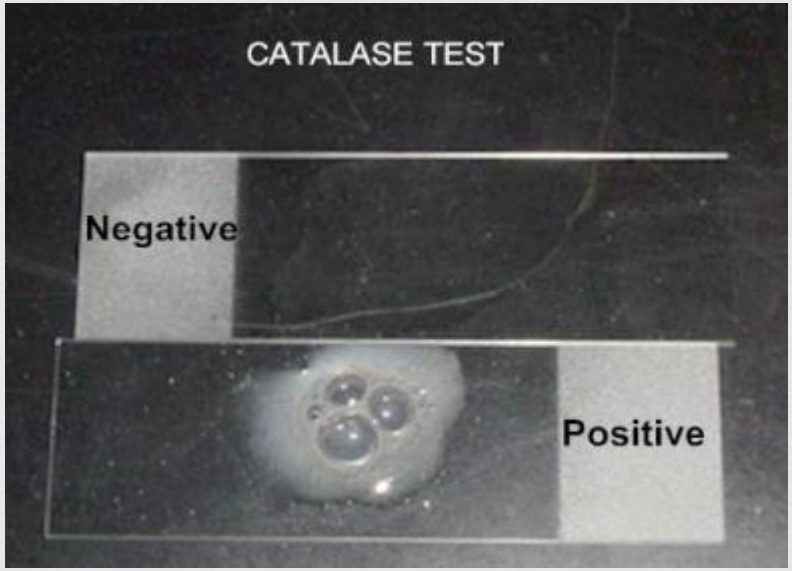
Streptococcous

Streptococcus

They are spherical, Gram-positive cocci arrange in long or short chain, also form pairs diplococcic (*Streptococcus pnumoniae)*, due to cell division in one plane only. They are non-motile, non-spore forming, catalase negative (help to distinguish them from Staphylococcus*)*. Some species are encapsulated.


CATALASE TEST
Negative
Positive

Streptococcus species are widely distributed in nature. Some are members of the normal human flora mostly residents in mouth, throat and intestine, also may act as opportunistic pathogens and few species (*Streptococcus pyogenes* and *Streptococcus agalactiae*) as primary pathogens.

Classification

1- Serological grouping:

The most reliable classification of *Streptococcus* is Lancefield which classify Streptococcus in serological groups according to the cell wall antigenic polysaccharide and other capsular antigen:

group A *Streptococcus pyogenes*

group B *Streptococcus agalactiae*

group D *Enterococcus faecalis* (previously called *S.faecalis*)

In *Streptococcus pneumoniae* , because it is surface carbohydrate antigens do not correspond to specific Lancefield group.

Classification

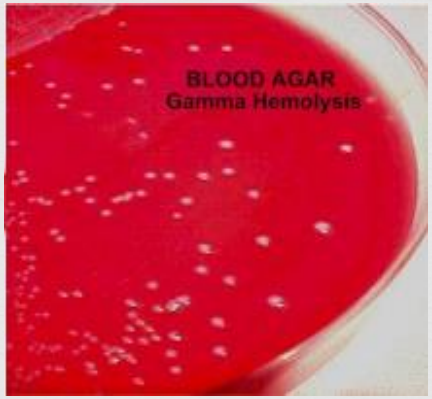
2- According to hemolytic activity on blood agar:

Alpha hemolysis (incomplete, green color): *Streptococcus pneumoniae*, viridans Streptococci.

Beta hemolysis (clear, complete lyses of red cells): *Streptococcus pyogenes*, *Streptococcus agalactiae*

Gamma hemolysis (no hemolytic): *Enterococcus faecalis*.


BLOOD AGAR
Alpha Hemolysis


BLOOD AGAR
Gamma Hemolysis

Culture characters

It is a best grow on nutrient agar with blood or serum so it called **fastidious**. The colony of Streptococcus on blood agar as discoid 1-2mm in diameter (like head of pin) most strains are facultative anaerobic and few are obligate anaerobic, some type need 10% CO_2. Energy is obtained mainly from the utilization of glucose.

Optimum temperature 37 ºC range 22-42 ºC except *Enterococcus faecalis* that can grow between 15-45 ºC and grow in 6.5% NaCl.

Biochemical tests

1- Hemolysis test:-

2- Bile solubility test:-

This test is used to identify *Streptococcus pneumoniae* from other spp.

a- Plate method:-

Place a drop of 2% sodium deoxy-cholate on some colonies and re-incubate at 37 ºC, the colonies will disappear within 30min.

b- Tube method:-

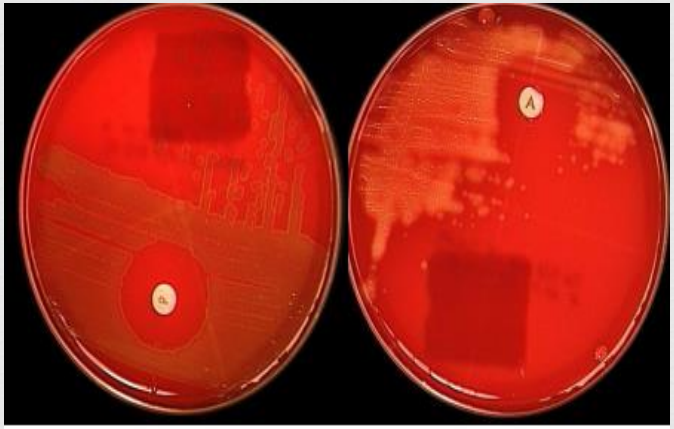
Add a drop of 10% sodium deoxy-cholate to broth culture and re-incubate at 37 ºC, the turbidity will disappear within 15min.

Biochemical tests

3-Sensitivity to Bacitracin and Optochin:-

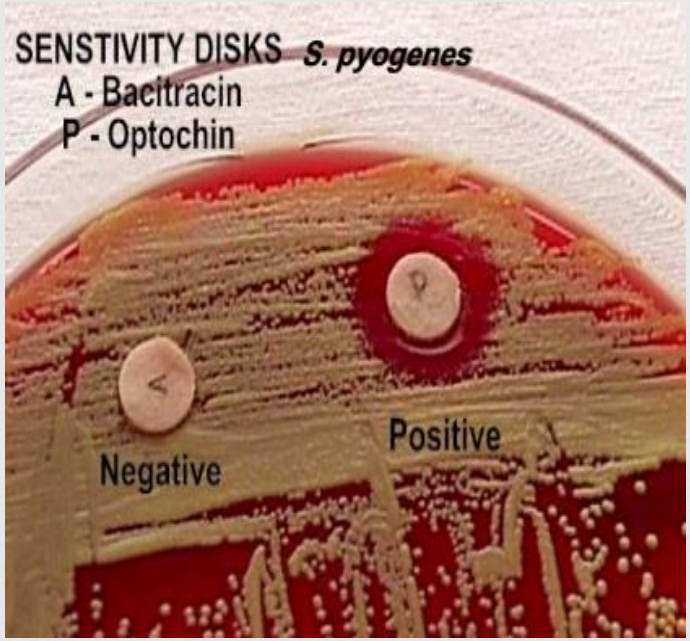
Each disk of drug is placed on blood agar or nutrient agar and incubate with Streptococcus after incubation, an inhibition surrounding the growth indicate positive result.

Biochemical tests



optochin disk(S) bacitracin disk(S)

S. pneumoniae *S. pyogenes*



Biochemical tests

4- Growth on 6.5% NaCl:-

All enterococci can be able to tolerate and grow in high concentration of sodium chloride (6.5%). Incubate nutrient broth containing 6.5% NaCl and incubate for 72hrs. after that, turbidity of the medium indicate the growth of organism.

Differential reaction of Streptococcous spp.

Streptococcal species	Haemolysis	bacitracin	Bile solubility	6.5% NaCl	Optochin
S. pyogenes	beta	+	-	-	-
S. agalactiae	beta	-	-	-	-
E. faecalis	gama	-	-	+	-
S. viridans	alpha	-	-	-	-
S.pneumoniae	alpha	-	+	-	+

Pathogenecity of Streptococcous:

1- The ability of lysis RBCs (hemolysis) by producing hemolysin enzyme (streptolysin O).
2- Other enzymes produced by Streptococci include **hyaluronidase** (spreading factor); **streptokinase** (cause fibrinolysis) and **β-lactamase**.
3- Ability to produce protease (causing necrosis, toxic shock syndrome).
4- Ability to produce different types of toxins.

Specimens:

Throat swab, pus, sputum, blood, urine, vaginal swab, feaces, peritoneal fluid, gingival swab, carious swab.

Oral Streptococci

- The facultative an aerobes Streptococci are the largest group of bacteria isolated from the oral cavity.
  Include S.sanguis, S.salivarius, S.mitis, S.mutans (S. viridans) which are found
  in:
  1. tooth surface.
  2. epithelial surface.
  3. smooth surface dental decay.

Oral Streptococci

The bacterial infections of the tissue surrounding the teeth cause inflammation of the gingival, periodontal ligament, cementum, and alveolar bone. .

Oral Streptococci possess enzymes called glucosyl transferase (GTFS) which are able to break down sucrose into glucose and fructose and utilize the glucose moiety in the synthesis of glucan polymers, or glucan.

Some of the glucan synthesized by S.mutans is water insoluble (mutan) and contributes the organism s ability to colonize on tooth surfaces. The S. mutans use of sucrose and other carbohydrates as energy source which leads to acid production which can promote enamel demineralization.