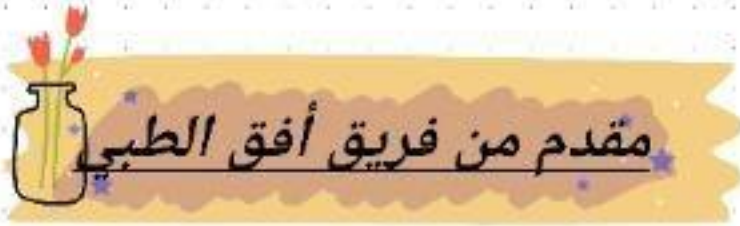
مقدم من فريق أفق الطبي


جامعة الأزهر - غزة
AL-AZHAR UNIVERSITY - GAZA
1412-1991 - ١٤١٢-١٩٩١


حركة الشبيبة الفتحاوية
جامعة الأزهر
Fateh Youth Movement

General Microbiology

Bacteria Compared with Other Microorganisms

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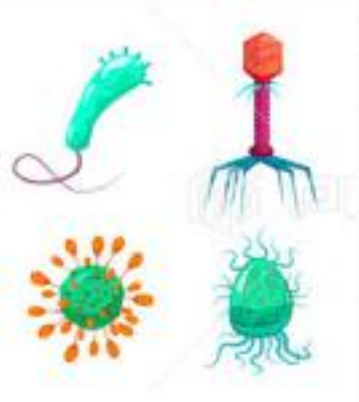


Introduction

- **Biology:** The science of living things.
- **Microbiology:** A branch of biology dealing with microscopic forms of life as bacteria, protozoa, viruses and fungi.
- **Branches of Microbiology:**
- Bacteriology, Parasitology, mycology and virology.

الطفيليات الفطريات الفيروسات

Microbes that cause infectious diseases

- The agents of human infectious diseases belong to five major groups of organisms: bacteria, fungi, protozoa, helminths, and viruses.
- Bacteria belong to the prokaryote kingdom,
- Fungi (yeasts and molds) belong to the kingdom of fungi
- protozoa are members of the kingdom of protists.
- Helminths (worms) are classified in the animal kingdom
- Protists and fungi are distinguished from animals and plants by being either unicellular or relatively simple multicellular organisms.
- Helminths are complex multicellular organisms.

Microbes that cause infectious diseases

- The helminths and the protozoa are commonly called parasites.
- Viruses are quite distinct from other organisms—they are not cells but can replicate only within cells.

acellular

⇒ ليس خلية

Important features of microbes

This distinction is based primarily on three criteria:

(1) **Structure.**

(2) **Method of replication.**

(3) **Nature of the nucleic acid.**

(1) Structure

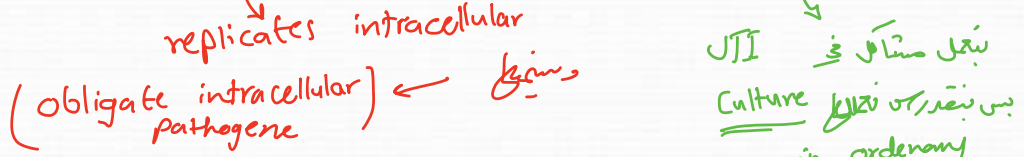
في الخلية البكتيرية
نواة حقيقية
حبيبة بالنواة

- Cells have a nucleus or nucleoid which contains DNA; this is surrounded by cytoplasm, within which proteins are synthesized and energy is generated.
- Viruses have an inner core of genetic material (either DNA or RNA) but no cytoplasm, and so they depend on host cells to provide the machinery for protein synthesis and energy generation.

ملاحظة: الفيروس ما بيدخل ال host cell بفقد كل مكوناته، ويدخل فقط على شكل DNA أو RNA

(2) Method of replication.

- Cells replicate either by binary fission or by mitosis, during which one parent cell divides to make two progeny cells while retaining its cellular structure.
- Prokaryotic cells (e.g., bacteria) replicate by binary fission, whereas eukaryotic cells replicate by mitosis.
- In contrast, viruses disassemble, produce many copies of their nucleic acid and protein, and then reassemble into multiple progeny viruses.
- Viruses must replicate within host cells because they lack protein-synthesizing and energy-generating systems.
- With the exception of rickettsiae and chlamydiae, which also require living host cells for growth, bacteria can replicate extracellularly.

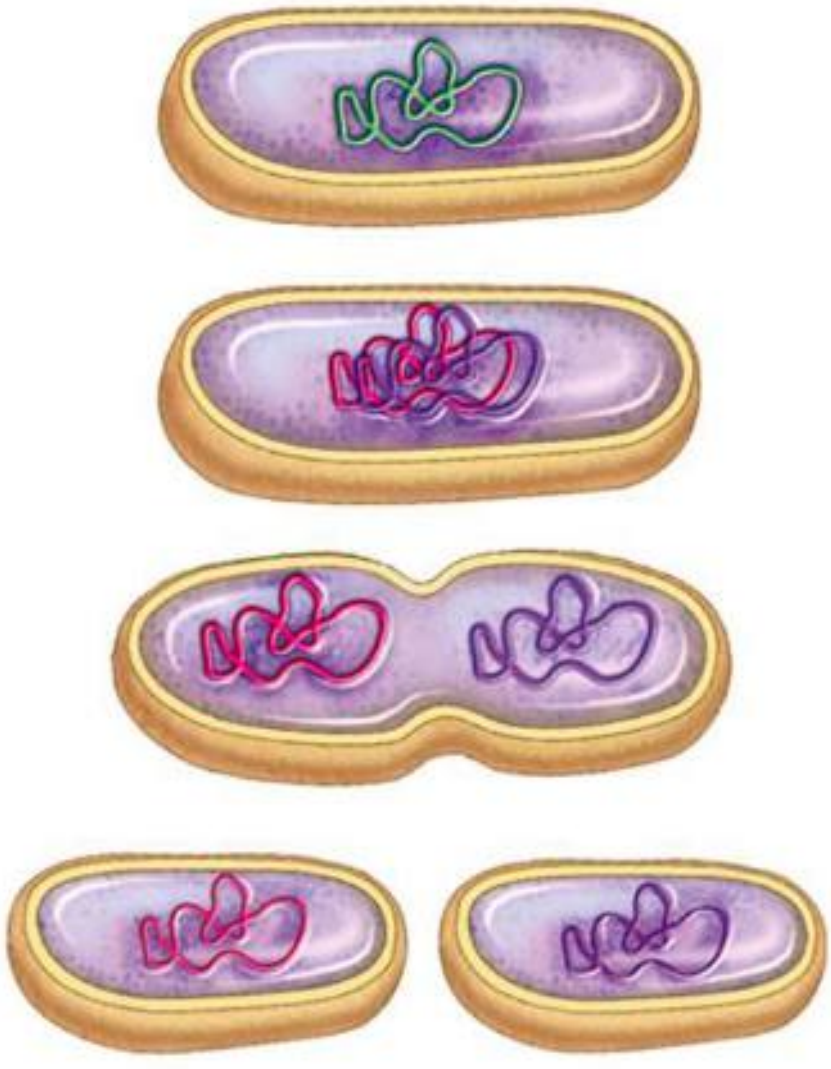


(3) Nature of the nucleic acid.

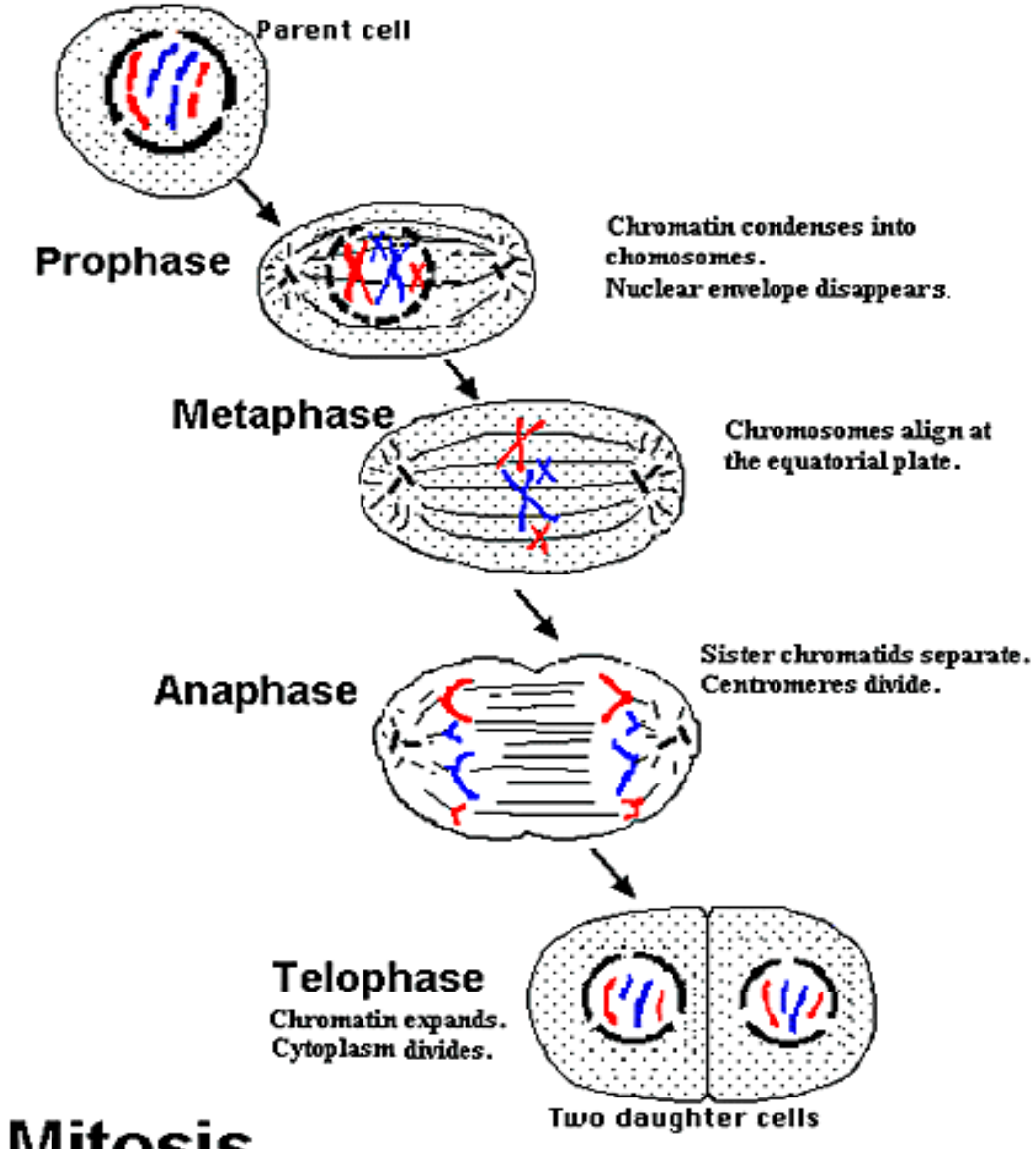
- Cells contain both DNA and RNA, whereas viruses contain either DNA or RNA, but not both.

Eukaryotes & prokaryotes

- Eukaryotic cell has a true nucleus with multiple chromosomes surrounded by a nuclear membrane and uses a mitotic apparatus to ensure equal allocation of the chromosomes to progeny cells.
- The nucleoid of a prokaryotic cell consists of a single circular molecule of loosely organized DNA, lacking a nuclear membrane and mitotic apparatus
- Eukaryotic cells contain organelles, such as mitochondria and lysosomes, and larger (80S) ribosomes (2 subunits), whereas prokaryotes contain no organelles and smaller (70S) ribosomes.
- Most prokaryotes have a rigid external cell wall that contains peptidoglycan, a polymer of amino acids and sugars, as its unique structural component.



Binary Fission


Parent cell
Prophase
Chromatin condenses into chomosomes.
Nuclear envelope disappears.
Metaphase
Chromosomes align at the equatorial plate.
Anaphase
Sister chromatids separate.
Centromeres divide.
Telophase
Chromatin expands.
Cytoplasm divides.
Two daughter cells

Mitosis

Eukaryotes & Prokaryotes

- Eukaryotes, do not contain peptidoglycan.
- Either they are bound by a flexible cell membrane, or in the case of fungi, they have a rigid cell wall with chitin, a homopolymer of N-acetylglucosamine, typically forming the framework.
- The eukaryotic cell membrane contains **sterols**, whereas no prokaryote, except the wall-less *Mycoplasma*, has sterols in its membranes

ما في عندها cell wall .

وعندها cytoplasmic membrane .

حتى عند زراعتها تحتاج إلى وسط بيئي خاص .

يحتوي على sterol حتى تنمو .

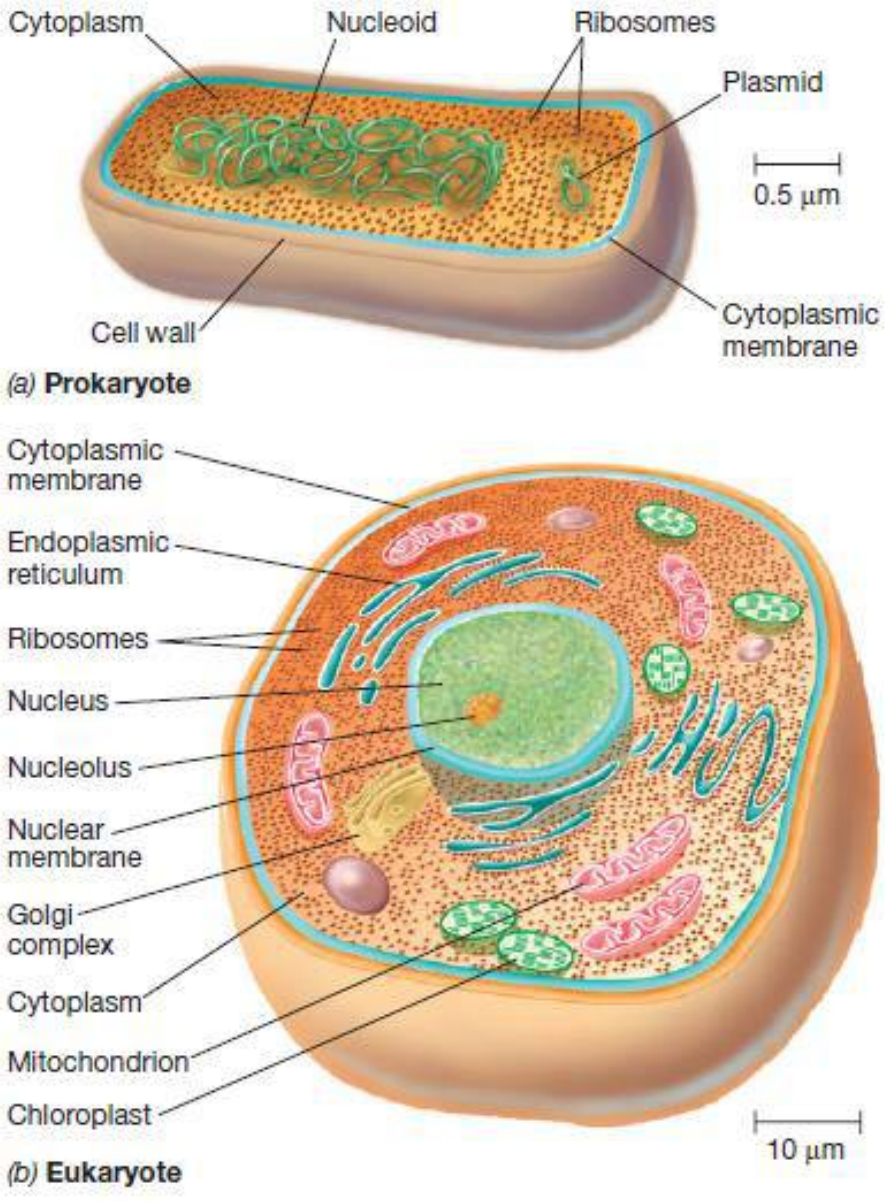


Figure 2.11 Internal structure of cells. Note differences in scale and internal structure between the prokaryotic and eukaryotic cells.

TABLE 1–3 Characteristics of Prokaryotic and Eukaryotic Cells

Characteristic	Prokaryotic Bacterial Cells	Eukaryotic Human Cells
DNA within a nuclear membrane	No	Yes
Mitotic division	No	Yes
DNA associated with histones	No	Yes
Chromosome number	One (multible)	More than one
Membrane-bound organelles, such as mitochondria and lysosomes	No	Yes
Size of ribosome	70S	80S
Cell wall containing peptidoglycan	Yes	No

TABLE 1–2 Comparison of Medically Important Organisms

Characteristic	Viruses (pro)	Bacteria (Eu)	Fungi	Protozoa and Helminths
Cells	No	Yes	Yes	Yes
Approximate diameter (μm)[1]	0.02–0.2	1–5	3–10 (yeasts)	15–25 (trophozoites)
Nucleic acid	Either DNA or RNA	Both DNA and RNA	Both DNA and RNA	Both DNA and RNA
Type of nucleus	None	Prokaryotic	Eukaryotic	Eukaryotic
Ribosomes (يعتمد على ال host cell)	Absent	70S	80S	80S
Mitochondria	Absent	Absent	Present	Present
Nature of outer surface	Protein capsid and lipoprotein envelope	Rigid wall containing peptidoglycan	Rigid wall containing chitin	Flexible membrane
Motility	None	Some	None	Most
Method of replication	Not binary fission	Binary fission	Budding or mitosis[2]	Mitosis[3]

* الفايروسات قبل دخوله ال host cell بيكون :

protein capsid فوقه RNA او DNA

lipoprotein envelope وفوقه

* وبكمه ليس كل الفايروسات لها lipoprotein envelope

TABLE 1–1 Biologic Relationships of Pathogenic Microorganisms

Kingdom	Pathogenic Microorganisms	Type of Cells
Animal	Helminths (worms)	Eukaryotic
Protists	Protozoa	Eukaryotic
Fungi	Fungi (yeasts and molds)	Eukaryotic
Prokaryote	Bacteria	Prokaryotic
non-cellular	Viruses	Noncellular

End of Lecture