

Tutorial session 1: The microbial world

Learning objectives:

- Differentiate the main types of microorganisms (prokaryotes, eukaryotes, acellular agents).
- Understand their place in the classification of life and their diversity.
- Apply simple classification criteria.
- Appreciate the ubiquity and major roles of microorganisms.

Part 1: Key concepts

1. What are the two major cellular structures that divide the living world?

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2. Name 3 major characteristics of prokaryotes.

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3. Which groups of microorganisms are considered acellular? Why?

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4. Give one example of a positive impact and one example of a negative impact of microbes on human health and the environment.

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Part 2: Application exercises

Exercise 1: Classify these microorganisms

For each organism listed below, indicate:

- A. **Cellular Type:** Prokaryote / Eukaryote / Acellular
- B. **Main Group:** Bacterium / Archaea / Fungus (yeast/mold) / Protozoan / Microscopic Algae / Virus.
- C. **A key characteristic or role:** e.g., Peptidoglycan cell wall, Photosynthesis, Pathogen, etc.
(Example provided for the first one)

Organism	A - Cellular Type	B - Main Group	C - Characteristic or Role (example)
<i>Escherichia coli</i>	Prokaryote	Bacterium	Model organism, inhabits the intestine.
<i>Influenza virus</i>			
<i>Saccharomyces cerevisiae</i>			
<i>Methanobrevibacter smithii</i>			
<i>Paramecium caudatum</i>			
<i>Penicillium camemberti</i>			
<i>Trypanosoma brucei</i>			
<i>Penicillium notatum</i>			
<i>Euglena gracilis</i>			

Exercise 2: Complete the following table with the terms: **Present / Absent / Possible Exception**.

Characteristic	Prokaryotic cell	Eukaryotic cell
Membrane-bound nucleus		
Circular "naked" DNA in the cytosol		
Cell wall		
Mitochondria		
Membrane-bound organelles (ER, Golgi...)		

Exercise 3:

A microbiologist isolates a unicellular microorganism from a water sample taken at a deep-sea hydrothermal vent with a temperature of 90°C. The environment is rich in hydrogen (H₂) and carbon dioxide (CO₂). Preliminary analysis of the microbe reveals:

- Size of about 1 μm .
- No membrane-bound nucleus.
- A cell wall that lacks peptidoglycan but contains pseudomurein.
- A circular DNA genome.
- It produces methane (CH_4) from CO_2 and H_2 .

Questions:

1. Is this microorganism prokaryotic or eukaryotic? Justify.

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2. To which major domain of life does it most likely belong? Justify

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