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ANTIBIOTIC RESISTANCE
A CHALLENGE FOR THE 21ST CENTURY

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Overview

- An introduction to antibiotics
- How do antibiotics develop resistance?
- Factors that increase the chance of antibiotic resistance
- Solutions to tackling antibiotic resistance
- Final comments

An introduction to antibiotics

In 1928, the Scottish biologist Alexander Fleming discovered that the Penicillium mould that had accidentally contaminated his experimental cultures of bacteria at St Marys hospital, had the ability to kill microorganisms. Fleming named this antibacterial substance 'penicillin'.

Penicillin was successful in treating bacterial infections among soldiers during WWII. However, soon after, penicillin resistance became a global crisis which put many of the advances prior to this decade at stake.

Upon reflection of his discovery, Fleming interestingly commented:

'When I woke up just after dawn on September 28, 1928, I certainly didn't plan to revolutionise all medicine by discovering the world's first antibiotic, or bacterial killer, but I suppose that was exactly what I did'.

Antibiotics have contributed greatly to the decline in mortality rates and the increase in life expectancy of many populations around the world. Bacterial infections, such as strep throat, can now be easily treated with antibiotics, but 80 years ago, this may not have been possible. Unfortunately, the consistent misuse and overuse of antibiotics in medicine and food production has led to the development of antibiotic resistance and has put the modern world at risk.

When antibiotics are used correctly, their effects are phenomenal- protecting individuals from fatal diseases to ensuring complex procedures such as chemotherapy are provided at a minimal risk. According to the World Health Organisation (WHO), "Deaths caused by infections from antibiotic-resistant bacteria will skyrocket over the next two decades, along with huge economic costs, without immediate, ambitious and coordinated action."

How do antibiotics develop resistance?

Some bacteria in the body are drug resistant due to a random mutation

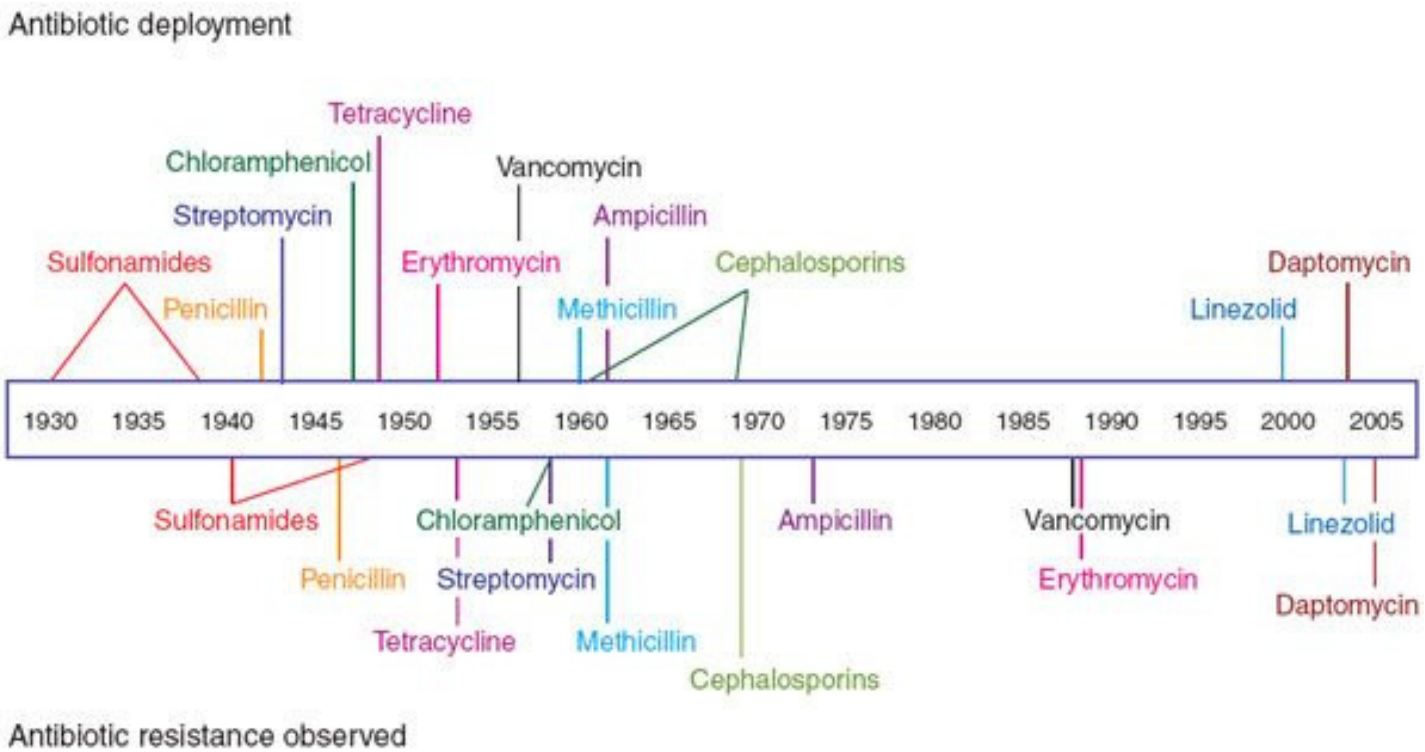
The antibiotic will kill bacteria, but not those resistant to the drug

The resistant strains will divide and multiply

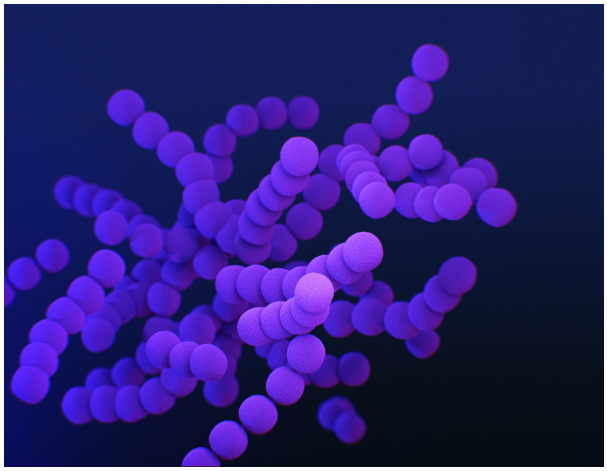
Bacteria are able to transfer their drug-resistance to other bacteria.

Drug-resistant bacteria can circulate in populations of humans and animals through food, water and the environment. The transmission of the resistant strains can be influenced by trade, travel and mitigation.

The figure below shows that shortly after an antibiotic has been introduced, resistant strains of bacteria begin to appear within a year:



Factors that increase the chance of antibiotic resistance



- Overuse and misuse of antibiotics
- Lack of access to clean water, sanitation and hygiene
- Poor infection and disease prevention
- Poor access to medicines/ vaccines
- Lack of understanding of antibiotic resistance

Solutions to tackling antibiotic resistance

Improve sanitation and hygiene:

- Improving living conditions can help reduce the need for antibiotics in the first place which in turn decreases the likelihood of any resistant strains of bacteria growing and spreading.

Optimising the use of antibiotics:

- Antibiotics are easy to access (through over the counter) and on the internet from a widespread of countries. People and animals should take the correct antibiotic at the right time and in the right amount to ensure that their treatment is most effective.

Promote the development and use of vaccines and alternatives:

- An increase in the number of vaccinations can reduce the need for antibiotics. Research is being conducted into the development of alternatives to antibiotics such as phage therapy, antibodies and probiotics.

Final Comments

Antibiotic resistance is one of the biggest public health challenges of our time. Each year in the UK, approximately 12,000 people die from antibiotic resistance (which is similar to the number of deaths from breast cancer). This “golden age” of discovery may soon come to an end, as more bacteria are becoming resistant to the antibiotics available to us. It is for this reason that healthcare organisations across the world have been focusing on developing stewardship policies to promote the appropriate use of antibiotics.

Catch me in the next issue on... Vaccinations!