Bacteria in your life

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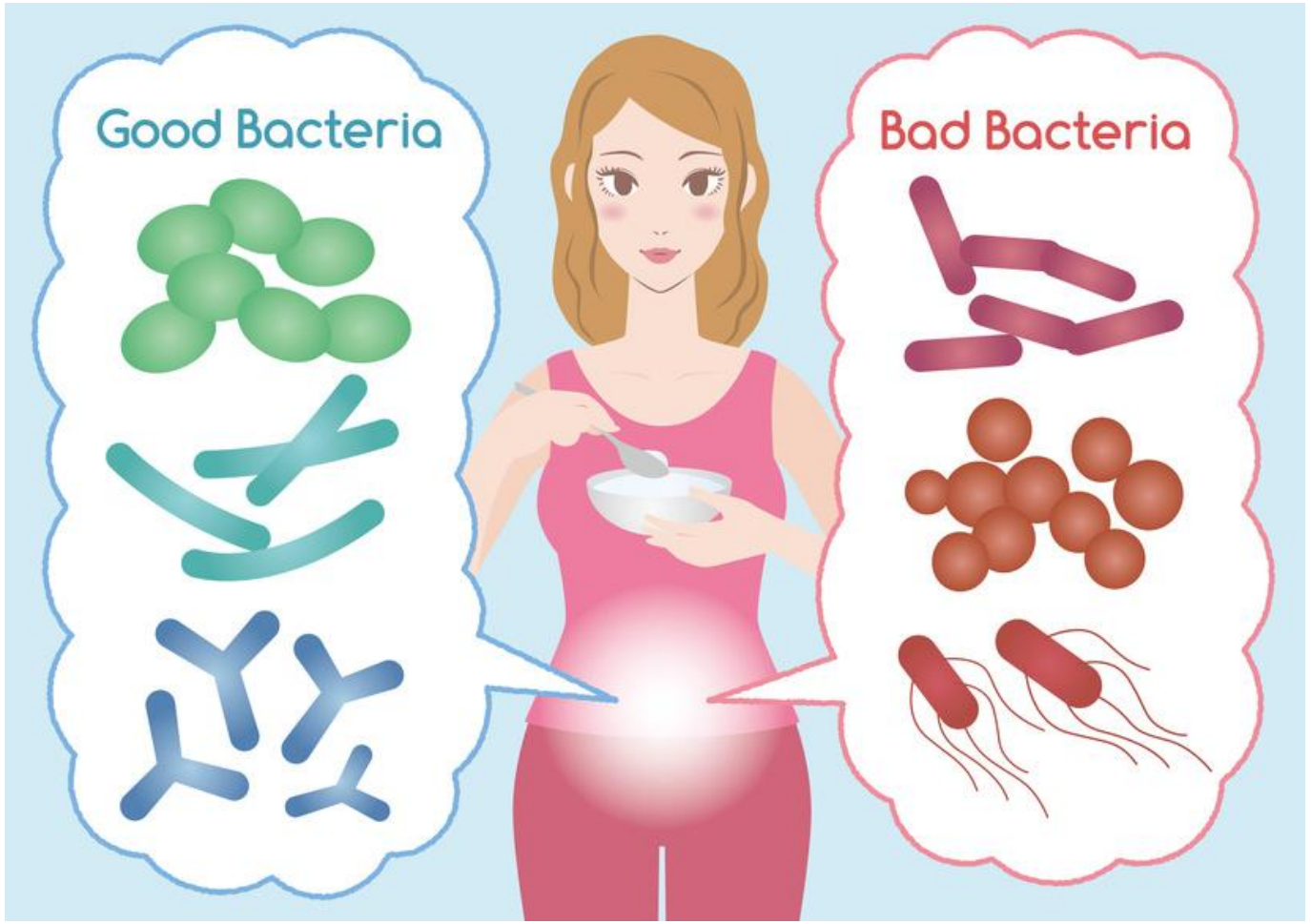
Bacteria That Help You

Your health depends on bacteria! These tiny organisms live inside your digestive system, especially in your large intestine. Most of them are harmless and actually help keep you healthy. For instance, certain bacteria in your intestines make **vitamin K**, which is important for your blood to clot properly.

Some bacteria also make chemicals called antibiotics that stop other bacteria from growing. For example, a type of **soil bacteria** creates **streptomycin**, an antibiotic. Another bacteria called **Bacillus** produces an antibiotic used in many **antiseptic ointments** you can buy without a prescription. Antibiotics are medicines that can treat bacterial diseases in humans and animals.



Bacteria and the Environment

Without bacteria, there would be layers of dead material all over Earth deeper than you are tall. Consumer bacteria called **saprophytes** help maintain nature's balance.

A saprophyte is any organism that uses dead organisms as food and energy sources. Saprophytic bacteria help recycle nutrients. These nutrients become available for use by other organisms.

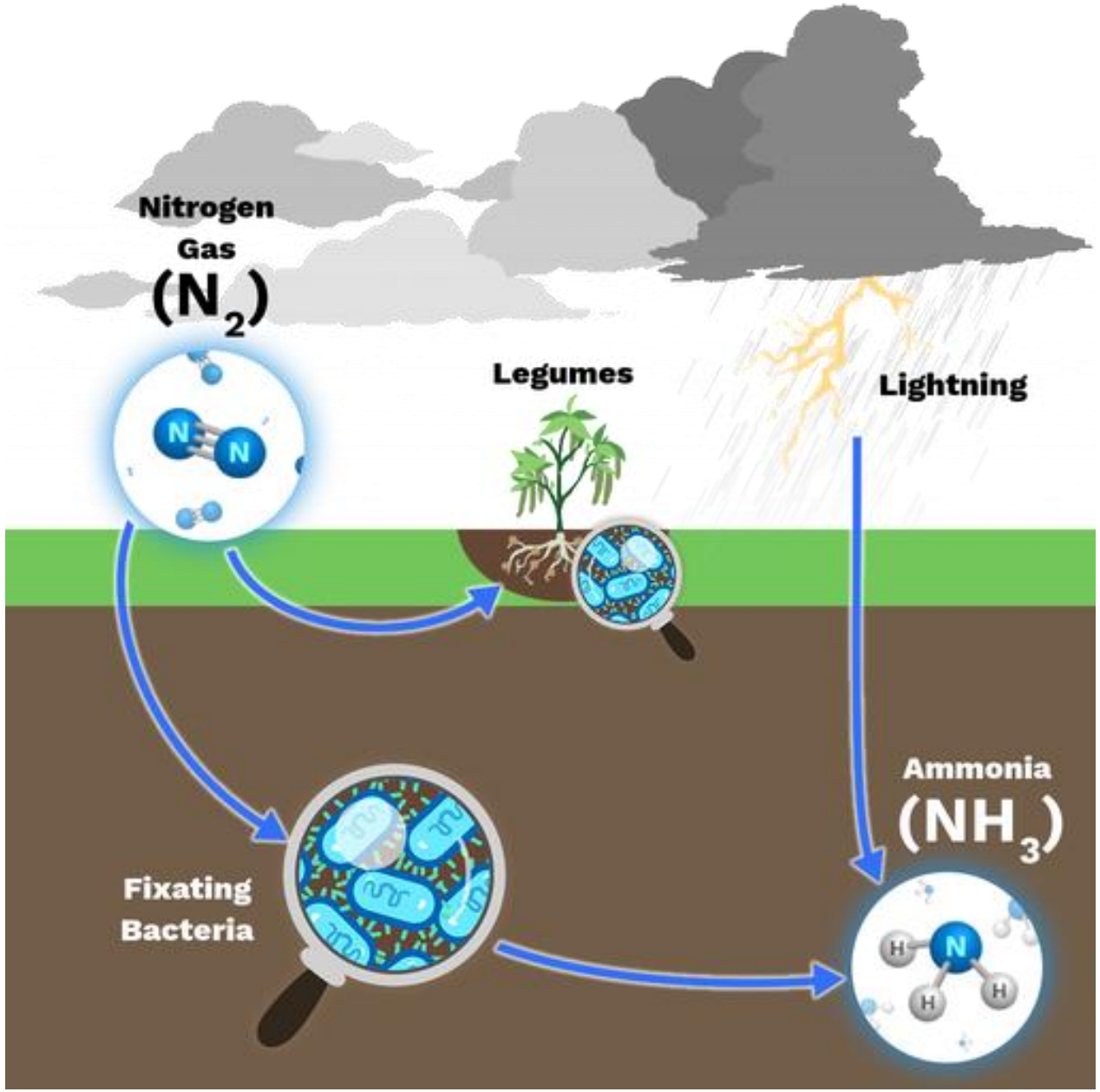
Most **sewage treatment plants** use saprophytic aerobic bacteria to break down wastes into carbon dioxide and water.

Microbe in Sewage Water Treatment

Nitrogen-fixing bacteria

Plants and animals must take in **nitrogen** to make needed **proteins** and **nucleic acids**. Animals can eat plants or other animals that contain nitrogen, but plants need to take nitrogen from the soil or air. Although air is about 78 percent nitrogen, neither animals nor plants can use it directly. **Nitrogen-fixing bacteria** change nitrogen from the air into forms that plants and animals can use.

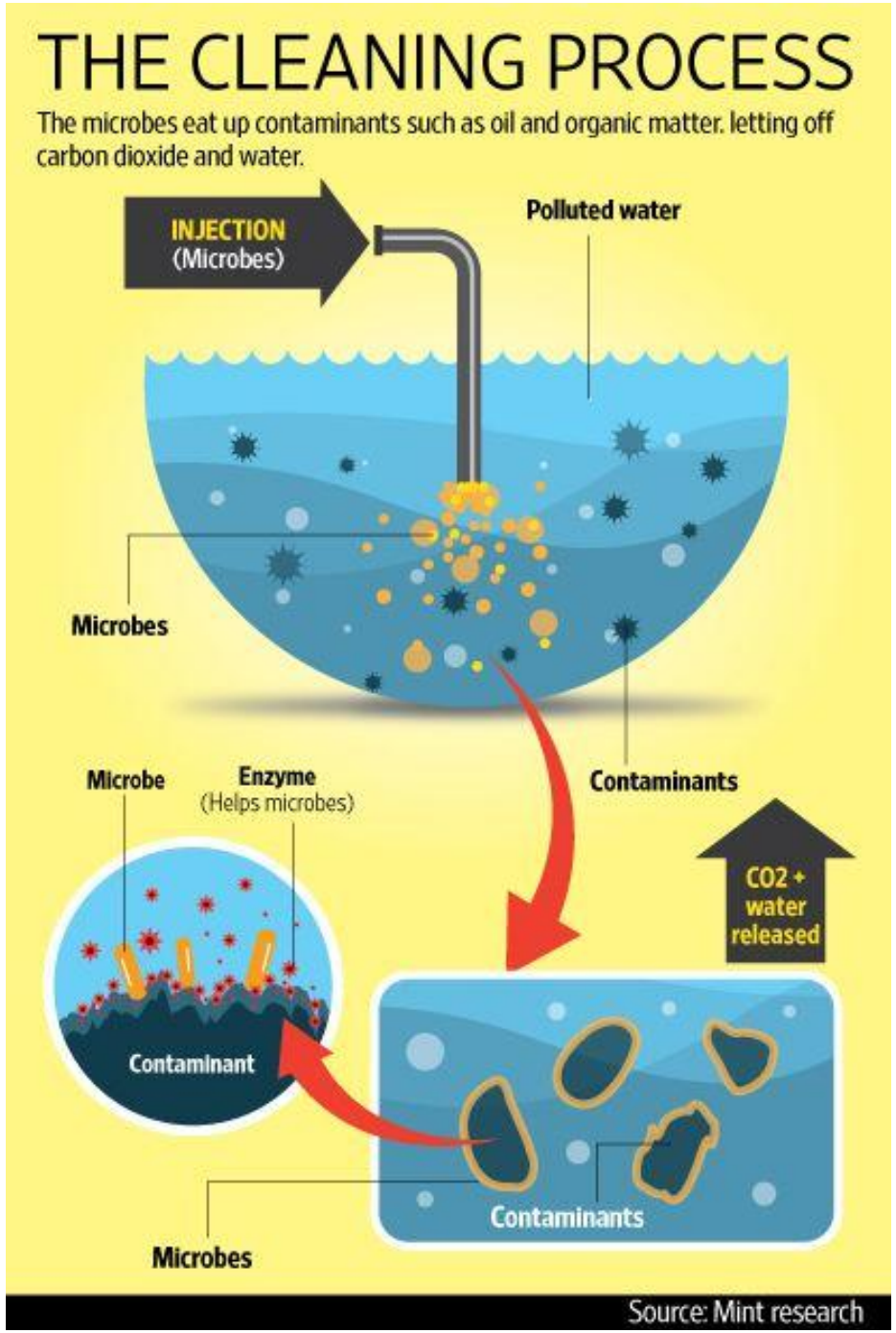
The roots of some plants such as peanuts and peas develop structures called nodules that contain nitrogen-fixing bacteria. It is estimated that nitrogen-fixing bacteria save U.S. farmers millions of dollars in fertilizer costs every year. Many of the cyanobacteria also can fix nitrogen and are important in providing nitrogen in usable forms to aquatic organisms.



Bioremediation

Using organisms to help clean up or remove environmental pollutants is called bioremediation. One type of bioremediation uses bacteria to break down wastes and pollutants into simpler harmless compounds.

Other bacteria use certain pollutants as a food source. Every year about five percent to ten percent of all wastes produced by industry, agriculture, and cities are treated by bioremediation. Sometimes bioremediation is used at the site where chemicals, such as oil, have been spilled. Research continues on ways to make bioremediation a faster process

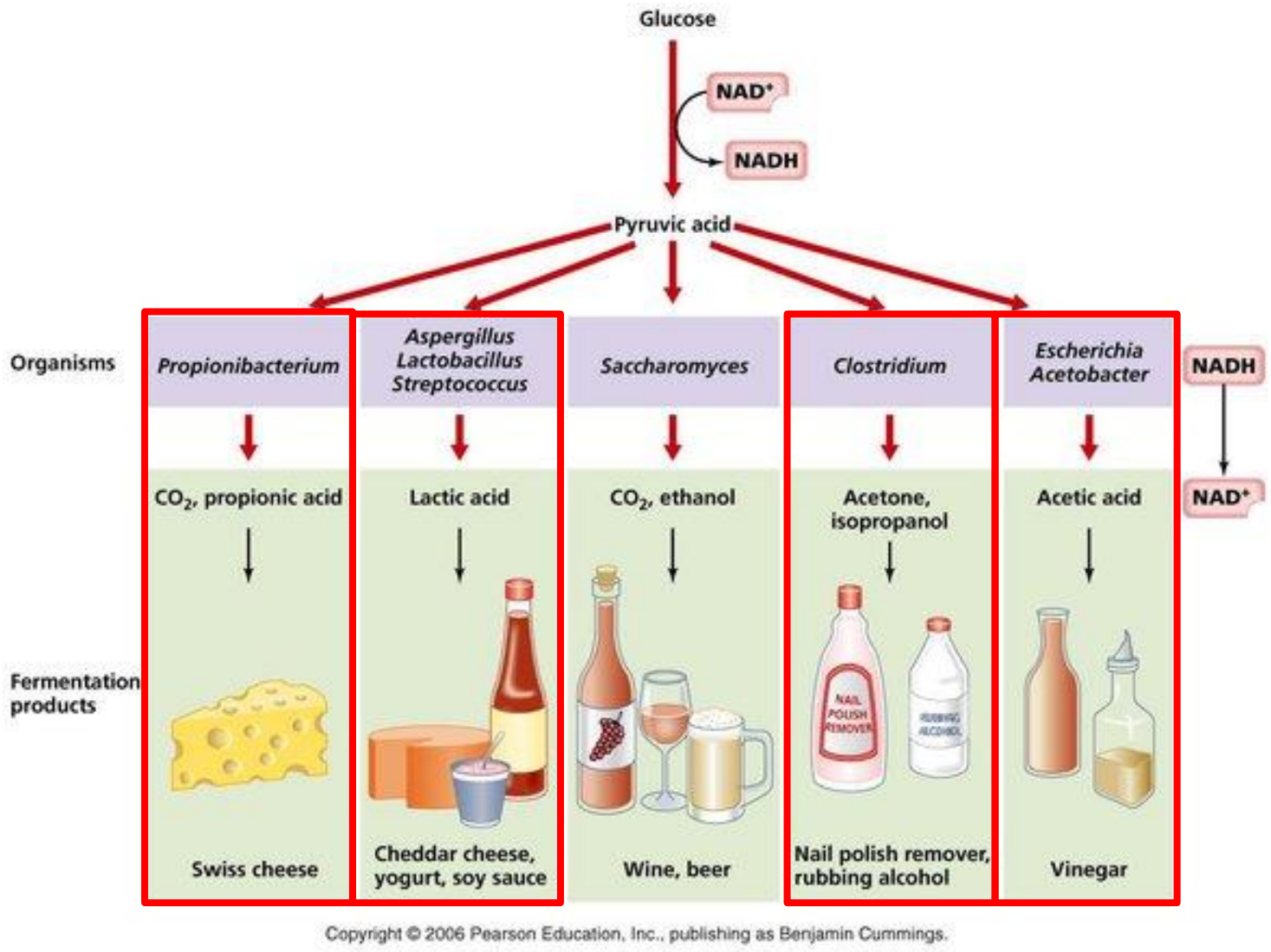


Bacteria and Food

Have you had any bacteria for lunch lately? Even before people understood that bacteria were involved, they were used in the production of foods. One of the first uses of bacteria was for making **yogurt**, a milk-based food that has been made in Europe and Asia for hundreds of years.

Bacteria break down substances in milk to make many dairy products. **Cheeses** and **buttermilk** also can be produced with the aid of bacteria.

Other foods you might have eaten also are made using bacteria. **Sauerkraut**, for example, is made with **cabbage** and a bacterial culture. **Vinegar**, **pickles**, **olives**, and **soy sauce** also are produced with the help of bacteria



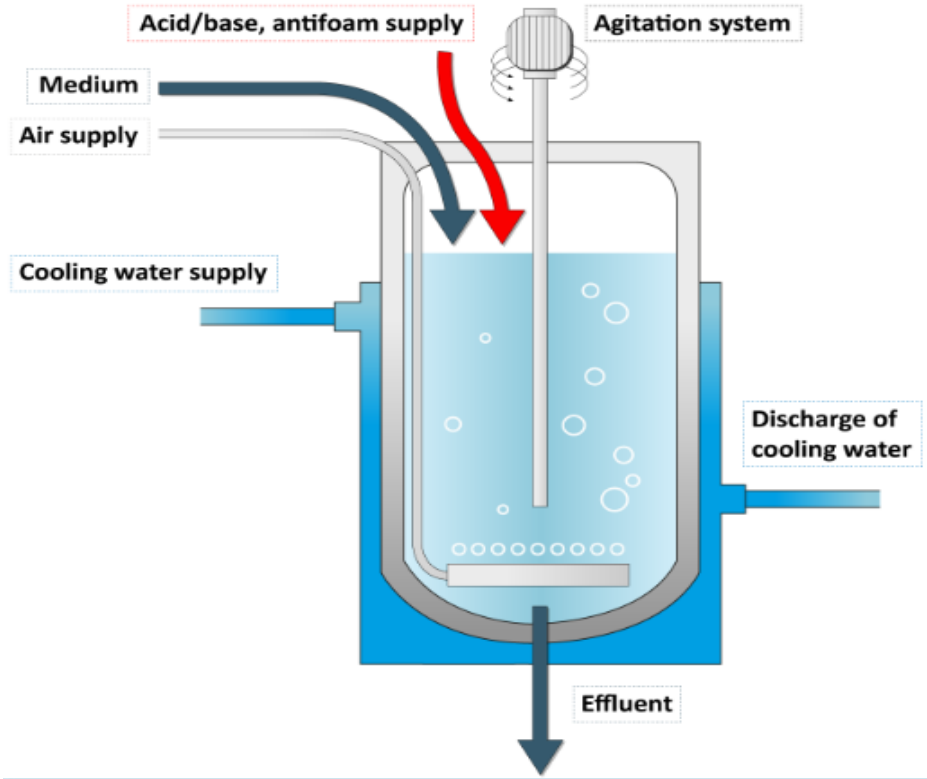
https://www.youtube.com/watch?v=D8AIamucOVQ

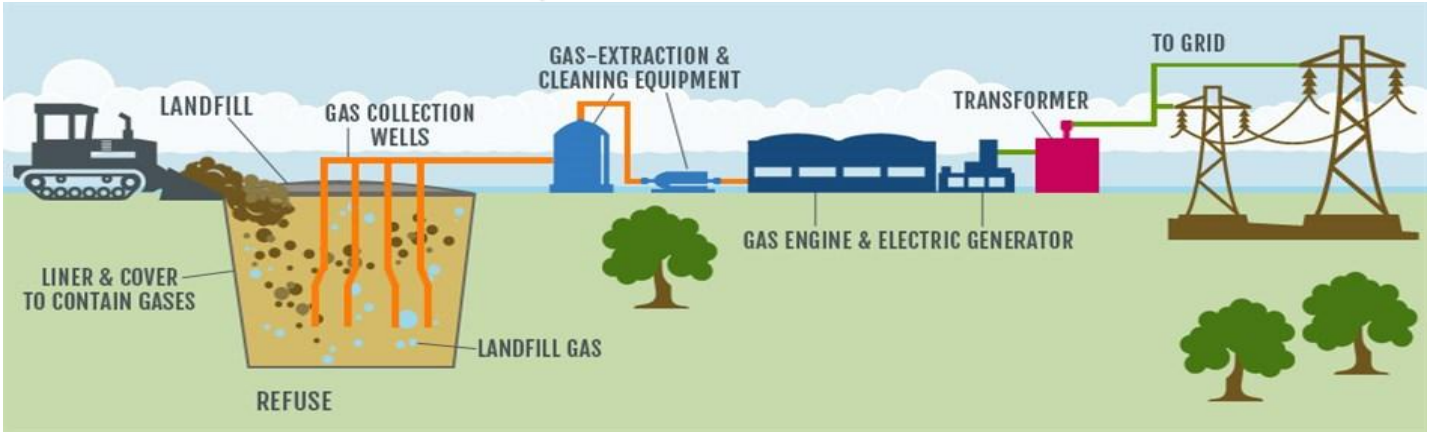
Bacteria in Industry

Many industries rely on bacteria to make many products. Bacteria are grown in large containers called **bioreactors**. Conditions inside bioreactors are carefully controlled and monitored to allow for the growth of the bacteria. **Medicines, enzymes, cleansers, and adhesives are some of the products that are made using bacteria.**

Methane gas that is released as a waste by certain bacteria can be used as a fuel for heating, cooking, and industry. In landfills, **methane-producing bacteria** break down plant and animal material. The quantity of methane gas released by these bacteria is so large that some cities collect and burn it. Using bacteria to digest wastes and then produce methane gas could supply large amounts of fuel worldwide.

Bioreactor



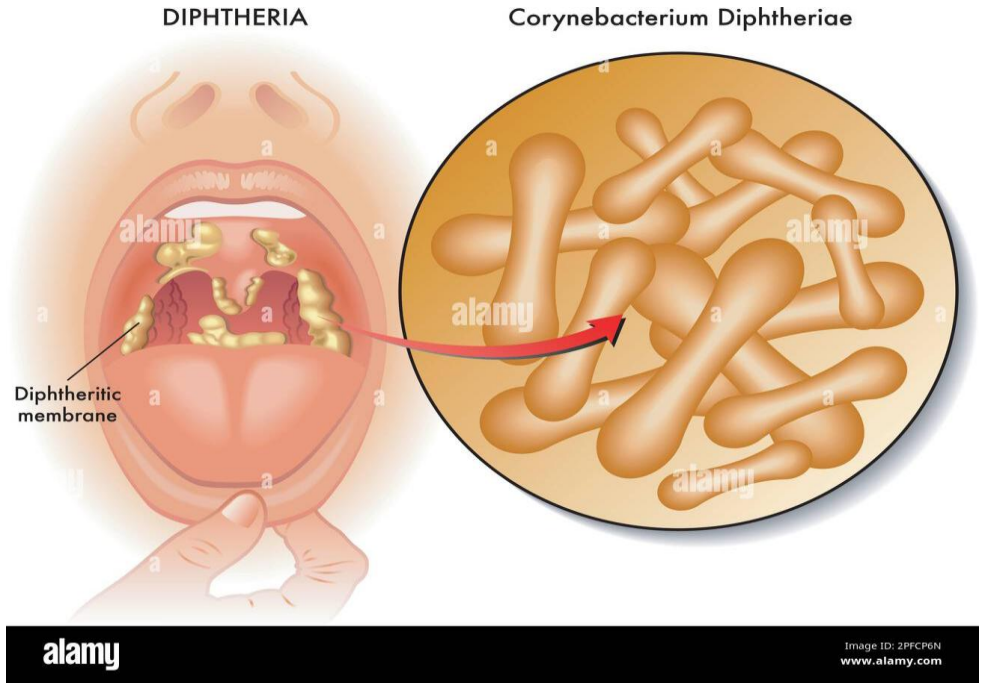


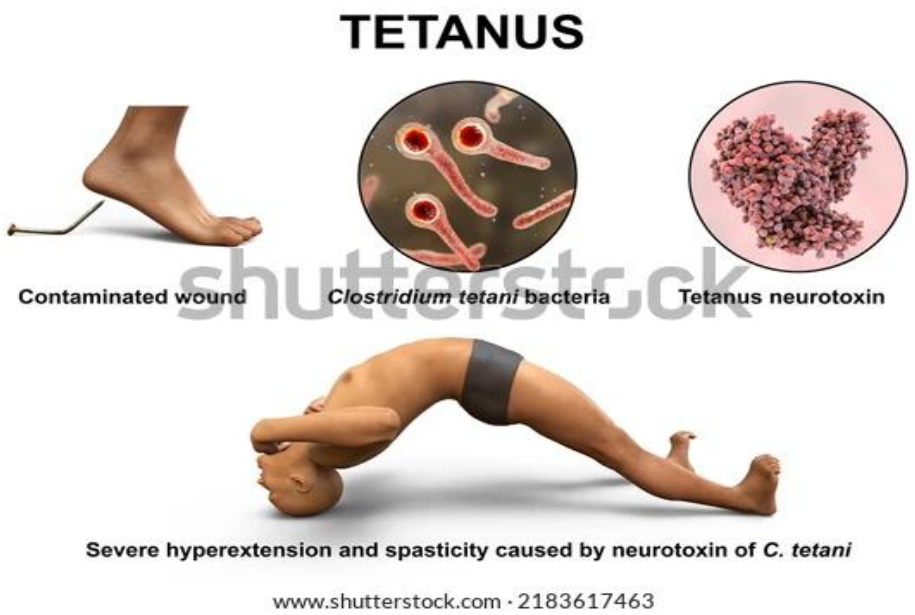
Harmful Bacteria

Not all bacteria are beneficial. Some bacteria are known as **pathogens**.

A pathogen is any organism that causes disease.

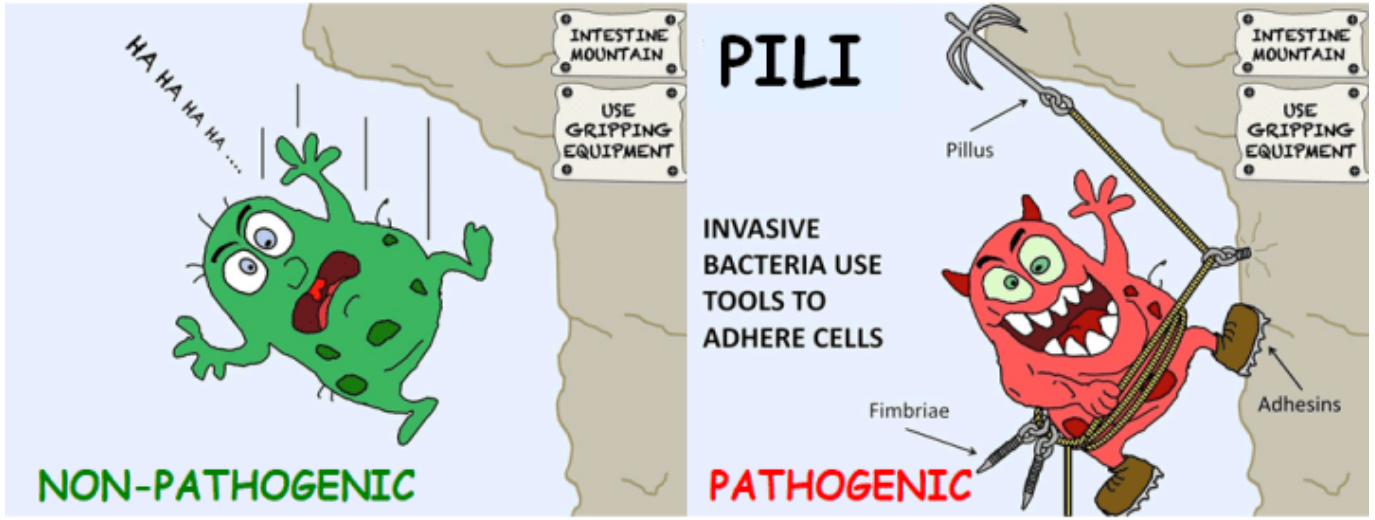
If you have ever had strep throat, you have had firsthand experience with a bacterial pathogen. Other pathogenic bacteria cause **diphtheria**, **tetanus**, and **whooping cough** in humans, as well as **anthrax** in humans and livestock





How Pathogens Make You Sick

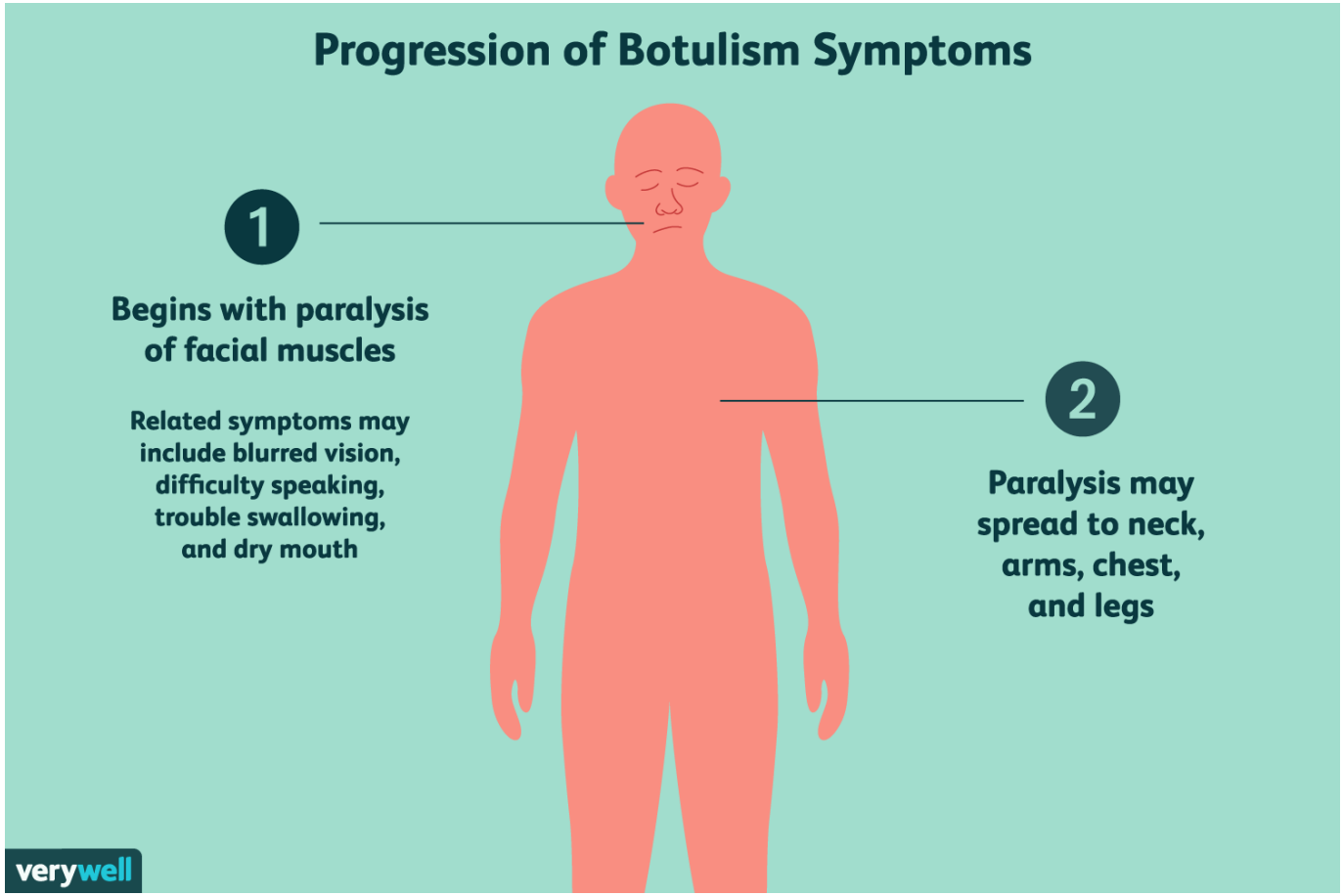
Bacterial pathogens can cause illness and disease by several different methods. They can enter your body through a cut in the skin, you can inhale them, or they can enter in other ways. Once inside your body, they can multiply, damage normal cells, and cause illness and disease.



Botulism

Some bacterial pathogens produce poisonous substances known as **toxins**.

Botulism—a type of food poisoning that can result in **paralysis** and **death**—is caused by a toxin-producing bacterium. **Botulism-causing bacteria** are able to grow and produce toxins inside **sealed cans** of food. However, when growing conditions are unfavorable for their survival, some bacteria, like those that cause botulism, can produce **thick-walled structures called endospores**. Endospores, can exist for hundreds of years before they resume growth. If the endospores of the botulism-causing bacteria are in canned food, they can grow and develop into regular bacterial cells and produce toxins again. Commercially canned foods undergo a process that uses steam under high pressure, which kills bacteria and most endospores



Endospores in some bacteria:

https://www.youtube.com/watch?v=NAcowliknPs

Pasteurization

Unless it has been sterilized, all food contains bacteria. But heating food to sterilizing temperatures can change its taste. Pasteurization is a process of heating food to a temperature that kills most harmful bacteria but causes little change to the taste of the food. You are probably most familiar with pasteurized milk, but some fruit juices and other foods also are pasteurized.