Welcome to Taft College

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Take Roll

Review Syllabus

Grading for lecture.

Grading for lab. Based mainly on notebook.

Prerequisites: Introductory Biology, Chemistry

Purpose for taking class.
How to succeed in Microbiology.

- Time: 3 hours per lecture hour, 3 hours for lab per week.
- Demonstrated success in prerequisites.
- Family support.
- Read material.
- Learn as you go. Develop a foundation. Enjoy the subject.
- Anoint your notes from text, review with others immediately following class sessions.
- Get to know others. Study together.
- Attend regularly. Be on time.
- It’s my job to identify the course objectives and present the lectures and labs to support them.
- It’s your responsibility to spend the time and effort needed to retain them for exams and lab notebook preparation.
Chapter 1

The Microbial World and You
99% + of microbes don’t produce human disease.

Microbes recycle the resources of our biosphere. Where? marine, soil, inside cells of most organisms.

Most microbes cannot be isolated by culture but their genomes can be detected by testing for DNA/RNA.

We will study the disease producers in humans.

Can you name some that have been in the news?
Brief History of Microbiology

 Robert Hooke, 1665: first observation of cells
 Antoni van Leeuwenhoek, 1673: first observation of live cells
 Louis Pasteur, 1861: disproved spontaneous generation; 1864: pasteurization
 Joseph Lister, 1867: aseptic surgery with antiseptic phenol
 Robert Koch, 1876: germ theory of disease (Koch’s postulates and anthrax)
 Edward Jenner, 1798: first vaccine for smallpox using cowpox
 Paul Erlich, 1910: first chemotherapy ‘magic bullet’ for a microbe, salvarsan (arsenic derivative) against syphilis
 Alexander Fleming, 1928: discovered penicillin
 Today there is a transition in progress from classical microbiology to molecular microbiology
Figure 1.2 - Overview

(a) Van Leeuwenhoek using his microscope

(b) Microscope replica

(c) Drawings of bacteria

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Naming and Classifying Microorganisms

- Each organism is assigned two names, a genus and a specific epithet (species)
- The names have to be underlined or italicized.
- **Genus** species
- **Genus** species
- Staphylococcus aureus
- Escherichia coli
System of Classification Based on Cellular Organization

- 3 Domains of Life proposed by Carl Woese, 1978
  - Eubacteria- Bacteria (prokaryote) with peptidoglycan cell walls
  - Archaea- Bacteria (prokaryote) without peptidoglycan cell walls
  - Eucarya- Eukaryotes (includes 4 Kingdoms)
    - Protista (slime molds, protozoa, and some algae)
    - Fungi (unicellular yeasts, multicellular molds, and mushrooms)
    - Plantae (some algae and all mosses, ferns, conifers, and flowering plants)
    - Animalia (includes sponges, worms, insects, and vertebrates)
Bacteria

- Small, simple, unicellular
- Genetic material not enclosed in nuclear membrane - called prokaryotes
- Cells appear as a **bacillus, coccus, or, spiral**
- May form pairs, chains, clusters or other groupings
- Reproduce by **binary fission**
- Have a wide range of chemical substances for nutrition
- Can move by appendages called **flagella**
Fungi

- Genetic material is enclosed in nuclear membrane - called eukaryotes
- May be unicellular (yeasts) or multicellular (most)
- Most typical fungi are molds - mycelia composed of hyphae
- Reproduce sexually or asexually
- Obtain nutrients by absorbing organic material from environment
Protozoa

- Unicellular eukaryotic
- Classified according to means of locomotion
  - Amoeba - move by extensions of cytoplasm called pseudopods
  - Others - long flagella or cilia
- Have a variety of shapes
- Live as free entities or parasites
- Absorb or ingest organic compounds from environment
- Reproduce sexually or asexually
Algae

- Unicellular or multicellular eukaryotes
- Obtain nourishment by photosynthesis
- Produce oxygen and carbohydrates that are used by other organisms
Viruses

- Different
  - Need electron microscope to view
  - Are acellular
  - Has a core of DNA or RNA surrounded by protein coat
  - Survive by using cellular machinery of other organisms
  - All parasites
Multicellular Animal Parasites

- Helminths - Flatworms and Roundworms
- During some stage of life cycle are microscopic in size
Microbes and Human Welfare

- Recycling Vital Elements
- Sewage Treatment
- Bioremediation: Using Microbes to Clean up Pollutants
- Insect Pest Control by Microorganisms
- Modern Biotechnology and Genetic Engineering
Microbes and Human Disease

- Normal Flora (Microbiota) - Variety of organisms on and in our bodies
- Produce disease when disease producing properties of organisms over take natural defenses
- Infectious disease - One in which pathogens invade a susceptible host. Organism carries out part of its life cycle inside host and as a result disease occurs.
Emerging Infectious Disease

- Bovine spongiform encephalopathy – Produced by prions
- Escherichia coli 0157:H7
- Ebola hemorrhagic fever
- AIDS
- Others due to AIDS
Slide Show

- Some of the organisms and diseases they cause
- Parasitic Disease
- Pneumonia
- Cardiovascular
- Skin: Scarlet Fever
- Fungal Disease – Tinea corporis (Ringworm)
- Arthropod Disease - Lice
- Viral Disease