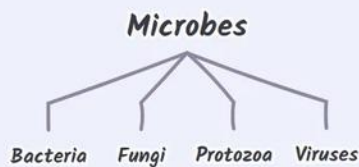


the same invisible organisms making our food and causing our diseases

The kinds of microbe *

- **micro-organisms** are too small to see without a microscope, and they are found almost everywhere
- **bacteria** are single celled and **prokaryotic**, having no true nucleus. Shaped as rods, spheres, spirals or commas
- **fungi** are eukaryotic and include **yeast**, **moulds** and **mushrooms**
- **protozoa** are single celled and eukaryotic, such as amoeba and Plasmodium
- **algae** are simple and photosynthetic, such as Chlamydomonas and Spirogyra
- **viruses** have **no cell structure at all** and can reproduce only inside a host cell, which puts them on the borderline of life



the four groups branching from one heading: the first three are cells and can live independently, while the last has no cell and is inert until it reaches a host

The useful ones

- **curd**: **Lactobacillus** converts the lactose of milk into lactic acid, setting the milk and souring it
- **bread and alcohol**: **yeast** ferments sugar into carbon dioxide and ethanol, the gas raising dough and the ethanol used in brewing
- **antibiotics**: **penicillin** from the mould *Penicillium*, the discovery that began modern antibiotics
- **nitrogen fixation**: **Rhizobium** in the root nodules of legumes converts atmospheric nitrogen into a usable form
- **decomposition**: microbes return the nutrients in dead matter to the soil, without which the cycles would halt
- **sewage treatment and biogas** both depend on microbes breaking down waste, giving clean water and methane

The harmful ones

- a **pathogen** is a microbe that causes disease, and only a small minority of microbes are pathogens
- **bacterial**: tuberculosis, typhoid, cholera, tetanus
- **viral**: influenza, measles, polio, dengue, rabies
- **protozoan**: malaria, carried by the Anopheles mosquito, and amoebic dysentery
- **fungal**: ringworm and athlete's foot
- microbes also cause **food spoilage**, and some leave **toxins** that remain dangerous even after the organism is destroyed

How a disease spreads

Route	Example	Prevention
Air, droplets	tuberculosis, influenza	cover the mouth, ventilate
Water	cholera, typhoid	boil or filter water
Vector	malaria, dengue	remove standing water, nets
Contact	ringworm	personal hygiene
Food	food poisoning	cook and store properly



the chain a communicable disease follows, drawn as four steps: breaking any one link stops the whole chain, which is why so many different measures each work on their own

each remedy breaks the route rather than treating the illness, which is why public measures such as clean water and drainage prevent far more disease than any medicine cures