

# Viruses, Bacteria & Microorganisms

## What are Microorganisms?

Microorganisms are tiny living organisms that cannot be seen with the naked eye. You need a microscope to see them.

Types of Microorganisms:

- Bacteria
- Viruses
- Protozoa
- Fungi
- Algae

Tip: Remember the acronym BVPFA = Bacteria, Viruses, Protozoa, Fungi, Algae

## Viruses

### What is a Virus?

A virus is a non-living particle outside a host. It becomes living only when it enters a host cell (like human cells, animal cells, or plant cells).

- Structure: Made of genetic material (DNA or RNA) and a protein coat called capsid
- Reproduction: Only inside a host
- Size: Extremely small (smaller than bacteria)

### Examples of Viral Diseases:

| Disease   | Virus Type          | Vaccine/Prevention             |
|-----------|---------------------|--------------------------------|
| Smallpox  | Variola Virus       | Smallpox Vaccine               |
| Rabies    | Rabies Virus        | Rabies Vaccine                 |
| Polio     | Polio Virus         | Salk/Sabin Vaccine             |
| Hepatitis | Hepatitis A/B Virus | Hepatitis Vaccine              |
| AIDS      | HIV (RNA Virus)     | No vaccine yet, use protection |
| Measles   | Rubeola Virus       | MMR Vaccine                    |

Mnemonic to remember viral diseases: "Some Real People Hate All Milk"  
(Smallpox, Rabies, Polio, Hepatitis, AIDS, Measles)

# Bacteria

## What is a Bacterium?

Bacteria are single-celled living organisms. They are the simplest form of life and can live without a host.

- Structure: Cell wall, no true nucleus (prokaryotic)
- Size: Bigger than viruses but still microscopic
- Reproduce: By dividing (binary fission)

Types of Bacteria:

- Helpful (e.g., *Lactobacillus* – makes curd)
- Harmful (cause diseases)

## Examples of Bacterial Diseases

| Disease             | Bacterium                          | Prevention/Treatment   |  |
|---------------------|------------------------------------|------------------------|--|
| <b>Tuberculosis</b> | <i>Mycobacterium tuberculosis</i>  | BCG Vaccine            |  |
| <b>Diphtheria</b>   | <i>Corynebacterium diphtheriae</i> | DPT Vaccine            |  |
| <b>Cholera</b>      | <i>Vibrio cholerae</i>             | Oral Rehydration (ORS) |  |
| <b>Tetanus</b>      | <i>Clostridium tetani</i>          | Tetanus Toxoid         |  |
| <b>Typhoid</b>      | <i>Salmonella typhi</i>            | Typhoid Vaccine        |  |

**Remember: DPT Vaccine protects against Diphtheria, Pertussis (Whooping Cough), and Tetanus**

## Protozoa

- Single-celled animals
- Often found in dirty water

### Examples:

| Disease           | Organism                     | Symptoms                |
|-------------------|------------------------------|-------------------------|
| Malaria           | <i>Plasmodium</i> spp.       | Fever with chills       |
| Amoebiasis        | <i>Entamoeba histolytica</i> | Stomach pain, dysentery |
| Sleeping Sickness | <i>Trypanosoma</i> spp.      | Sleepiness, fever       |

Carriers: Mosquito (malaria), Tsetse fly (sleeping sickness)

## Fungi

- Non-green plants (no chlorophyll)
- Can be unicellular (e.g., yeast) or multicellular (e.g., mold)
- Reproduce by spores

## Algae

- Mostly aquatic and green
- Do photosynthesis like plants

### Examples:

- *Chlorella* – used in space food
- *Spirogyra* – called "pond silk"
- *Volvox* – colony-forming algae

## Good vs. Bad Microorganisms

| Good Microbes                             | Bad Microbes                               |
|-------------------------------------------|--------------------------------------------|
| <i>Lactobacillus</i> – Makes curd         | <i>Salmonella</i> – Causes typhoid         |
| <i>Rhizobium</i> – Fixes nitrogen         | <i>Vibrio cholerae</i> – Causes cholera    |
| <i>E. coli</i> – Produces Vitamin B12     | <i>Mycobacterium</i> – Causes tuberculosis |
| <i>Penicillium</i> – Source of penicillin | <i>Yersinia pestis</i> – Causes plague     |

## Vaccines in Human Defense

Vaccines are weakened or killed forms of microbes that help our body learn to fight the real disease.

| Disease      | Vaccine Name         | Discoverer               |
|--------------|----------------------|--------------------------|
| Smallpox     | Smallpox Vaccine     | Edward Jenner            |
| Rabies       | Rabies Vaccine       | Louis Pasteur            |
| Polio        | Salk & Sabin Vaccine | Jonas Salk, Albert Sabin |
| Tuberculosis | BCG                  | Calmette & Guerin        |
| Diphtheria   | DPT                  | Emil von Behring         |

### **Important Facts**

Smallest virus: Rhino Virus (Common Cold)

- Largest virus: Variola (Smallpox Virus)
- Helpful Virus: Bacteriophage – attacks harmful bacteria
- Largest Bacterium: *Thiomargarita namibiensis*
- Smallest Bacterium: *Mycoplasma genitalium*

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