

A microscopic view of numerous rod-shaped bacteria, likely bacilli, arranged in various orientations. The bacteria are light blue and have a slightly textured surface. They are set against a dark blue background with a subtle, lighter blue circular pattern. The entire image is framed by a thick, dark blue border.

How Viruses and Microbes Impact Humans

(Interactive Notebook Pg. 22)

The image shows a dense field of rod-shaped viruses, likely bacteriophages, against a light blue background. The viruses are oriented in various directions, creating a textured, almost crystalline appearance. The entire image is framed by a thick, dark blue border. The text is centered over the image.

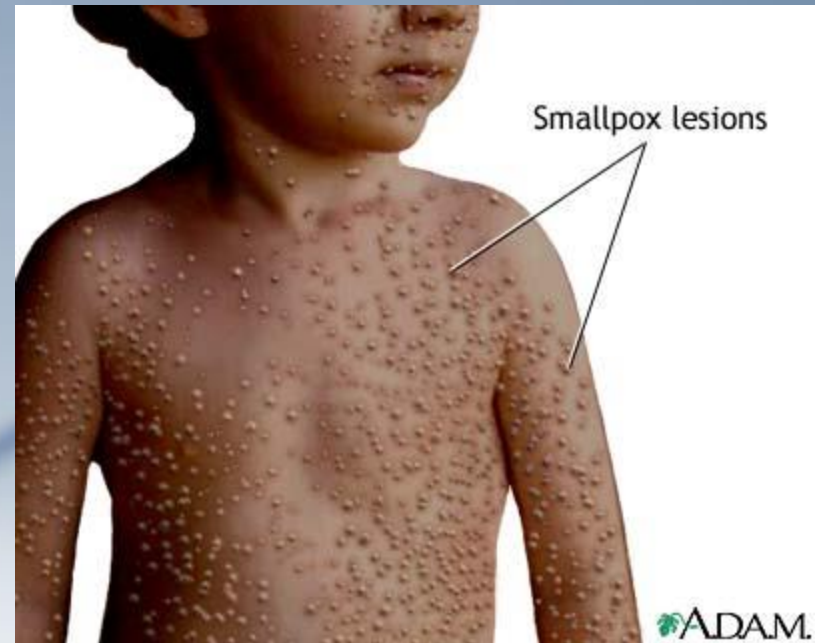
Viruses
(left side)

Harmful:

- Something that causes disease is called pathogenic
- A disease producing agent is called a pathogen
- Human Diseases: Warts, common cold, Influenza (flu), Smallpox, Ebola, Herpes, AIDS, Chicken pox, Rabies
 - HIV infects Helper T Cells (A type of white blood cell)
- Viruses can be prevented with vaccines, but **NOT** treated with antibiotics.
 - (antibiotics treat bacteria)

Beneficial:

- Genetic Engineering – harmless virus carries genes into cells.
- Phage Therapy – using viruses to kill pathogenic bacteria



The Body's Response to Viruses (Antibodies)

- In the US, viruses are responsible for approx. 80% of all infectious disease.
- Mammals protect themselves by producing antibodies to the virus
- An antibody is a protein secreted by cells in the immune system in response to a foreign substance in the body.
- The antibodies attach to the virus and flag it.
- If the virus was not destroyed directly by the antibody or held captive by it until the virus can be surrounded and destroyed by white blood cells

The Body's Response to Viruses (Antibodies)

- If this doesn't happen, the body can be reinfected
- These specific **antibodies** remain in the body of the organism after the virus has been destroyed.
- If the same virus attempts another invasion, it is quickly killed by the antibodies.
- Vaccines cause the body to produce antibodies to a virus to prevent infection
 - Sometimes similar viruses are used to make vaccines for other viruses.

A microscopic view of numerous rod-shaped bacteria, likely bacilli, arranged in a dense, overlapping cluster. The bacteria are light blue or cyan in color and have a slightly textured, cylindrical appearance. The background is a soft, out-of-focus light blue. The entire image is framed by a dark blue border.

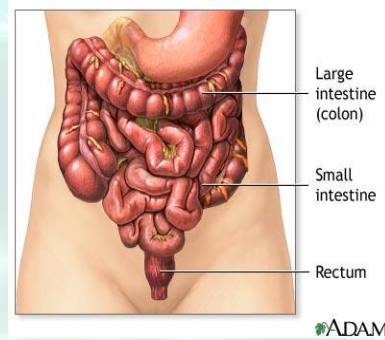
Bacteria
(right side)

Benefits of Bacteria

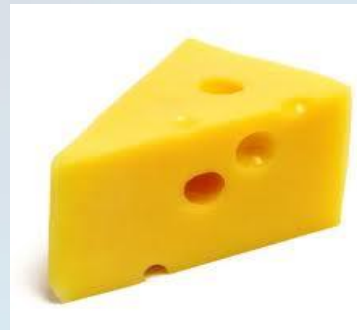
- **Bacteria are vital to maintaining the living world because:**
 1. Some are producers and can put oxygen back into the atmosphere
 2. They are decomposers and can break down dead organic matter
 3. Nitrogen fixation – bacteria live in symbiotic relationship with legumes (bean plants) to convert nitrogen gas to a usable form of nitrogen for plants.

Beneficial Bacteria

4. Bacteria can also be helpful in the large intestine by preventing infections and producing substances we need, such as vitamin B and K.



5. Bacteria are also essential to the production of yogurt, cheese, and pickles.



Beneficial Bacteria

- 6. Bacteria are used to synthesize drugs
 - Example: Genetically engineered *E. coli* is used to produce insulin

Harmful effects of Bacteria

1. Bacteria can invade our cells and use them as **food**.
2. Bacteria can produce **toxins** that are poisonous waste products which damage our cells.
3. Some bacteria become **antibiotic-resistant** due to overuse of antibiotics.
 - Example: **MRSA Methicillin-resistant *Staphylococcus aureus***

Common Bacterial Diseases

- Strep-throat
- Tooth Decay
- Chlamydia
- Lyme Disease
- Tuberculosis
- Cellulitis



- **Methicillin-resistant *Staphylococcus aureus* (MRSA)** is a bacterium that causes infections in different parts of the body.
- Most often, it causes mild infections on the skin, causing sores or boils

Treating and Controlling Bacteria

- Sterilization – heat, boiling water, hand washing
- Disinfectants – Example – Lysol
- Food storage and processing – canning, keeping food cold or frozen
- Vaccines – many bacteria have vaccines to prevent them
- Once a harmful bacteria has infected the body, antibiotics can be used to attack and destroy the bacteria