

# MICROBIOLOGY

Discover the science of microorganisms

Organisms & Evolution

- Microbiology: The study of living things too small to see with the naked eye:
  - The four main divisions of life are Bacteria, archaea, eukaryotes, and viruses
  - Each division is DNA & RNA, except for the viruses those are some of the other things



Characteristic	Bakterien	Archaea	Eukaryota	Prokaryota
Size	0,2 – 5 mikrometer	0,2 – 5 mikrometer	5 – 100 mikrometer	0,200 – 0,500 mikrometer
Nucleinsäure	None	Yes	Yes	None
Chromosomal DNA	DNA	DNA	DNA	DNA or RNA
Lipid bilayer	None	Yes	Yes	Yes/no membrane
Reproduction	Binary fission	Binary fission, meiosis, mitosis, endosymbiosis	Meiosis	None
Microorganismen	None	None	None	None
Prokaryotische organelles	None	None	None	None
RNA – polymeerase	None	None	None	None
Chromatin/nukleinsäure Verbindungen	None	None	None	None
Membranen zwischen Zellkernen	None	None	None	None
Cell wall	Peptidglykans	Proteinolipids, teichoic acids	Cellulose, heteropolysaccharides, protein	None

## Bacteria

- Were the first cells on Earth
- Contain over 500 different phyla (major groupings)
  - Are the most abundant form of life
  - People have more bacteria growing on/in them than human cells
- Incredibly diverse
  - There are thousands of different species in one gram of soil
- Live in most environments, including the deep sea, underground, and space

## Architecture

- Relatively uncommon with fewer known species.
  - Most common in extreme environments (e.g., deep-sea vents and high salinity lakes)
- Combine some features of prokaryotes and eukaryotes.
- Often known as extremophiles and will grow when other organisms cannot.

Ex: Halophiles, salt loving; sulfophiles, sulfur loving; thermophiles, heat loving; lithophiles, rock loving; methanophiles, methane loving; dominants, proto

## Experiments

- May be simple cells (e.g., yeast, algae, and amoebae) or multicellular (e.g., fungi, plants, and animals).
  - Contain membrane-bound subcompartments that separate specific functions, particularly the nucleus.
  - Division includes microscopic organisms previously belonging to the Monera kingdom.

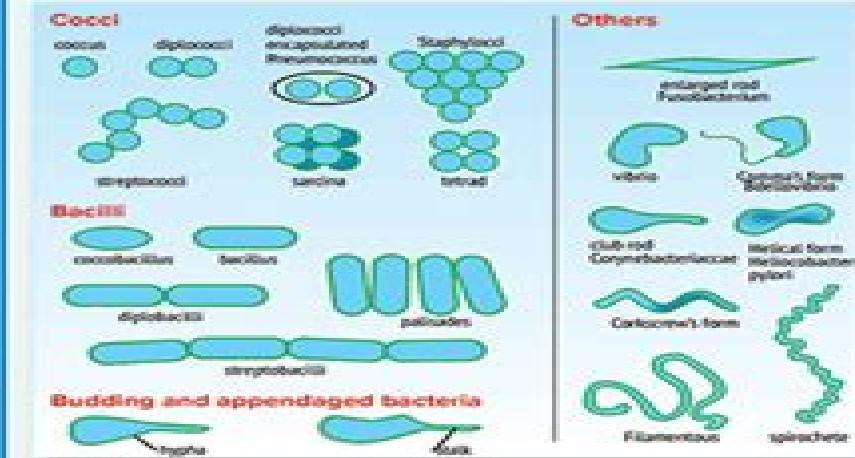
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- Many viral viruses are not alive as they are obligate parasites and cannot replicate without other cells.
- Different viruses target all three domains.
- Viruses may use DNA or RNA as genetic material and use molecules from the host cell to make more virus particles, ultimately killing the host.

Shapes & Types 6

## **Bacterial & Archaeal Cell Shapes & Growth Characteristics**

- **Coccoliths:** Spherical
- **Rhizoliths:** Root-shaped
- **Spiraloliths:** Spiral-shaped
- **Phloromorpholiths:** Multiple whorls are present



- Diplotax: meaning two; a diplotaxose is two cocci that have grown together
- Tetrads: Four cocci that grow together in a square
- Strands: Eight cocci that grow together in a cube
- Streptococci: meaning chains; a streptococcosis is cocci that have grown together in a chain
- Staphylococci: meaning clusters; a staphylococcosis is cocci that have grown to collect in a cluster

### Marketplace Types

- **Chloroplasts:** Small cell-like used for photosynthesis and for recycling.
- **Microvilli:** Long finger-like used for locomotion; usually there are only one or two per cell.
- **Miller module:** Single cells living in a damp environment (e.g., under leaves in a forest) that come together during reproduction.



- **Amoebae:** Free-living cell that can change its shape and engulf its prey
- **Prokary:** Non-plant, non-fungal organisms (e.g., bacteria and archaea)
- **Algae:** Photosynthetic organisms with a nucleus and chloroplasts. Many are single cells, others are multicellular, but many forms are still microscopic (i.e., *volvox*)
- **Eukaryote:** Photosynthetic eukaryote with a nucleate cell wall often with a complex syncytial pattern
- **Yeasts:** Eukaryotes, single-celled, round fungi
- **Mold:** Multicellular fungus which forms root-like projections (hyphae) that may contain cross-walls (septate) or not (nonseptate)

## Virtual Shopping

- **Efficiency:** Spatial arrangement and grouping of small microcolonies that can appear multi-chambered

# Microbiology 101 Study Guide

**Anthony S. Fauci**

**Microbiology 101 Study Guide:**

## **Microbiology 101 Study Guide** Book Review: Unveiling the Power of Words

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