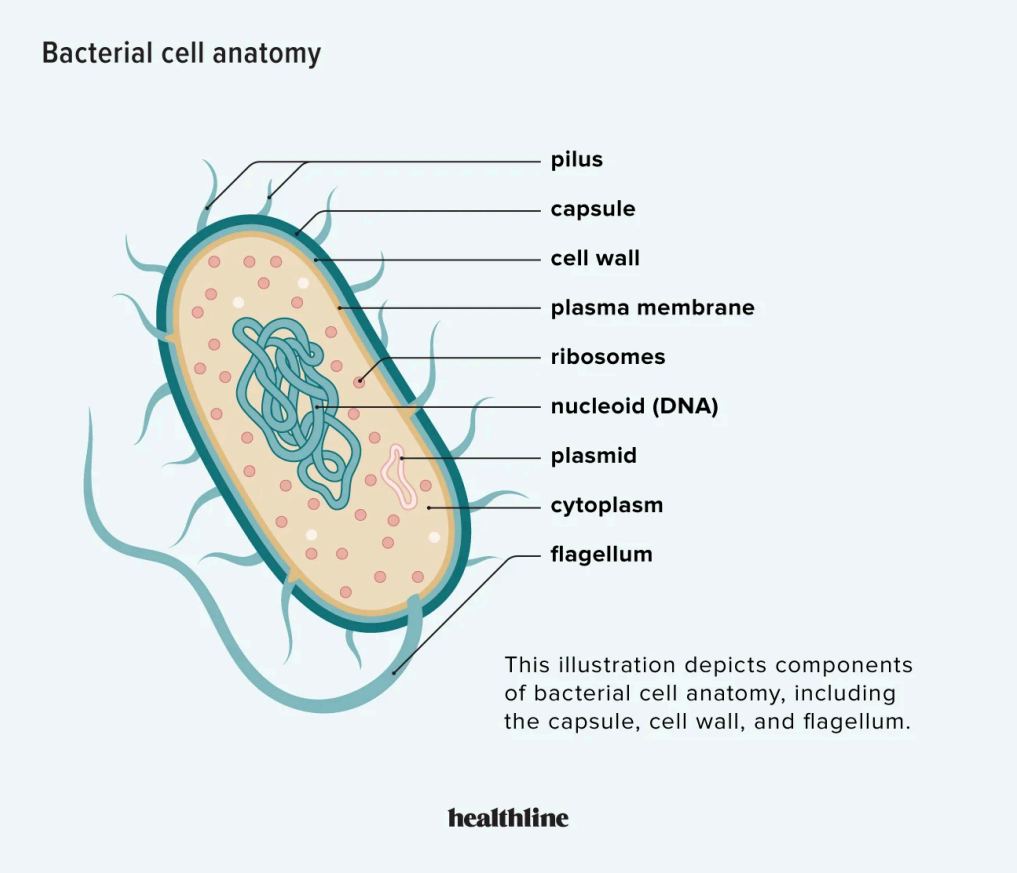
🦠BACTERIA,VIRUS and PRIONS

🔍 What are Bacteria?



- Bacteria are **unicellular (single-celled) prokaryotic organisms**.
- They do **not have a nucleus**; instead, their DNA is located in the **nucleoid region**.
- Found **everywhere** – in soil, water, air, and even inside living organisms.

🧬 Structure of a Bacterial Cell

Structure	Function
Cell wall	Gives shape and protection

Cell membrane	Controls entry/exit of substances
Cytoplasm	Jelly-like substance where cell activities happen
Ribosomes	Protein synthesis
Nucleoid	Area containing circular DNA
Plasmid	Small, extra DNA; can carry useful genes (e.g. antibiotic resistance)
Flagellum	Helps in movement
Capsule	Outer layer for protection (in some bacteria)

🧪 Shapes of Bacteria

1. **Coccus** – Spherical
2. **Bacillus** – Rod-shaped
3. **Spirillum** – Spiral-shaped

🔄 Reproduction

- Bacteria reproduce **asexually** by **binary fission** (one cell splits into two identical cells).

🌱 Nutrition Types

- **Autotrophic**: Make their own food (e.g. photosynthetic bacteria).
- **Heterotrophic**: Depend on other organisms for food.

🦠 Useful Roles of Bacteria

- **Decomposers** – Break down dead matter.
- **Nitrogen fixation** – Convert nitrogen into usable form for plants.

- **Used in food production** – Yogurt, cheese, vinegar.
- **Genetic engineering** – Produce insulin, enzymes.

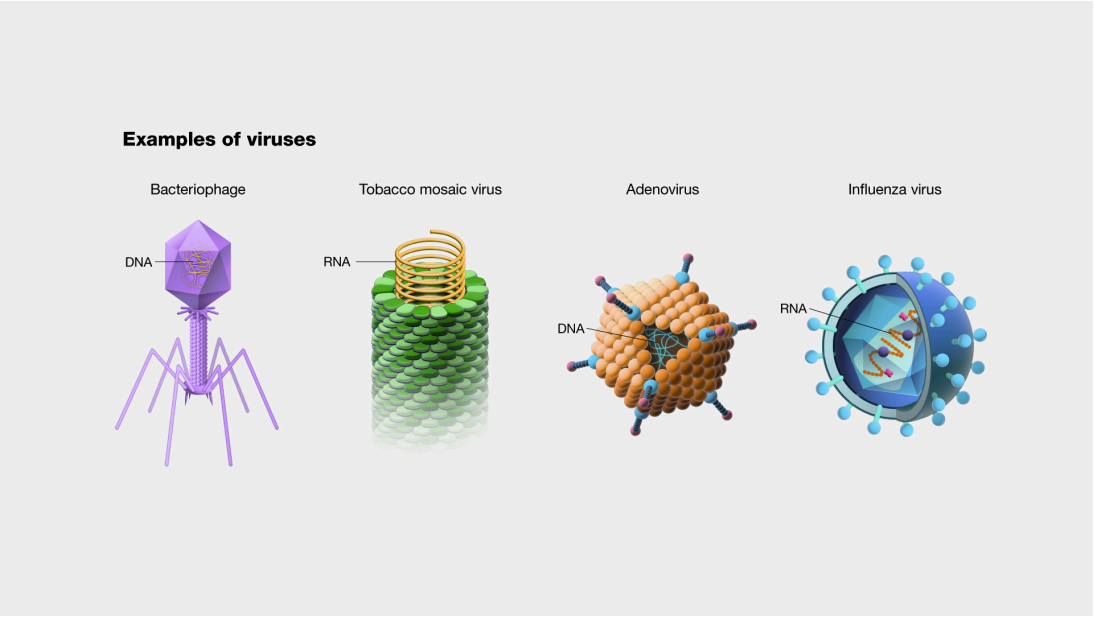
☣️ Harmful Effects

- Cause diseases (e.g. tuberculosis, strep throat, cholera).
- Spoil food.
- Some produce toxins.

💊 Controlling Bacteria

- **Antibiotics**: Kill or stop bacterial growth.
- **Sterilization**: High heat or chemicals to kill bacteria.
- **Vaccines**: Prevent bacterial infections (e.g. tetanus vaccine).

🦠 NOTES ON VIRUSES



🔍

What is a Virus?

- A **virus** is a **nonliving particle** that can infect living cells.
- It cannot reproduce on its own — it must **invade a host cell** to replicate.
- Viruses are **much smaller than bacteria**.

🧬 Structure of a Virus

Part	Function
Genetic material	DNA or RNA (not both) — contains viral instructions
Capsid	Protein coat that protects the genetic material
Envelope (optional)	Outer layer made of lipids (only in some viruses like influenza or HIV)
Spikes	Help the virus attach to host cells

🦠 Are Viruses Living?

- **No**, because they:
    - Cannot reproduce without a host
    - Do not carry out metabolism
    - Do not grow or respond to stimuli

⚙️ How Do Viruses Reproduce?

They follow **two main cycles**:

1️⃣ Lytic Cycle – *Fast and Destructive*

The virus immediately takes over the host cell to make copies of itself, then **bursts the cell open** (lysis).

🔁 Steps of the Lytic Cycle:

1. **Attachment** – Virus binds to the host cell.
2. **Injection** – Viral DNA/RNA enters the cell.
3. **Replication** – Host machinery makes viral parts.
4. **Assembly** – New viruses are assembled.
5. **Lysis** – Host cell bursts, releasing new viruses.

🧨 **Result:** The host cell **dies**, and viruses **spread quickly**.

2️⃣ Lysogenic Cycle – *Hidden and Slow*

The virus **inserts its DNA** into the host genome and **stays dormant** (inactive) for a while.

🔁 Steps of the Lysogenic Cycle:

1. **Attachment** and **injection**
2. **Integration** – Viral DNA becomes part of the host's DNA.
3. **Dormancy** – The virus is copied each time the host divides.
4. **Activation** – Eventually, the virus may switch to the **lytic cycle**.

🧬 **Result:** No immediate damage; the virus hides in the body for a long time (e.g., herpes, HIV).

🧪 Examples of Viral Diseases

Disease	Virus Type
Flu	Influenza virus
COVID-19	SARS-CoV-2
Chickenpox	Varicella zoster
AIDS	HIV (retrovirus)
Rabies	Rabies virus

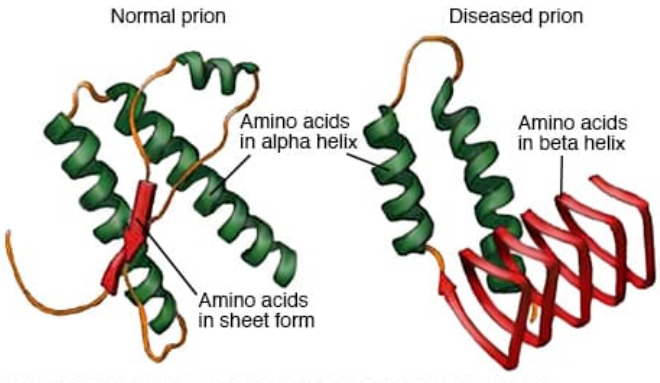
💉 Prevention and Treatment

- **Vaccines**: Stimulate the immune system (e.g., measles, HPV, COVID-19)
- **Antiviral drugs**: Slow virus replication (not kill directly)
- **Hygiene & safety**: Handwashing, masks, safe practices

🧠 NOTES ON PRIONS

🔍 What Are Prions?

- **Prions** are **infectious proteins**.



- Unlike viruses or bacteria, **they contain no DNA or RNA**.
- They are **misfolded versions** of normal proteins found in the brain.
- The term **"prion"** comes from **“proteinaceous infectious particle.”**

🧬 How Do Prions Cause Disease?

- A prion causes disease by triggering **normal brain proteins to misfold**.
- These abnormal proteins **accumulate** and **damage brain tissue**.
- This leads to **neurodegenerative diseases** (brain breakdown).

☣️ Characteristics of Prions

Feature	Description
Infectious	Spread by ingestion, contaminated tools, etc.
No nucleic acids	No DNA or RNA
Resistant	Survive heat, radiation, and disinfectants
Affect brain/nervous system	Cause spongy holes in brain tissue

🧠 Diseases Caused by Prions (Prion Diseases)

These diseases are called **Transmissible Spongiform Encephalopathies (TSEs)**:

Disease	Affected Species
Creutzfeldt–Jakob disease (CJD)	Humans
Variant CJD (from mad cow)	Humans
Bovine Spongiform Encephalopathy (BSE)	Cattle (Mad cow disease)

Scrapie	Sheep and goats
Chronic Wasting Disease	Deer and elk

⚠️ Key Points

- **No cure** exists; prion diseases are **fatal**.
- Incubation period can be **very long** (years).
- Prevention includes **avoiding infected meat** and **sterilizing surgical tools**.

❓How Are Prions Different from Other Pathogens?

Feature	Bacteria	Virus	Prion
Living?	Yes	No	No
DNA/RNA?	Yes	Yes (DNA/RNA)	No
Cell?	Yes	No	No
Causes disease?	Yes	Yes	Yes