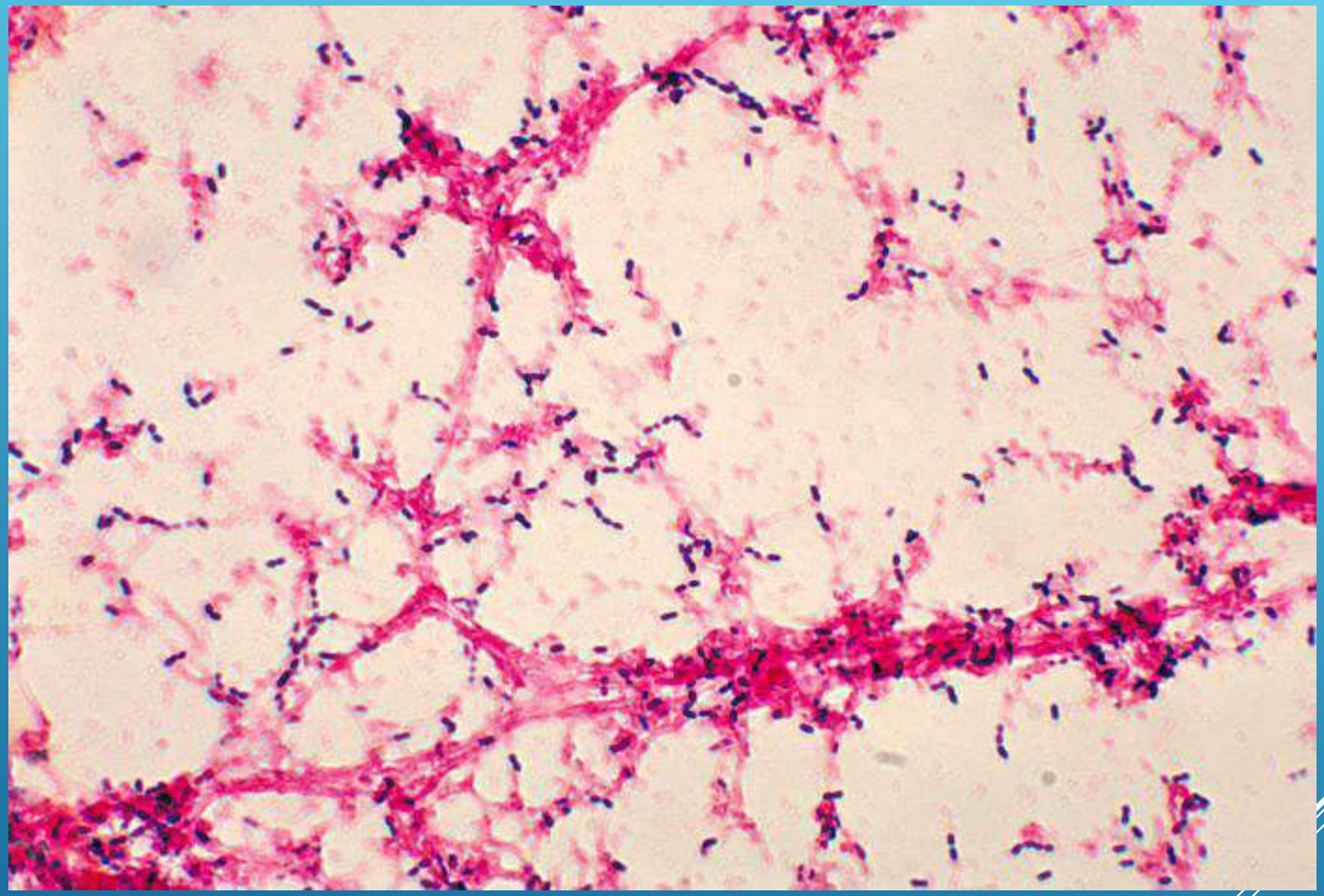
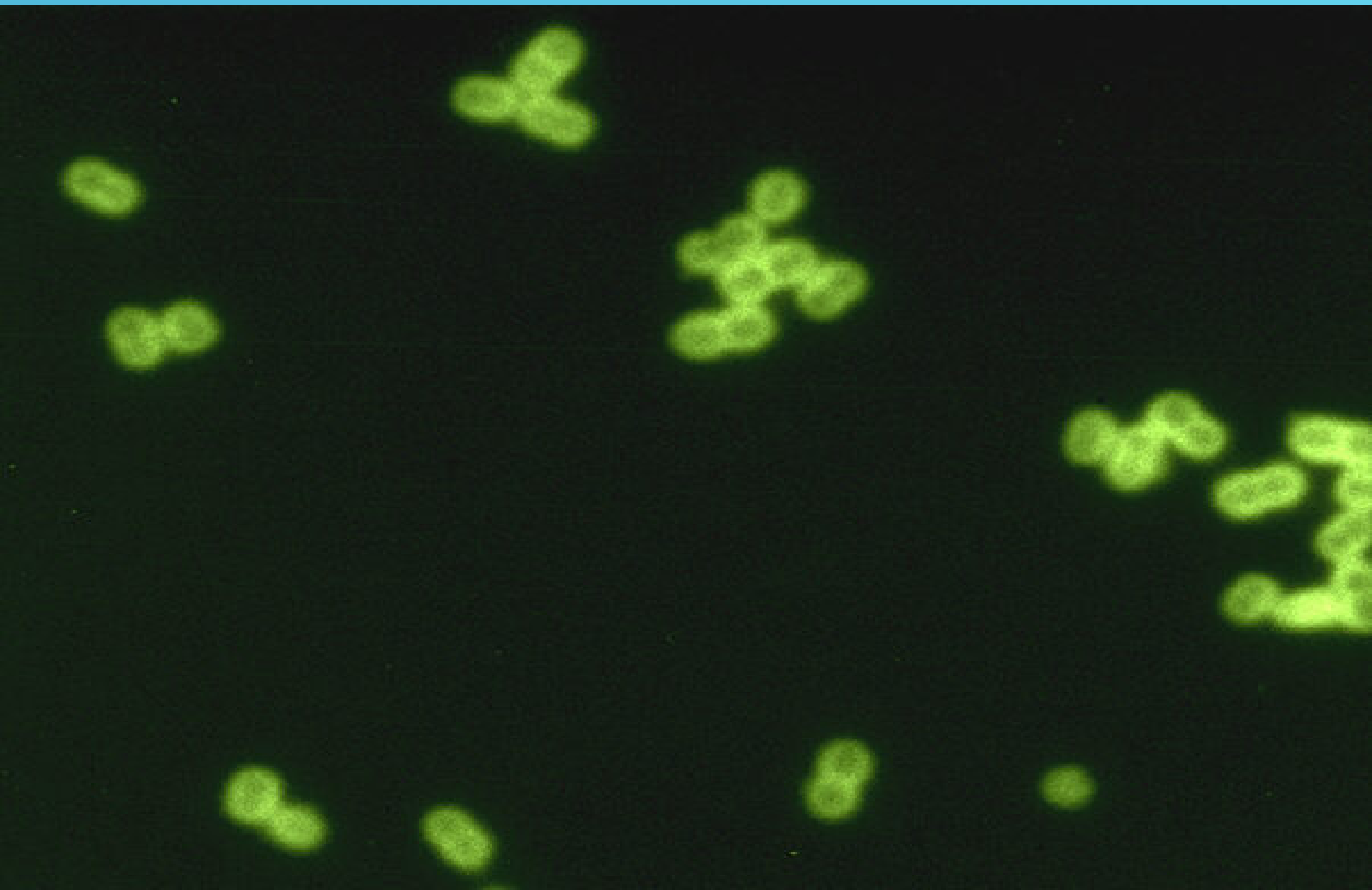
Streptococci

- Streptococci
  - facultative anaerobe
  - Gram-positive
  - usually chains (sometimes pairs)
  - catalase negative
- **(staphylococci are catalase positive)**



Streptococcus pneumoniae (diplococcus). Fluorescent stain

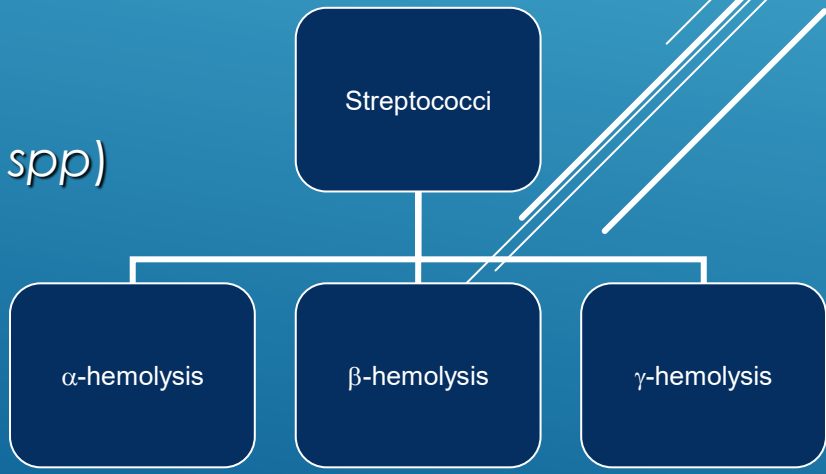


Classification of Streptococcus:

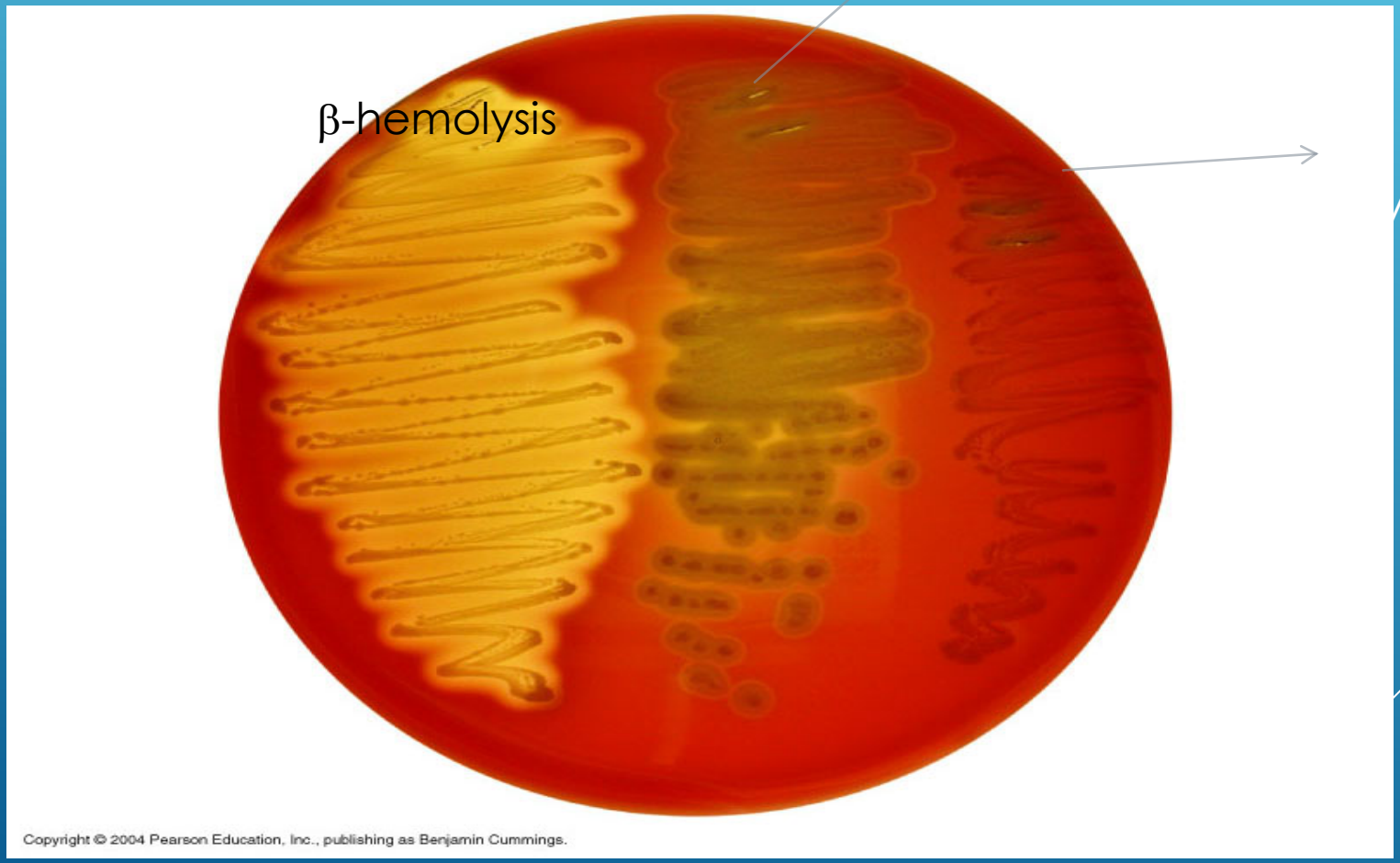
1. Type of growth on blood agar medium.
2. Serologic specificity.
3. Biochemical and physiological factors.
4. Capsular polysaccharide

Classification of Streptococci Based on Hemolysis on Blood Agar

- Hemolysis on BA
  - α-hemolysis
    - Partial hemolysis
    - Green discoloration around the colonies
    - e.g. non-groupable streptococci (*S. pneumoniae* & *S. viridans*)
  - β-hemolysis
    - Complete hemolysis
    - Clear zone of hemolysis around the colonies
    - e.g. Group A & B (*S. pyogenes* & *S. agalactiae*)
  - γ-hemolysis
    - No lysis
    - e.g. Group D (*Enterococcus spp*)

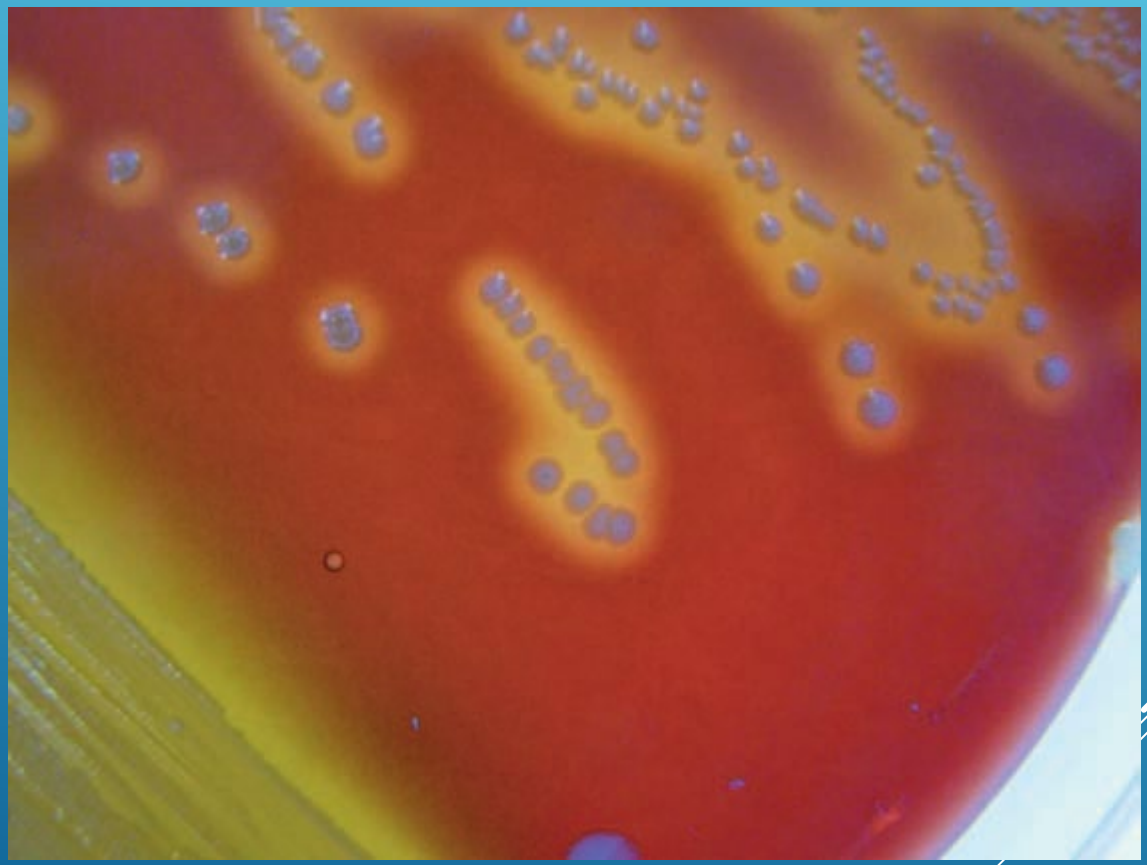


α-hemolysis



ysis

Figure Group A streptococci on blood agar showing beta hemolysis



Viridans streptococci on blood agar showing alpha hemolysis

Classification Based on Lancefield Proteins

Lancefield, working with various streptococcal species, discovered proteins in the cell wall that were unique to certain organisms. These proteins were labeled Group A, Group B, Group C, and so on through Group M. Currently three Lancefield Groups are of medical importance: Group A, Group B, and Group D.

Group A Strep--*Streptococcus pyogenes*
Group B Strep--*Streptococcus agalactiae*
Group D Strep--*Streptococcus bovis, Enterococcus faecalis*

Specimens:

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

Lab diagnosis:

Gram stain
Colonial Morphology on blood agar.
Catalase test.
Blood hemolysis
Optochin disc sensitivity test.
Bile solubility test.
Capsular swelling.
Growth 6.5%NaCl
Bacitracin disc test.
CAMP test

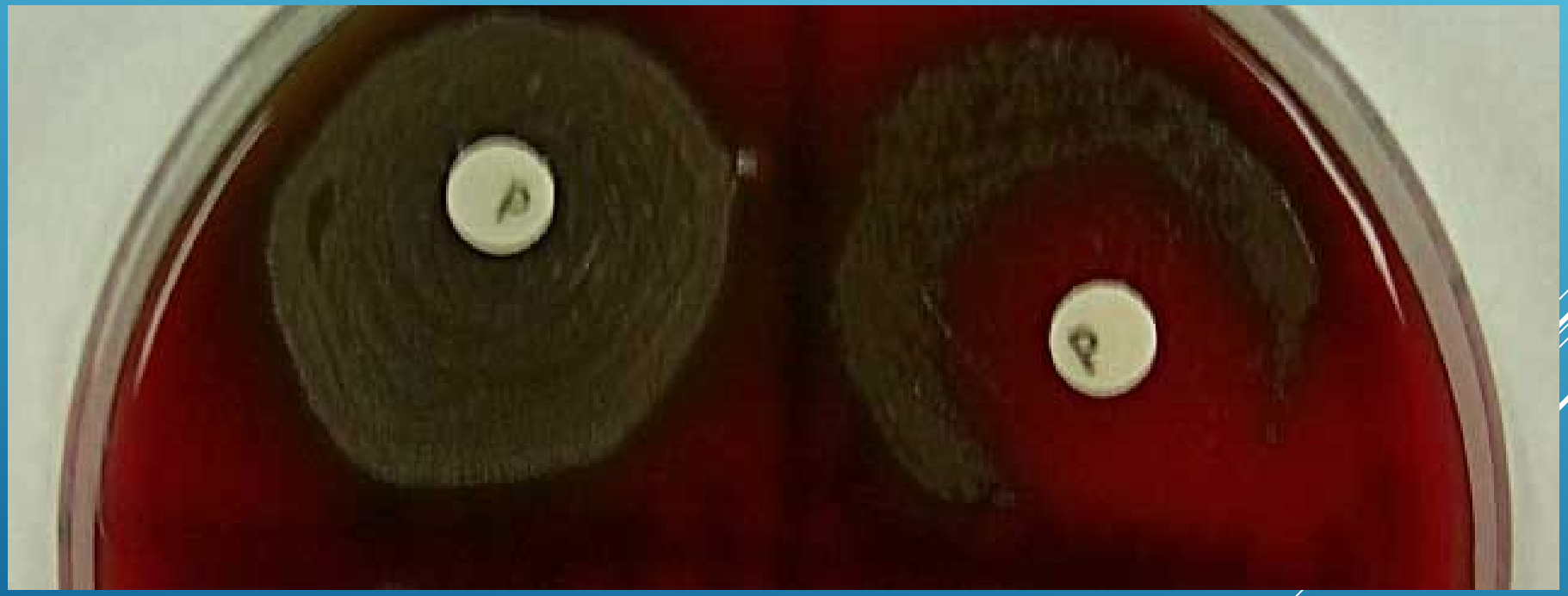
Biochemical Identification

Bacitracin sensitivity testing

This is a differential test used to distinguish between organisms sensitive to the antibiotic bacitracin and those not. Bacitracin is a peptide antibiotic produced by *Bacillus subtilis*. It inhibits cell wall synthesis and disrupts the cell membrane. This test is commonly used to distinguish between the -hemolytic streptococci: *Streptococcus agalactiae* (bacitracin resistant) and *Streptococcus pyogenes* (bacitracin sensitive).

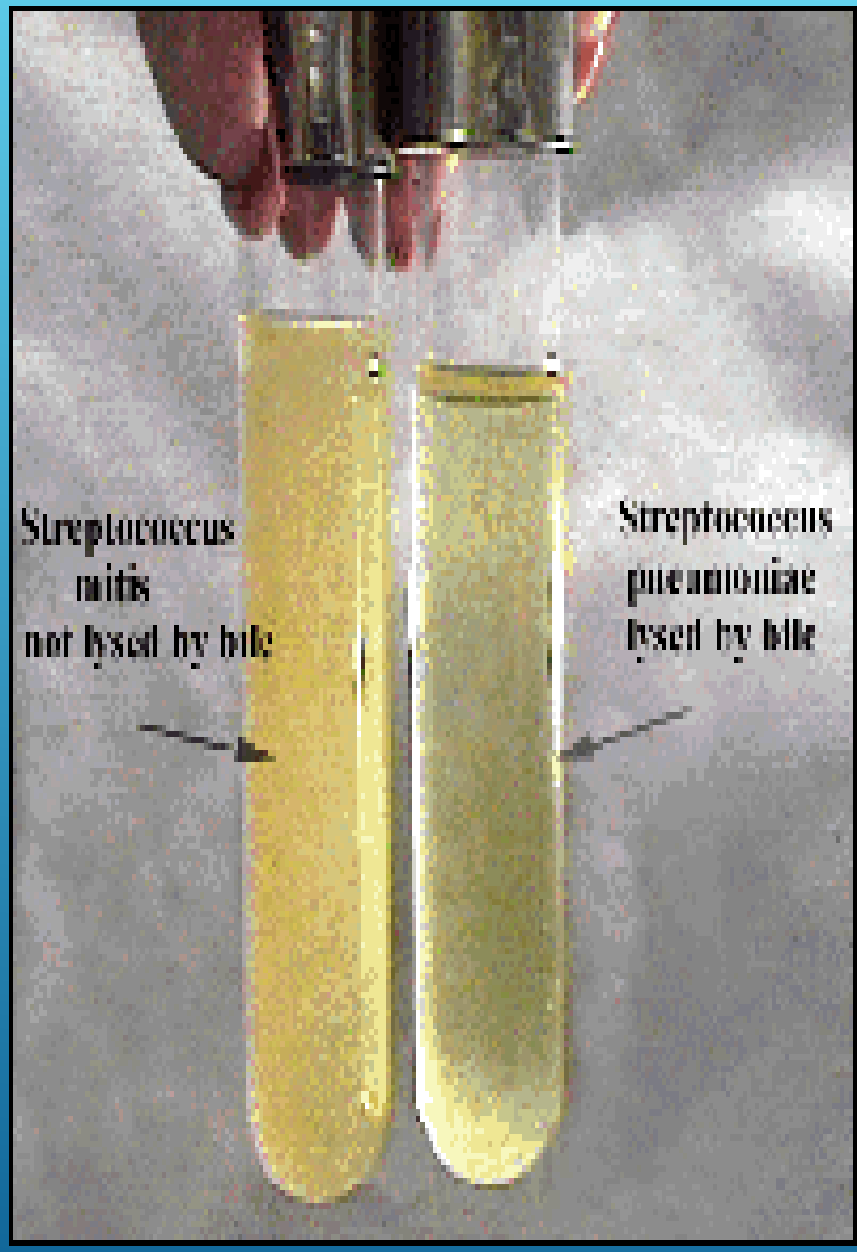
Susceptibility test

- **Optochin "P" disk Differentiates *S. pneumoniae* from other alpha-hemolytic streptococci (Viridans group)**



❑ Bile solubility test

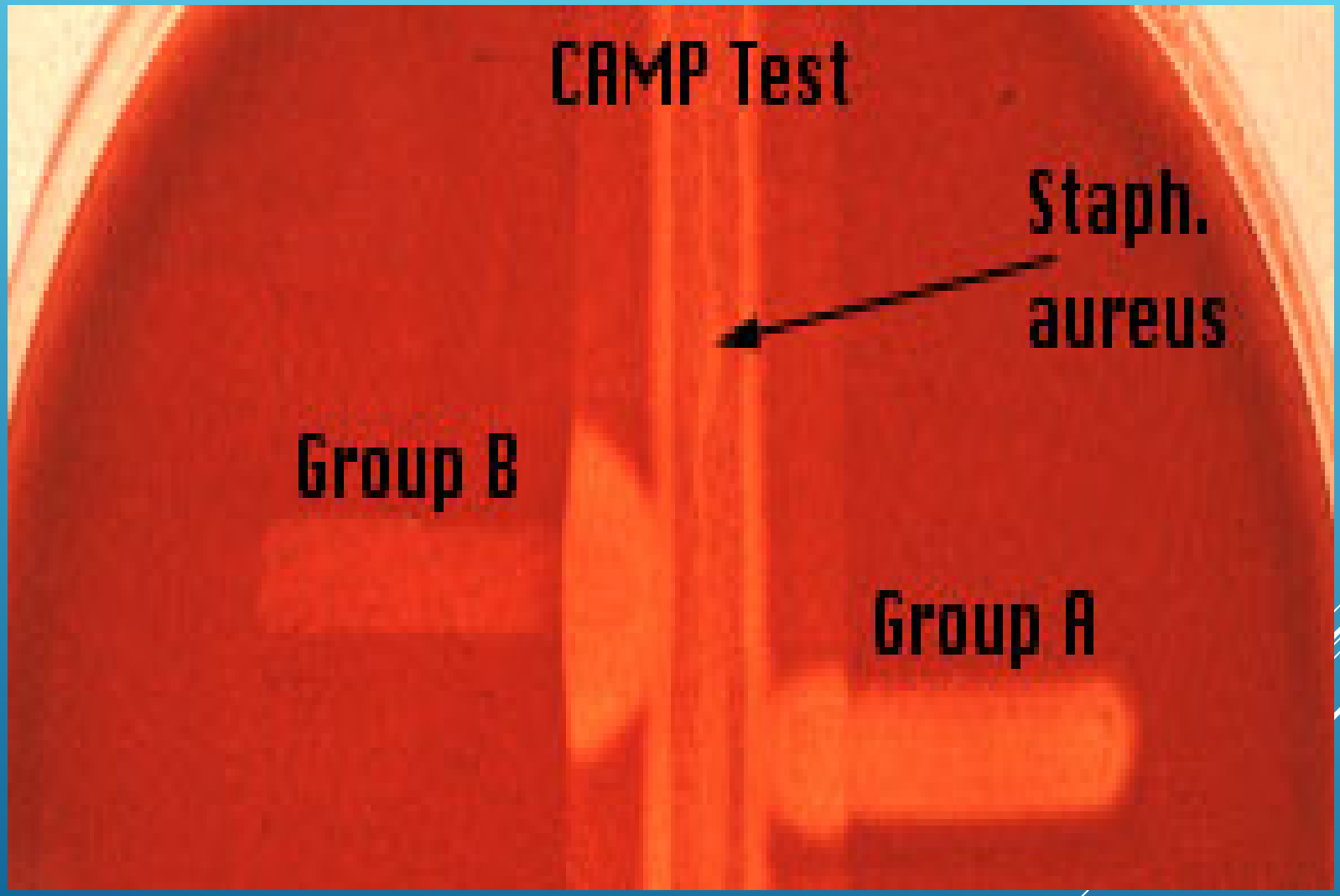
S pneumoniae lyses in a suspension of sodium deoxycholate while other viridans streptococci do not lysePositive test appears as clearing in the presence of bile while negative test appears as turbid



❑ CAMP Test

This is a synergistic test between *Staphylococcus aureus* and *Streptococcus agalactiae*.

S. agalactiae produces CAMP factor. *S. aureus* produces sphingomyelin C, which binds to red blood cell membranes. The two bacteria are streaked at 90° angles of one another. They do NOT touch. The CAMP factor produced by *S. agalactiae* enhances the beta-hemolysis of *S. aureus* by binding to already damaged red blood cells. As a result, an arrow of beta-hemolysis is produced between the two streaks. The test is presumptive for *S. agalactiae* that produces CAMP factor.


CAMP Test
Staph.
aureus
Group B
Group A

- Bile Esculin hydrolysis
  - **Ability to grow in 40% bile and hydrolyze Esculin are features of streptococci that possess Group D antigen**
- Growth in 6.5% NaCl broth
  - **Differentiates Group D streptococci from enterococci**

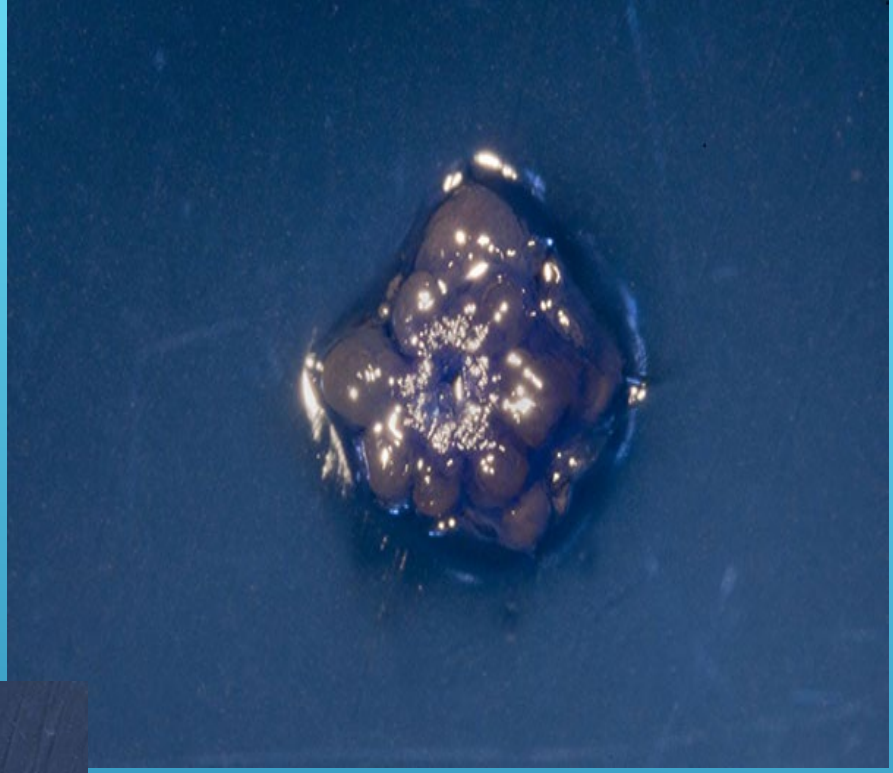
Both Group D streptococci and enterococci produce a positive (left) bile Esculin hydrolysis test.

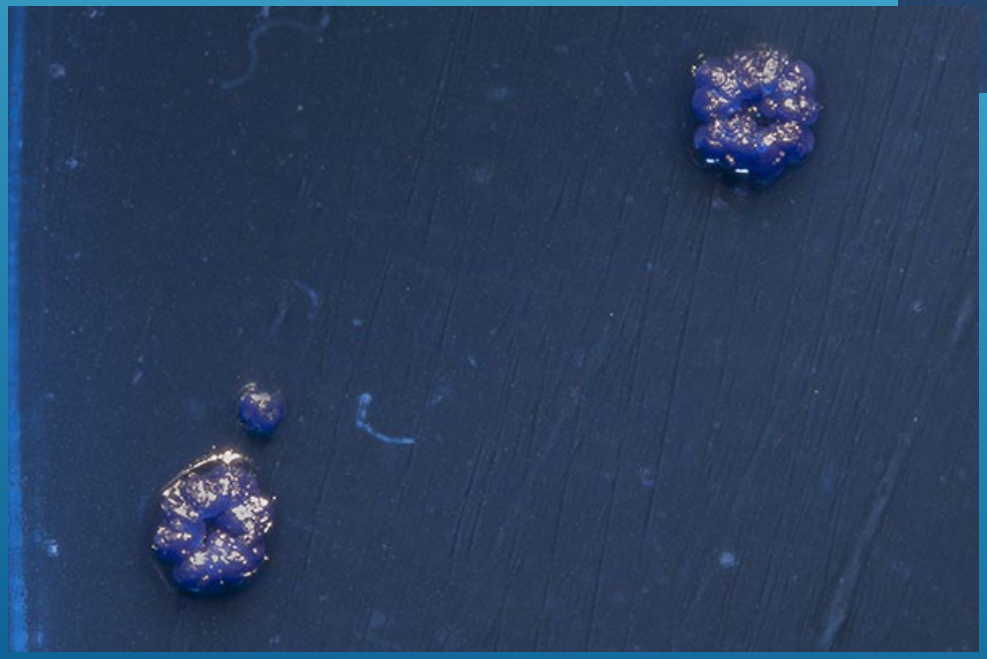
Streptococcus mutans

Streptococcus mutans is a Gram-positive bacterium that lives in the mouth. It can thrive in temperature ranging from 18-40° C.
The bacterium metabolizes different kinds of carbohydrates, creating an acidic environment in the mouth as a result of this process.
This acidic environment in the mouth is what causes the tooth decay. It is the leading cause of dental caries (tooth decay) worldwide. *S. mutans* is considered to be the most cariogenic of all of the
oral *Streptococci*

Colonies of *S. mutans*

S. mutans:- pin point to medium size, gray to light or medium blue, the colony is soft to the touch.

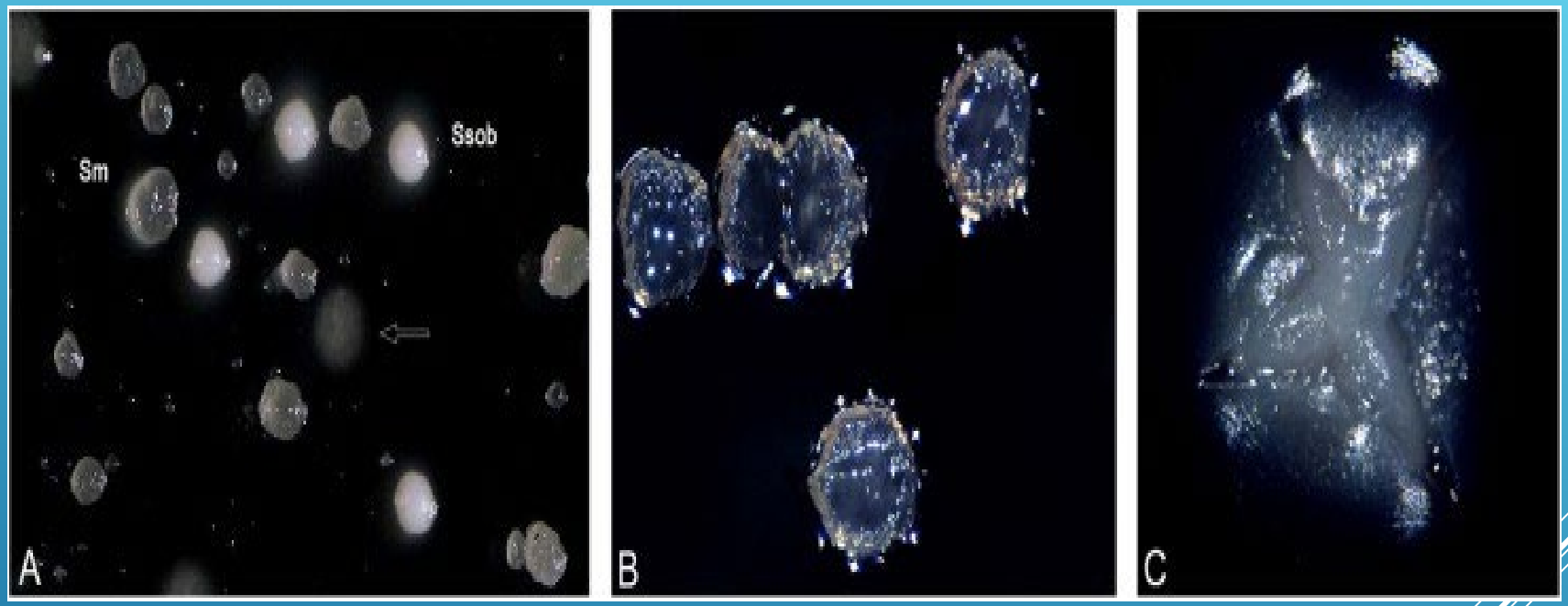




Mitis-Salivarius agar (M-S)
Agar is differential medium

Alpha-
hemolytic *Streptococcus* species
"Viridans group" streptococci,
including species such as
the *Streptococcus mutans,*
***mitis,* and *salivarius* groups display**
alpha hemolysis

-Colonies of *S. sobrinus*



pin point to medium, translucent to dark blue, shiny colonies are very hard and rubbery to the touch of an inoculating needle.

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