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((Microbiology 2))

Stage 2

2025 - 2026

Lecture 1

Introduction to Medical Microbiology

By

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Introduction to Medical Microbiology

Comparing Prokaryotic and Eukaryotic cells

- ❖ All living cells can be classified into two groups, prokaryotes and eukaryotes, based on certain structural and functional characteristics.
- ❖ In general, prokaryotes are structurally simpler and smaller than eukaryotes. The DNA (genetic material) of prokaryotes is usually a single, circularly arranged chromosome and is not surrounded by a membrane; the DNA of eukaryotes is found in multiple chromosomes in a membrane-enclosed nucleus.
- ❖ Prokaryotes lack membrane-enclosed organelles, specialized structures that carry out various activities.
- ❖ Plants and animals are entirely composed of eukaryotic cells. In the microbial world, bacteria and archaea are prokaryotes. Other cellular microbes—fungi (yeasts and molds), protozoa, and algae—are eukaryotes.

The chief distinguishing characteristics of Prokaryotes:



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1. Their DNA is not enclosed within a membrane and is usually a single circular chromosome (Some bacteria have a linear chromosome.)
2. Their DNA is not associated with histones (special chromosomal proteins found in eukaryotes).
3. They lack membrane-enclosed organelles.
4. Their cell walls almost always contain the complex compound peptidoglycan.
5. They usually divide by binary fission. During this process, the DNA is copied, and the cell splits into two cells.

The chief distinguishing characteristics of Eukaryotes:

- 1) Their DNA is found in the cell's nucleus, which is separated from the cytoplasm by a nuclear membrane, and the DNA is found in multiple chromosomes.
- 2) Their DNA is consistently associated with chromosomal proteins called histones.
- 3) They have a number of membrane-enclosed organelles, including mitochondria, endoplasmic reticulum, Golgi complex, lysosomes, and sometimes chloroplasts.
- 4) Their cell walls, when present, are chemically simple.
- 5) Cell division usually involves mitosis, in which chromosomes replicate and an identical set is distributed

into each of two nuclei. Division of the cytoplasm and other organelles follows, so that the two cells produced are identical to each other.

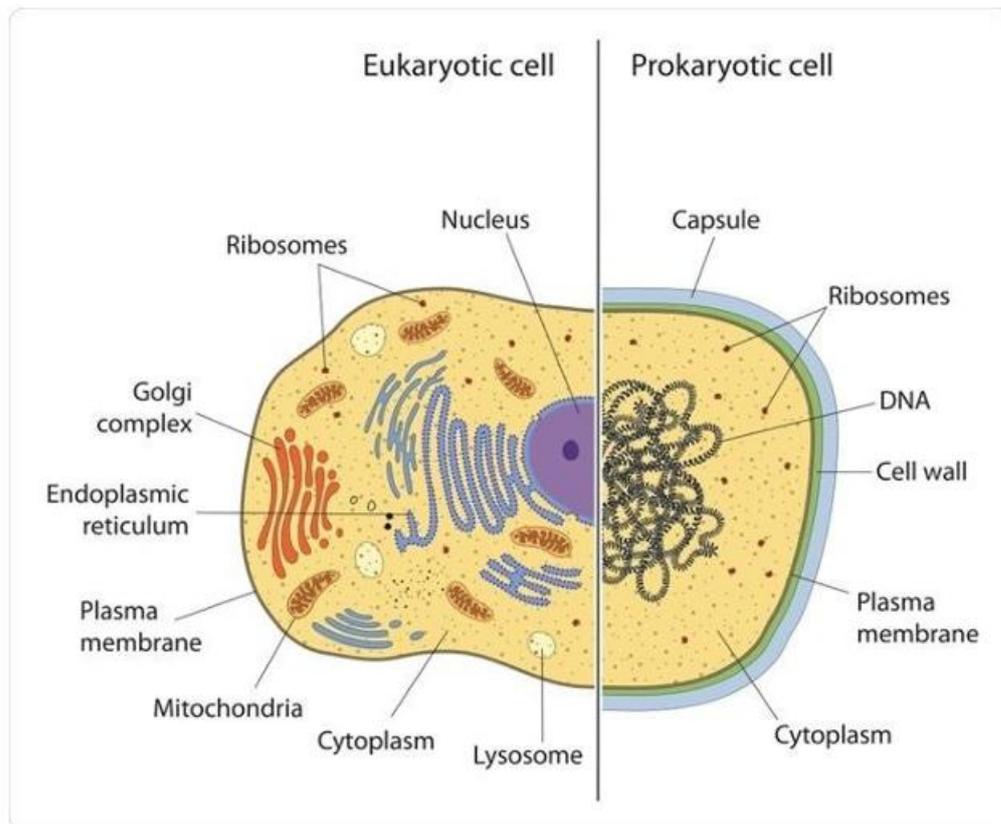


Figure 1-1. Eukaryotic vs Prokaryotic Cell.

Types of Pathogens

The agents which because infectious diseases are called pathogens. These are Viruses, Bacteria, Fungi, and Protozoans.



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Sl.No.	Infectious agents	Diseases
1.	Viruses	Common cold, Influenza, Measles, Mumps, Chicken pox, AIDS, Hepatitis-B etc.
2.	Bacteria	Cholera, Typhoid, Tuberculosis, Tetanus, Anthrax, Food poisoning etc.
3.	Fungi	Skin infections.
4.	Protozoans	Malaria, Kala-azar, Amoebic dysentery, Sleeping sickness.

Basic Terminology Used in Medical Microbiology

Microorganisms: An organism of microscopic size. These organisms cannot be seen by the naked eye. (eg: virus, bacteria, fungi...etc)

Pathogen: Any type of microorganism that can cause infection or disease in a host is called a pathogen.

Infection: Infection occurs when viruses, bacteria, or other microbes enter your body and begin to multiply.

Disease:- A disease is a condition that destroys the normal functioning of cells, tissues, and organs, which are characterized by their signs and symptoms.

Sign: A medical sign is a physical response linked to a medical fact or characteristic that is detected by a physician, nurse, or medical device during the examination of a patient.

Symptoms:- A symptom is a manifestation of disease apparent to the patient himself.



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Virulence: Virulence is the relative capacity of a microbe to cause damage in a susceptible host, and a virulence factor is a microbial component that can damage a susceptible host.

Bacteremia:- The presence of bacteria in the bloodstream.

Viremia:- The presence of a virus in the bloodstream.

Aerobic:- The organism which may survive in the presence of oxygen or free air is called aerobic.

Obligate aerobes:- An organism that requires only oxygen to grow and survive.

Anaerobic: The organisms that can survive in the absence of oxygen or free air are called anaerobic.

Obligate anaerobes:- The organisms that can grow and survive only in the absence of oxygen.

Facultative anaerobes:- The organisms that can survive in both oxygenated as well as the deoxygenated environment.

Motile: The ability of an organism to move independently.

Mesophilic: An organism that grows best in moderate temperature, neither too hot nor too cold (20-45°C)

Thermophilic: An organism that grows best at higher temperatures (55- 65°C, maximum 80°C)

Capnophilic: Capnophiles are microorganisms that grow in the presence

of high concentration of carbon dioxide (5-10% CO₂)

Halophilic: Halophiles are microorganisms that require a certain concentration of salt to survive.



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Commensal bacteria: Those types of microbes that reside on the surface of the body or at the mucosa without harming human health.

Opportunistic pathogens: Some commensals or saprophytes can produce disease, when the host is immunocompromised.

Antibiotic: Antibiotics are medicines that fight bacterial infections in people and animals. They work by killing or inhibiting bacterial growth.

Antiseptic: An antiseptic is a substance that stops or slows down the growth of microorganisms.

Antiseptics are applied to the external body surface.

Incubation period: The time period to cause disease to develop in the body.

Sterilization: It is a process by which an article's surface or medium is made free from all microorganisms, either in vegetative form or spore form.

Disinfection: disinfection means the destruction of all pathogens or microorganisms that are capable of producing infection, but not necessarily spores. All organisms may not be killed, but the number is reduced to a level that is no longer harmful to health.

Disinfectant: By which disinfection is done is known as a disinfectant. (Disinfection is also used for living cells/tissues).

Ingestion: The process of taking food, drink, or other substances into the body by swallowing or absorbing them.

Inhalation: It is the process of drawing air into the respiratory tract, primarily for the purpose of breathing and oxygen exchange within the body.



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Host: The term "host" mainly refers to a living organism that acts as a harbour for an invading pathogenic organism.

Vector: A carrier of a disease-causing agent from an infected individual to a non-infected individual.