MEDICAL MICROBIOLOGY

LEC. 1
INTRODUCTION

By:
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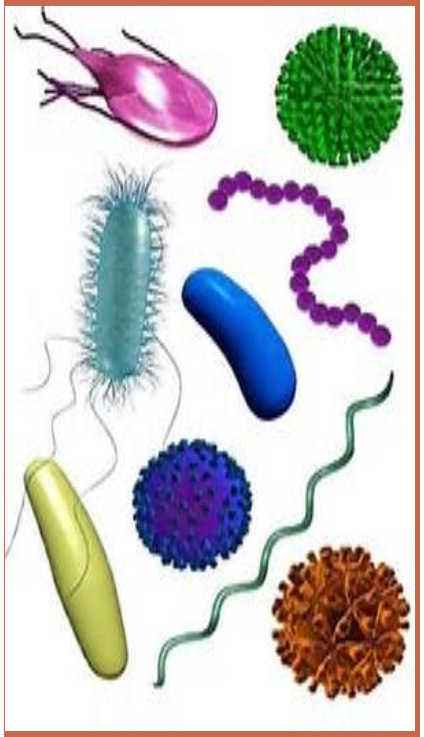

Microbiology

Microbiology is the science dealing with living organisms that are very small, and are not directly visible to the unaided eye (naked eye).

These creatures are present everywhere, but only some of them are disease producers.

Medical microbiology is the science that concerned with the causation of disease by these pathogens, their diagnosis and cure.

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Microorganisms and Hosts

Microorganisms can be divided according to the relationship with the host to three types:

A- Free living: they live in water, soil, air but not found on human body and they obtain their energy from day light and some from oxidation of inorganic matter.

B- Saprophytes: they grow on dead decaying matter to obtain their energy, but Some of these saprophytic microorganisms may invade the body of human or animal causing important diseases (**Parasite**).

C- Parasite: they live in or on a living host and obtain their nourishment from them. They can be subdivided to:

- **commensal (mutualism):** which present normally in or on the host's body called normal flora. In certain condition, they can enter the tissue and cause disease **(opportunistic pathogen)**
- **Pathogenic:** they can overcome the defenses mechanisms of the host and enter the tissue causing signs and symptoms of infection.

Eukaryotes and prokaryotes

Microorganisms can include bacteria, viruses, fungi and protozoa.

A major biological division separates the microorganisms into **Eukaryotes** and **Prokaryotes.** Bacteria came under Prokaryote and other microorganisms of medical importance came under Eukaryote, while **viruses** from the boundary between living and non-living organism.

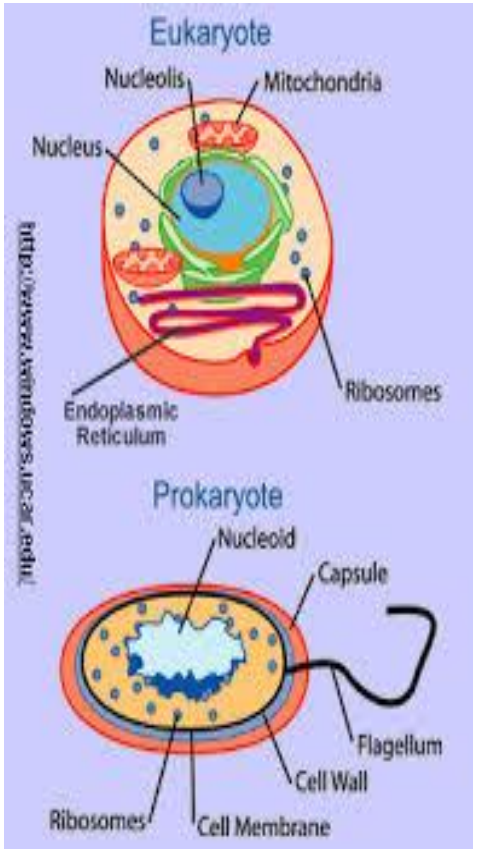
Animal (Eukaryotic) Cell

Eukaryotes and prokaryotes

Eukaryotes and Prokaryotes can be distinguished on the basis of their structure and the complexity of their organization:

1- Eukaryotic cell has a true nucleus with multiple chromosomes surrounded by a nuclear membrane and have mitotic apparatus, while prokaryotic nucleoid consists of a single circular DNA without nuclear membrane and mitotic apparatus.

2- Eukaryotic cell contains organelles, large ribosome 80 S, while prokaryotes contain no organelles and smaller ribosome 70 S.



3- Prokaryote have a rigid cell wall contain peptidoglycan, Eukaryote do not contain peptidoglycan, but in case of fungi have cell wall with chitin.

4- cell membrane of eukaryotes contains sterols, whereas no prokaryotes except Mycoplasma, has sterols in its membrane.

Eukaryotes and prokaryotes

Differences between prokaryotes and eukaryotes

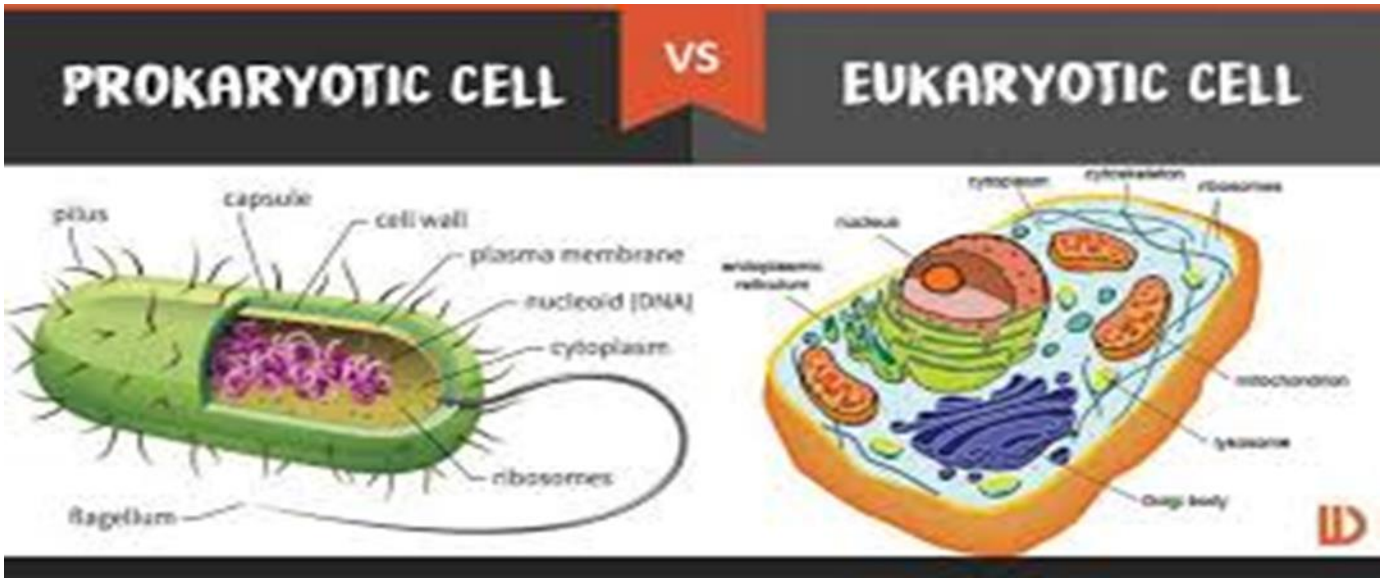
property	Prokaryotes	eukaryotes
Nucleus		
• Nuclear membrane	Absent	Present
• Nucleolus	Absent	Present
• Chromosome	One, circular	More than one, linear
• Mitotic division	Absent	Present
• DNA associated with histones	Absent	Present
Cytoplasm		
• Membrane-bound organelles	Absent	Present
• Golgi apparatus	Absent	Present
• Ribosome	70 S	80 S
Chemical composition		
• Cell wall containing peptidoglycan	Absent	Present
Approximate diameter	1 µm	10 µm
Cilia	Absent	Present
Pilli	Present	Present

Note:

Eukaryotes and prokaryotes are true microorganisms because:

1. They contain all the enzymes required for their multiplication.

2. They possess the biological requirements necessary for the production of metabolic energy.

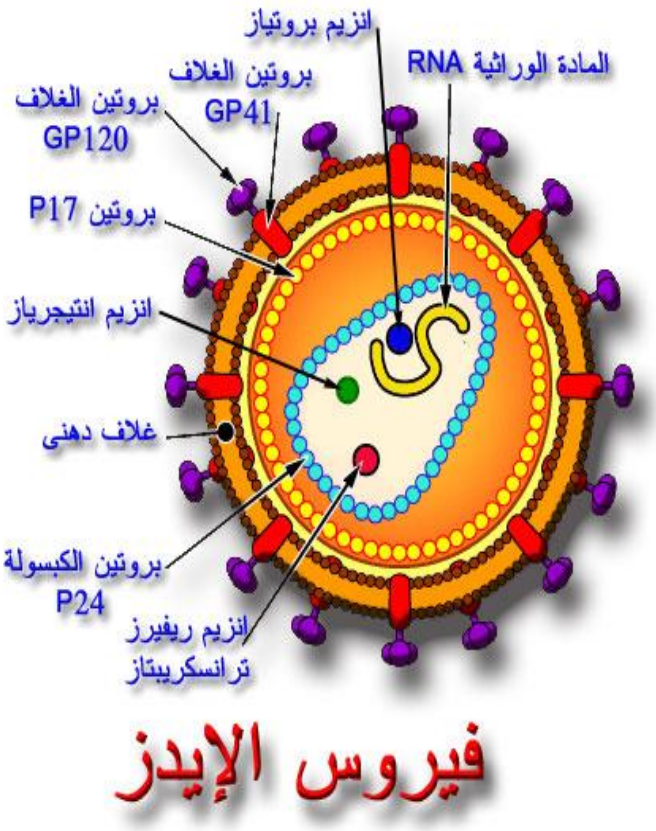


Viruses

However, the bellow organisms do not meet the above criteria;

Viruses:

are the smallest microorganisms that cannot seen by light microscope unless we use the electron microscope. The virus particle consists of nucleic acid, either DNA or RNA enclosed in a protein coat called capsid. The capsid protein protect the nucleic acid and facilitate attachment and penetration of the host cell. **Viruses lack the cell organelles that required for viral replication and energy production**, therefore all viruses are obligatory intracellular parasites. Different viruses infect a wide range of human, plants & animals and even algae, bacteria & protozoa.

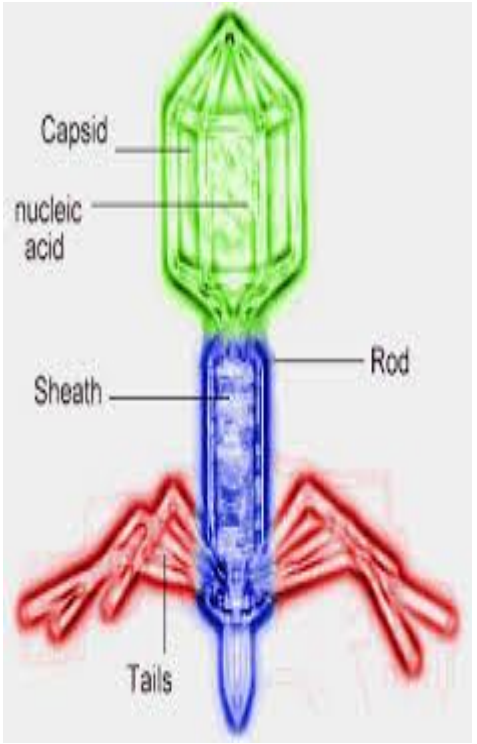


Viruses *vs* other microorganisms

Bacteria, fungi and protozoa are cellular, whereas viruses are not. The distinction is based on three criteria:

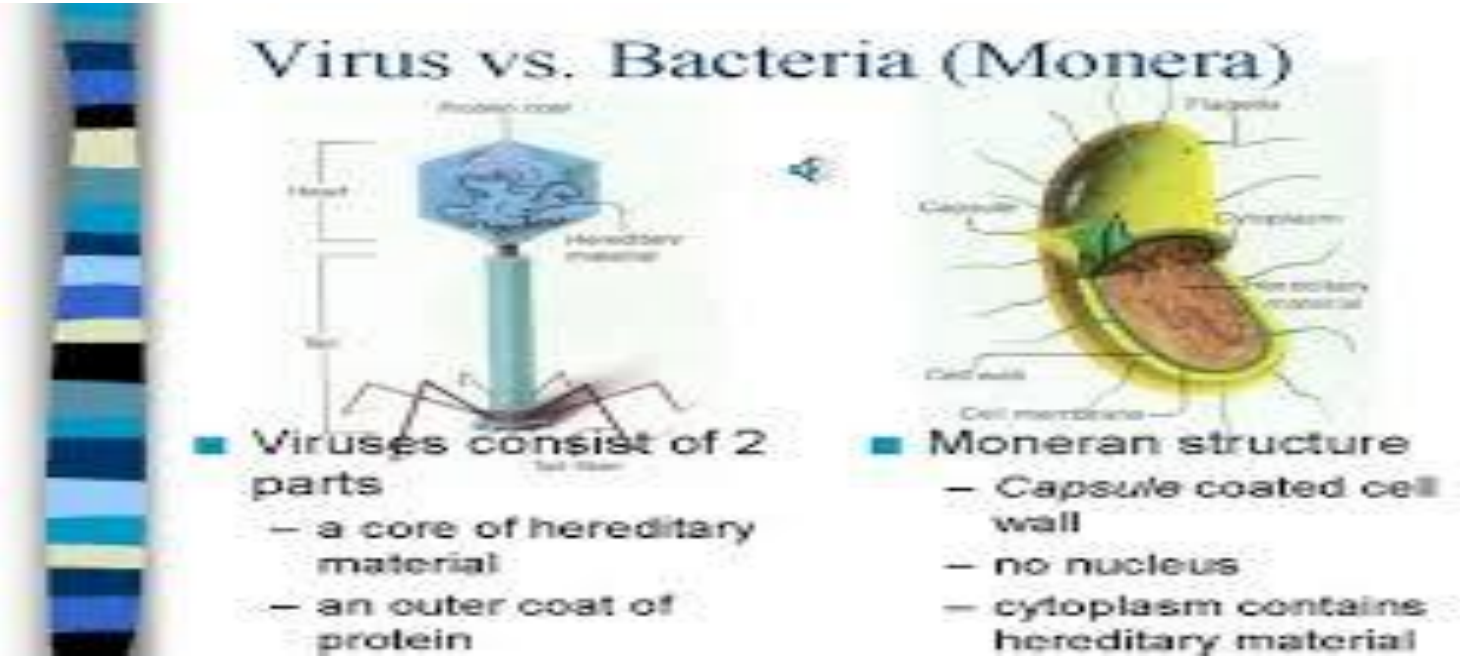
1- Structure: cells have a nucleus or nucleoid containing DNA surrounding by cytoplasm. Viruses have an inner core of genetic material (DNA or RNA) but no cytoplasm.

2- Method of replication: cells are replicated by binary fission or mitosis to produce two progeny cells. Viruses disassemble, produce many copies of their nucleic acid and protein, then reassemble into multiple progeny viruses



Viruses *vs* other microorganisms

3- Nature of nucleic acid: cells contain both DNA and RNA, whereas viruses contain either DNA or RNA but not both



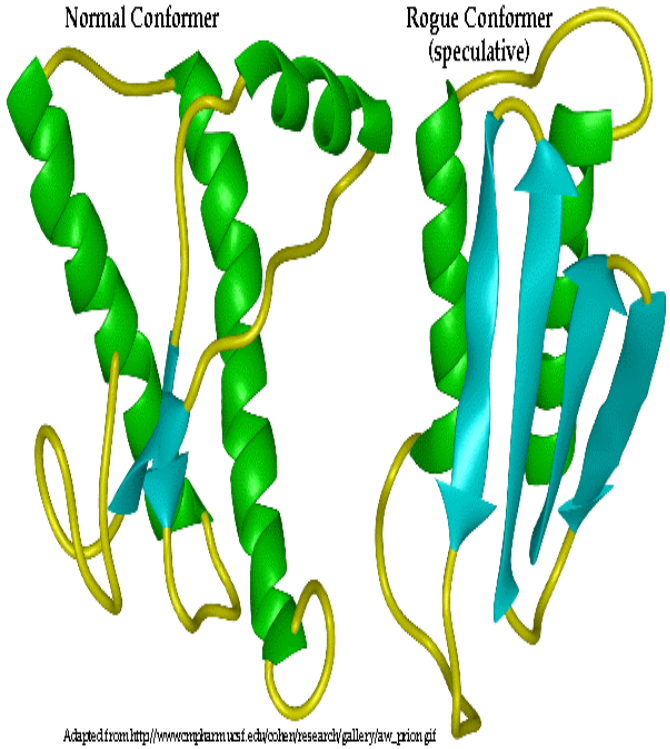
Viroids & prion

Viriods:

Small single-stranded covaelently closed circular RNA molecules existing as highly base-pair rod-like structures with no capsid. A number of transmissible plant diseases caused by viriods. It replicated by DNA-depended RNA polymerase of the plant host.

Prion:

These are unconventional transmissible protein material devoid from any amount of nucleic acid. It is the causative agents of Bovine spongiform encephalopathy (Mad cow) and Creutzfeldt-Jakob disease in human.




Thank you