

## Fighting Disease - Discovering magic bullets

### *Why could Pasteur not discover 'magic bullets' before Ehrlich did?*

Look at this typical exam question and think about how you might tackle it in your exam. When you are ready, compare your work with these two answers.

**Carina** - Pasteur could not discover 'magic bullets' before Ehrlich did because he didn't have the necessary knowledge about how the body works. Pasteur was a famous scientist who proved that spontaneous generation did not happen and that it was germs in the air that caused decay. He began to work on anthrax, which was a disease in sheep and cattle, and managed to first of all isolate the germ and then develop a vaccine which could be injected into animals and prevent them catching the disease. Ehrlich discovered magic bullets because he had found out chemical dyes could be used to target certain bacteria and then his team tried lots of different solutions until they found the right one.

**Emma** - There are several reasons why Pasteur could not find out about magic bullets. The most important one was probably that scientific knowledge had not reached the right level. Ehrlich was able to discover that chemical dyes could be used to attack specific bacteria because Pasteur's work had shown that microbes caused disease and Koch had then identified the bacteria that caused specific diseases. Without these earlier discoveries, Ehrlich would not have tried to use chemical dyes in this way, so it is unfair to expect Pasteur to make this discovery without the basis of that knowledge. Technology had improved in the period between Pasteur and Ehrlich so that better microscopes were available to help Ehrlich's research and he was also able to take advantage of the chemical dye industry. Pasteur worked alone, although he knew about Koch's discoveries, but Ehrlich worked as part of a team and the scientific approach of controlled experiments was difficult and expensive to carry out by a single person. In this way, money and teamwork also helped Ehrlich whereas Pasteur did not have these advantages. Now read through the Examiner's view to find out which of these is the better answer and why.

**The Examiner's view** - Carina tends to describe the work of Pasteur and, although she mentions the level of scientific knowledge and Ehrlich's use of chemical dyes and teamwork, she does not explain how these points meant that Ehrlich could make the discovery of magic bullets and why Pasteur could not.

This approach to the question means that Emma's first paragraph is better than all of Carina's answer but then Emma goes on to look at several points - the level of scientific knowledge, technology, money and team work. For each of these she explains how they helped Ehrlich and how they were not available to help Pasteur.