

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	No	No	Yes	No
Genetic Information	DNA	DNA	DNA or RNA	
Lipid Bilayer	No	Substituted	No	Substituted
Polysaccharides	None, unique	None, more like eukaryotes	Large	No
Mitochondria	No	No	No	No
RNA Polymerase	Simple, 3 subunits	More complex, 8 subunits	More complex, 12 subunits	Depend on protein: bacterial
Gene without membrane	No	No	No	No
Membrane	None	None	Cellulose, non-cellulose, none	None
Cell wall	Peptidoglycan	Surfactant, stiffness, toxins	Cellulose, non-cellulose, none	No

Bacteria

- Were the first cells on Earth.
- Contain over 50 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



- Diplococci: Prefix meaning two; a diplococcus is two cocci that have grown together.
- Tetrad: Four cocci that grow together in a cube.
- Sarcinae: Eight cocci that grow together in a cube.
- Streptobacilli: Prefix meaning chain; a streptobacillus is a bacillus that have grown together in a chain.
- Staphylococci: Prefix meaning cluster; a staphylococcus is a cocci that have grown together in a cluster.

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., yeasts).
- Eukaryotes: Photosynthetic eukaryote with a eukaryotic 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

R Sandford

Microbiology 101 Study Guide:

Decoding **Microbiology 101 Study Guide**: Revealing the Captivating Potential of Verbal Expression

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Table of Contents Microbiology 101 Study Guide

1. Understanding the eBook Microbiology 101 Study Guide
 - The Rise of Digital Reading Microbiology 101 Study Guide
 - Advantages of eBooks Over Traditional Books
2. Identifying Microbiology 101 Study Guide
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Microbiology 101 Study Guide
 - User-Friendly Interface
4. Exploring eBook Recommendations from Microbiology 101 Study Guide
 - Personalized Recommendations
 - Microbiology 101 Study Guide User Reviews and Ratings
 - Microbiology 101 Study Guide and Bestseller Lists

5. Accessing Microbiology 101 Study Guide Free and Paid eBooks
 - Microbiology 101 Study Guide Public Domain eBooks
 - Microbiology 101 Study Guide eBook Subscription Services
 - Microbiology 101 Study Guide Budget-Friendly Options
6. Navigating Microbiology 101 Study Guide eBook Formats
 - ePUB, PDF, MOBI, and More
 - Microbiology 101 Study Guide Compatibility with Devices
 - Microbiology 101 Study Guide Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Microbiology 101 Study Guide
 - Highlighting and Note-Taking Microbiology 101 Study Guide
 - Interactive Elements Microbiology 101 Study Guide
8. Staying Engaged with Microbiology 101 Study Guide
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Microbiology 101 Study Guide
9. Balancing eBooks and Physical Books Microbiology 101 Study Guide
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Microbiology 101 Study Guide
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Microbiology 101 Study Guide
 - Setting Reading Goals Microbiology 101 Study Guide
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Microbiology 101 Study Guide
 - Fact-Checking eBook Content of Microbiology 101 Study Guide
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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