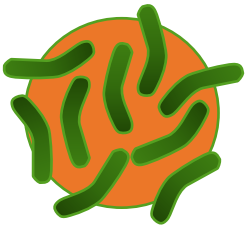
Antibiotic resistance



Antibiotics include substances that kill or inhibit the growth of bacteria. Antibiotics occur naturally in the environment and are produced by bacteria and fungi where they are thought to be used in defence against other bacteria or to send chemical messages as means of communication. Because of their ability to kill or stop the growth of bacteria, we use them as medicines to treat bacterial infections in humans and animals.

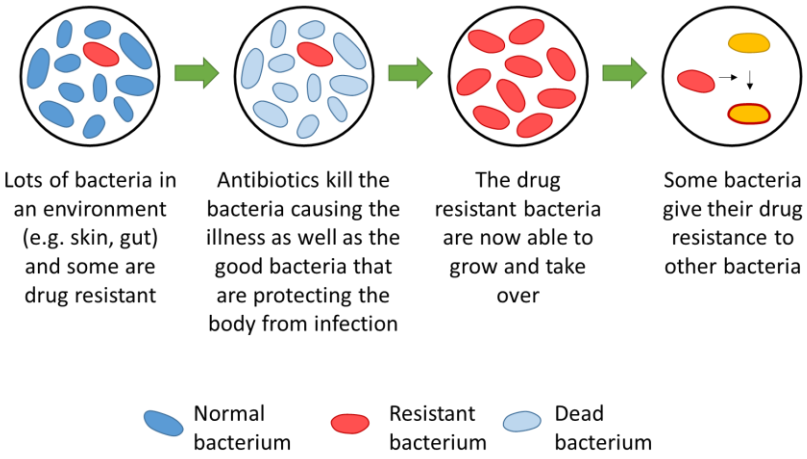
Antibiotic resistance means **the bacteria are resistant**, not the human or animal that is being treated. There are many different families of antibiotics, which are used to treat different bacterial infections. Some antibiotics are specific for certain bacteria whereas others are active against a range of bacteria and these are known as broad-spectrum antibiotics.

Some bacteria can become resistant to more than one antibiotic and they are often referred to as superbugs. **Antibiotics are not effective against other types of microbe such as viruses or fungi**. For that you need anti-virals or anti-fungal reagents.

When antibiotic resistance occurs, antibiotics do not work and the infections can no longer be treated. Resistant bacteria can also persist and spread to other people or animals. Bacterial resistance to antibiotics is a very important global issue; **it is estimated that resistant bacteria will cause 10 million human deaths each year by 2050**. Routine and complicated surgical operations would be linked to a high risk of untreatable infections. Mild infections that we currently treat with antibiotics and thus do not worry about could become deadly in the future.

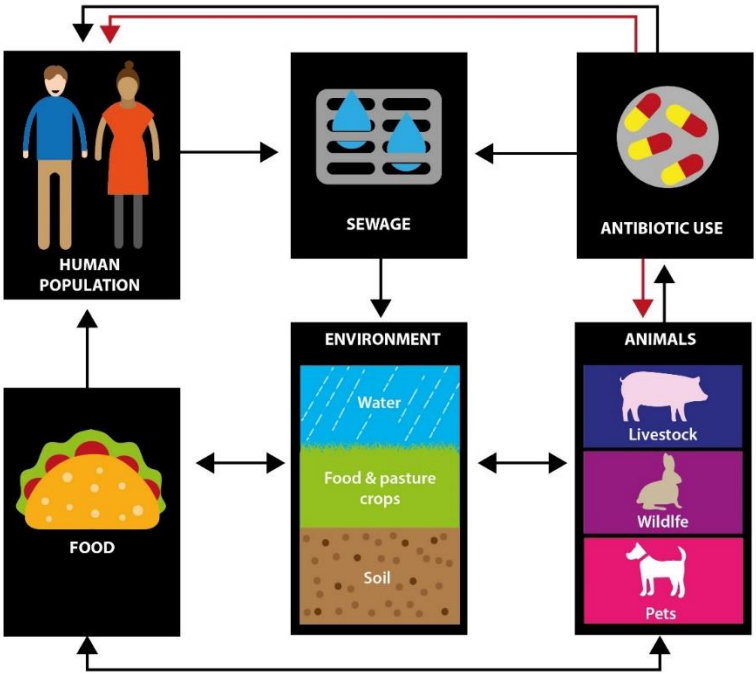
Antibiotic resistance occurs naturally in nature but it can **develop and spread** more rapidly when bacteria are exposed to antibiotics. Because antibiotics have been **overused and used inappropriately** in **healthcare** and **farming** since their discovery, this process has been greatly accelerated and a large number of bacteria are now resistant. **Bacteria can evolve**, through changes in their DNA or acquisition of new pieces of DNA and these changes allow them to resist the effects of the drugs. bacteria also evolve better ways to pump out toxic drugs as a protective strategy. These resistant bacteria can then also be spread due to poor hygiene or inefficient infection control. An example of antibiotic misuse is taking an antibiotic to treat the common cold or the flu, which are caused by viruses and not bacteria.

How antibiotic resistance develops



Resistance often develops in **hospitals**. Use of antibiotics is vital for major surgeries/clinical procedures, so they are more frequently used in hospitals, but people who are ill are less able to fight infection. Bacteria can also spread very easily between patients, hospital staff and visitors due to direct contact. Because of this, **good hygiene practices such as hand washing are vital**. This simple action is still the best way to fight against nosocomial (hospital acquired) infections, especially for hospital staff.

Once resistant bacteria have evolved, they can also be **spread within the community**, from person to person or from animals to people and *vice versa*. Bacteria can also be spread through the environment, and scientists are trying to understand how resistant bacteria are spread between **farms, sewage, hospitals effluent, wildlife and water bodies**. These bacteria can also be spread globally through **travel, food importation**, and **migratory wildlife populations**. Additionally, because some antibiotics are very stable and may persist in water systems, their presence could be a driver of bacterial resistance in the environment. A compounding problem is that different types of bacteria have different resistance strategies.



Antibiotics were also heavily used in **agriculture** for disease treatment of animals, and in low levels to prevent infections and to help animals grow faster. There are now laws to prevent overuse from happening in the UK and EU and although the use of antibiotics by farmers has reduced greatly, this is not regulated in all countries. Resistant bacteria that emerge on farms can then be transferred to humans directly, via food or via the environment.

How do we stop antibiotic resistance?

There are certain things that we can all do to limit the development of antibiotic resistance. **You should**

- Only use prescribed antibiotics as directed by your doctor.
- Never share antibiotics or use leftover antibiotics.
- Use good hygiene to limit the spread of resistant bacteria and avoid infections.
- Keep vaccinations up-to-date.
- Don't use antibiotics for viral or fungal infections.

In **medicine and hospitals**, good hygiene is vital. Professionals should also test to understand what is causing an infection, to confirm whether antibiotics are needed and prescribe specific antibiotics at the right dose, for the correct duration.

In the **agricultural sector**, antibiotics should only be given to animals to control or treat infections and these should be prescribed by a vet. Farming practices must also follow good hygiene and biosecurity practices. Animals should be not be allowed to get stressed, which can increase the development of infections. More effort is required to prevent environmental spread of drugs, for example from run-off.

Scientists also have important and wide-ranging roles. Some are working to develop improved vaccines and diagnostics for humans and animals. This will reduce the requirement for antibiotics, and ensure that infections are diagnosed quickly and correctly so the appropriate treatments are given. Other scientists are trying to discover new antibiotics so we do not run out of treatment options. Scientists also help to improve our understanding of how bacteria and their genes are spread in the environment, and how this can be reduced.

Finally, **governments and policy makers** also have an important role in developing policies and supporting strategies to reduce the use of antibiotics and raise awareness of this important issue.

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