

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'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	1–90 micrometers	0.02–0.3 micrometers
Nucleus	No	No	Yes	No
Genetic information	DNA	DNA	DNA	DNA or RNA
Lipid bilayer	Yes	Modified	Yes	Sometimes
Ribosomes	Small, unique	Small, more like eukaryotes	Large	No
Membrane-bound organelles	No	No	Yes	No
RNA polymerase	Single, 3 subunits	More complex, 8 subunits	Most complex, 12 subunits	Depends on genetic material
Grow without outside help	Yes	Yes	Yes	No
Maximum number of cells	1	1	Many	Non-cellular
Cell wall	Peptidoglycan	Several different forms	Cellulose, sometimes none	None

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/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 terrestrial.

Archaea

- 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.
 - ECG: Halophiles, salt loving; sulfophiles, sulfur loving; thermotrophs, heat loving; methanotroph, rock loving; methanophiles, methane loving (ruminant guts).

Eukaryotes

- May be single cells (e.g., yeast, algae, and amoebas) 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.

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 & Archeal Cell Shapes & Growth Characteristics

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



- Diplo-:** Prefix meaning two; a diplococcus is two cocci that have grown together.
- Tetrad:** Four cocci that grow together in a plane.
- Sarcinae:** Eight cocci that grow together in a cube.
- Strepto-:** Prefix meaning chain; a streptococcus is cocci that have grown together in a chain.
- Staphylo-:** Prefix meaning cluster; a staphylococcus is 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 two per cell.
- Slime molds:** Single cells living in a damp environment (e.g., under leaves in a forest) that come together during replication.



- Amoeba:** Free-form cell that can change its shape and engulf its prey.
- Protist:** Non-plant, non-fungi organism (e.g., ciliates and flagellates).
- Algae:** Photosynthetic organism with a nuclei and chloroplasts. Many are single cells, others are multicellular, but many forms are still microscopic (i.e., volvox).
- Diatoms:** Photosynthetic eukaryote with a silicate cell wall often with a complex symmetrical pattern.
- Yeast:** Eukaryotic, single-celled, round fungi.
- Mush:** Multicellular fungus which forms hair-like projections (hyphae) that may contain crosswalls (septate) or not (non-septate).

Viral Shapes

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

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M Tight



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Microbiology Study Guide Elizabeth Machunis-Masuoka, 2004 *Microbial Applications Vol.2* Vipin Chandra Kalia, 2017-04-17 This contributed volume provides insights into multiple applications using microbes to promote productivity in agriculture to produce biochemicals or to respond to challenges in biomedicine It highlights the microbial production of nanocompounds with medical functionality alongside new anti mycobacterial strategies and introduces plant growth promoting Rhizobacteria as well as the correlation between biofilm formation and crop productivity Further the authors illustrate the green synthesis of biochemical compounds such as hydroxamid acid or biosurfactants using microbial and fungal enzymes It inspires young researchers and experienced scientists in the field of microbiology to explore the combined use of green white and red biotechnology for industrial purposes which will be one of the central topics for future generations *Peterson's Annual Guides to Graduate Study*, 1983 *Study Guide for Microbiology* Pearson, Robert W. Bauman, Elizabeth Machunis-Masuoka, Laura Bonazzoli, 2005-02-23 This valuable study tool features chapter summaries self quizzes critical thinking questions and a guide to using the Microbiology Place Website and CD ROM **National Library of Medicine Current Catalog** National Library of Medicine (U.S.), 1971 First multi year cumulation covers six years 1965 70 Pearson's Clinical Medical Assisting Nina Beaman, Lorraine Fleming-McPhillips, 2007 Having a balanced understanding of legal and ethical concepts and applying them to a multitude of real life clinical and administrative situations is essential to any health professional This text provides this balance by helping health professionals understand both the intention as well as the realities of the law All the while preparing them for the major ethical considerations and dilemmas they may encounter Written in a straightforward manner aimed at health professionals in a variety of settings this book introduces the reader to many topics affecting health care today such as the legal system patient physician relationship professional liability and malpractice prevention confidentiality physician s public duties medical records and bioethical issues Through this introduction healthcare professionals will better understand the ethical obligations to the patient the employer and themselves For Medical Assisting students **Manual of Environmental Microbiology** Cindy H. Nakatsu, Robert V. Miller, Suresh D. Pillai, 2016-05-02 The single most comprehensive resource for environmental microbiology Environmental microbiology the study of the roles that microbes play in all planetary environments is one of the most important areas of scientific research The Manual of Environmental Microbiology Fourth Edition provides comprehensive coverage of this critical and growing field Thoroughly updated and revised the Manual is the definitive reference for information on microbes in air water and soil and their impact on human health and welfare Written in accessible clear prose the manual covers four broad areas general methodologies environmental public health microbiology microbial ecology and biodegradation and biotransformation This wealth of information is divided into 18 sections each containing chapters written by acknowledged topical experts from the international community Specifically this new edition

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knowledge of environmental microbiology in a single source. It details the natural fate of microorganisms in the environment as well as the intentional attempts to eliminate from the environment microorganisms that are pathogenic to humans or to plants and animals. The basic principles of environmental microbiology and general analytical methodologies common across the range of the environments covered are presented first. The core sections are structured with regard to the type of environmental medium being discussed. This landmark effort defines the study of environmental microbiology as we know it today and serves as an essential contribution to the literature.

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