

# MICROBIOLOGY

Discover the science of microorganisms

## Organisms & Evolution //

**Microbiology:** The study of living things too small to see with the naked eye.

- The five main divisions of life are Bacteria, archaea, eukaryotes, and viruses.
- Each division's DNA is more similar to its own than to any of the other three.



Characteristic	Bacteria	Archaea	Eukaryotes	Viruses
Size	0.2—5 micrometers	0.2—5 micrometers	1—100 micrometers	100—1000 micrometers
Nucleus	None	None	Yes	None
Genetic material	DNA	DNA	DNA or RNA	None
Lipid bilayer	None	Substituted	Yes	None
Polysaccharides	None, except	None, some like eukaryotes	Large	None
Mitochondria	None	None	Yes	None
RNA polymerase	Simple, 3 subunits	More complex, 8 subunits	More complex, 12 subunits	Depend on protein: bacterial
Chromosomal nucleic acids	None	None	None	None
Membrane-bound organelles	None	None	Cellulose, mitochondria, others	None
Cell wall	Peptidoglycan	Surfactant, stiffness, toxins	Cellulose, mitochondria, others	None

### Bacteria

- Were the first cells on Earth.
- Contain over 30 different phyla (major groupings).
  - Are the most abundant form of life.
  - People have more bacteria growing on them than human cells.
- Extremely diverse.
  - There are thousands of different species in one gram of soil.
  - Live in most environments, including the deep sea, underground, and terrestrial.

### Archaea

- Relatively uncommon with fewer known species.
- Most common in extreme environments (e.g., deep-sea vents and high salinity lakes).
- Contain some features of prokaryotes and eukaryotes.
- Often known as extremophiles and will grow when other organisms cannot.
- Ex: Halophiles, salt loving; sulfophiles, sulfur loving; thermotrophs, heat loving; lithotrophs, rock loving; methanophiles, methane loving (ruminant guts).

### Eukaryotes

- May be single 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.
  - Divisions includes microeukaryotic organisms previously belonging to the Monera kingdom.

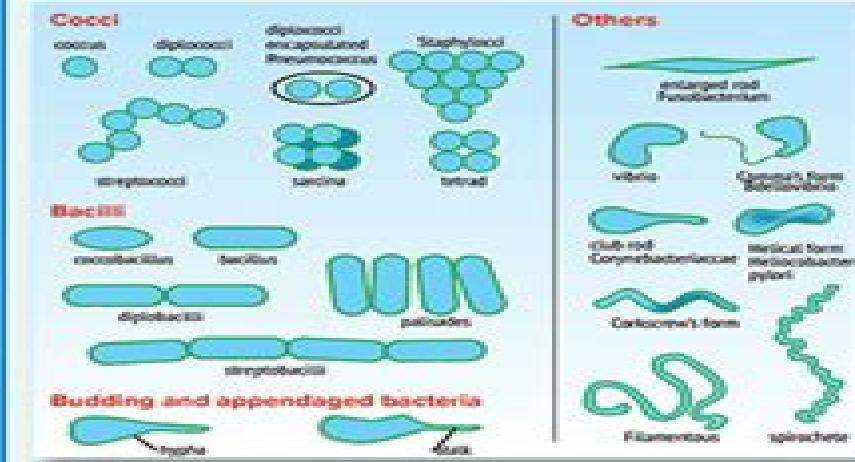
### Viruses

- Many feel 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 //

### Bacterial & Archival Cell Shapes & Growth Characteristics

- Cocci: Spherical
- Bacilli: Rod-shaped
- Spirilli: Spiral-shaped
- Pleomorphic: Multiple shapes are possible



- Diplo-: Prefix meaning two; a diplococcus is two cocci that have grown together.
- Tetra-: Four cocci that grow together in a cube.
- Sarcina: Eight cocci that grow together in a cube.
- Strepto-: Prefix meaning chain; a streptococcus is cocci that have grown together in a chain.
- Spiralobacilli: Prefix meaning corkscrew; a spiralobacillus is a bacillus that have grown together in a corkscrew.

### Eukaryotic Types

- Ciliates: Short-cilia used for locomotion and/or feeding.
- Flagellates: Long flagella used for locomotion; usually there are only one or three per cell.
- Slime molds: Single cells living in a damp environment (e.g., under leaves in a forest) that come together during replication.



- Amoebae: Free-living cell that can change its shape and engulf its prey.
- Flagellate: Nonplant, non-fungi eukaryote (e.g., ciliates and flagellates).
- Algae: Photosynthetic eukaryote with a nucleus and chloroplasts. Many are single cells, others are multicellular, but many forms are still microscopic (e.g., diatoms).
- Diatoms: Photosynthetic eukaryote with a silicate cell wall often with a complex symmetrical pattern.
- Yeasts: Eukaryotic, single-celled, round fungi.
- Mold: Multicellular fungus which forms hair-like projections (hyphae) that may contain asexually (conidia) or sex (conidia).

### Viral Shapes

- Helical: Spiral arrangement of protein capsid molecules that can appear rod-shaped.

# Microbiology 101 Study Guide

**Michael T. Murphy**

**Microbiology 101 Study Guide:**

Microbiology 101 Study Guide: Bestsellers in 2023 The year 2023 has witnessed a noteworthy surge in literary brilliance, with numerous engrossing novels entralling the hearts of readers worldwide. Lets delve into the realm of popular books, exploring the captivating narratives that have captivated audiences this year. The Must-Read : Colleen Hoovers "It Ends with Us" This heartfelt tale of love, loss, and resilience has captivated readers with its raw and emotional exploration of domestic abuse. Hoover skillfully weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can succeed. Uncover the Best : Taylor Jenkins Reids "The Seven Husbands of Evelyn Hugo" This intriguing historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reids absorbing storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. Discover the Magic : Delia Owens "Where the Crawdads Sing" This evocative coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens crafts a tale of resilience, survival, and the transformative power of nature, entrancing readers with its evocative prose and mesmerizing setting. These top-selling novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of captivating stories waiting to be discovered. The novel begins with Richard Papen, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a quiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a brilliant and gripping novel that will keep you guessing until the very end. The novel is a warning tale about the dangers of obsession and the power of evil.

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