The development of antibiotics

The term **antibiotic** is used to describe any treatment that destroys or limits the growth of bacteria in the human body. The first true antibiotic was **penicillin**. Penicillin was different to Salvarsan 606 and Prontosil as it was created using microorganisms, not chemicals. Penicillin was isolated from a mould sample by Alexander Fleming in 1928 and developed into a usable treatment by Florey and Chain in 1940 (see pages 119–121).

Inspired by the discovery of penicillin, other scientists investigated moulds and fungi in the search for more antibiotics. Streptomycin was discovered by American scientist Selman Waksman in 1943. This antibiotic was so powerful that it was even effective against tuberculosis, which had previously been thought to be incurable. During the 1950s and 1960s, even more antibiotics were discovered.

Research into the development of new antibiotics has not stopped. In the 21st century, pharmaceutical companies continue to test substances to develop new antibiotics. This is because some bacteria have developed a resistance to the antibiotics we already have. If new treatments are not developed, scientists fear that the old antibiotics will become totally ineffective against diseases that we think we have beaten, such as septicaemia (blood poisoning).

Therefore, in the short term, antibiotics have been a miracle cure for a variety of diseases. However, their long-term impact has yet to be measured.

The impact of science and technology on advances in medicines

As with diagnosis, the way that we treat diseases now is almost unrecognisable from the way that people treated them before 1900. This is largely due to huge **advances in science and technology.**

Scientists have now developed medicines that pinpoint and treat specific diseases. Even if they are unable to cure some diseases, such as diabetes and lung cancer, treatments have been developed to help patients manage their illness. Scientists are now able to identify the causes of disease in most cases, because they know what they are looking for – for example, a microbe, a tumour or an unusual gene. This is a huge change from the 19th century.

Improved scientific understanding has also led to better testing and trialling of new treatments before they are given to patients. In the past, drugs did not have to go through this process before being used to treat disease. This meant that mistakes were made. The most famous of these mistakes was the use of the drug thalidomide in the 1960s to treat pregnant women suffering from morning sickness. The drug caused birth defects.

Now, it takes several years for a new drug to be trialled thoroughly before being used. This slows down progress but ensures drugs are safe for everybody.

Source A

This article, entitled *'Too much of a good thing'*, was published in *The Telegraph* in 2013, by Joe Shute.

Antibiotics are no longer effective. The drugs that have transformed life and longevity and saved countless millions since penicillin was discovered by Sir Alexander Fleming in 1928 now saturate [fill] every corner of our environment. We stuff them into ourselves and our animals; we spray them on crops, dump them in rivers, and even – as emerged at a meeting of science ministers from the G8 last year – paint them on the hulls of boats to keep off barnacles.

As a result, an invisible army of super-resistant bacteria has evolved, one that is increasingly claiming lives – currently more than 25,000 a year in Europe alone...

Many leading scientists and doctors and politicians are freely adopting the language of global catastrophe. Infections such as tuberculosis and septicaemia – the scourge of earlier centuries – are once again killing us at frightening rates. We have used, or are using, our so-called drugs of last resort.

THINKING HISTORICALLY Change and continuity (4b&c)

The bird's eye view

Development	Example of immediate changes	Example of change in the medium term	Example of change in the long term
The development of antibiotics		Scientists developed a way of making antibiotics, which meant they could be modified to attack particular diseases.	Antibiotics are still used widely to treat diseases and infections. However, there are an increasing number of diseases that are resistant to them.

Imagine you are looking at the whole of history using a zoomed-out interactive map like Google Maps™. You have a general view of the sweep of developments and their consequences, but you cannot see much detail. If you zoom in to the time when antibiotics were first developed, you can see the event in detail but will know nothing of its consequences in the medium or long term.

Look at the table above and answer the following:

1 What were the immediate changes brought about by the development of antibiotics? Write down at least two changes that could complete that column in the table.

2 Look at the medium-term changes and the long-term changes. How are they similar? How are they different?

3 Work in groups of three. Each take the role of the teacher for one of the above (the immediate changes, the medium-term changes or the long-term changes). Give a short presentation to the other two students in your group, explaining the key changes over your timescale. They may comment and ask questions.

Answer the following individually:

4 How was your explanation of change different to the other explanations? Write a short paragraph using examples from what you and the rest of your group said.

5 What happens to the detail, particularly of the medium- and short-term changes, when you zoom out to look at the long-term changes?

6 What are the advantages and disadvantages of zooming in to look at a specific time in detail?

New technology has made it easier to create and provide drugs to treat diseases.

- **Mass production of pills** has made the distribution of drugs much easier.
- **The development of capsules**, which dissolve in the stomach to release the drug, means taking drugs to treat disease is easier.
- **Hypodermic needles** allow the precise dose to be introduced directly into the bloodstream.
- **Insulin pumps** for young people suffering from diabetes deliver insulin without the need for injections.

Activities ?

1 Draw a timeline to show when the different drugs described in this section were developed. Label each one with details, such as who was responsible for its development and which diseases the drug fights.

2 Describe how science and technology assisted in the development of new chemical treatments.

3 Individuals like Ehrlich and Domagk inspired British scientists to look for new treatments, while science and technology made them possible. Which factor do you think has been the most important in the development of treatments post-1900?