

# Unit I – What are Microorganisms (Chapter 2)

## Why Study Microbiology?

1. *Impact on Human Health*
  2. *Balance of Nature - food source, play a role in decomposition, help other animals digest grass (cattle, sheep, termites).*
  3. *Environmental – provide safe drinking water; development of biodegradable products; use bacteria to clean up oil spills, etc. – called bioremediation.*
  4. *Industrial – foodstuffs (beer, wine, cheese, bread), antibiotics, insulin, genetic engineering*
  5. *Agricultural - research has led to healthier livestock and disease-free crops.*
- **Microbiology defined** - The study of microbiology is the study of microorganisms, which are organisms that are invisible to the naked eye.

## I. Classification of Microorganisms

The 5 major groups of microorganisms: bacteria, algae, fungi, protozoa, and viruses. We will also study some other smaller groups such as prions and viroids. The one property that links these groups together is their very small size!

- a. **2 types of cells** (viruses, prions and viroids are acellular – “without a cell”):
  1. **Prokaryotic** (“before nucleus”) – *these guys are cells, but they have no internal membrane bound structures (no membrane-bound nucleus or membrane-bound organelles); includes only the bacteria.*
  2. **Eukaryotic** (“true nucleus”) – *do have internal membrane bound structures (membrane bound nucleus and membrane-bound organelles); includes organisms such as protozoans, fungi, algae, animals, plants.*

## Relative Size Comparison

Cells Alive “How Big...” Simulation

b. **Bacteria** (singular - bacterium) (study of bacteria - bacteriology)

1. prokaryotic
2. unicellular
3. size: 1/1000 the volume of a typical eukaryotic cell
4. 2 groups (discovered in 1970's) - we'll discuss more later
  - a. Archaeobacteria - ancient bacteria
  - b. Eubacteria - true bacteria
5. some shapes: bacillus (rod), coccus (spherical), spirillum (spiral), vibrio (curved rod)
6. motile or nonmotile
7. how do they obtain their energy?
  - a. photosynthetic autotrophs - use energy from the sun to produce their own carbohydrates for energy.
  - b. chemosynthetic autotrophs - process inorganic molecules for energy (ex. sulfur or iron).
  - c. heterotrophs - depend on outside sources of organic molecules (ex. carbohydrates or sugars) for energy

Through 1/6/09

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8. temperature extremes: -20oC to 110oC (that's really cold & really hot! freezing is 0oC and boiling is 100oC)
9. Examples of diseases?

c. **Algae** (singular - alga) - not a focus in this course.

1. eukaryotic
2. unicellular or multicellular
3. size: some microscopic, some macroscopic (ex. kelp)

4. motile or nonmotile
5. how do they obtain their energy? photosynthetic autotrophs
6. disease causing? no

d. **Fungi** (singular - fungus) (study of fungi - mycology)

1. eukaryotic
2. unicellular or multicellular (yeasts are unicellular, molds are multicellular)
3. nonmotile
4. how do they obtain their energy? Heterotrophs

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5. Why are they ecologically important? Scavengers; they live off dead matter and thus, decompose it.
6. examples of diseases (called mycoses)?
7. examples of nonpathogenic fungi?

e. **Protozoa** ("first animals")

1. eukaryotic
2. unicellular
3. motile or nonmotile
4. how do they obtain their energy? Heterotrophs
5. disease causing - 2 examples: malaria & giardiasis (one of the "don't drink the water diseases")

f. **Viruses** - (study of viruses - virology)

1. acellular, so not considered prokaryotic or eukaryotic; obligate intracellular parasites; when they are outside of a host cell, there is no evidence that these guys are alive.
2. basic structure of a virus - a piece of nucleic acid (RNA or DNA) enclosed by a protein coat (capsid); possess no nucleus, organelles, cell membrane, or cytoplasm.
3. size - 1/10 to 1/1000 the size of an ordinary bacterial cell.
4. nonmotile
5. examples of diseases?