

Standard: Students will evaluate the role of natural selection in the development of the theory of evolution.

Element: Recognize the role of evolution to biological resistance (pesticide and antibiotic resistance).

EQ: What is biological resistance?

Since the process of evolution happens over many generations, we rarely experience it within our lifetimes.

However, some organisms (like bacteria) have extremely short life cycles and multiply very quickly.

Under the right conditions, some bacteria can multiply every 20 minutes!



Some species of bacteria cause diseases in humans and other organisms. These diseases include strep throat, pneumonia, food poisoning (*Salmonella* and *E. coli*), and tuberculosis.

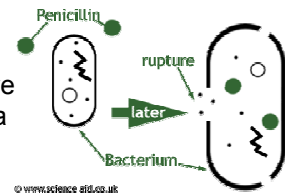
We have developed drugs called **antibiotics** in order to treat these disorders. Penicillin is a very common antibiotic.



How do antibiotics work?

Most antibiotics work by destroying the cell wall of the bacteria.

Remember that animal cells don't have cell walls, but bacteria cells do.



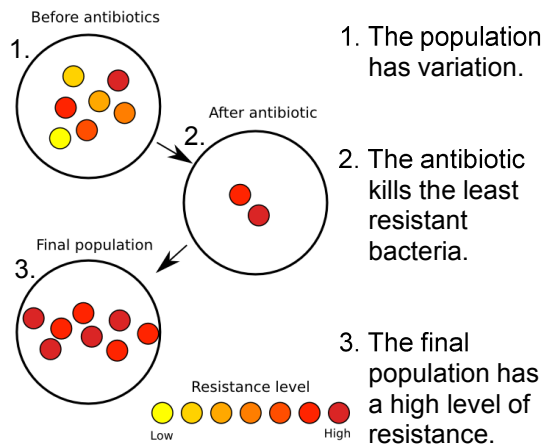
This means that the antibiotics do not harm our cells, even though they kill the bacteria.

Because there is always **variation** in a population, some bacteria can have a mutation that prevents them from being killed by antibiotics.

The ability to survive exposure to antibiotics is called **antibiotic resistance**.

Antibiotic resistant bacteria are normally very rare in the population.

However, if antibiotics are used very frequently then all of the non-resistant bacteria get killed and only the antibiotic resistant bacteria survive to reproduce.





Doctors are concerned about the overuse of antibiotics.

If people take unneeded antibiotics, there is a greater chance of developing antibiotic resistant bacteria.

Already, most bacterial diseases already have at least one strain that is resistant to antibiotics.

Why antibiotics won't work for your cold:

The common cold is caused by a **virus**.

A virus is a simple structured that consists of two basic parts:

- 1) Genetic Information (DNA or RNA)
- 2) Protein Coat

A VIRUS IS NOT A LIVING ORGANISM!!!

Why isn't a virus considered a living organism?

- 1) All living things are made of cells. *Viruses are not.*
- 2) All living things can maintain homeostasis. *Viruses cannot.*
- 3) All living things have metabolism. *Viruses do not.*
- 4) All living things can reproduce. *Viruses cannot reproduce on their own; they inject their genetic information into a cell and the cell makes new viruses.*

It isn't just bacteria that can become resistant.

Farmers often use chemicals such as pesticides (to kill insects) and herbicides (to kill weeds).

These pests often develop resistance to pesticides in the same way that bacteria develop resistance to antibiotics. When unwanted organisms develop resistance to the methods humans use to kill them, it is called **biological resistance**.