

Classification of Microorganisms

۲ Year

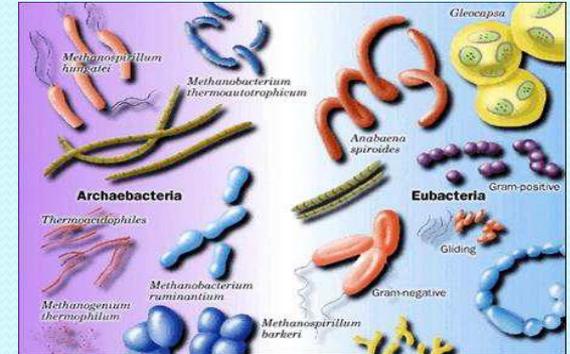
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Classification of Microorganisms

- The 4 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!
- 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.

- **A. 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
 - a. some shapes: **bacillus** (rod), **coccus** (spherical), **spirillum** (spiral), **vibrio** (curved rod)
 - b. motile or nonmotile
 - c. 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
 - d. temperature extremes: -20°C to 110°C (that's really cold & really hot! freezing is 0°C and boiling is 100°C)
 - e. examples of diseases?



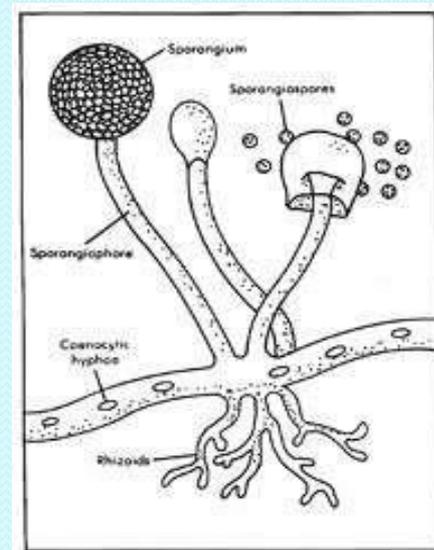
B. Algae (singular - alga) - not a focus in this course.

- ١. eukaryotic
- ٢. unicellular or multicellular
- ٣. size: some microscopic, some macroscopic (ex. kelp)
- ٤. motile or nonmotile
- ٥. how do they obtain their energy? photosynthetic autotrophs
- ٦. disease causing? No



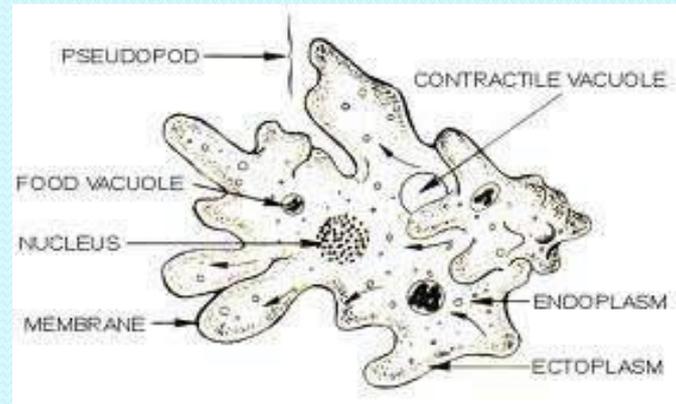
C. Fungi (singular - fungus) (study of fungi – mycology)

- ١. eukaryotic
- ٢. unicellular or multicellular (yeasts are unicellular, molds are multicellular)
- ٣. nonmotile
- ٤. how do they obtain their energy?
- a. heterotrophs
- b. Why are they ecologically important? Scavengers; they live off dead matter and thus, decompose it.
- ٥. examples of diseases (called **mycoses**)?
- examples of nonpathogenic fungi?



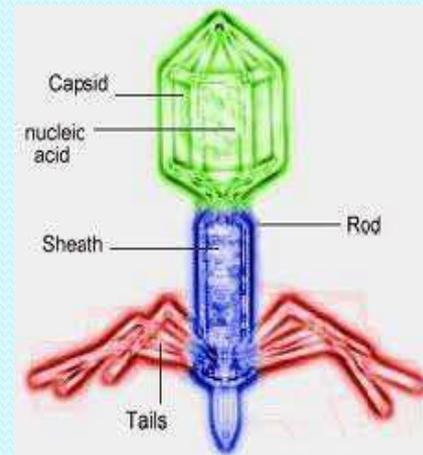
D. Protozoa ("first animals")

- 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”)



E. 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?



- **Important Note:** We will consider a sixth group, the **helminths** (worms), in our study of microbiology. While most of the adult stages of these worms are macroscopic, many of them go through a microscopic stage in their life cycles (egg & larval stages). Some examples of helminths are tapeworms, hookworms, pinworms, heartworms, and Chinese liver flukes. More to come later!!



• Naming and Classifying microorganisms

- Linnaeus system for scientific nomenclature
- Each organism has two names: Genus and Specific epithet

• Scientific Names

- Italicized or underlined. The genus is capitalized, and the specific epithet is with lowercase
- Could be as an honor for the scientist
- A Latin origin
- e.g. *Escherichia coli* (*E. coli*)
 - discoverer: Theodor Escherich
 - describes the habitat (colon/intestine)
- e.g. *Staphylococcus aureus* (*S. aureus*)
 - Clustered (staphylo), spherical (cocci)
 - Gold colored colonies (aureus)

Bacterial Taxonomy Based on Bergey's Manual

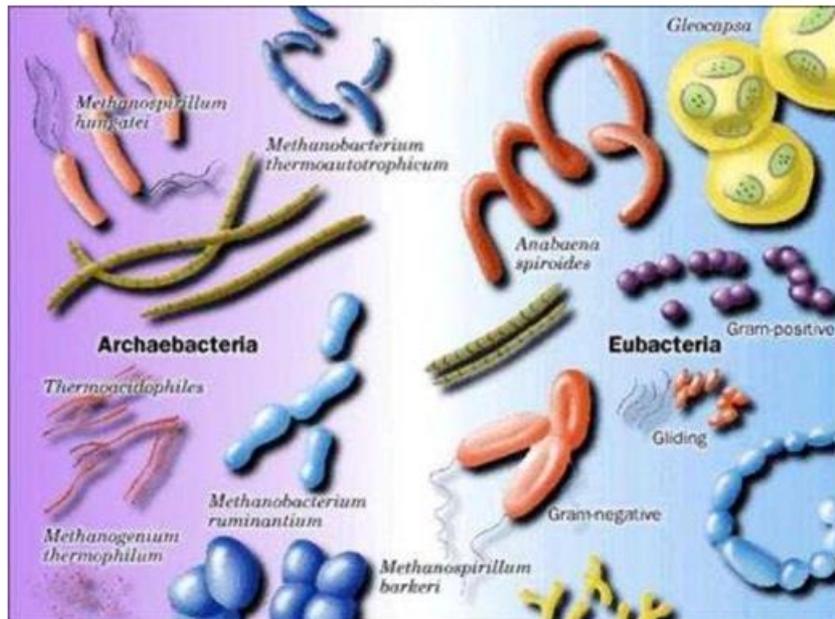
- Bergey's Manual of Determinative Bacteriology – five volume resource covering all known procaryotes
- classification based on genetic information –phylogenetic
- two domains: Archaea and Bacteria
- five major subgroups with 20 different phyla

Bacteria (P)/ Bacterium (S)

- Prokaryotes
- Has peptidoglycan cell walls
- Binary fission
- Utilize organic/inorganic chemicals, or photosynthesis to obtain energy

Archaea

- Prokaryotic
- Lack peptidoglycan
- Live in extreme environments
- Include
 - Methanogens
 - Extreme halophiles
 - Extreme thermophiles



Taxonomy Ranks

- Domain
- Kingdom
- Phylum
- Class
- Order
- Family
- Genus
- species



End