MICROBIOLOGY MIMM211
(Biology of Microorganisms)

Lecture 1

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Course lecturers
• Dr. Benoit Cousineau (Bacteriology)
• Dr. Samantha Gruenheid (Infectious Diseases)
• Dr. Amee Manges (Epidemiology)
• Dr. Don Sheppard (Fungi)
• Dr. Martin Olivier (Parasitology)
• Dr. Matthias Götte (Virology)
• Dr. Malcolm Baines (Immunology)

About the Course
• Lectures: M-W-F from 8:30 to 9:20 am
• Location: Stewart Biology, room S1/4
• The previous edition (6th) is also fine

Computer Support
• WebCT Vista (http://www.mcgill.ca/webct)
  - Course outline (syllabus)
  - Important dates:
    - Labour Day, Monday Sept. 07, no lecture
    - Canadian Thanksgiving, Monday Oct. 12th, no lecture (replaced by Thursday Dec. 3rd)
    - Last lecture, Thursday Dec. 3rd
    - Midterm exam: Wednesday Oct. 21st, in class, 8:30 to 9:20 am, lectures 1-15 only
  - All lectures in PDF format
  - Audio and visual recording of lectures by ICC (Instructional Communication Centre)
  - Sample examination questions
Course evaluation

- One midterm exam (50 questions)
  - 25% of course grade
  - Lectures 1-15

- One final exam (150 questions)
  - 75% of course grade
  - Given by the Faculty of Science
  - Not cumulative (lectures 16 to 39)

- Both examinations are objective-type, that is, multiple-choice questions graded by computer

What is Microbiology?

Microbial Biology or Biology of Microorganisms or Study of Microscopic Organisms

Chapter 1. The History and Scope of Microbiology

- Microbiology (definition)
  - Size of organisms studied
    - Microorganisms: cannot see by unaided eye
  - Set of techniques used to study these small organisms
    - Microscope, isolate microorganisms, grow pure cultures (culture media), sterilization

What is Microbiology (2)?

- Microorganisms are also called "microbes"
  - They are ubiquitous in nature (everywhere)
  - From thermal vents (300°C) to artic ice (-40°C)
  - Associated to humans (gut, skin)
  - Useful to humans
    - Food (bread, cheese, WINE, BEER, etc.)
    - Biotechnology (antibiotics, vitamins, vaccines, enzymes)
    - Harmful or deadly to humans (human pathogens)
      - Important historical impact (plague, malaria, AIDS)
  - Study perspective: gross morphology, fine structure, nutrition, reproduction, physiology, genetics, classification, evolution, distribution, intersections with other living things and environment
Microorganisms can be found in the 3 kingdoms of life:
- Bacteria
- Archaea
- Eucaryya

Members of the microbial world
- Procaryotic or prokaryotic cell
  Pro (before) karyon (nucleus)
  - Bacteria (singular, bacterium)
  - Archaea (singular, archaeon)
- Eucaryotic or eukaryotic cell
  Eu (true) karyon (nucleus)
  - Algae (singular, alga)
  - Fungi (singular, fungus)
  - Protozoa (singular, protozoon)
- Non-living microorganisms
  - Prokaryotic and eukaryotic viruses

Microorganisms share common threads of life
- Can grow (increase in size)
- Metabolism
  - Need energy to grow (consume, transform, store)
  - Consume nutrients
  - Excrete wastes
- Motion (moving itself or having internal motion)
- Reproduction (create identical entities that are separate)
- Response to stimuli (measure properties of their environment and act upon certain conditions)

The CELL is the basic structural unit of life and microorganisms are usually unicellular
Historical perspectives

- Lucretius (98-55 B.C.) and Girolamo Fracastoro (1478-1553) suggested that invisible organisms cause disease

- 1590-1608: Johannes Jansen develops the first microscopes

- 1665: first description and depiction of a microorganism by Robert Hooke (1635-1703) using a microscope: the reproductive structures (sporangia) of the microfungus *Mucor*

Hooke’s sporangia of *Mucor*

Historical perspectives (2)

- 1674: discovery of bacteria and protozoa by Anthony van Leeuwenhoek (1632-1723) a Dutch merchant
  - Small hand-held microscopes (hobby, 50X to 300X)
  - Invisible creatures, animalcules (small animals)
  - Everywhere: water, soil, teeth scrapings, excrements
  - Animalcules are alive
    - Increase in numbers and move
    - “Appeared” in certain materials

⇒ **Spontaneous generation**: spontaneous formation of living things from inanimate matters
van Leeuwenhoek’s microscope

van Leeuwenhoek’s microscope (2)
Historical perspectives (3)

**Spontaneous generation or abiogenesis:**
formation of living things from inanimate matters

- Aristotle (384-322 B.C.), Descartes, Newton and numerous other scientists believed in spontaneous generation

- Origin of many organisms: invertebrates, rats, flies, etc.

- In 1665, Francesco Redi (1626-1697) showed that fly larvae can only develop in meat that fly can reach

- Different for microorganisms? decomposition forms microorganisms or microorganisms cause decomposition?