To avoid any confusion, there are no actual bullets involved, this is what they called antibiotics as they attacked the specific microbes with a 'shot' but left the body unharmed.
In the late 19th Century, more microbes responsible for specific diseases were being discovered. This meant that doctors now understood that the body produced antibodies to fight disease that had previously infected it – this is how vaccines worked. The hunt was on to make artificial or chemical antibodies that would work in the same way, attacking the infection without harming the body.

**Vaccines**
Robert Koch found a way of staining bacteria to identify them in 1880. Paul Ehrlich, a member of his team, decided to take this idea further.

Ehrlich thought that a chemical compound could be used not just to stain the bacteria causing an infection, but which would kill them (and only them) as well.

Ehrlich said this would be like a Magic Bullet. The chemical would ‘shoot’ the infection, not the patient.
The first breakthrough came in the treatment of syphilis, an STD that had been treated by mercury since the 16th century, which was poison!

There had been some success with arsenic compounds (a mixture of 2 or more elements), but this attacked the body as well as the disease as arsenic is poisonous. **Even with the deaths, Ehrlich had proven that chemicals could kill bacteria...** this encouraged other scientists.

It's very possible, this mercury treatment for my syphilis is what finished me off!

Symptoms of syphilis, it could also be fatal!
This was a major step in the progress of medicine as it was the first chemical that could be used to kill infection inside the body.

**How did it work?**

Salvarsan606 needed to be improved upon, it was made from arsenic. What problem could this have?

Arsenic is poisonous therefore Salvarsan606 could sometimes kill the patient as well as the infection.
In 1932 Gerhard Domagk found the second magic bullet after years of methodical research. This was a red dye called Prontosil and killed the bacteria causing BLOOD POISONING.

He injected mice with a lethal dose of a streptococcal infection. He then injected them with Prontosil, which cured them.
SUCCESS IN HUMANS?

• Soon he had the chance to try it out on a human, his own daughter, who was seriously ill with the same streptococcal infection. Having no other cure, he injected her with Prontosil and she recovered.

• With the aid of the new, powerful electron microscopes which had been in use since the early 1930s, scientists found that the active ingredient was a sulphonamide which came from coal tar.

• The discovery of sulphonamides led to the development of drugs which cured gonorrhoea, pneumonia, and scarlet fever. They led to the number of mothers dying following postnatal infection being slashed from 20% to 4.7%.
In the early 20th century, a scientist named Paul Ehrlich tested as many arsenic compounds as he could to find a cure for syphilis. By 1907, he had tested over 600 compounds, but had not found a cure.

In 1909, a Japanese scientist named Hata retested all of the compounds and found that compound number 606 cured syphilis. The drug, named Salvarsan 606, was the first 'magic bullet'.

In 1932, scientist Gerhard Domagk discovered that a bright red dye called Prontosil killed bacterial infections in mice. Domagk was forced to test Prontosil out on his own daughter, who had developed blood poisoning; it cured her.

Scientists at the Pasteur Institute in Paris discovered that Prontosil worked by preventing the bacteria from multiplying in the body. This made it possible for the body's own immune system to kill the bacteria. These drugs are called bacteriostatic antibiotics.

Scientists began to look for other drugs that worked in the same way. In 1938, British scientists developed M&B 693. This was another bacteriostatic antibiotic. It was successfully used to treat Winston Churchill for pneumonia during the Second World War.
Magic Bullet #3 – The most important of all?.... **PENICILLIN**

Penicillin was different to the first 2 magic bullets as they were *artificially / chemically* made, penicillin was created using micro organisms. It was isolated from mould.

Following from this discovery using living organisms, scientists all over the world *(just like with Koch’s discoveries)* were inspired to research using fungi and moulds.

**BUT...**

Although these Magic Bullets have been a miracle cure for many diseases, in the recent short term, research has shown that bacteria are developing a resistance to some antibiotics which means many of the old diseases could come back.

“As a result of us having antibiotics for everything and everywhere...An invisible army of super resistant bacteria has evolved claiming 25000 lives a year in Europe alone!....This is a global catastrophe, the scourge of earlier centuries (TB & Scepticaemia) are killing us at frightening rates”. *Joe Shute in The Telegraph, 2013*
FACTORS CHECK POINT:
Before we look at Penicillin in more detail, let’s reflect on FACTORS.

Which factor is the most important in the treatment and prevention of illness in the 19th / 20th Century?

Science & Technology:
You will now be given a series of information cards on IMPACT OF SCIENCE & TECHNOLOGY on treatment and prevention, your job is to organise them into the following headings in your book:

- Crucial
- Important
- Not important
As with diagnosis, the way we treat disease is now unrecognisable from the periods before 19th Century – This is largely due to huge advances in science and technology. **Do you agree?**

You must talk about:

- Science & Technology
- Individuals
- ONE other

**Use your work from the last few lessons to help**

Write a 2 sided argument to this question. Remember to include BOTH sides of the argument (agree & disagree) and a conclusion. You have some further information to help you
TOPIC TEST

- Revise for your next Topic Test on
  
  - GENETICS
  - DIAGNOSIS
  - MAGIC BULLETS