

Lecture: 1

THE MICROBIAL WORLD

TAXONOMIC CLASSIFICATION OF ORGANISMS

TAXONOMY : is the science of organismal classification.

Classification is the assignment of organisms (species) into an organized scheme of naming .ideally these schemes are based on evolutionary relationships (the more similar the name, the closer the evolutionary relationships).

TAXON:- A group or category of related organisms.

Two key characteristics of taxa are:

- Members of lower level taxa (e.g. Species) are more similar to each other than are members of higher level taxa (eg. Kingdom or domain).
- Member of specific taxa are more similar to each other than any members of different specific taxa found at the same hierarchical level (eg. Humans are more similar to apes, when comparison between species, than either is similar to, for example, *Escherichia coli*).

NOTE// that taxa are dynamic, changing as our knowledge of organism and evolutionary relationships change

BINOMIAL NOMENCLATURE

- All Organisms are named using binomial nomenclature (viruses are exceptions)
- Binomial nomenclature employs the names of the two level taxa, genus and species, to name a specie. Binomial nomenclature includes:

i. Genus comes before species (e.g., *Escherichia coli*)

ii. Genus name is always capitalized (e.g., *Escherichia*)

iii. Species name is never capitalized (e.g., *coli*)

iv. Both names are always either italicized or underlined

(e.g *Escherichia coli*)

v. The genus name may be used alone, but not the species name (i.e saying or writing “*Escherichia* “ alone is legitimate while saying or writing “ *coli*” is not)

The five kingdom system

The five kingdom system was first proposed in 1969 and is showing its age. The five kingdoms include:

1. Plantae (the plants).
2. Fungi (the fungi).
3. Animalia (the animals).
4. Protista (the unicellular eukaryotes).
5. Monera (the prokaryotes).

Kingdom of Monera

It contain three categories:

1. Eubacteria:
Are our common, everyday bacteria, some of which are disease – causing; also the taxon from which mitochondria originated.
2. Cyanobacteria :
Are photosynthetic eubacteria, the taxon from which chloroplast originated
3. Archaeobacteria:
Are distinctive in their adaptation to extreme environments (e.g., very hot, salty, or acidic) though not all archaeobacteria live in extreme environments. These distinctions are more phenotypic than they are evolutionary (i.e., a cyanobacteria is a eubacteria, and neither is an archaeobacteria).

Domain System.

The domain is a taxonomic category that is either above the level of kingdom or supersedes the kingdom. The domain system contains three members :

1. Eukaryotes (domain Eukarya)
2. Eubacteria (domain Bacteria)
3. Archaeobacteria (domain Archaea)

Bacterial species

A bacterial species is defined by the similarities found among its members.

Bacterial classification depends on the following characteristics.

1. Morphology and arrangement
2. Staining
3. Cultural characteristics
4. Biochemical reactions
5. Antigenic structure
6. Base composition of bacterial DNA

EUKARYOTIC CELL

The eukaryotic cell has a true membrane bound nucleus, usually containing multiple chromosomes, a mitotic apparatus, a well-defined endoplasmic reticulum and mitochondria.

PROKARYOTIC CELL

The prokaryotic cell possesses naked DNA without associated basic proteins, divides amitotically by binary fission and bounded by a semi rigid cell wall.

The differences features between Prokaryotic & Eukaryotic Cell :

| Feature | Prokaryotic Cell | Eukaryotic Cell |
|-----------------------------------|--------------------------|-----------------|
| Size | 1µm | 10µm |
| Nuclear membrane | Absent. | Present |
| Chromosome | Single | Multiple |
| Nucleus | Absent | Present |
| Histones | Absent | Present |
| Sexual Reproduction | Absent | Present |
| Cytoplasmic ribosomes | 70s | 80s |
| Mitochondria | Absent | Present |
| Endoplasmic reticulum | Absent | Present |
| Lysosomes | Absent | Present |
| Micro filaments and tubules | Absent | Present |
| Site of oxidative phosphorylation | Cell Membrane | Mitochondria |
| Site of photosynthesis | Cell Membrane | Chloroplast |
| Peptidoglycan | Present | Absent |
| Cell membrane composition | Phospholipids & Proteins | Sterols |