

Taxonomy and Classification

- **Classification, nomenclature, and identification** are the three separate but interrelated areas of **taxonomy**.
- Classification can be defined as the arrangement of organisms into taxonomic groups (taxa) on the basis of similarities or relationships.
- Nomenclature is naming an organism by international rules according to its characteristics.

Taxonomy and Classification

- **Identification refers to the practical use of a classification scheme:**
 - (1) To isolate and distinguish desirable organisms from undesirable ones.
 - (2) To verify special properties of a culture; or, in a clinical setting.
 - (3) To isolate and identify the causative agent of a disease.
- Based on genotypic (genetic) and phenotypic (observable) similarities and differences.

Taxonomy and Classification

Classification of Bacteria:

1-Phenotypic Classification of Bacteria:

- Microscopic morphology
- Macroscopic morphology
- Biotyping
- Serotyping
- Antibiogram patterns
- Phage typing

2-**Genotypic Classification of Bacteria: the most precise method for classifying bacteria include:**

- Guanine plus cytosine ratio
- DNA hybridization
- Nucleic acid sequence analysis
- Plasmid analysis
- Ribotyping
- Chromosomal DNA fragment analysis

3- Analytic classification of bacteria: using chromatographic pattern include:

- Cell wall fatty acid analysis
- Whole cell lipid analysis
- Whole cell protein analysis
- Multilocus enzyme electrophoresis

4-Other useful classification:

*According to their oxygen requirement into:

- 1-Aerobic
- 2- Anaerobic
- 3- Facultative anaerobic
- 4- Microaerophilic

***According to temperature into:**

- 1- Thermophilic (41 and 122 c°).
- 2- Mesophilic (grows best in moderate temperature 20-45c°).
- 3- Psychrophilic (cold loving, less than 15 c°).

***According to their growth factors into:**

- 1-Fastidious organism (required special growth factor)
- 2- Non fastidious (simple)

Numerical Taxonomy

- Also called **computer taxonomy, phenetics, or taxometrics.**
- Numerical classification schemes use a large number (frequently 100 or more) of un-weighted taxonomically useful characteristics.
- The computer clusters different strains at selected levels of overall similarity (usually $> 80\%$ at the species level) on the basis of the frequency with which they share traits.

Taxonomy

- According to a proposal by **Woese**, the world of living things is classified in the domains bacteria, archaea, and eucarya. In this system, each domain is subdivided into kingdoms.
- Bacteria:
 - heterotrophic eubacteria → all human pathogen bacteria.
 - photosynthetic cyanobacteria → not pathogenic.

Taxonomy

- Chlamydiae → obligate intracellular parasites .
- Rickettsiae → obligate intracellular parasites, rod shaped to coccoid, that reproduce by binary transverse fission.
- Mycoplasmas → bacteria without rigid cell walls.

The rank of taxonomy can be seen in this table:

Grading	Example
Kingdom	Prokaryote
Division	Gracilicutes
Class	Scotobacteria
Order	Eubacteriales
Family	Enterobacteriaceae
Genus	Escherichia
Species	coli

- For practical purposes, only the ranks of the family, genus, and species are commonly used.

Nomenclature

- *Provides naming assignments for each organism.
- * Family name is capitalized and has an-*aceae* ending (e.g., *Micrococcaceae*).
- *Genus name is capitalized and followed by the species name, begins with a lowercase letter; should be *italicized* in print but underlined in the script (e.g., *Staphylococcus aureus* or Staphylococcus aureus).

Nomenclature

- * Using the first letter of the genus followed by a period and the species (name) (e.g., *S. aureus*).
- * Species abbreviated *sp.* (singular) or *spp.* (plural) is used when the species is not specified. e.g. *Staphylococcus sp.* Or *Staphylococcus spp.*
- * When referred to as a group, their names are neither capitalized nor underlined (e.g., *staphylococci*).
- * The plural of *genus* is *genera* (e.g., Enterobacteriaceae family) includes large groups of bacteria (genera).