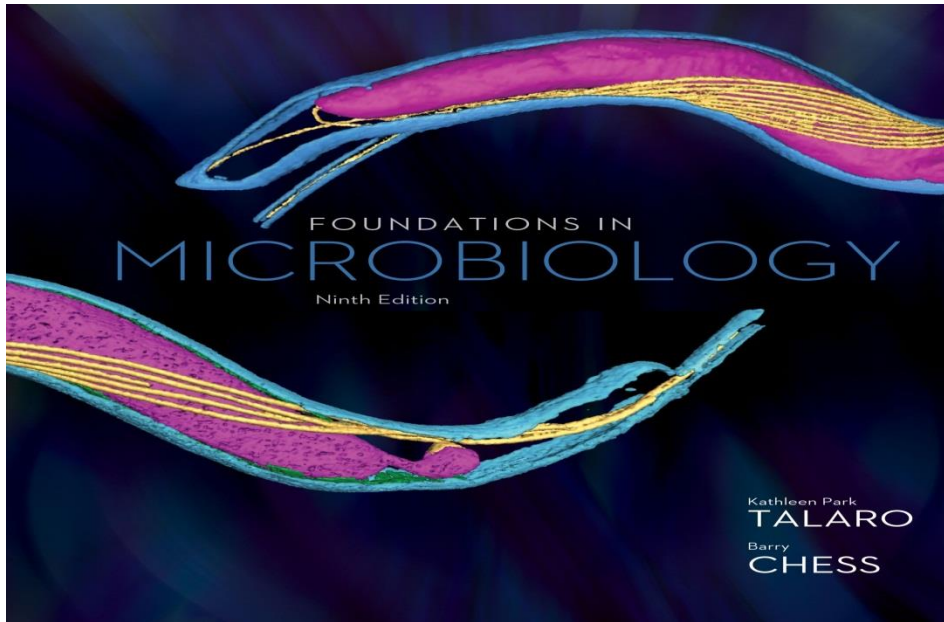


LECTURE 3:

INTRODUCTION IN MICROBIOLOGY



Did you know that you're mostly microbes. There are more microbial cells in your body than your own cells!

Microbes are found everywhere: in and on your body, in streams and rocks, on your smart phone screen, and in your food.

Despite their bad reputation, microbes are mostly useful or have a neutral effect on our lives.

Microbiology : The study of organisms too small to be seen without magnification.

Microorganisms are too small to see with the naked eye unicellular structures. They have ability to reproduce themselves with simple cell division. The single cell of the microorganisms contains the complete genetic material and can be transferred to the next generation of cells.

Microorganisms include:

Bacteria ,, Viruses ,, Fungi ,,Protozoa ,,Helminths (worms),,Algae.

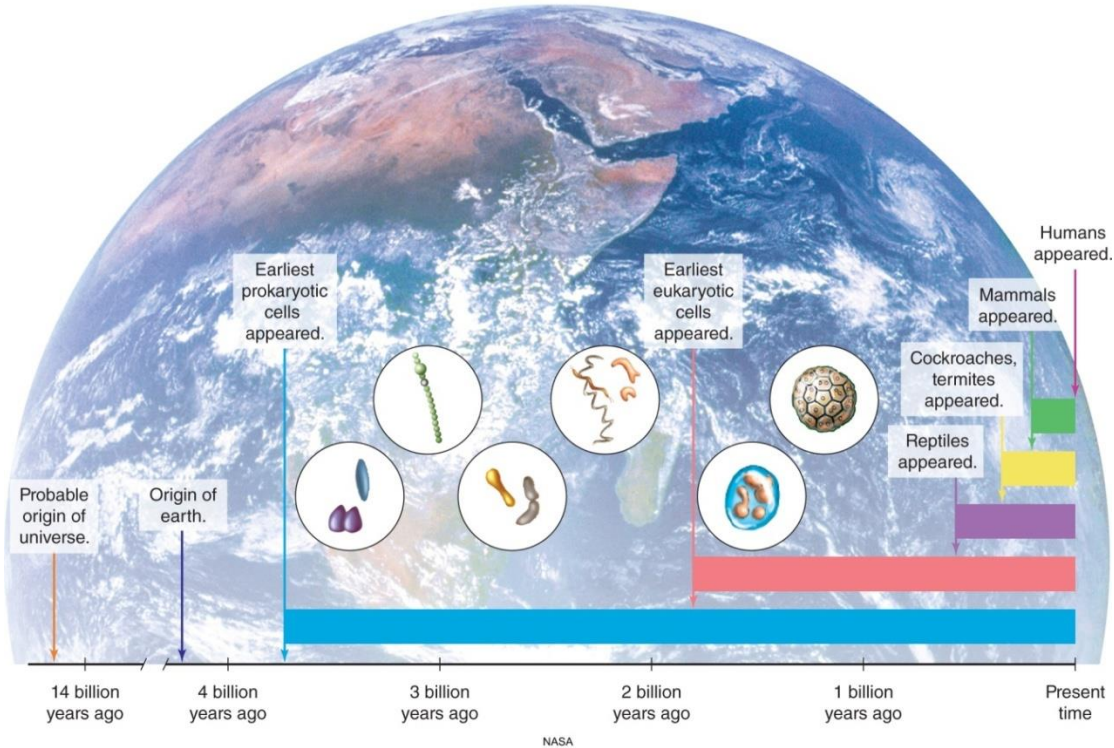
Origins of Microorganisms

Bacteria-like organisms have existed on earth for about 3.5 billion years

Prokaryotes (pre-nucleus): Simple cells

Eukaryotes (true nucleus): Complex cells

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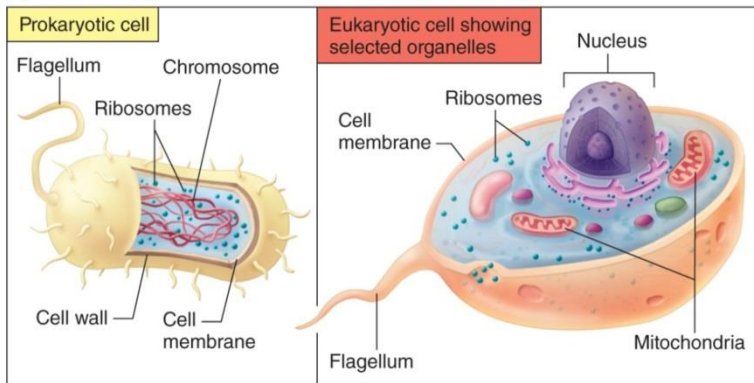
Microbial Structure

Prokaryote – microscopic, unicellular organisms, lack nuclei and membrane-bound organelles

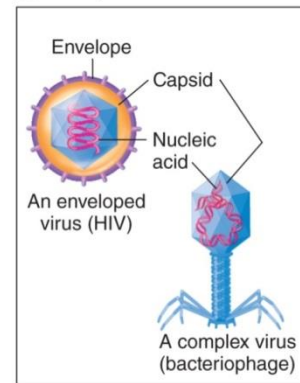
Eukaryote – unicellular (microscopic) and multicellular, nucleus and membrane-bound organelles

Viruses - Acellular, parasitic particles composed of a nucleic acid and protein

(a) Basic cell types



(b) Examples of viruses



Microbiologists study these organisms using tools:

Like microscopes, genetics, and culturing.

Microscopes allow scientists to magnify microbial cells that are otherwise too small to see.

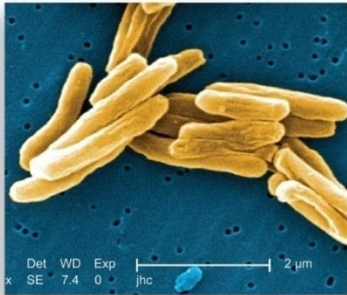
Genetics and molecular biology help scientists understand the evolutionary relationships between microbes and their habitats.

Culturing is the term used to describe growing microbes, usually combined with tests to see what the microbes like to utilize or what conditions they can live in.

Microbial Diversity: 6 Types of Microbes

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Reproductive spores



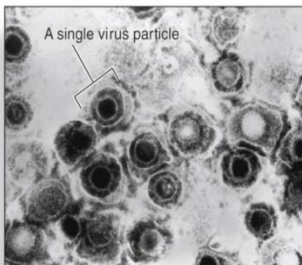
Bacteria: *Mycobacterium tuberculosis*, a rod-shaped cell (15,500x).



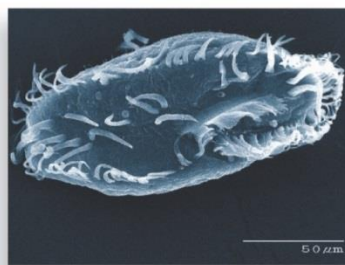
Fungi: *Histoplasma capsulatum*, with lollipop-like reproductive structures (750x). This agent is the cause of Ohio Valley fever.



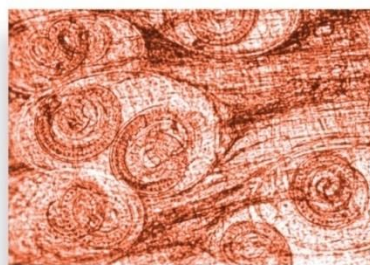
Algae: desmids, *Spirogyra* filament, and diatoms (golden cells) (500x).



Virus: *Herpes simplex*, the cause of cold sores (100,000x).



Protozoa: A protozoan, *Oxytricha trifallax* bearing tufts of cilia that function like tiny legs (3,500x).



Helminths: Roundworms of *Trichinella spiralis* coiled in the muscle of a host (250x). This worm causes trichinellosis.

(top left): Janice Carr/CDC; (top middle): Dr. Libero Ajello/CDC; (top right): © Charles Krebs Photography; (bottom left): CDC; (bottom middle): National Human Genome Research Institute; (bottom right):

The Importance of Microorganisms

They have great impact on human lives and are used for different purposes as listed below:

1-Food:

Nature uses microorganisms to carry out fermentation processes, and for thousands of years mankind has used yeasts, moulds and bacteria to make food products such as bread, beer, wine, vinegar, yoghurt and cheese, as well as fermented fish, meat and vegetables.

2-Medicine:

Microbes play a major role in the development, production, and future of medicine. Vaccines and antibiotics are only two of the hundreds of uses for microbes in the medical field. Microbes have played a significant role in the development of medical treatments.

3-Human health

1-Human digestion: Microorganisms can form an [endosymbiotic](#) relationship with other, larger organisms. For example, the bacteria that live within the human digestive system contribute to gut immunity, synthesise [vitamins](#) such as [folic acid](#) and [biotin](#), and ferment complex indigestible [carbohydrates](#).

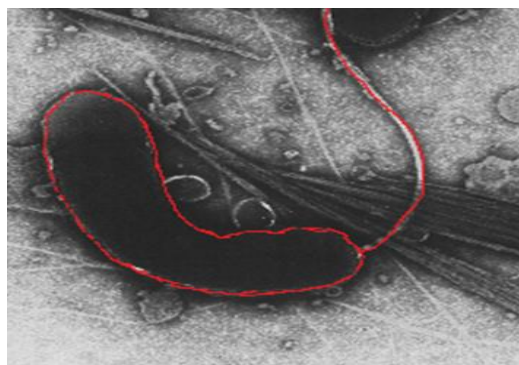
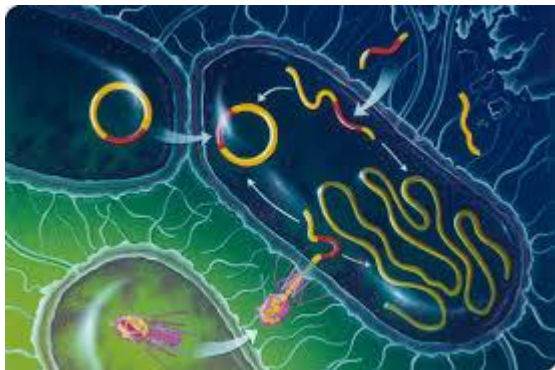
2-Disease: Microorganisms are the cause of many infectious diseases.

The organisms involved include [pathogenic bacteria](#), causing diseases such as [tuberculosis](#) and [anthrax](#). Protozoa, causing diseases such as [malaria](#) and [dysentery](#). Fungi causing diseases such as [candidiasis](#). However, other diseases such as [influenza](#), [yellow fever](#) or [AIDS](#) are caused by [pathogenic viruses](#)

4-Biotechnology: Production of foods, drugs, and vaccines using living organisms

5-Genetic engineering: Manipulating the genes of organisms to make new products

6-Bioremediation: Using living organisms to remedy an environmental problem



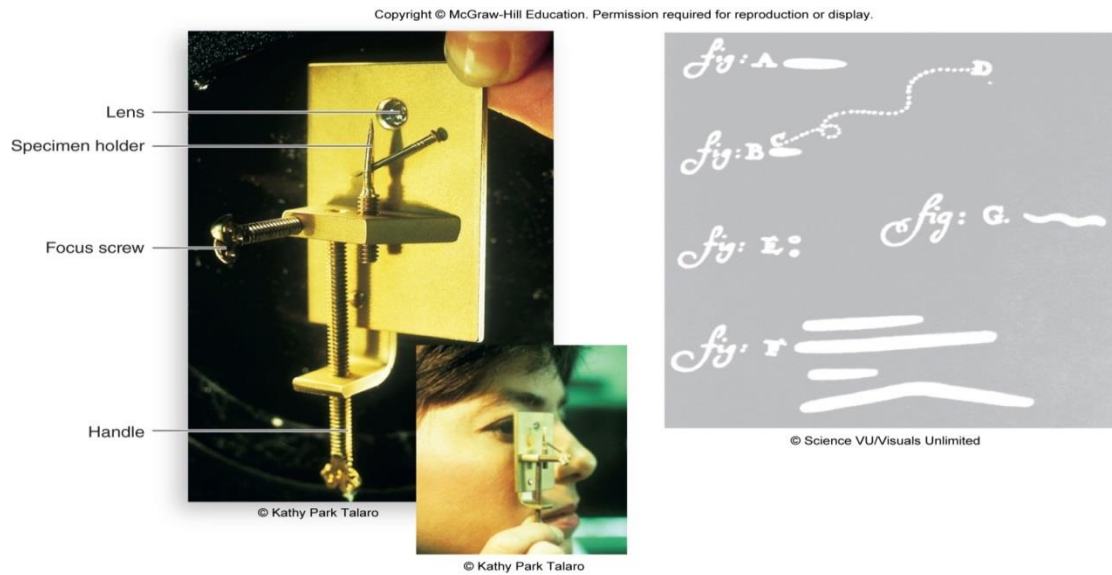
Vibrio cholera

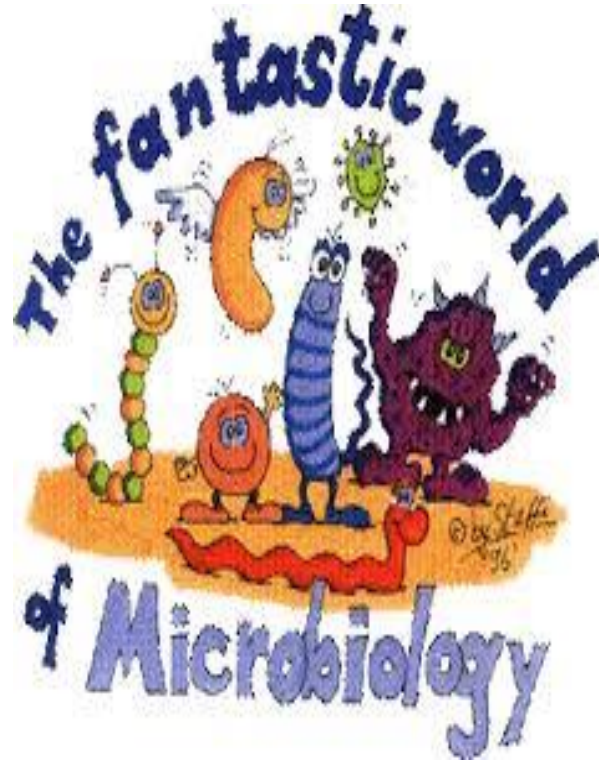
Antoine van Leeuwenhoek (1632-1723)

Leeuwenhoek's Work

First to observe living microbes

Single-lens magnified up to 300X





Microbiology

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Microbiologist : is a scientist who studies microscopic life forms and processes. This includes study of the growth, interactions and characteristics of microscopic organisms such as bacteria, algae, fungi. using tools like microscopes, genetics, and culturing.

Microbes are found everywhere in and on your body, in streams and rocks, on your smart phone screen, and in your food. Despite their bad reputation, microbes are mostly useful or have a neutral effect on our lives.

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