

# Classification and identification of microorganism

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## **Taxonomy:Organizing,Classifing and Naming Microorganism**

- **Taxonomy:**Gr ,*taxis*,arrangement,and *nomose*,name.Put organism into categories or taxa(singular:taxon) to show degrees of similarities among organisms.
- **Taxonomy** :is the science of the classification of organisms. Its goal is to show relationships among organisms.
- **Taxonomy:** Is a hierarchical scheme for the classification , identification and nomenclature of organisms which are grouped in categories called taxa, based on feature ranging from general to specific.
- **Classification:** Is the orderly arrangement of organisms into groups, preferably in a formal shows evolutionary relationships.
- **Nomenclature:** Is the process of assigning name to the various taxonomic rankings of each microbial species.
- **Identification:** is the process of discovering and recording the traits of organism so that they may placed in an overall taxonomic scheme.
- **Systematics, or phylogeny,** is the study of the evolutionary history of organisms.
- The hierarchy of taxa reflects evolutionary, or phylogenetic, relationships.

### **The advantage of taxonomy:**

- To establish the relationships between one group of organisms and another and to differentiate them.
- provides a common reference for identifying organisms already classified.
- Taxonomy is a basic and necessary tool for scientists, providing a universal language of communication.

### **The study of Phylogenetic:**

1. Phylogeny is the evolutionary history of a group of organisms.
2. The taxonomic hierarchy show evolutionary, or phylogenetic, relationships among organisms.

- 3. Bacteria were separated into the Kingdom Prokaryotae in 1968.
- 4. Living organisms were divided into five kingdoms in 1969.

### **The three domain(Woese-Fox system)**

- Living organisms are currently classified into three domains. A domain can be divided into kingdoms.
- In this system, plants, animals, and fungi belong to the Domain Eukarya.
- Bacteria (with peptidoglycan) form a second domain.
- Archaea (with unusual cell walls) are placed in the Domain Archaea.
- Archaea bacteria : simple prokaryotes that often live in extreme environment.

### **Phylogenetic hierarchy**

- Organisms are grouped into taxa according to phylogenetic relationships (from a common ancestor).
- Some of the information for eukaryotic relationships is obtained from the fossil record.
- Prokaryotic relationships are determined by rRNA sequencing.

### **The level of classification**

- The taxa between the top and bottom levels are , in descending order :domain , kingdom, phylum ,class , order , family , genus and species.
- Each domain can be subdivided into a series of kingdoms , each kingdom is made up of several phyla ,each phylum contains several classes, and so one.

### **Scientific nomenclature (Linnaeus;1701-1778).**

The method of assigning the scientific name is called the binomial system of nomenclature:

- The scientific name is always a combination of the generic(genus) name followed by the species name.
- The generic part is capitalized ,and species part beginnings with a lowercase letter .
- Both could be italicized(or underlined),e.g *Staphylococcus aureus* or Staphylococcus aureus.

### **Classification of Prokaryotes**

- Rules for assigning names to bacteria are established by the International Committee on Systematics of Prokaryotes.

- Bergey's Manual of Systematic Bacteriology is the standard reference on bacterial classification.
- A group of bacteria derived from a single cell is called a **strain**.
- Closely related strains constitute a bacterial **species**.
- **clone**: a population of cells derived from a single parent cell.
- All cells in the clone should be identical.
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## Methods of Classifying and identifying Microorganisms:

**1- Morphological characteristics** are useful in identifying microorganisms, especially when aided by differential staining techniques.

### 2-Differential staining:

- Most bacteria are either Gram positive or Gram-negative.
- Microscopic exam. Of a Gram stain or an acid -fast stain is used to obtain information quickly in the clinical environment.

### 3-Biochemical tests:

- Enzymatic activities are widely used to differentiate bacteria.
- Even closely related bacteria can usually be separated into distinct species.
- Quickly identify the pathogens, by the use of selective and differential media or by rapid identification methods.
- A clinician can then provide appropriate treatment.
- Epidemiologists can locate the source of an illness.
- A limitation of biochemical testing is that mutations and plasmid acquisition can result in strains with different characteristics.

**4-Dichotomous Keys** : . Dichotomous keys are used for the identification of organisms.

### 5-Serological tests:

#.Slid agglutination test:

- Antiserum (plural: antisera). If an unknown bacterium is isolated from a patient, it can be tested against known antisera and often identified quickly.
- Serological testing can differentiate not only among microbial species, but also among strains within species.
- Strains with different antigens are called serotypes, serovars, or biovars.

Serological testes

Enzyme-linked immunosorbent assay (ELISA).

A reaction between the known antibodies and the bacteria provides identification of the bacteria.

**6-Phage typing** : Phage typing is the identification of bacterial species and strains by •  
determining their susceptibility to various phages.

**7-DNA Base Composition:**

- The percentage of GC base pairs in the nucleic acid of cells can be used in the classification of organisms.

**8-Nucleic Acid Hybridization:**

- Single strands of DNA, or of DNA and RNA, from related organisms will hydrogen-bond to form a double-stranded molecule; this bonding is called nucleic acid hybridization.

**References**

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- Talor, K.P. (2008). Foundations in Microbiology: Basic principles, Sixth edition.