Classification of bacteria

Taxonomy: (Gr. Taxon = arrangement); is the science that dealing with the classification , identification and nomenclature of organisms.

Classification: is the categorisation of org.s into taxonomic groups; so that, biochemical, physiological, genetical, and morphological properties are necessary for establishing a taxonomic rank.

Identification: is the isolation and distinguishing of a specific mo. among a mixed microbial flora.

Nomenclature: is the naming of an org. by an established group of scientists.

The taxonomic ranks, are:

1. Kingdom
2. Phylum
3. Class
4. Order
5. Family
6. Genus
7. Species
8. Subsp. , biotype , strain , serotype.

Criteria for bacterial identification:

1. Growth on nutrient media:

A. General use complex media; e.g. (N. agar ; N. broth).

B. Non-selective N. media; e.g. (Blood agar ; Chocolate agar).

C. Selective N. media;

i. Na-azide, selects for G+ve over G-ve bacteria.

ii. Bile salts (Na-deoxycholate), selects for G-ve enteric bac.

Over mucosal and most G+ve bac.

iii. Colistin and nalidixic acid medium; inhibits the growth of many G-ve bac.

D. Differential media; used to differentiate between 2 groups of Mo.s ; e.g. EMB agar and McConkey agar.

2. Microscopy:

Examination of stained bacterial cells under the microscope, to determine the following traits :

(i) **cellular shape** (cocci, bacilli or spiral form)

(ii) **groups** (diplo- , tetrads , staph. Or strepto.)

(iii) **The cells** stained **G+ve** or G-ve

(iv) Acid-fast or Non-acid-fast.

3. Biochemical tests:

e.g. oxidase test, catalase test, IMViC tests , coagulase test; and many other reactions.

4. Immunological tests:

To differentiate serotypes, serogroups and serovars (all of these levels are below the species level).

The serological methods used in such differentiation are called:

i. biotyping

ii. serotyping

iii. bacteriophage typing

5. Genetic diversity:

The bacteria are wether:

i. carrying plasmid(s) or not.

ii. carrying bacteriophage or not.

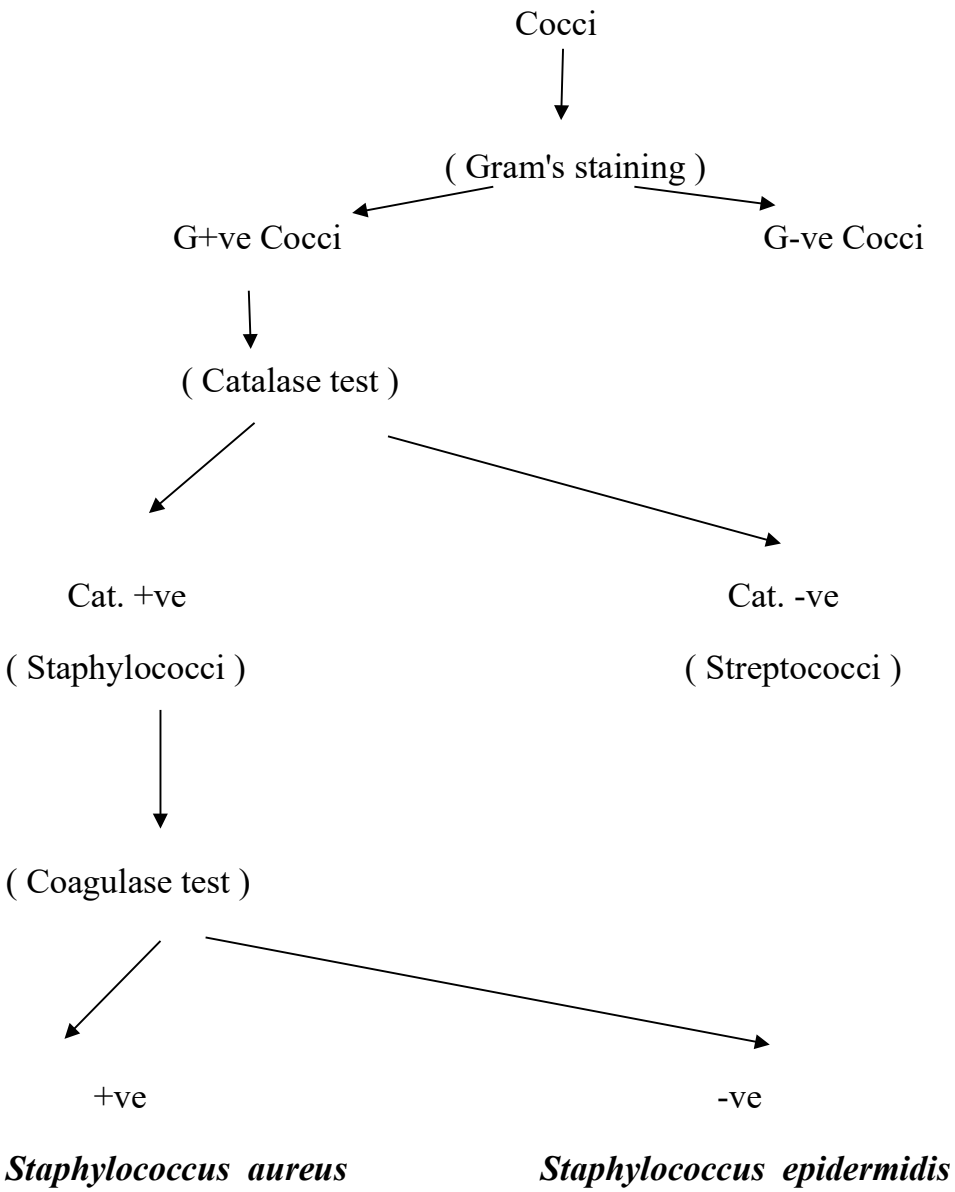
iii. Patterns of antibiotic resistance(s).

iv. Genes encoding certain enzymes (like lactose utilization).

Classification systems:

1. Dichotomous keys:

Depends on the presence (+ve) or absence (-ve) of a certain trait :



2. Numerical taxonomy:

Based on biochemical measures of activity; the best example is using the **" Analytical Profile Index " (API) System** ; which facilitate the use of num. taxonomy to identify a wide range of mo.s.

API system depends on biochemical and physiological traits. Identification of mo.s depends on levels of similarity (> 80% of trait similarity).

3. Nucleic Acid based taxonomy:

Includes:

i. Plasmid analysis

ii. Restriction endonuclease analysis

iii. Genomic analysis

iv. Repetitive sequence analysis

v. Ribosomal RNA analysis

The major groups of mo.s :

Based on **"Bergy's Manual of Determinative Bacteriology"**:

1. Bacteria (Eubacteria) : include;
   i. Green-filamentous bac.
   ii. Spirochetes.
   iii. G+ve bac.
   iv. G-ve bac.
   v. Eubacteria lacking cell wall

2. Archaea (primitive bac.):

i. Halophiles

ii. Methanogenes

iii. Thermoacidophiles

3. Eucarya (Eucariotic mo.s):

i. Fungi

ii. Slime molds

iii. Algae

iv. Protozoa