Department of biology

2025-2026

((MICROBIOLOGY))

Stage (2)

LEC- ((2))

Introduction to microbiology

By

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What is Microbiology???

- study of:
  - Organisms of microscopic size
  - Classification
  - Morphology
  - Physiology
  - Metabolism
  - Distribution in nature
  - Relationship to each other and other living organisms

Why to study microbiology???

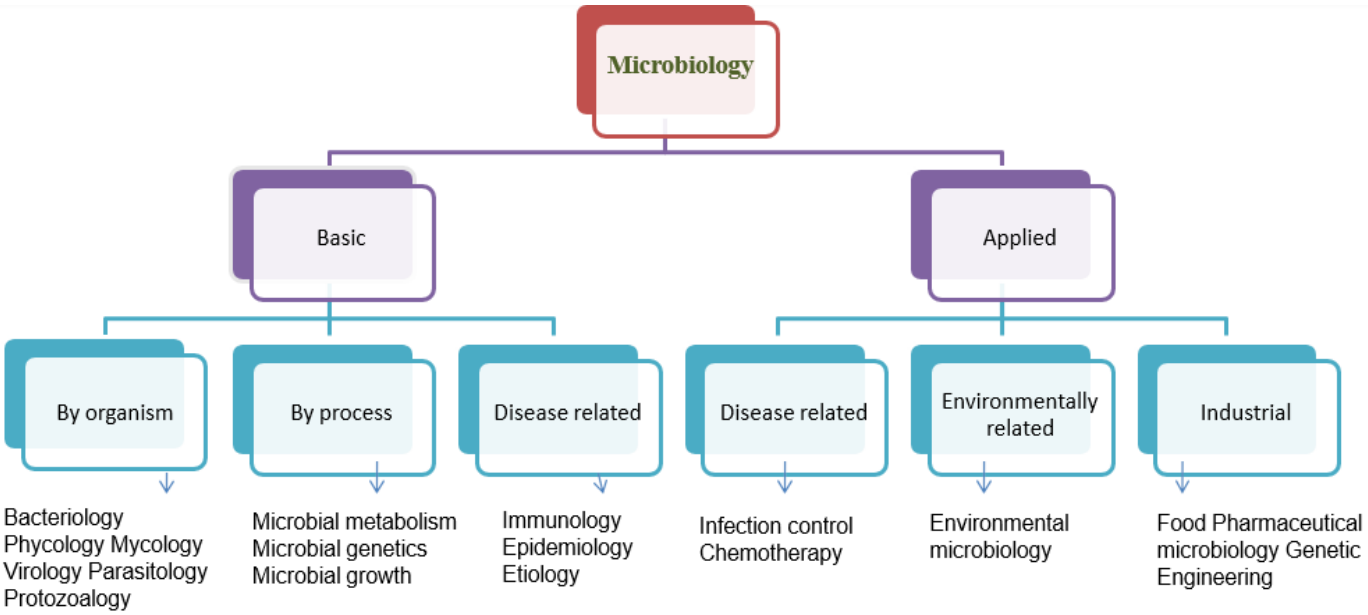
Distribution in Nature:

- Habitant: nearly everywhere in Nature
  - Grow where they get food , moisture and temperature suitable for growth
- Air
- Soil
- Oceans
- Food
- Surfaces of our body and inside alimentary canal

Microbiology

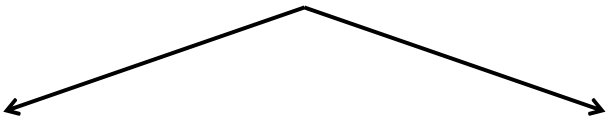
- The word Microbiology was derived from Greek words mikros – small, bios – life, logy – science.
- Microbiology is a science which deals with living organisms of microscopic size.
- Study of microorganisms started after the discovery of microscope by Antony Van Leeuwenhoek. He is known as father of microbiology
- The term microbiology was introduced by a French Chemist - Louis Pasteur, who demonstrated that fermentation was caused by the growth of bacteria and yeast. He is known as father of modern microbiology.

Themes in Microbiology and its field



Effects on Human beings:

Microorganisms



Beneficial

Food

Bread, Cheese, Yoghurt,

Vinegar

Industrial applications

Enzymes, Amino acids, Vitamins, Antibiotics, Vaccines, Pharmaceutical industries, Sewage treatment

Agriculture

Recycling of elements, Nitrifying bacteria

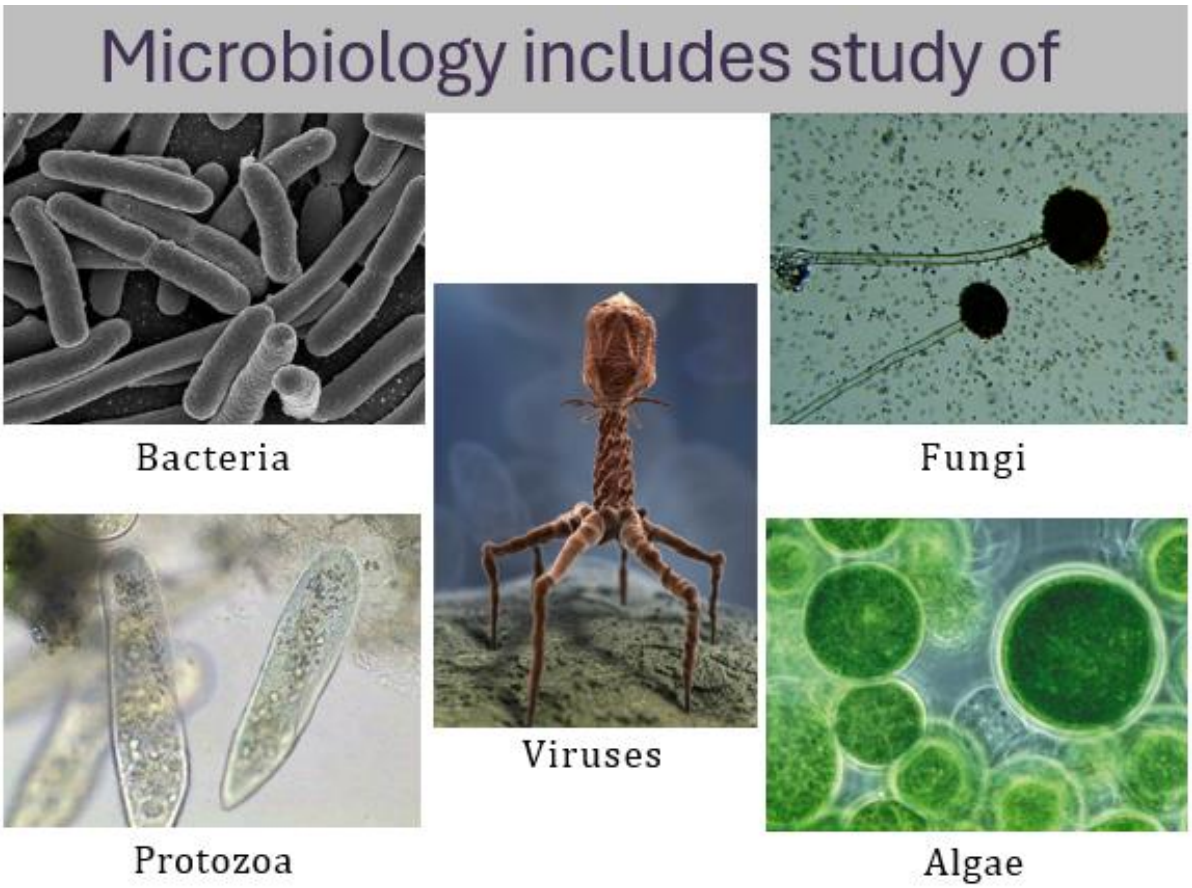
Harmful

Food spoilage

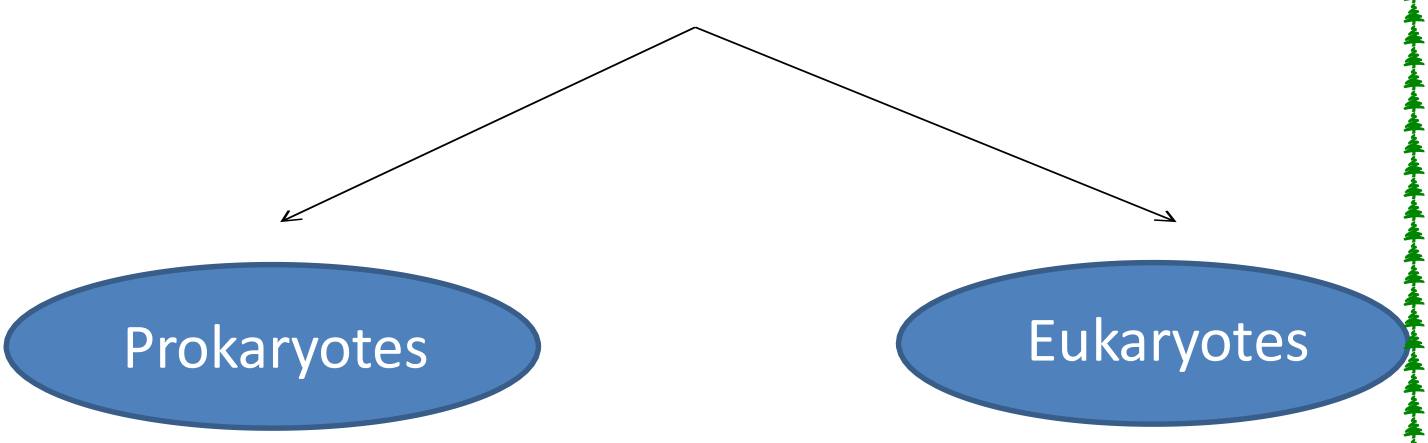
Diseases

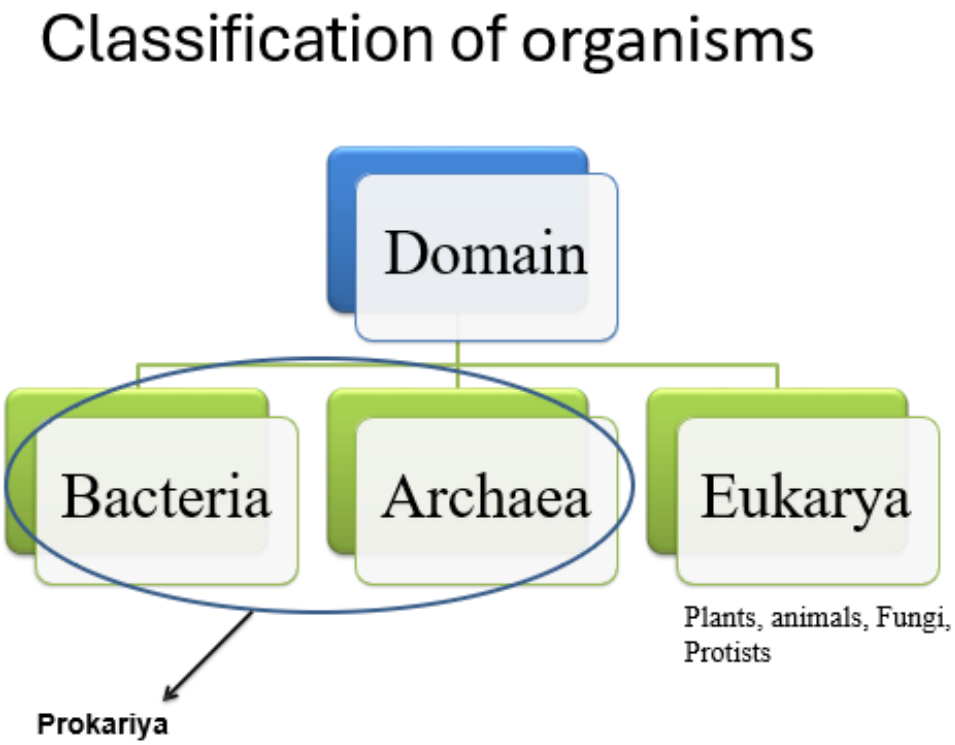
Bacterial Viral

Fungal

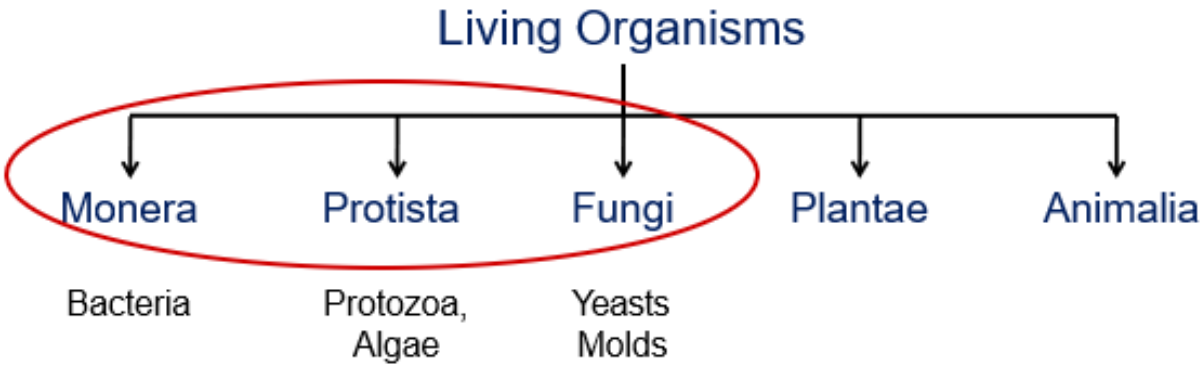


Classification of microorganisms





Five Kingdom classification of organisms:



Basic structural and functional unit of life: Cell

	Prokariyotic cell	Eukariyotic cell
Organisms	Bacteria, Archaea	Algae, Fungi, Protozoa, Plants, Animals
Size	1-4 µm	>5 µm
Nucleus	Nuclear membrane absent, Nucleolus absent	Nucleus bounded by nuclear membrane, Nucleolus present
Cell wall	Peptidoglycan present	Peptidoglycan absent
Plasma membrane	Sterols absent, Cytoplasmic streaming absent	Sterols present, Cytoplasmic streaming present
Membrane-enclosed organelles	Absent	Present
Ribosome	70 S	80 S

Prokaryotic vs Eukaryotic Cells

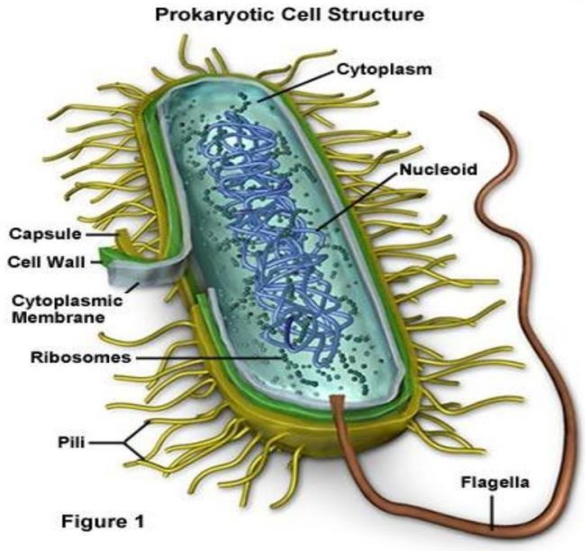
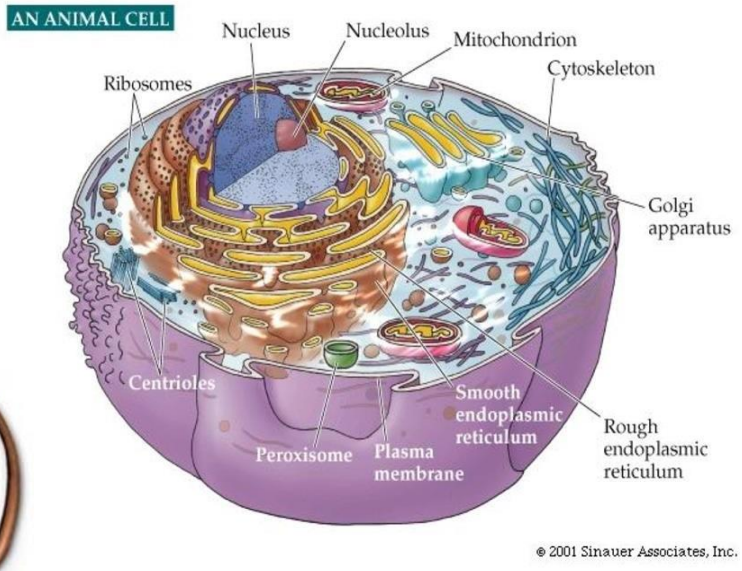


Figure 1



Naming microorganisms

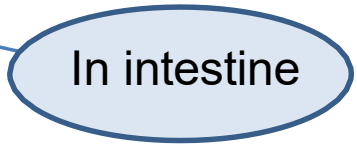
- Linnaeus system for scientific nomenclature
- Each organism has two names:
  - Genus
  - Specific epithet (species)

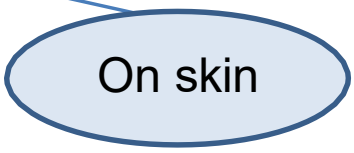
Scientific Names

- 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)





Characteristics of major groups of Microorganisms

Bacteria

Size:

0.2-1.5 by 3-5 µm

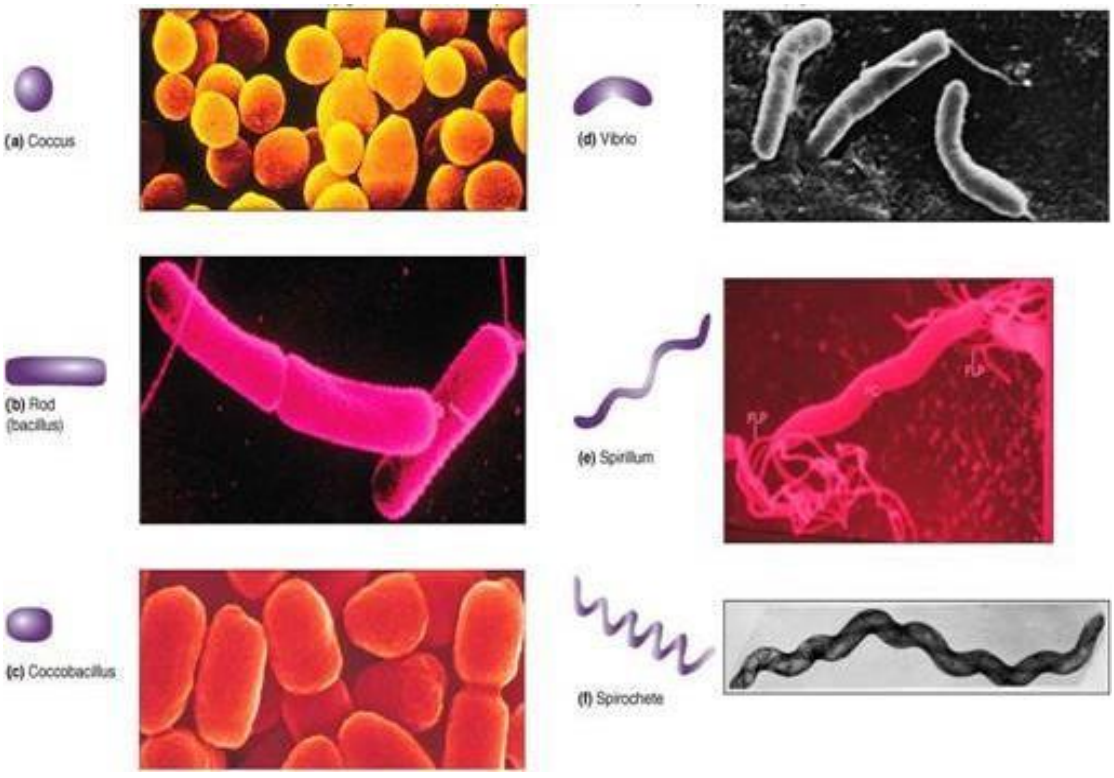
Important Characteristics:

- Prokaryotic
- Unicellular
- Simple Internal structure
- Grow on artificial laboratory media
- Reproduction asexual (mostly simple cell division)

Practical significance:

- Some cause diseases
- Some perform role in natural cycling of elements and increase soil fertility
- Manufacture of valuable compounds in Industry


bacillus (rod)
coccus (spherical)
spirillum (spiral)
spirochaete (corkscrew)
vibrio (comma)
chain of cocci
cluster of cocci
pair of cocci
chain of bacilli

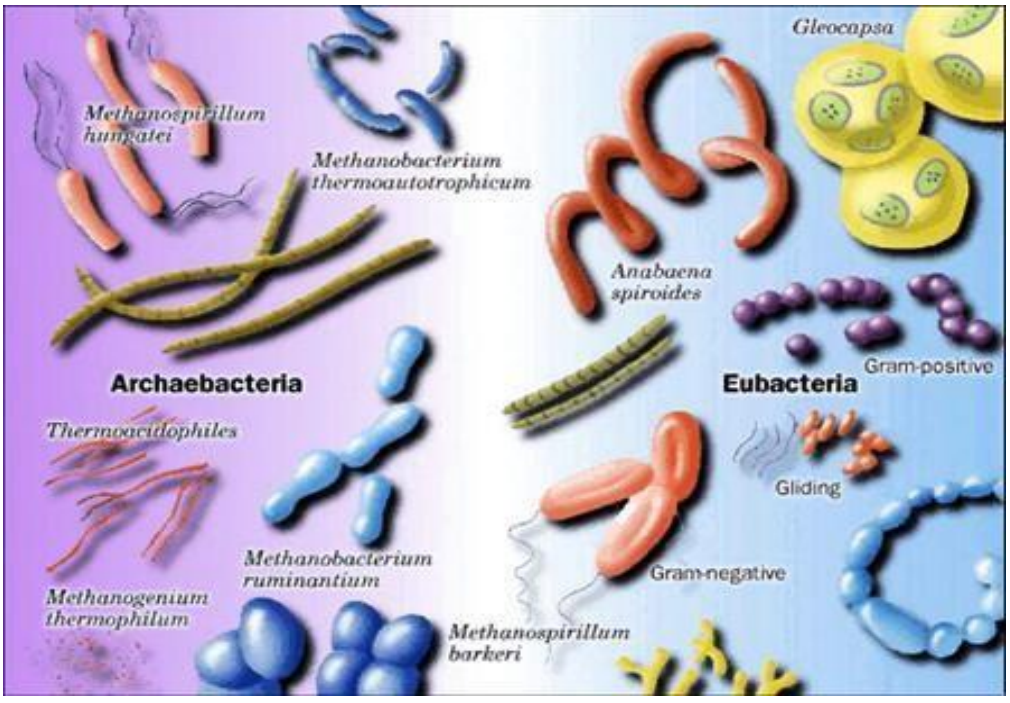

(a) Coccus
(d) Vibrio
(b) Rod (bacillus)
(e) Spirillum
(c) Coccobacillus
(f) Spirochete

Bacteria (P)/ Bacterium (S)

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

Archaea

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



Viruses

Size:

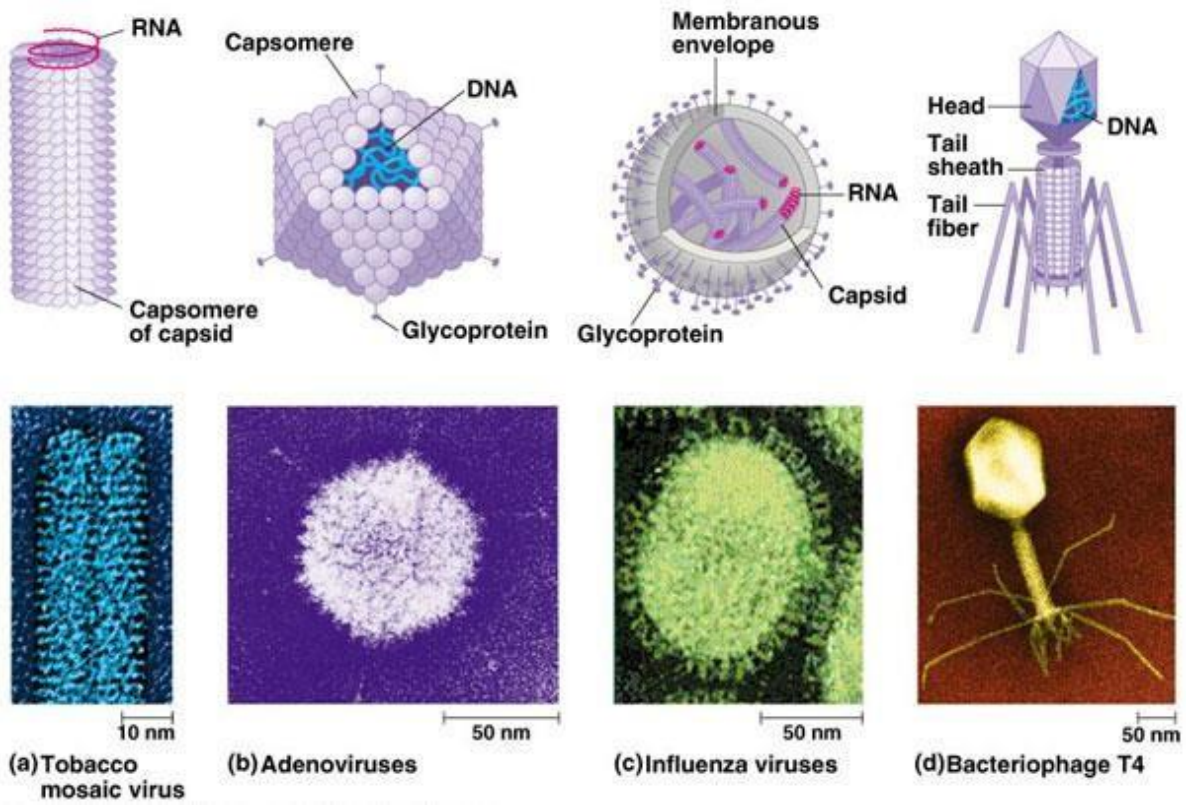
- 0.015-0.2 µm

Important Characteristics:

- Do not grow on artificial media require living cells within which they reproduce
- Obligate parasites
- Electron microscopy required to observe

Practical significance:

- Cause diseases in humans, animals, plants
- Also infect microorganisms



Fungi (Yeasts)

Size:

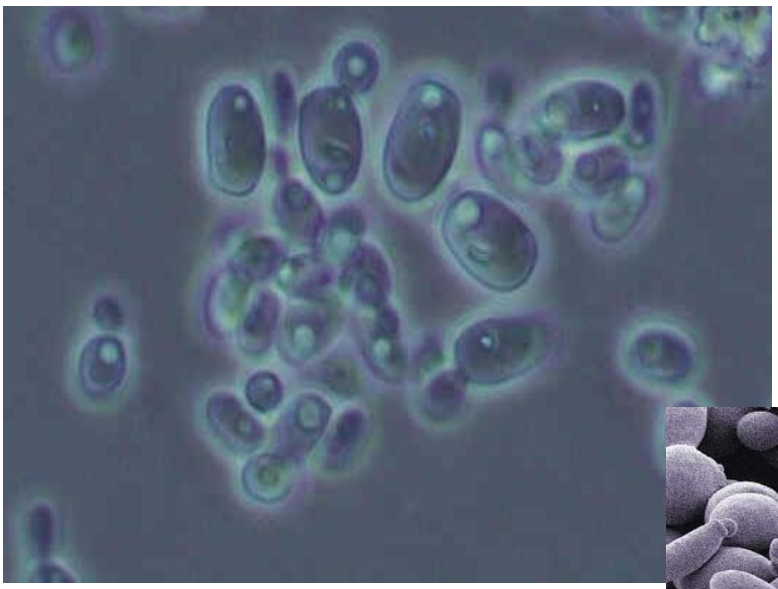
- 5.0-10.0 µm

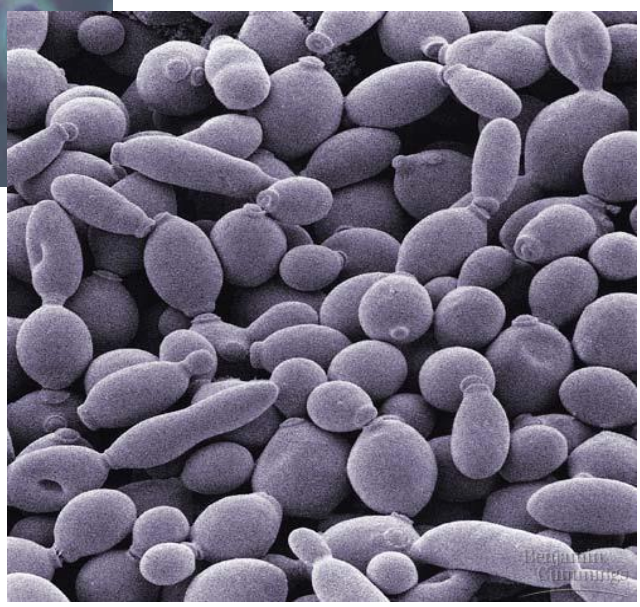
Important Characteristics:

- Eukaryotic
- Unicellular
- Grow on artificial laboratory media
- Reproduction asexual (cell division/ budding) or sexual

Practical significance:

- Some cause diseases
- some are used as food supplements
- Manufacture of alcoholic beverages





Fungi (Molds)

Size:

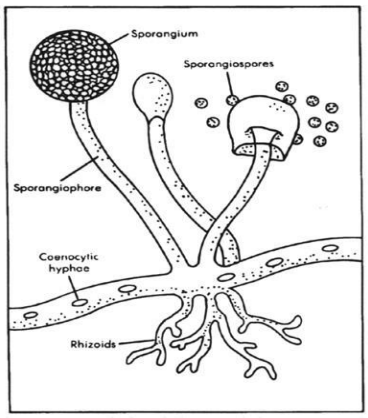
2.0-10.0 µm by several mm

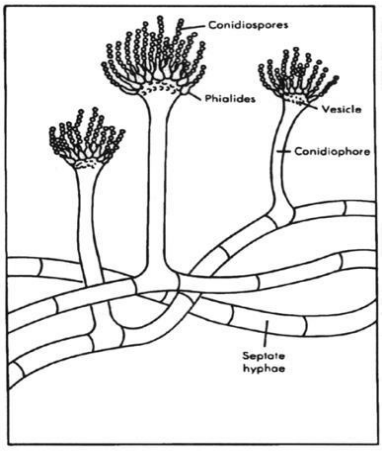
Important Characteristics:

- Eukaryotic
- Multicellular
- Many distinctive structural features
- Cultivated on artificial laboratory media
- Reproduction asexual or sexual

Practical significance:

- Decomposition of many materials
- Industrial production of many chemicals like antibiotics
- Can cause diseases





Protozoa

Size:

- 2.0-200 µm

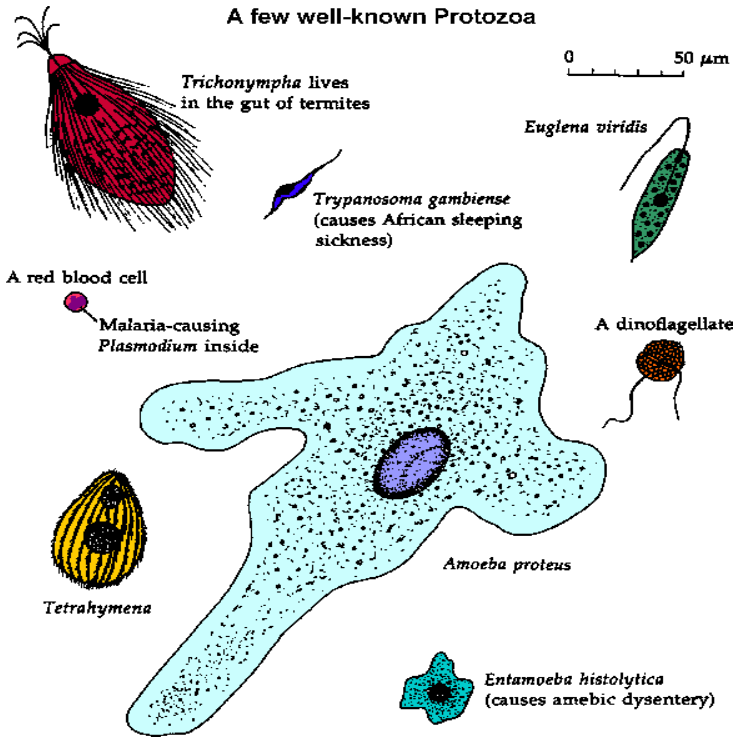
Important Characteristics:

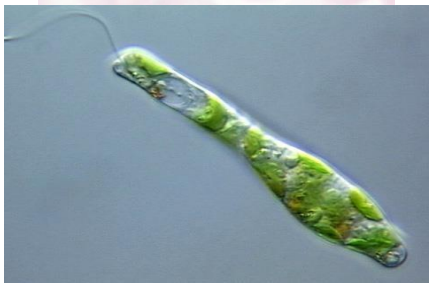
- Eukaryotic
- Unicellular
- Some cultivated on laboratory media while some are intracellular parasites
- Reproduction asexual or sexual

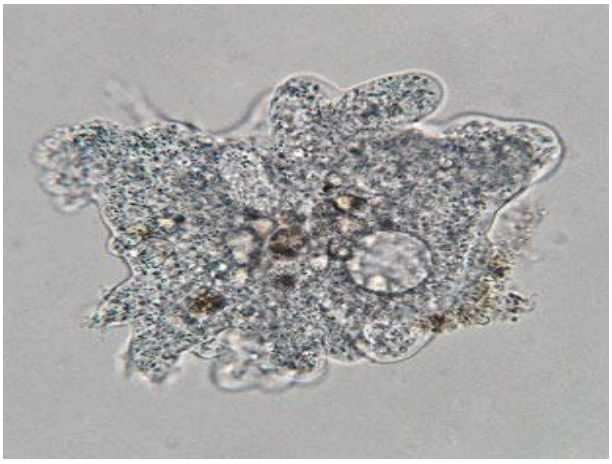
Practical significance:

- Some cause diseases

Food for aquatic animals







Algae

Size:

- 1.0 µm to several centimeters

Important Characteristics:

- Eukaryotic
- Unicellular or Multicellular
- Photosynthetic
- Most occur in aquatic environments
- Reproduction asexual or Sexual

Practical significance:

- Production of food in aquatic environments
- Source of food and in Pharmaceuticals
- Some produce toxic substances