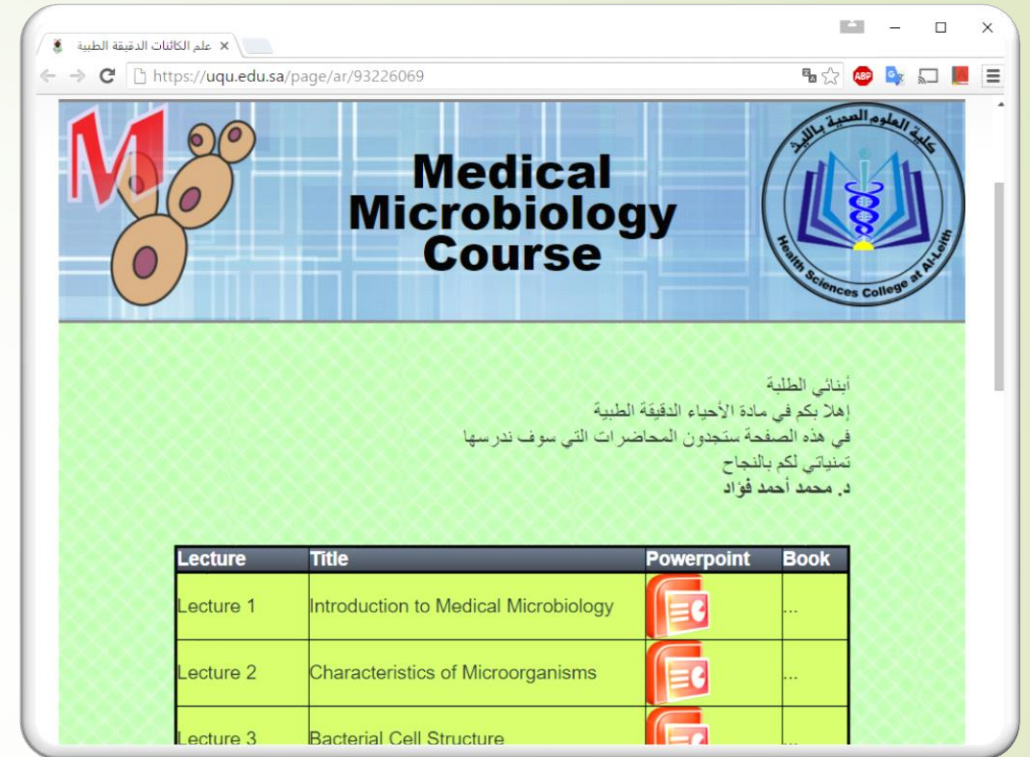


Lecture (1)



INTRODUCTION TO MEDICAL MICROBIOLOGY

Study Sources






علم الكائنات الدقيقة الطبية

https://uqu.edu.sa/page/ar/93226069

Medical Microbiology Course

كلية العلوم الصحية بالجامعة
Health Sciences College at Umm Al-Qura

أبناي الطلبة
إهلا بكم في مادة الأحياء الدقيقة الطبية
في هذه الصفحة سنجدون المحاضرات التي سوف ندرسها
تمنيتي لكم بالنجاح
د. محمد أحمد فؤاد

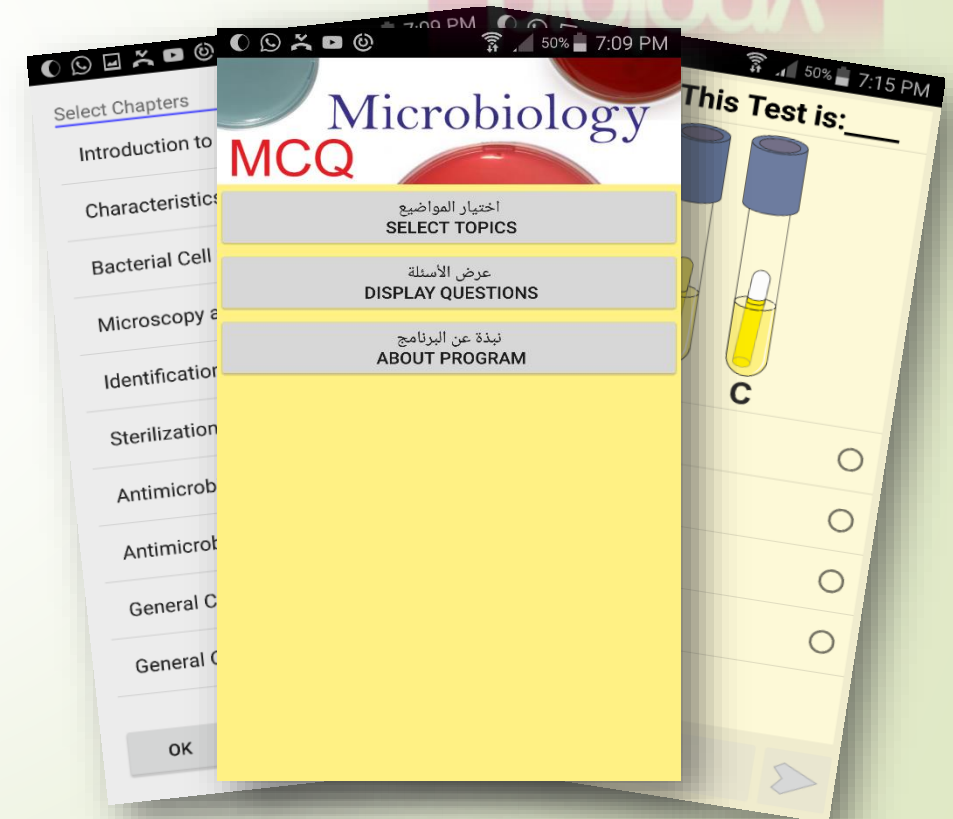
Lecture	Title	Powerpoint	Book
Lecture 1	Introduction to Medical Microbiology		...
Lecture 2	Characteristics of Microorganisms		...
Lecture 3	Bacterial Cell Structure		...

Teacher Web Site:

<https://uqu.edu.sa/masaidahmed/microbiology>

Android Program: **MCQ Basic Microbiology**

https://play.google.com/store/apps/details?id=com.mohmicro.bm_mcqprogram



Android Program: **Microbiology EduCards**


<https://play.google.com/store/apps/details?id=com.mohmicro.educards>





Objectives



1. Define **microorganisms** and the **science of microbiology**
 2. Define taxonomy, nomenclature and binomial nomenclature.
 3. Enumerate taxonomic ranks and the five kingdoms of life.
 4. Compare and contrast **Eukaryotes** and **prokaryotes**.
 5. List Major **groups** of **human pathogens**
- 



Microbiology:

- Microbiology is the science that deals with microorganisms.
- The word *microbiology* is derived from the Greek:
 - mikros = small
 - bios = life
 - logos = science.

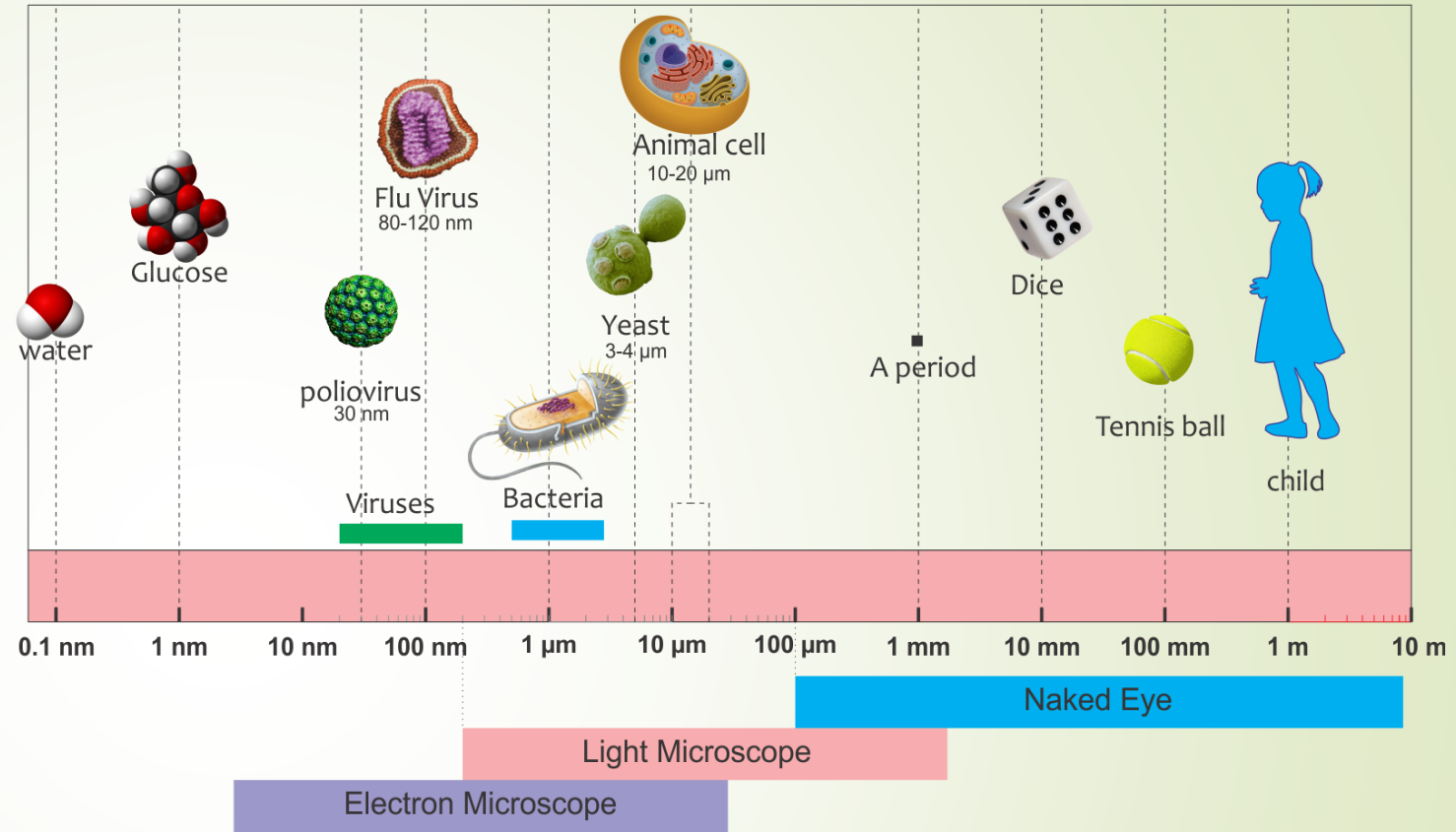
Microorganisms

Microorganisms are small living organisms that can not be seen by naked eye except by microscope.



- An object must measure about 100 micrometers (μm) to be visible without a microscope.
- Note that fungi (yeast), bacteria and viruses are outside the range of vision of naked eye.

[1 μm = 0.001 mm]



Relative sizes on a logarithmic scale, from 0.1 nm to 1 m.

This picture shows the tip of a surgical needle (shown in purple) contaminated with bacteria (shown in yellow).





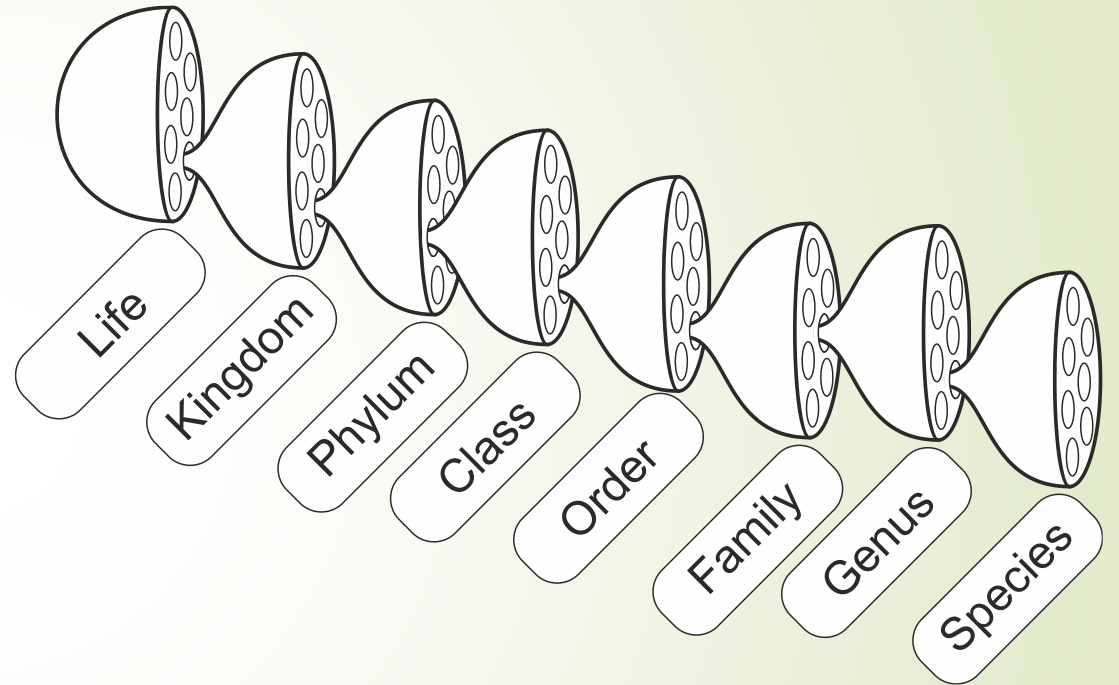
Taxonomy and Nomenclature

- **Taxonomy** is the science of classifying organisms.
- **Taxon** - group of organisms in a classification system (plural : taxa).
- **Nomenclature** is system of assigning scientific names to organisms and groups (taxa).

Taxonomic Ranks

There are seven main taxonomic ranks:

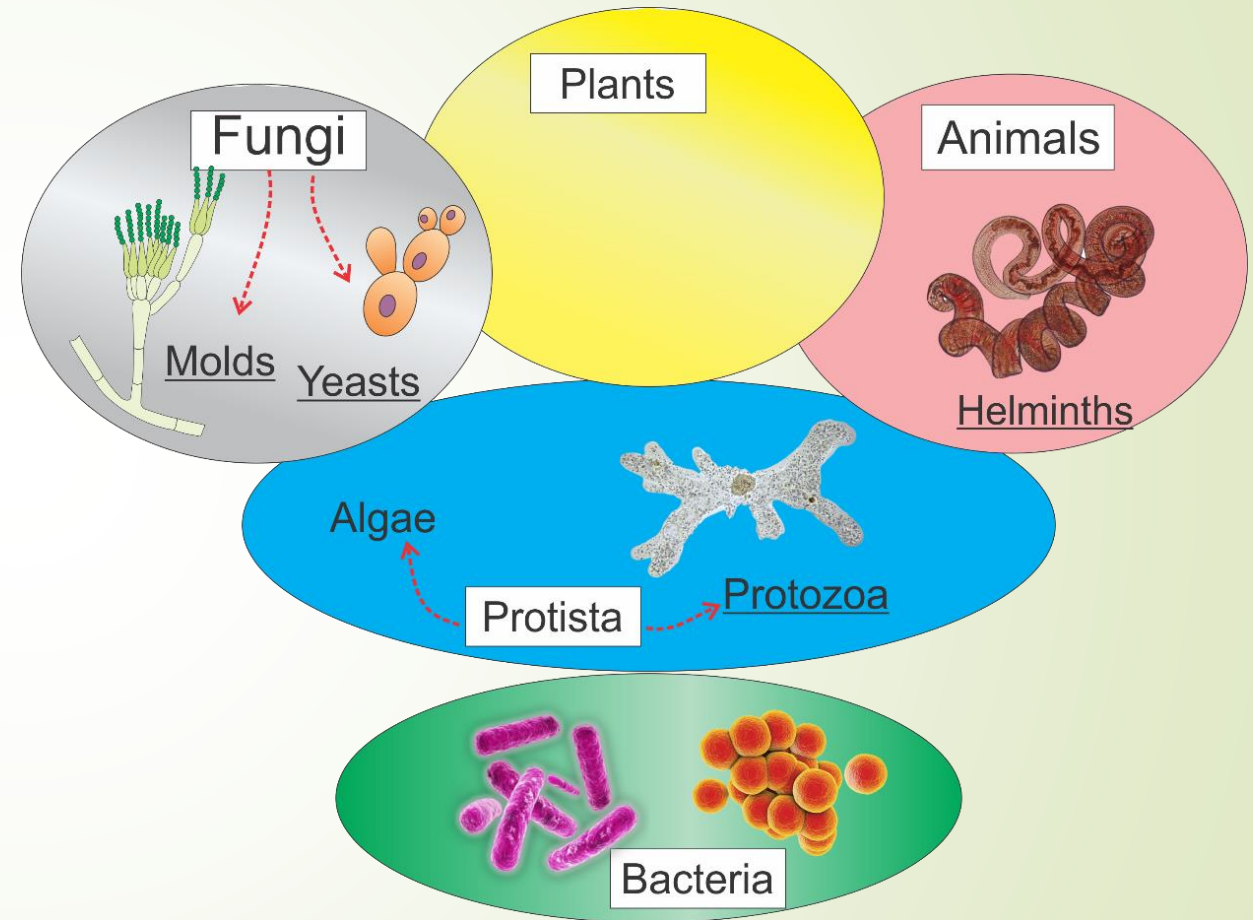
- **Kingdom**
- **Phylum**
- **Class**
- **Order**
- **Family**
- **Genus**
- **Species**



The Five Kingdoms of Life

Biologists generally classify living organisms into one of the five kingdoms illustrated here:

- Fungi
- Plants
- Animals
- Protista (includes Algae and Protozoa)
- Bacteria (Monera)



The Binomial nomenclature

- Binomial nomenclature is the formal system of naming species.
- Each organism name has two parts, the genus name and the species name.

Example:

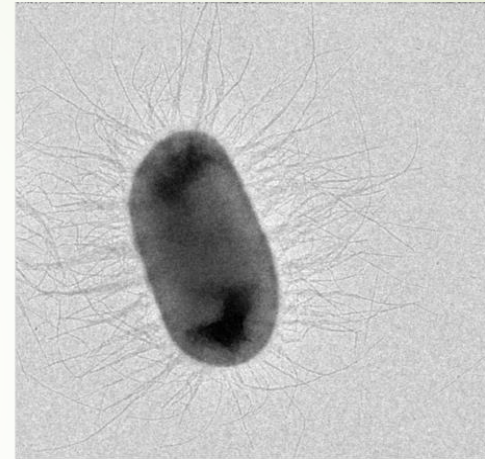
Staphylococcus aureus

↑
Genus

↑
Species

Example of binomial nomenclature

Escherichia coli is a common commensal intestinal bacterium.



Escherichia

coli

Genus

Species

The Binomial nomenclature

- The first letter of the genus name is always **CAPITALIZED**.
- The first letter of the species name is **not** capitalized.
- Both genus and species names are **italicized**.

Staphylococcus aureus

↑
Genus

↑
Species



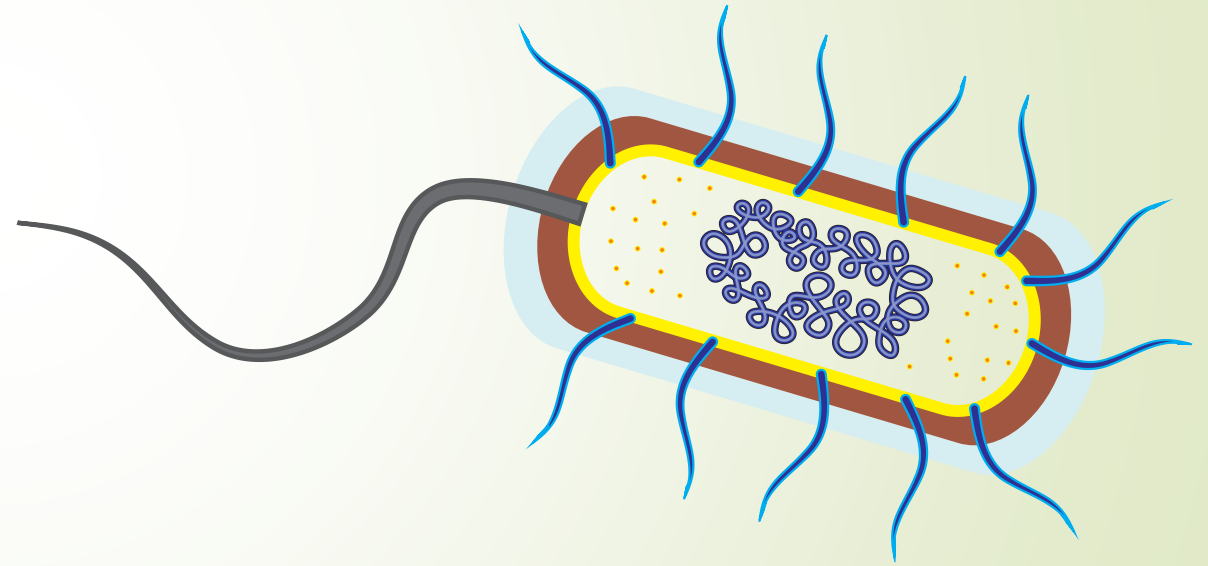
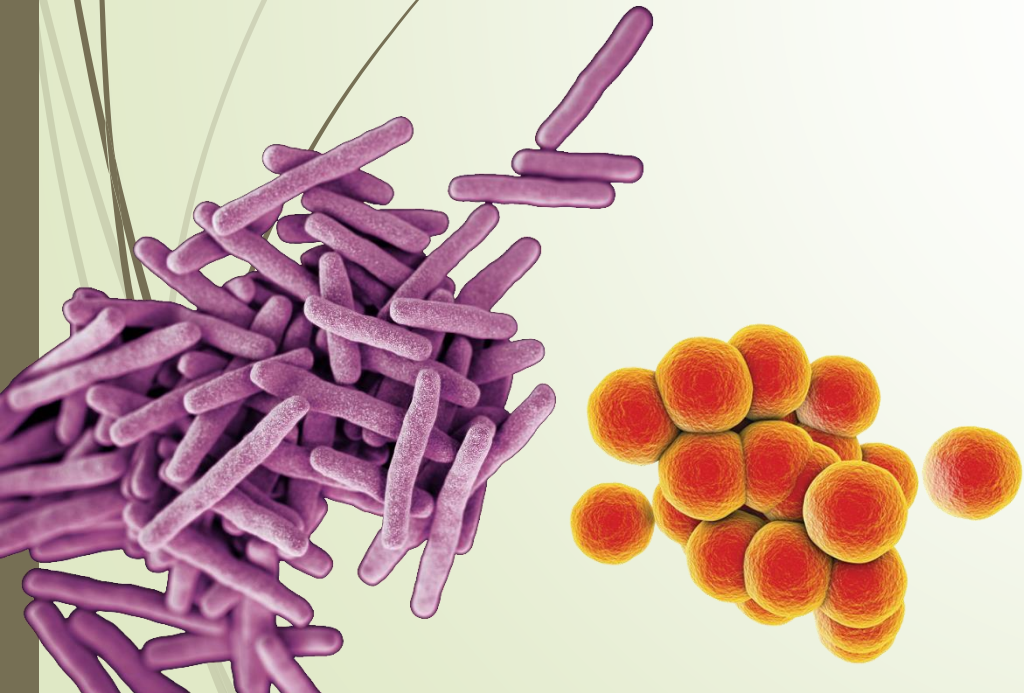
Eukaryotes and prokaryotes

There are two major divisions of cellular organisms: **eukaryotes** and **prokaryotes**.



Prokaryotes

- Cells with primitive nucleus (single naked chromosome without nuclear membrane)
- Example → bacteria.



Pro : premature or primitive
Karyon : nucleus

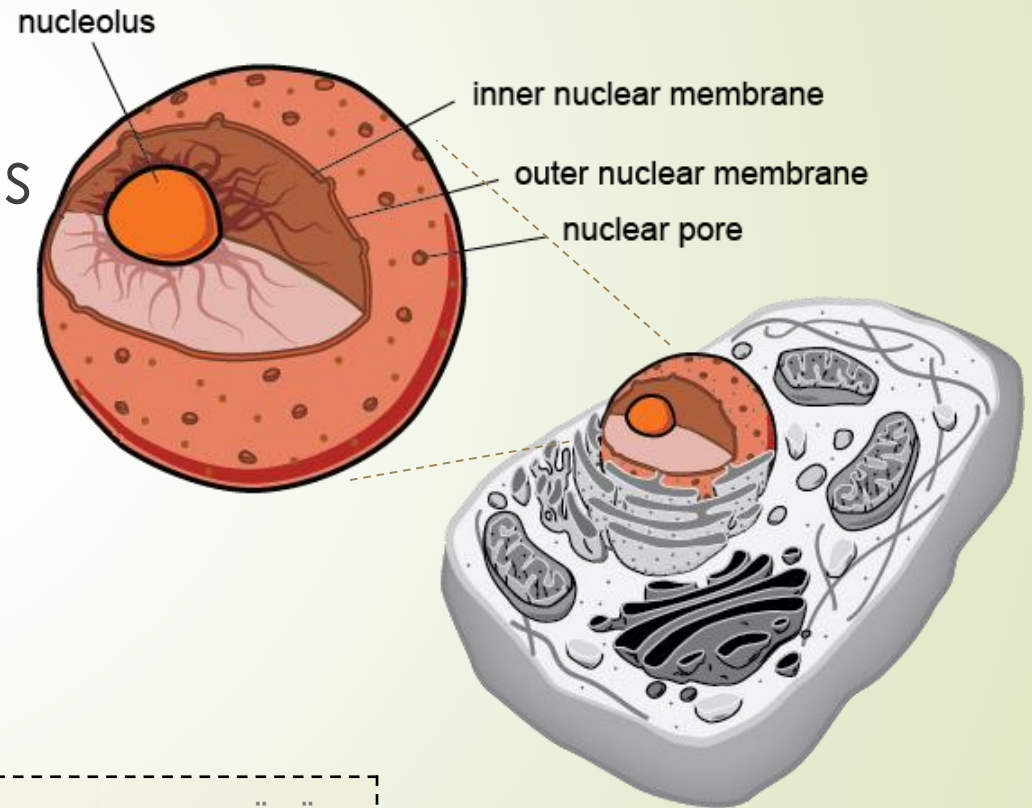
بدائي
نواة

Eukaryotes

Cells with true nucleus which contain a nuclear membrane, nucleoli, and multiple chromosomes within the nucleus.

Example:

- ➔ Fungi, protozoa.
- ➔ Animal and plant cells.



eu : true

Karyon : nucleus

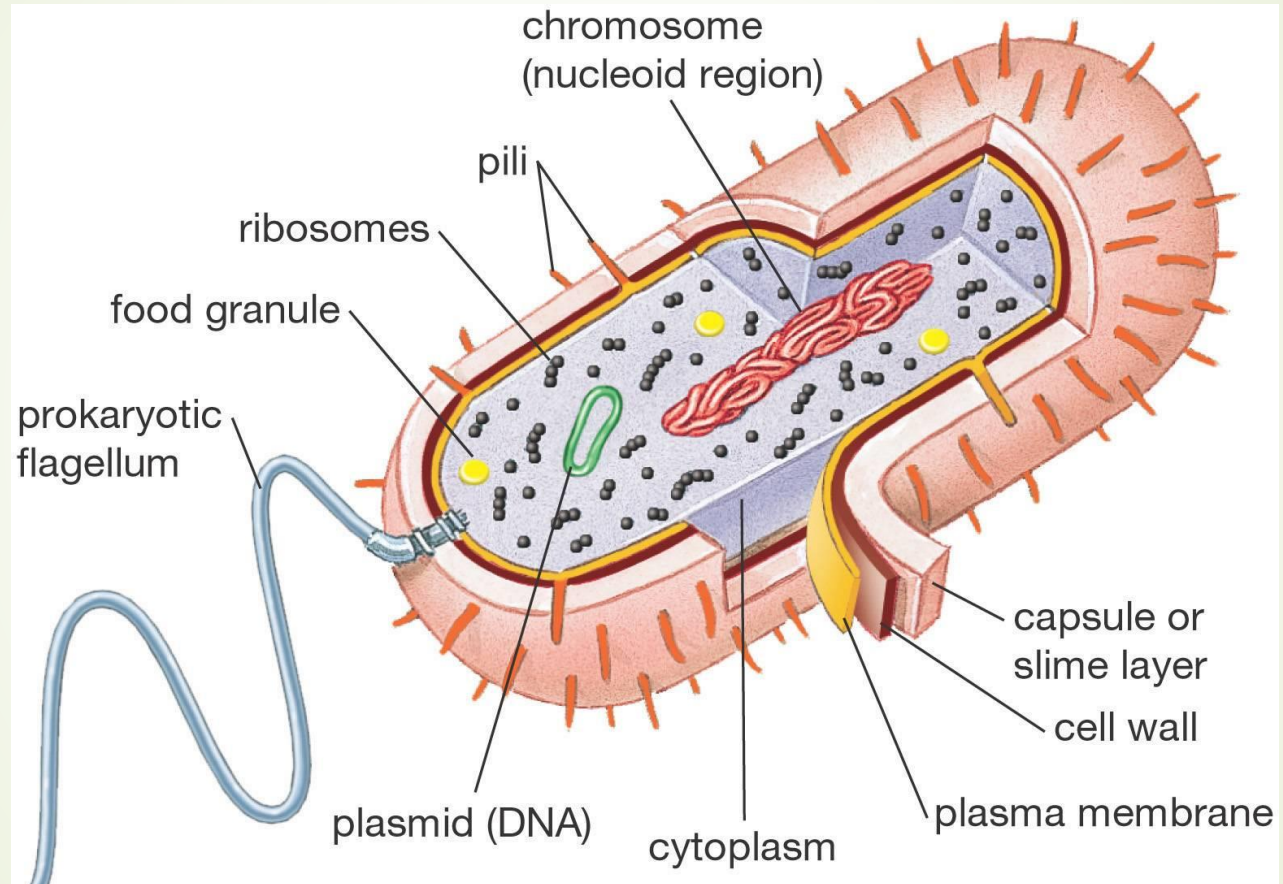
حقيقي

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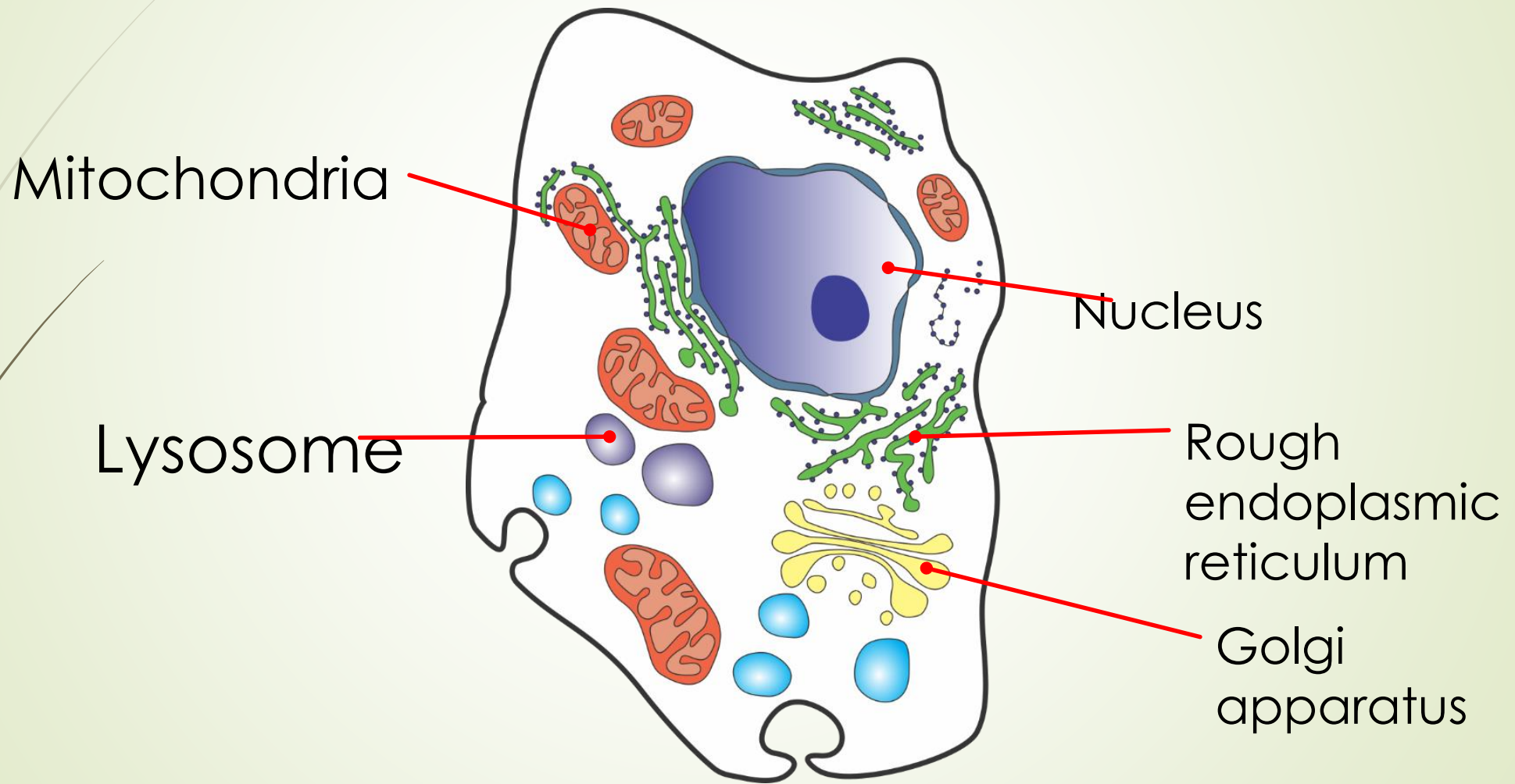
Differences between prokaryotic and eukaryotic cells

	Prokaryotic cell	Eukaryotic cell
Cell Size	Smaller	Larger
Nucleus	<ul style="list-style-type: none">- No nuclear envelope (membrane)- Single circular chromosome	<ul style="list-style-type: none">-Nuclear envelope (membrane) is present-Multiple linear chromosomes.
Membrane-bound organelles	Not present	<ul style="list-style-type: none">-Present-Examples: mitochondria, Golgi apparatus, endoplasmic reticulum.
Ribosome	Smaller (70S)	Larger (80S)
Cell wall	<ul style="list-style-type: none">-Present-Based on peptidoglycan	<ul style="list-style-type: none">-Present or absent-When present, based on cellulose (plants) or chitin (Fungi)
Division	Simple binary fission (SBF)	Mitosis or meiosis
Example	-Bacteria	<ul style="list-style-type: none">-Fungi-Protozoa

A Prokaryotic cell



A Eukaryotic cell (Animal cell)



Major groups of human pathogens:

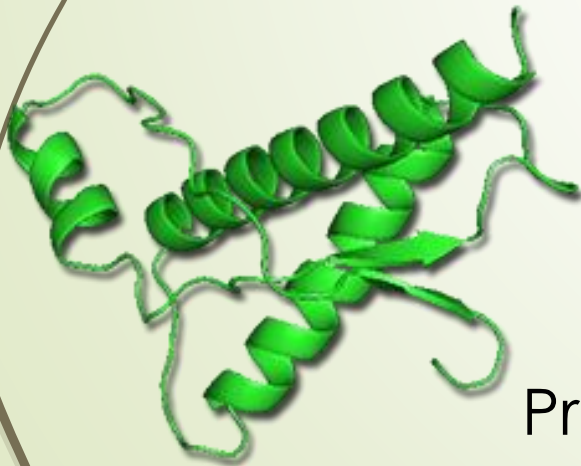
There are six types of infectious agents:

1. Bacteria,
2. Fungi,
3. Protozoa,
4. Helminths,
5. Viruses,
6. Prions

Acellular infectious agents

Viruses and prions are not composed of cells, they are subcellular or acellular infectious agents:

- Prions lack nucleic acid and consist only of proteinaceous infectious particles.
- Viruses are not cells but can replicate only within cells.



Prion



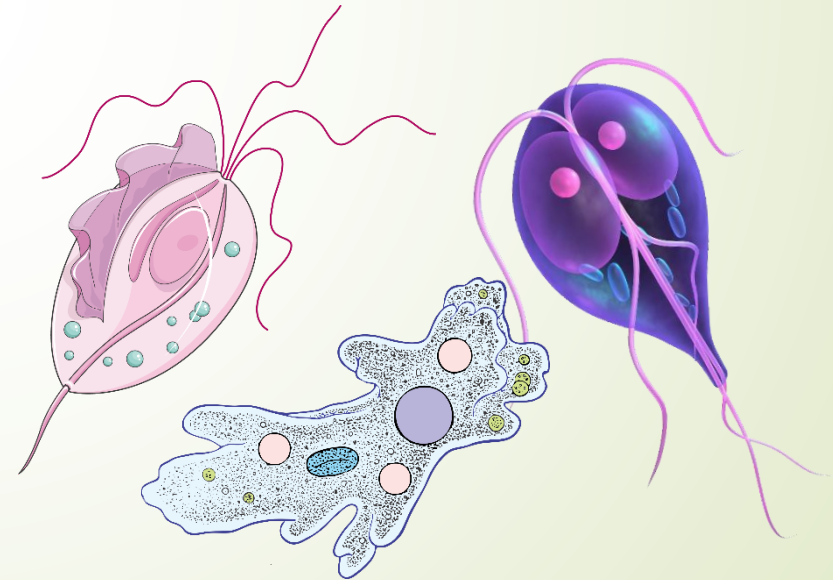
Virus

Parasites

- Protozoa and helminthes are commonly called **parasites**.
- They are studied in **parasitology**.



Helminths



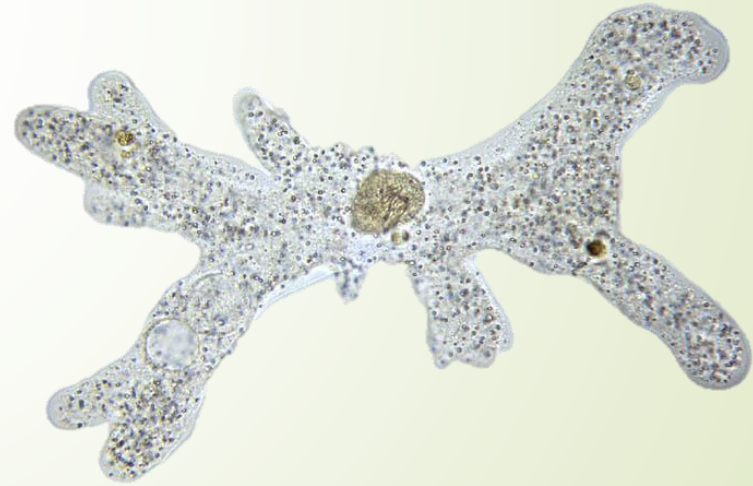
Protozoa

Parasites

- **Amoeba** is an example of infectious protozoa.
- **Ascaris** is an example of infectious helminths.

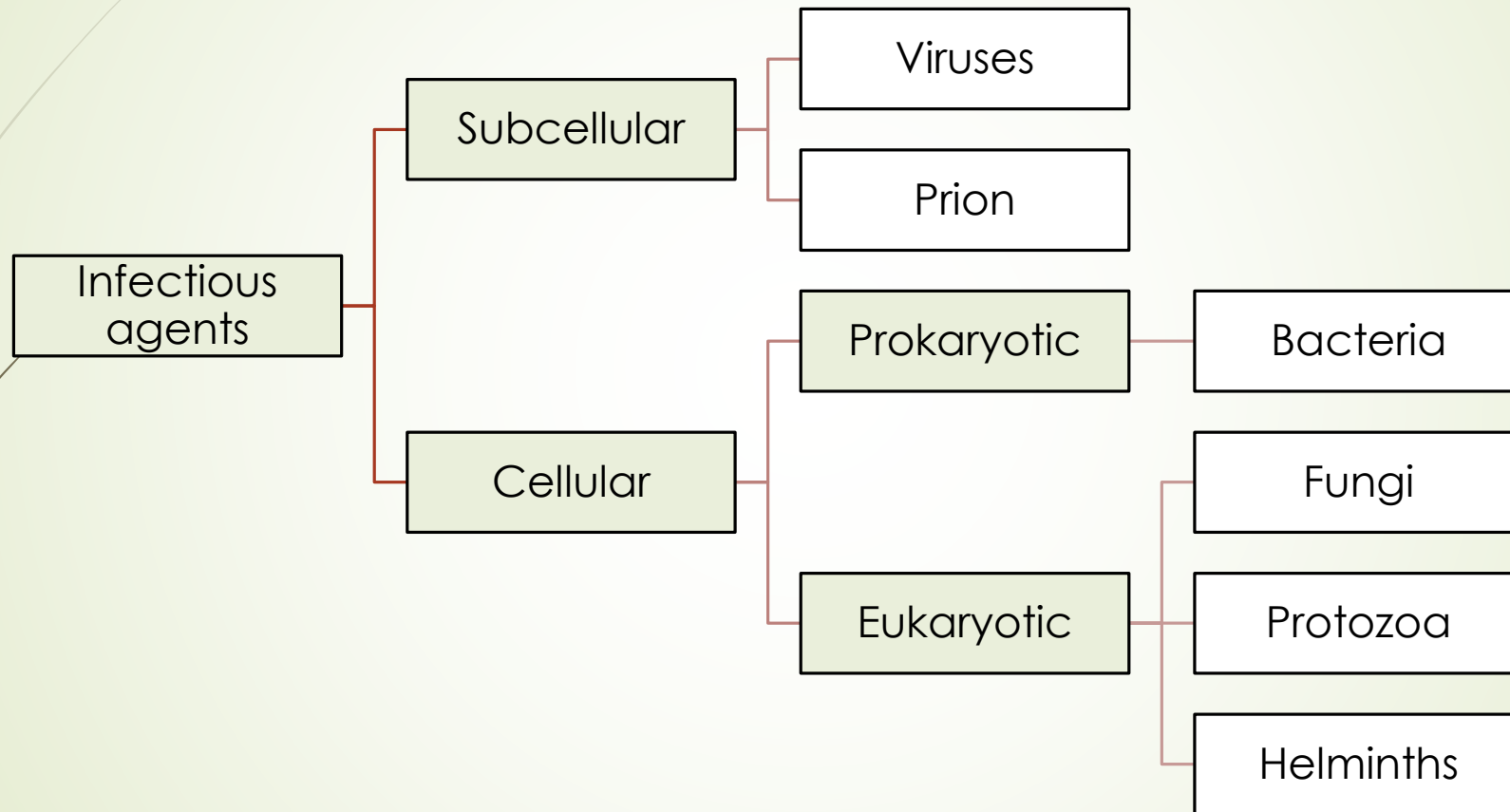


Ascaris



Amoeba

Major groups of human pathogens






Quizzes



1. Features of prokaryotes includes:

- A. No nuclear membrane.
- B. No membrane bound organelles.
- C. Divide by simple binary fission
- D. Contain single circular chromosome
- E. All of the above





2. In the binomial nomenclature organism name is composed of _____ and _____?

- A. Family and species
- B. Family and genus
- C. Genus and species
- D. Class and family





3. Cells with a true nucleus are called:

- A. Prokaryotes
- C. Eukaryotes
- D. Viruses







4. Which of the following microorganisms has a true nucleus:

- A. Viruses
- B. Fungi
- C. Prions
- D. Bacteria





5. The infectious agent that is composed of protein but lack nucleic acid is:

- A. Viruses
 - B. Fungi
 - C. Prions
 - D. Bacteria
- 
- 

6. Which of the following is subcellular

- A. Fungi
- B. Prion
- C. Bacteria
- D. Protozoa





7. Subcellular infectious agents include:

1)

2)



8. Which of the following is Eukaryotic

- A. Fungi
- B. Prion
- C. Bacteria
- D. Viruses



9. Which of the following is Prokaryotic

- A. Fungi
- B. Prion
- C. Bacteria
- D. Viruses





10. Eukaryotic infectious agents include:

1)

2)





11. True or false:

1. Microbiology is science that deals with bacteria.
2. Prokaryotic cells has membrane bound organelles such as mitochondria
3. Eukaryotic cells has 70S ribosomes
4. In the binomial nomenclature every organism name has two parts, the family name and the genus name.

