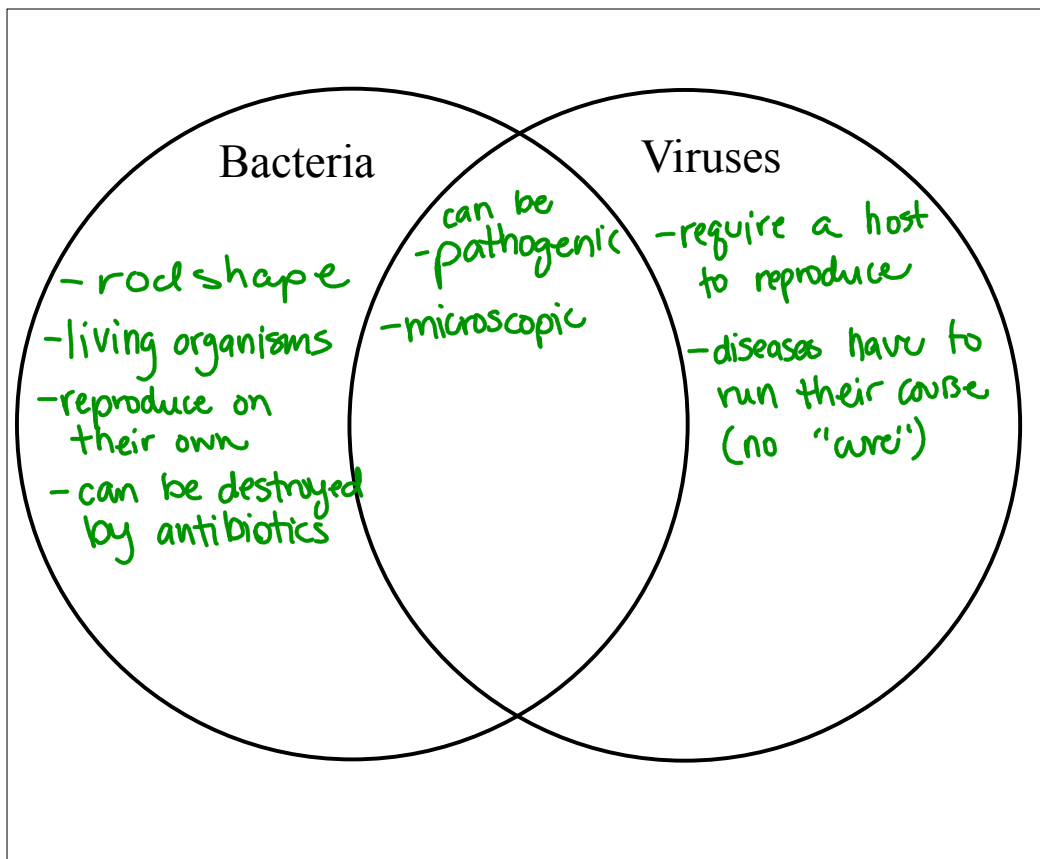


Honors Biology Bellringer:

Make a Venn Diagram comparing bacteria and viruses. Use the book if you need to (chapter 20).



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

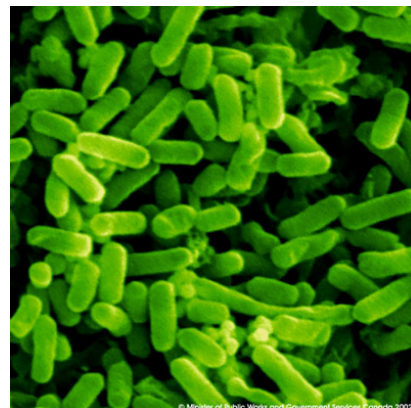
Element: Recognize the role of evolution to biological resistance (pesticide and antibiotic resistance).

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.

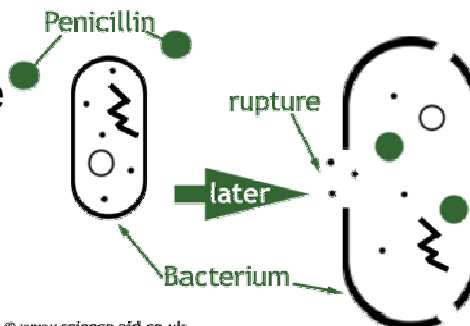
We have developed drugs called antibiotics in order to treat these disorders. Penicillin is a very common antibiotic.



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.



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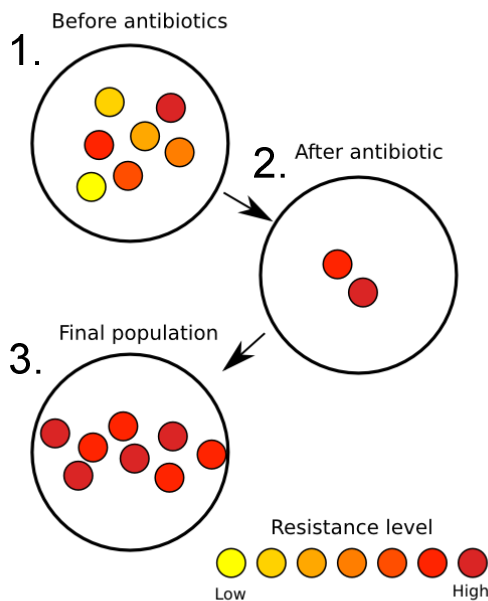
This means that the antibiotics do not harm our cells, even though they kill the bacteria.

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**.



The image below represents a population of bacteria living in a petri dish. The steps below show how it is possible for a “normal” population of bacteria to become antibiotic resistant.



1. The population has variation.
2. The antibiotic kills the least resistant bacteria.
3. The final population has a high level of resistance.



EUROPEAN ANTIBIOTIC AWARENESS DAY

NHS

UNFORTUNATELY, NO AMOUNT OF ANTIBIOTICS WILL GET RID OF YOUR COLD.

The best way to treat most colds, coughs or sore throats is plenty of fluids and rest. For more advice talk to your pharmacist or doctor.

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Doctors are concerned about the overuse of antibiotics.

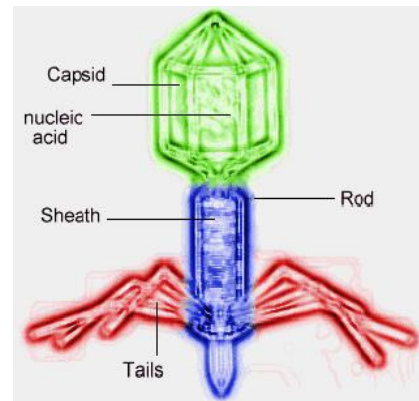
Already, most bacterial diseases have at least one strain that is resistant to antibiotics.

Why antibiotics won't work for your cold:

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

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

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



A VIRUS IS NOT A LIVING ORGANISM!!!

Viruses are not made of cells and therefore do not have a cell wall. This means that antibiotics will have no effect on viral infections.

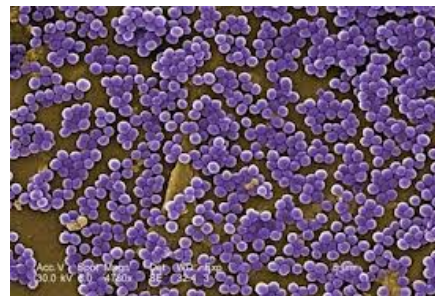
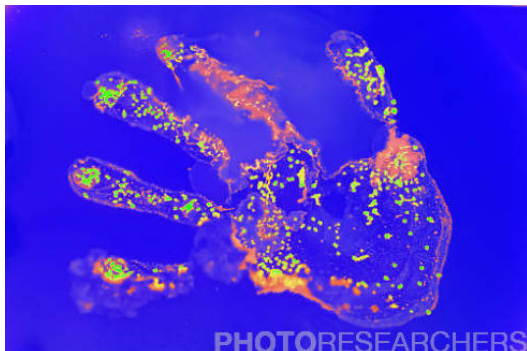
Many times when people get sick, they see the doctor in order to get medicine that will make them well again. If the illness is caused by a virus, there isn't much a doctor can do except treat the symptoms.

There are two major reasons why antibiotic resistance is on the rise:

1. People taking antibiotics when they aren't necessary (such as if they have a viral infection).
2. People not taking the full dose of antibiotics when they *are* prescribed.



In both of these circumstances, bacteria are being exposed to antibiotics in your system. Under normal conditions there would only be a very small percentage of antibiotic resistant bacteria in the population. As long as there are no antibiotics present, the resistant bacteria would not have an advantage.



With antibiotics present, however, the resistant bacteria have an advantage over the susceptible bacteria. Natural selection takes place and over time most of the bacteria will be resistant to antibiotics. With such a large population of resistant bacteria, the likelihood of transmitting an antibiotic resistant infection is much higher than normal.



Testing the resistance of microbes in the lab. These Petri dishes contain lawns of bacteria (creamy yellow) cultured from two different clinical samples. The white discs each contain different antibiotics. Where clear zones appear around the discs, bacterial growth has been prevented by the antibiotic. This image has been provided courtesy of Dr. Manfred Brigl and Esperanza Albano of the Clinical Microbiology Laboratory at the Brigham and Women's Hospital, Boston.

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**.

