

Dr.Md Saifullah Fahim

Asst.Professor & HOD

Deptt.of Botany

AL-Hafeez college ,Arrah.

B.Sc Part 1

Paper 2

TOPIC:- Comparative account of Prokaryotes and Eukaryotes

Prokaryotes were the only form of life on Earth for millions of years until more complicated eukaryotic cells came into being through the process of evolution.

In 1665, Robert Hook discovered cell. Some cells have membrane bound organelles and some do not have.. Organisms that are made up of single cell are known as single-celled organisms or unicellular and from many cells are known as multi-cellular organisms.

When scientists studied cells of various living organisms from an electron microscope, it was found that many organisms have no distinct nucleus surrounded by cell membrane.

Thus, two types of cells are found in the organisms eukaryotic and prokaryotic

Prokaryotes;-

The term "prokaryote" is derived from the Greek word "pro" means before and "karyon" means: nucleus.

This name was given to this type of cell because it does not have true nucleus

A **prokaryote** is a unicellular organism that lacks a membrane-bound nucleus, mitochondria, or any other membrane-bound organelle.

Prokaryotes are divided into two domains, Archaea and Bacteria. Organisms with nuclei and other organelles are placed in the third domain, Eukaryota.

Prokaryotes are asexual, reproducing without fusion of gametes. The first organisms are thought to have been prokaryotes.

Prokaryotic cells are the most primitive cells. They do not have definite nucleus which includes bacteria and cyanobacteria (blue green algae).

Eukaryotes:-

the term “Eukaryotes” was derived from a greek word,

‘Eu’ means True and ‘karyon’ means nucleus.

Animals, plants, algae and fungi are all eukaryotes. There are also eukaryotes amongst single-celled protists. In contrast, simpler organisms, such as bacteria and archaea, do not have nuclei and other complex cell structures. Such organisms are called prokaryotes.

The eukaryotes are often treated as a **super kingdom**, or **domain**.

It is believed that eukaryotes have been evolved from the prokaryotes. They have been characterised by their membrane nucleus.

That is they contain a definite nucleus. The chromatin bodies are enclosed by a nuclear membrane.

They are larger than prokaryotes and show better structural organisation and increased functional efficiency than prokaryotes.

The distinction between **prokaryotes** and **eukaryotes** is considered to be the most important distinction among groups of organisms. Eukaryotic cells contain membrane-bound organelles, such as the nucleus, while prokaryotic cells do not.

Differences in cellular structure of prokaryotes and eukaryotes include the presence of mitochondria and chloroplasts, the cell wall, and the structure of chromosomal DNA.

Difference between Prokaryotic Cell and Eukaryotic cell

	Prokaryotic cell	Eukaryotic Cell
Nuclear membrane	Nuclear membrane absent	Nuclear membrane present
Nucleus	Well organised nucleus absent thus nuclear material is called as Incipient nucleus/prokaryon/ Genophore /nucleoid etc.	Present nucleus well organised
Number of chromosomes	Most prokaryotes contain one circular chromosomes called Plasmids	Eukaryotes possess multiple pairs of linear chromosomes.
Cell Type	Usually unicellular (some cyanobacteria may be multicellular)	Usually multicellular
Example	Bacteria, Cyanobacteria(BGA) Mycoplasma(PPLO), Rickettsias, Actinomycetes.	All Animals and Plants cells including human cells, protista, algae, fungi, Protozoan
Genetic Recombination	Prokaryotes such as bacteria do not of much of sex life. However genetic diversity through three recombination techniques;	Meiosis and fusion of gametes

	transduction, transformation, and conjugation	
Lysosomes and peroxisomes	Absent	Present
Microtubules	Absent or rare	Present
Endoplasmic reticulum	Absent	Present
Mitochondria	Absent	Present
Chloroplast	Absent; chlorophyll scattered in the cytoplasm	Present
DNA wrapping on proteins.	Prokaryotes do not have histones (with exception of those species in the domain Archaea). Prokaryotes compress their DNA into smaller spaces is through super coiling.	Eukaryotes wrap their DNA around proteins called histones.
.Ribosomes	70S, distributed in the cytoplasm.	Larger size 80s, found on membranes as in endoplasmic reticulum; 70s present in organelles such as Chloroplast and mitochondria.
Vesicles	Present	Present
Golgi apparatus	Absent	Present
Mesosome	Cell membrane may have infolding called mesosomes	absent
Chloroplasts	Absent; chlorophyll scattered in the cytoplasm	Present (in plants)

Flagella	Flagella, if present are simple and are formed of a protein flagellin are 20nm in diameter and are not enclosed in cell membrane	Flagella, if present, are complex have 9+2 patterns of micro tubules formed of a protein tubulin, are 200nm. in diameter and enclosed in cell membrane.
Permeability of Nuclear Membrane	not present	Selective
Plasma membrane with steroid	Usually no	Yes
Cell wall	Present (made by peptidoglycan/Murein/Mumaric acid/Mucopeptide	Present only in plant cells and fungi (made by cellulose or chitin)
Vacuoles	Absent but gas vacuole may present	Present as sap vacuoles in plant cell.
cyclosis	absent	Cytoplasmic streaming is present.
Centrosome	absent	Centrosomes is present except in flowering Plants and few other
Cell size	0.1 to 5.0 um in diameter.	10-100um .
Duration of cell cycle	Cell cycle is short, takes 20- 60 minutes to complete	takes 12-24 hours to complete. Cell cycle is long.
Respiratory system	In plasma membrane	In Mitochondria

Protein synthesis	Take place in cytoplasm	Transcription in nucleus&translation In cytoplasm on ribosomes
Reproduction	Reproduction in prokaryotes is asexual and usually takes place by binary fission. Archaea reproduce asexually by binary fission, fragmentation ,or budding	Both asexual and sexual
Example	Bacteria and Archaea(Archaeobacteria)	Plant and Animal cell etc.
Genetic information	DNA is circular(plasmid) usually free-floating in cytoplasm	DNA is linear, found in nucleus