME: RENAISSANCE MEDICINE (I)

## IDEAS ABOUT THE CAUSES OF DISEASE AND ILLNESS

In the Renaissance period there was further investigation into Ancient Greek and Roman theories on disease and anatomy. Ideas from the Medieval period were beginning to be challenged and existing assumptions were tested. However, some things did still stay the same.

CHANGE IN IDEAS ABOUT CAUSES	CONTINUITY IN IDEAS ABOUT CAUSES
<ul style="list-style-type: none"> <li>Gradually, throughout the Renaissance period, <b>fewer people believed in supernatural or religious causes</b> of disease.</li> <li>Various new rational explanations for disease were suggested, such as <b>seeds in the air spreading disease</b>.</li> <li>A major change in this period was the <b>decline in the influence of the Church</b> and with it the focus on God as a cause of disease.</li> <li>There was a shift to a <b>more scientific approach</b> to diagnosing illness.</li> </ul>	<ul style="list-style-type: none"> <li>The theory of <b>miasma continued to be believed by many</b> to be the cause of disease. It was a particularly popular theory during epidemics.</li> <li>The Theory of the Four Humours continued to be an accepted explanation for disease, although by 1700 very few physicians still believed in it.</li> </ul>

### Why did the Church lose influence?

During the Renaissance, new religious ideas challenged the authority of the Catholic Church, weakening its influence. People were still very religious, but they **no longer relied on their religion for explaining the causes of disease**. Furthermore, the ideas of Galen, which were supported by the Church, were relied upon less.

### Change in the work of physicians and scientists.

During this period, the way in which disease was diagnosed by physicians gradually began to improve.

- Fewer believed in Astrology and physicians stopped using astrology charts.
- Due to improved knowledge on digestion, physicians realized that urine was not a good way to diagnose disease.
- Physicians carried out more direct observations of their patients.

## THE 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 was invented around 1440 by Gutenberg. By the start of the Renaissance, there were hundreds of printing presses across Europe.
- This 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 ideas and books of scientists and doctors could be shared more effectively and much faster.

### 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**.
- From 1665, the Royal Society published a journal called *Philosophical Transactions*, in which scientists could study, challenge and build on each other's research. In this way, theories could spread through the medical community quickly.

## KEY INDIVIDUALS

### Andreas Vesalius

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

- He improved understanding of the human body and made the student of anatomy central to the study of medicine.
- He proved that some of Galen's work was incorrect.
- He encouraged other medical professionals to carry out dissections and make further discoveries.
- His work was widely published and included detailed illustrations of the human body.

### 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 did not rely on medical books when making a diagnosis but **observed patients and kept records**.
- He was instrumental in the 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 did not treat individual symptoms.

### William Harvey

Harvey studied medicine at Cambridge, then Padua. He became a lecturer of anatomy in London and was known for carrying out public dissections. He also taught the importance of observing patients and recording symptoms rather than relying on books.

Harvey's most notable achievement was the discovery of the circulation of blood.

- Harvey researched Vesalius' theory that blood flowed towards the heart, which contradicted Galen's theory. He proved Vesalius 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 as Galen had thought.
- He discovered that arteries and veins were part of one system and that blood was pumped around the body by the heart.

## MEDICINE THROUGH TIME: RENAISSANCE MEDICINE (2)

### CHANGE IN PREVENTION, TREATMENT AND CARE

#### Changes in Prevention and Treatment

- More emphasis on **removing miasma** through draining swamps and removing sewage and rubbish from streets
- 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. Such remedies included sarsaparilla, used to treat the Great Pox, and ipecacuanha from Brazil, later known as just ipecac, which was effective as a cure for dysentery (a stomach bug that causes severe diarrhoea)
- Theory 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.

However, the improved knowledge and discoveries of the Renaissance **had a limited impact because** ideas were slow to be accepted and the discoveries did not improve the understanding of the cause of disease.

### CONTINUITY IN PREVENTION, TREATMENT AND CARE

#### Continuity in Prevention and Treatment

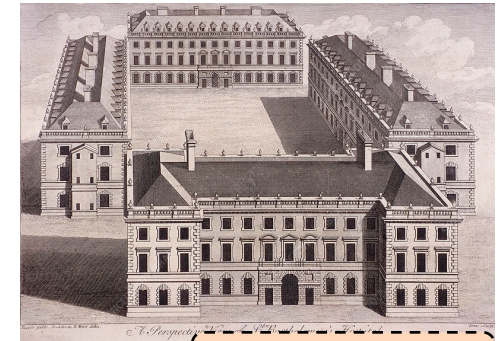
- Traditional herbal remedies
- Healthy living as shown in *Regimen Sanitatis*
- Superstitions and prayer.
- Cleanliness
- Bleeding and purging
- Purifying the air.

#### 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 most people. Members of the community (again, usually women) helped with advice and remedies. Some were paid for their services.

## HOSPITALS

- 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.
- In 1536, the dissolution of the monasteries in England by Henry VIII caused most hospitals to close.
- 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.
- More pest houses began to appear, where people suffering from a particular contagious disease could go for care.
- When hospitals did re-appear, they were run by **physicians focused on treating the sick rather than by religion**.



St Bartholomew's Hospital

### CHANGE AND CONTINUITY IN THOSE WHO TREATED THE SICK

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

#### Training for apothecaries, surgeons and physicians

	APOTHECARIES AND SURGEONS	PHYSICIANS
CONTINUITY	<ul style="list-style-type: none"> <li>They were still not given university training and were still considered inferior to physicians and they were cheaper.</li> </ul>	<ul style="list-style-type: none"> <li>They were still trained at universities and the training lasted for many years.</li> <li>Training was still based on learning from textbooks rather than practical experience and observation.</li> </ul>
CHANGE	<ul style="list-style-type: none"> <li>Both were better trained through being in guild systems, where they were apprentices, then journeymen, before becoming masters</li> <li>A license was now needed to work as an apothecary or surgeon, and these were only issued after completing training</li> </ul>	<ul style="list-style-type: none"> <li>There was better access to a wider variety of medical books and detailed drawing due to the printing press</li> <li>Gradually, new ideas about anatomy (led by Vesalius) and causes of disease inspired some physicians to become more practical and experimental.</li> <li>Dissection was legalised but took time to become commonplace.</li> </ul>

## MEDICINE THROUGH TIME: CASE STUDIES

### THE BLACK DEATH & THE GREAT PLAGUE

THE BLACK DEATH  
1348

#### SYMPTOMS

- Swelling of the lymph glands into large lumps filled with pus (known as buboes)
- Fever and chills
- Headache
- Vomiting, diarrhoea and abdominal pain

#### IDEAS ABOUT CAUSES OF THE BLACK DEATH

- **Religion:** God sent the Plague as a punishment for people's sins
- **Astrology:** the position of Mars, Jupiter and Saturn was unusual at this time
- **Miasma:** bad air or smells caused by decaying rubbish
- **Volcanoes:** poisonous gases from European volcanoes and earthquakes carried in the air
- **The Four Humours:** most physicians believed that disease was caused by an imbalance in the Four Humours
- **Outsiders:** strangers or witches had caused the disease.

#### TREATMENTS FOR THE GREAT PLAGUE

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. However, 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

#### WHAT WAS IT?

The Black Death reached England 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.

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.



THE GREAT PLAGUE  
1665

#### TREATMENTS PEOPLE USED FOR THE BLACK DEATH

- 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

#### HOW PEOPLE TRIED TO PREVENT CATCHING THE BLACK DEATH

- **Praying and fasting** because people believed that God had sent the disease, it made sense to show God how sorry they were by punishing themselves or showing how devoted to their religion they were.
- **Clearing up rubbish in the streets.**
- **Smelling their toilets or other bad smells**, in the belief that this would overcome the plague.
- **Lighting a fire in the room, ringing bells or having bird flying around the room** to keep the air moving.
- **Carrying herbs and spices** to avoid breathing in 'bad air'.
- **Not letting unknown people enter the town or village.**

#### COMPARING THE GREAT PLAGUE & THE BLACK DEATH

These two diseases were the same, so comparing the methods used to treat and prevent the is a useful guide to understanding what **changed** and what stayed the same (**continuity**) in over 300 years of medicine.



#### IDEAS ABOUT CAUSES OF THE GREAT PLAGUE

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

- **Miasma was by far the most commonly believed cause** of the Plague.
- 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

#### GOVERNMENT ACTION DURING THE GREAT PLAGUE

A big difference between 1665 and 1348 was far greater action 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
- Streets were regularly cleaned, and dogs and cats were killed
- 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 40 days or taken to the pest house if a member caught the plague.
- Days of fasting and public prayers were ordered

# MEDICINE THROUGH TIME: EIGHTEENTH & NINETEENTH CENTURY (I)

## CHANGE IN IDEAS ABOUT 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 theorized 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.

## 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 19<sup>th</sup> century.

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

Social attitudes towards science were changing at this time. This meant that there was an increasing awareness of the need for rational explanations for the cause of disease.

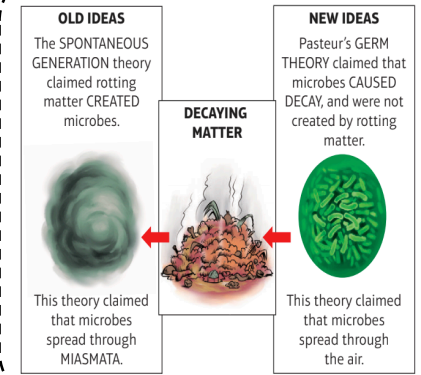
## THE SIGNIFICANCE OF PASTEUR AND KOCH

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 (for example, Joseph Lister) who did make the link between microbes and disease.

Koch's work had more of an impact in Britain and he inspired others to research other microbes. However, it still 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.

## CONTINUITY IN IDEAS ABOUT CAUSES OF DISEASE

There were few new ideas about the cause of disease in the 18<sup>th</sup> 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.

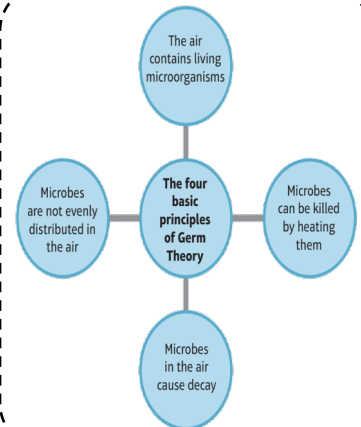


## PASTEUR'S GERM THEORY EXPLAINED

In 1860, the French Academy of Science challenged scientists to produce evidence to either prove or disprove the theory of spontaneous generation. With the use of microscopes, Pasteur was able to observe unwanted microbes in wine and vinegar, which turned both liquids 'bad'. Pasteur published these findings in 1861 and called the discovery Germ Theory. Pasteur proved that spontaneous generation was inaccurate because **decay did not happen to sterilized matter that was left undisturbed**. Instead, something in the air was causing the decay. Pasteur went on to theorise that, as germs were causing decay, they may also be causing disease in the human body. He observed one particular type of microorganism killing off France's silkworm population, which seemed to prove this theory. However, he did not publish this 'germ theory of infection' until 1878.

## KOCH'S WORK ON MICROBES

Pasteur had been the first scientist to identify microbes and their role in decay, but it was Robert Koch who successfully identified that different germs caused many common diseases. Koch discovered the bacteria that caused tuberculosis (TB) in 1882. In 1883, he discovered cholera, and in 1884 he proved that it was spread in water supplies when he found it in drinking water in India, where a cholera epidemic had broken out.



## MEDICINE THROUGH TIME: EIGHTEENTH & NINETEENTH CENTURY (2)

### THE IMPACT OF FLORENCE NIGHTINGALE



Florence Nightingale was significant in influencing improvements in hospital care. Her changes to hospital conditions after witnessing high death rates in military hospitals had a significant impact on public opinion towards hospital care in Britain.

- 1 Nursing wasn't seen as a respectable job for women and there was little training
- 2 Florence Nightingale attended the first nurses' 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 and 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 the newspapers in Britain. She published books on nursing and hospital organization and set up a training school for nurses and midwives.

### CHANGES IN HOSPITAL CARE

The following examples of Great Ormond Street Hospital over a nineteen-year period show the changes that took place in hospitals during this period.

#### Great Ormond Street Hospital in 1856:

- New hospitals (financed by charities and local councils) opened during the 19<sup>th</sup> century to look after the sick.
- The first cottage hospital (small buildings where nurses gave care and GPs prescribed a home treatment) opened in 1859.
- Middle and upper classes could afford doctors to continue to treat them at home.
- 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.

#### Great Ormond Street Hospital in 1875:

- Due to the work of reformers such as Florence Nightingale, hospital cleanliness and organization improved, and nurses were better trained. Pasteur's germ theory led to improved hygiene too.
- Nurses were given a more central role in caring for patients and assisting doctors.
- 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.

### DEVELOPMENTS IN ANAESTHETICS AND ANTISEPTICS

The three main problems that made surgery so dangerous were blood loss, pain and potential infection. The 19<sup>th</sup> century saw significant developments in the management of pain (anaesthetics) and the reduction of infection (antiseptics).

#### The Search for an Anaesthetic:

- 1 Before 1800, alcohol and opium had little success in easing pain during operations.
- 2 In 1844, Laughing gas was being used in dentistry in the USA, but failed to ease all pain and patients remained conscious.
- 3 From 1846, Ether was used and made patients completely unconscious and lasted a long time. However, it could make patients cough during operations and sick afterwards. It was also highly flammable and had to be transported in heavy glass bottles.
- 4 From 1847, Chloroform was used and was very effective with few side effects. However, it was difficult to get the dose right and could kill people because of the effect on their heart. An inhaler helped to regulate the dosage.
- 5 In 1884, Cocaine was first used. In 1905 a less addictive version – novocaine – was used as a general anaesthetic.

#### The Development of Antiseptics

Joseph Lister was a surgeon who worked at Glasgow Royal Infirmary. When Lister began working as a surgeon in 1861, half of the patients in surgery were dying from postoperative infections.

In 1864, Lister read Pasteur's Germ Theory and learnt that carbolic acid killed parasites in sewage. Lister then began soaking bandages in carbolic acid to avoid his patient's wounds becoming infected.

He also used the acid to clean wounds and equipment as well as inventing a spray to kill germs in the air.

In 1867, Lister stated that his ward had been free from infection (sepsis) for 9 months. He then went on to publish his ideas.

#### Opposition to developments in anaesthetics and antiseptics

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

#### The impact of anaesthetics and antiseptics

Surgery became pain free, and patients didn't struggle so deeper, more complex surgery became possible and the death rate dramatically decreased as surgery was more successful.

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 childbirth.

#### The Impact of Lister's Ideas

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 sterilized clothing and used sterilized instruments.



## MEDICINE THROUGH TIME: EIGHTEENTH & NINETEENTH CENTURY (3)

### APPROACHES TO THE PREVENTION OF DISEASE

There were some important developments in disease prevention in the 19<sup>th</sup> century as Germ Theory began to be used to create **vaccines** for some diseases. The government also began to play an active role in public health.

#### The Process of Developing Vaccinations

1. Pasteur began to carry 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 same disease.
3. Pasteur admired Jenner and called his new discovery 'vaccination' in tribute to him.
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.

#### The 1875 Public Health Act (Government Intervention)

Previously the government had done little to improve living conditions – it did not see this as its duty. Instead, they adopted a 'hands-off' or *laissez-faire* policy. However, during the 19<sup>th</sup> century, this attitude changed due to the several epidemics and increasing scientific evidence that disease was caused by poor living conditions. Therefore, the Public Health Act (1875) stated that **city authorities had to provide clean water, sewers, public toilets, street lighting and public parks**. It was now also necessary to **inspect lodging houses for cleanliness, monitor the building of new houses, check the quality of food sold in shops and employ a public officer of health to monitor disease**.

### CASE STUDY: FIGHTING CHOLERA IN LONDON (1854)

#### What was it?

- 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.
- It causes severe diarrhoea and vomiting leading to dehydration.
- It was known as the 'blue death' as dehydration turns the skin blue.
- It mostly affected the poorest, slum areas of cities but the rich were affected too.

#### 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.

#### The Work of John Snow

- Snow was a well-respected doctor and surgeon in London. He theorised that cholera was spread through contaminated drinking water, not 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 could not collect water from it and the number of deaths fell dramatically as a result.
- Later, **it was discovered that a cesspit close by was leaking waste into the well**.
- In 1855, Snow presented his findings to the government.
- At first, many did not believe Snow as he had no scientific evidence, and the Germ Theory would not emerge until 1861. As a result, the government did not act. However, in the long-term, Snow's work contributed to the completion of the sewer system in 1875 and helped to make the link between dirty water and disease, leading to the Public Health Act in 1875.

### EDWARD JENNER AND VACCINATION

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

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...

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 for others to follow.

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 for free of charge for the poor. Vaccinations were made compulsory in 1853.

In 1979, the World Health Organisation announced that Smallpox had been eradicated.

### THE SIGNIFICANCE OF JENNER

Jenner's work proved that scientific methods could lead to a disease being wiped out. He saved many lives, **but** he didn't know why it worked, the link between cowpox and smallpox was unique so didn't lead to other vaccinations and other diseases were still killing people.

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 for free, and some doctors didn't vaccinate properly and so it did not work.



## MEDICINE THROUGH TIME: MEDICINE IN MODERN BRITAIN (I)

### IMPROVEMENTS IN DIAGNOSIS

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

The 20<sup>th</sup> century saw big 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 samples.
- 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 Advancements.

Examples of technology used in 20<sup>th</sup> and 21<sup>st</sup> century medicine include:

- Hypodermic needles
- Microscopes
- Incubators
- X-rays
- Prosthetic limbs
- MRI, CT and ultrasound scans
- Endoscopes
- Pacemakers
- Dialysis machines
- Insulin pumps
- Blood pressure and blood sugar monitors

## ADVANCES IN UNDERSTANDING THE CAUSES OF ILLNESS AND DISEASE: GENETICS AND LIFESTYLES

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

### Genetics

- During the 19<sup>th</sup> century, Gregor Mendel showed how human characteristics could be passed between generations.
- In the 20<sup>th</sup> century, new technology such as electron microscopes and X-rays allowed scientists to analyse human cells in greater detail. They found that every cell in the body contained **DNA** – codes that control 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 and eventually worked out the double helix structure of DNA in 1953.

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 or a way of preventing most genetic diseases.

### Lifestyle Factors

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

#### 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.



## MEDICINE THROUGH TIME: MEDICINE IN MODERN BRITAIN (2)

### CHANGE IN CARE AND TREATMENT

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

#### **Magic Bullets.**

- Robert Koch discovered that different chemical dyes stained specific microbes. Emil von Behring discovered that the body manufactures antitoxins that only attack the microbe causing 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 606<sup>th</sup> one.
- 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 to prevent its growth. The first to be discovered was **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.

#### **Advances: keyhole and microsurgery.**

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

#### **Advances: robotic surgery.**

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

### APPROACHES TO PREVENTION

#### **The NHS.**

Since 1948, taxes have funded a wide range of healthcare services provided by the National Health Service, such as

- Seeing a GP
- Hospital care and operations.
- Health visitors for pregnant women and young children.
- Ambulances and emergency treatment.
- Health care for the elderly.



#### **Improved Access to Care.**

The establishment of the NHS improved access to healthcare because all treatment was entirely free, so everyone had access to the same level of care. However, healthcare provision was unequal across different parts of the country, both in terms of the number of doctors and hospitals and their standards, and this took time to improve.

Some types of healthcare are still difficult to access. For example, few people receive NHS dental treatment due to a lack of NHS dentists. In general, though, far more people access healthcare today than in 1900.



#### **Compulsory Vaccinations**

Although many vaccines that successfully prevented some diseases had been developed in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries, people had to pay to receive them, and many could not afford to do so. In 1938, 3000 people died in a diphtheria epidemic, which led to a government-funded immunization programme. This has been followed by many others. Vaccination is still controversial, however, and some people choose not to have their children vaccinated.

#### **Prevention Measures.**

Since 1948, the government has taken more action to prevent people getting ill.

- Funding more testing and vaccinations.
- Better disposal of rubbish and sewage.
- Laws reducing air and water pollution.
- Laws banning advertising of cigarettes and smoking in public areas.
- Laws improving health and safety at work.
- Environmental health officers inspecting food outlets.

#### **Lifestyle Campaigns.**

Since 1948, the government has funded publicity to raise awareness of illnesses and dangers to health, such as smoking and binge-drinking, with some success: the 1980s 'AIDS don't die of ignorance' campaign reduced cases of HIV infection.

More recently, events and initiatives such as the Change4Life campaign, have encouraged healthy behaviour to prevent disease.

# MEDICINE THROUGH TIME: CASE STUDIES

## THE DEVELOPMENT OF PENICILLIN & THE FIGHT AGAINST LUNG CANCER

### THE DEVELOPMENT OF PENICILLIN

In 1928, **Alexander Fleming** noticed that bacteria in a Petri dish was being killed by a **penicillium mould**. He tested it on other bacteria and discovered that mould produced an excellent antibiotic – penicillin.

In 1929, Fleming published his findings but did not believe that penicillin would work on living people and did not ask for funding to continue his research.

Several years later, **Howard Florey, Ernst Chain and their team** continued Fleming's research on **penicillin**. It proved effective on mice, so they tested it on humans. Penicillin killed bacteria and therefore the infection – it was proved to work on humans.

#### Alexander Fleming

Fleming worked on the battlefields of the First World War. Part of his job was to study soldiers' infected wounds and try to find treatments for them. Many died from their infections. After the War, he worked at St Mary's Hospital in London where he continued his work to try and find a way of healing bacterial infections.

#### Howard Florey and Ernst Chain

Florey was an Australian pathologist who was researching ways to kill bacteria at Oxford Medical School. He assembled a group of scientists to help him. One of his first recruits was the German biochemist, Ernst Chain. They, together with Fleming, won the Nobel prize in 1945.

#### Mass Production

Penicillin still wasn't used for medical treatment because huge amounts were needed to treat just one person, and growing the mould took time and lots of space and was therefore expensive.

- 1 Florey asked UK drug companies and factories to help, but they were being used for the war effort.
- 2 In 1941, Florey asked US drug companies. Some agreed to help but on a very small scale.
- 3 The effectiveness of penicillin was demonstrated that same year.
- 4 After the USA joined WWII, the government saw the need for more penicillin to treat casualties and so funded 21 companies to mass-produce it.
- 5 US drug companies began mass production in 1942 and the British companies followed in 1943.

### THE FIGHT AGAINST LUNG CANCER

The 20<sup>th</sup> century saw a huge rise in the number of lung cancer cases. Today, it is the second most common cancer in the UK and has a poor survival rate compared with other cancers. This is because it is difficult to diagnose and treat. The majority of lung cancers are caused by smoking or passive smoking (inhaling the smoke), though some people develop lung cancer for no apparent reason.

#### Diagnosis

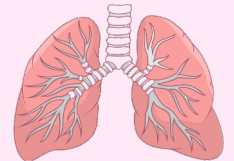
Symptoms of lung cancer include a persistent cough, coughing up blood, breathlessness, tiredness, unexplained weight loss and repeated chest infections, but these can also be symptoms of many other conditions too and the cancer is often very developed by the time symptoms begin.

If lung cancer is suspected, most patients are given a CT scan and if this shows a mass, a sample of the cells are collected and tested.

#### Treatment

The following are treatments that can either cure the cancer or prolong the life of the patient.

- Surgery to remove the tumour or carry out a lung transplant.
- Radiotherapy to try to shrink the tumour or prevent its growth.
- Chemotherapy to try to shrink the tumour, or prevent the cancer returning.



Chemotherapy and radiotherapy are both treatments for cancer. Chemotherapy used special drugs to shrink or kill cancer cells whereas radiotherapy kills these cells with high-energy beams such as X-rays or protons.

#### Prevention

The UK government has tried various methods to reduce the number of people smoking in order to try to prevent the number of cases of lung cancer.

- TV advertising for cigarettes was banned in 1965, and for cigars and tobacco in 1991. All forms of advertising have since been banned.
- Tax on tobacco products is regularly increased to make smoking more expensive and, in turn, to encourage people to stop.
- In England in 2007, smoking was banned in public places where people worked and this ban was extended in 2015 to cars carrying under-18s.
- In 2007, the legal age for buying tobacco products was raised from 16 to 18.
- Various campaigns have been funded to educate people about the risks of smoking, to encourage them to stop or not to start.
- Today, shops are not allowed to publicly display tobacco products.
- Cigarette packaging became standardized in May 2016, and with graphic warnings of the dangers whatever the brand in the hope that this would put people off smoking.

