GRAM POSITIVE AND GRAM NEGATIVE COCCI

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Nomenclature:

- Naming of bacteria according to accepted international rule (International Code of Nomenclature of Bacteria1992).
- Only one official name comprising of two parts.

  First part Generic name.

  Second part Species name.

- Latin or Latinized

Italicized

- Generic name capital, species small letter
- Example: ***Staphylococcus aureus***

Classification

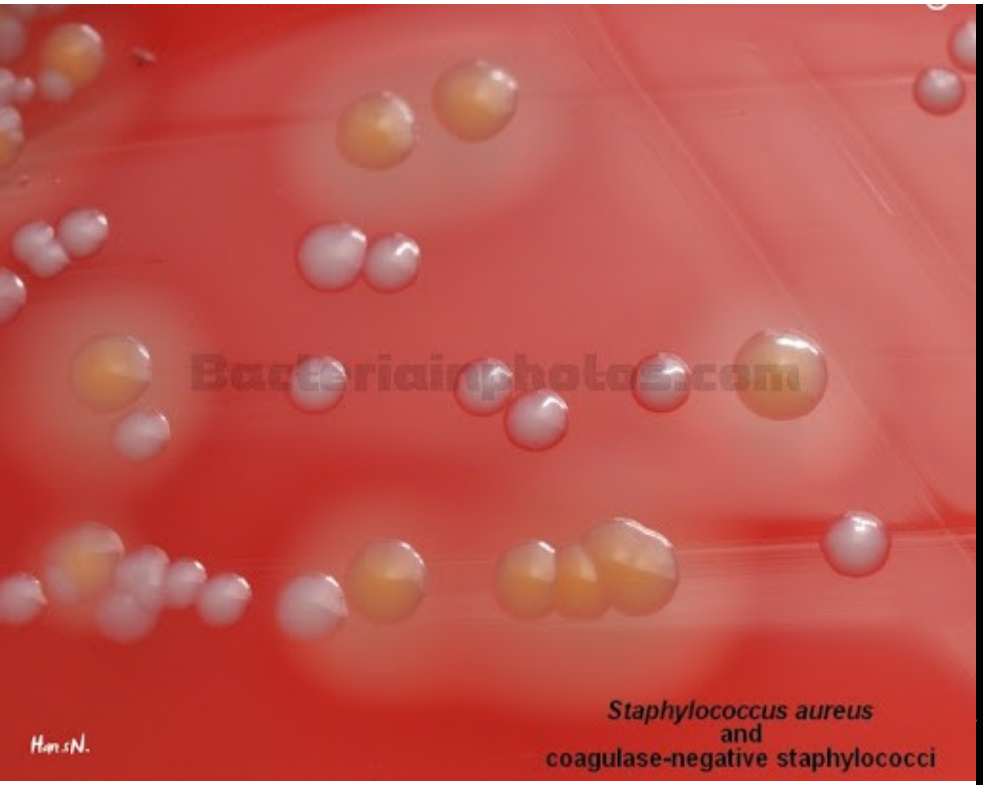
- Rigid thick walled.
- Flexible thin walled.

  Spirochetes – Treponema, Borrelia & Leptospira
- Wall – less (Mycoplasma).

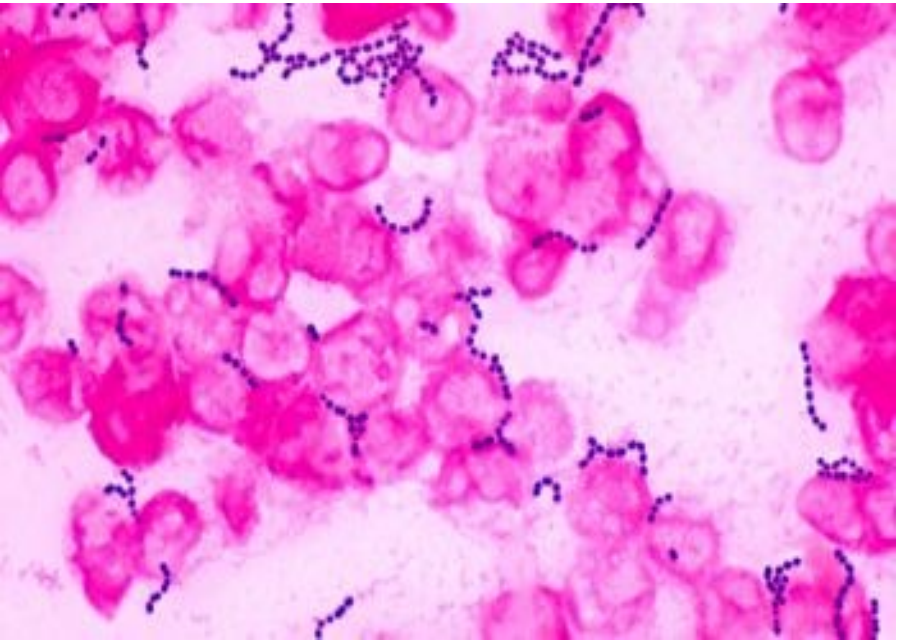
Rigid thick walled

- Cocci:
  Gram Positive
  (Staphycococcus & Streptococcus)
  Gram Negative (Neisseria)
  (Meningitidis &

Staphylococci: aureus & epidermidis

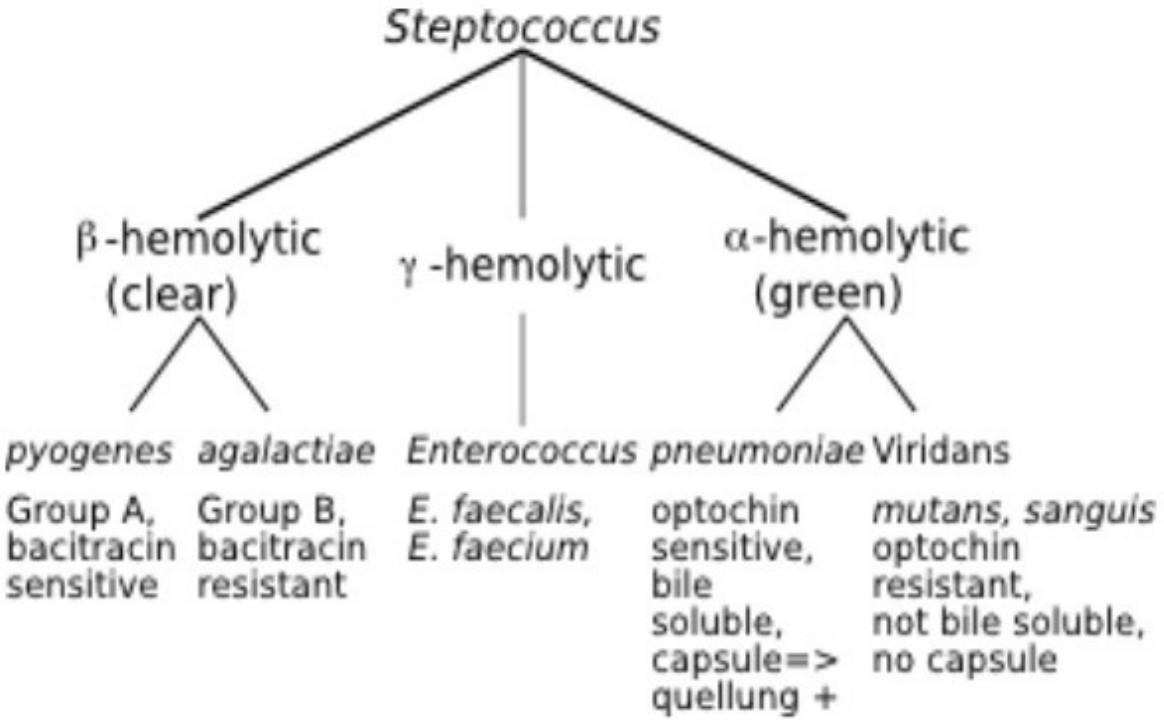


Streptococci (GPC in chains)



Streptococci

Brown`s classification



Staphylococcus

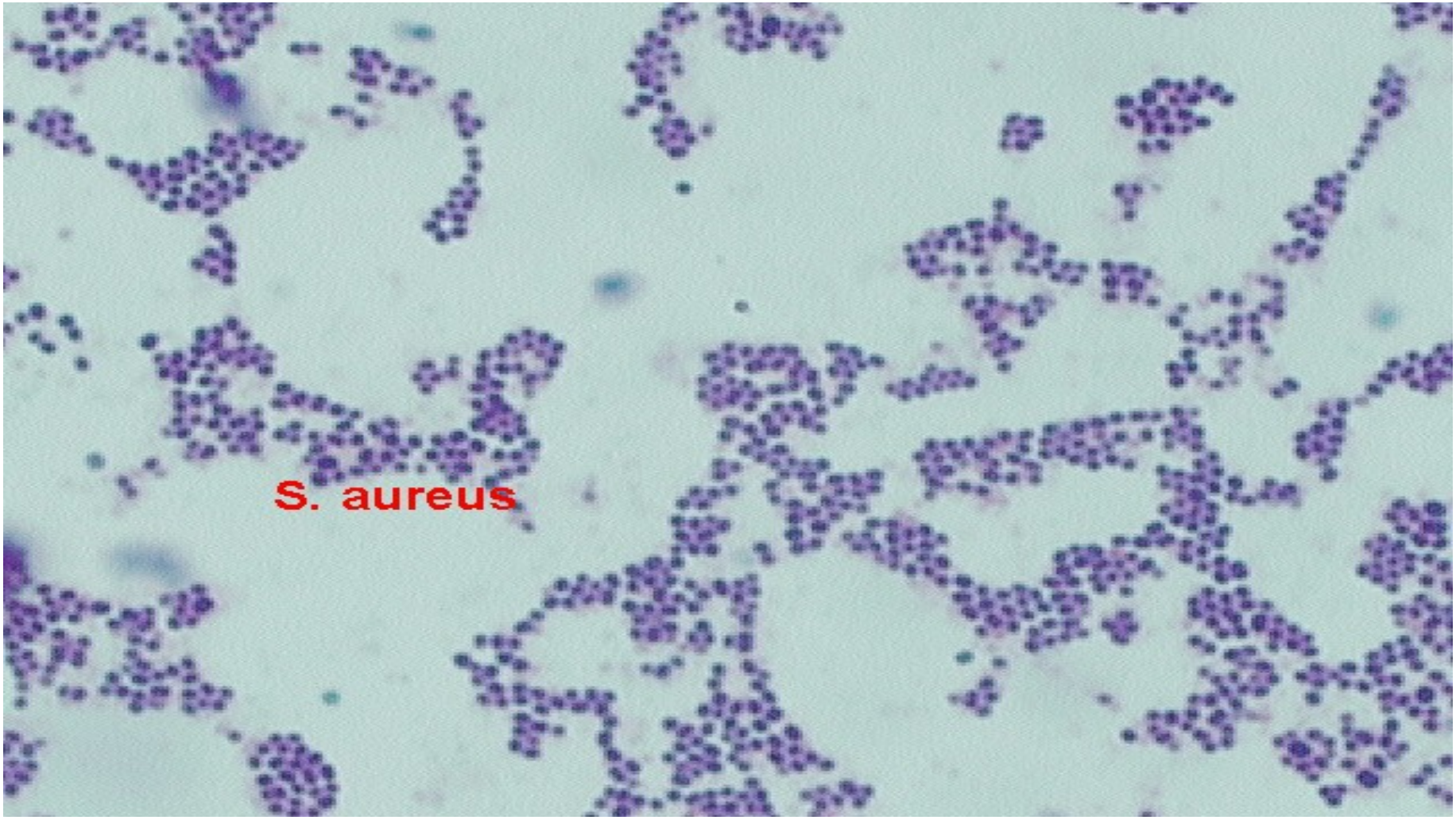
- **Family:** Staphylococcaceae
- **Genus:** Staphylococcus

➢ GRAM+VE

➢ Non-motile, Non sporing

➢ Arranged in irregular grape like clusters

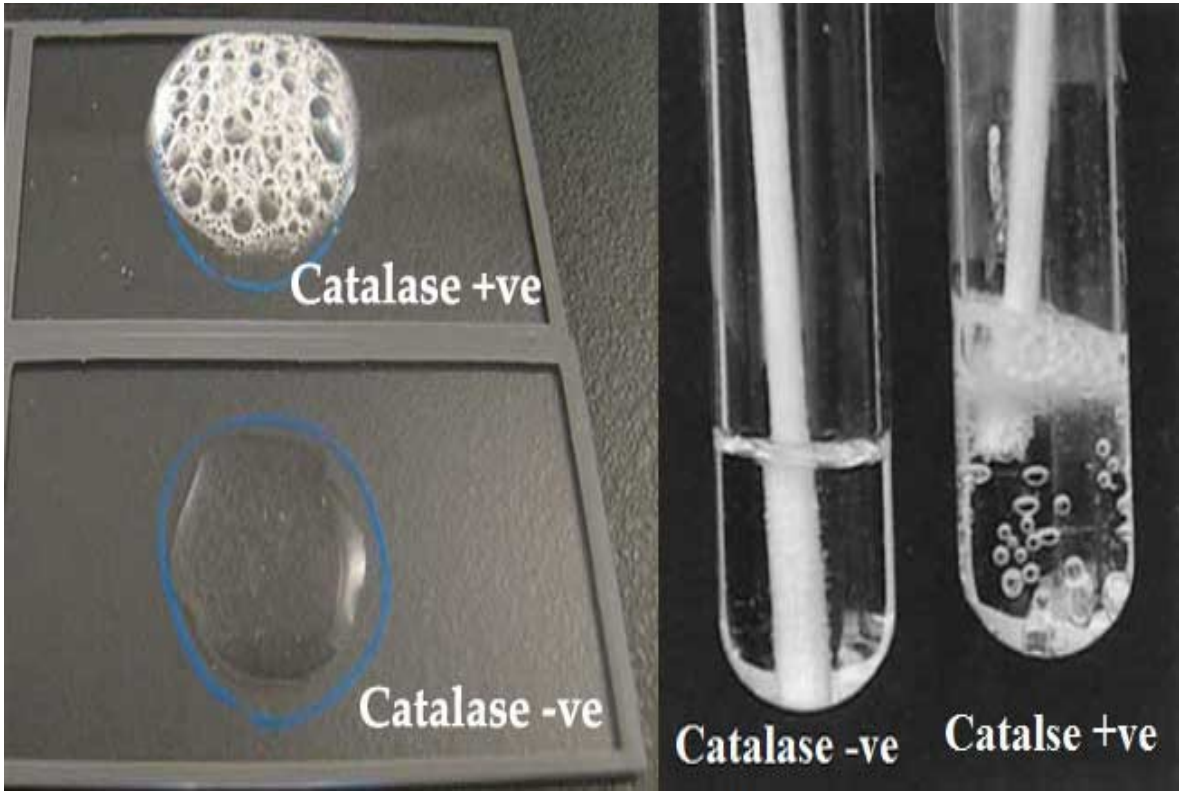
➢ Catalase + ve


S. aureus

Catalase Enzyme test

- Staphylococci are catalase positive
- Streptococci are catalase negative

Catalase Enzyme test



DNase Test

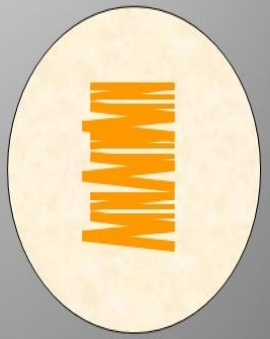
Deoxyribonuclease (DNase) Test:

Principle:

DNA (Insoluble In acid) —DNase enzyme→ Nucleotides (soluble In acid)

Procedure:

1. Inoculate DNase agar plate with the test organism.
2. Incubate the plate at 35oC for 24 hrs.
3. Flood the plate with 1M HCl.

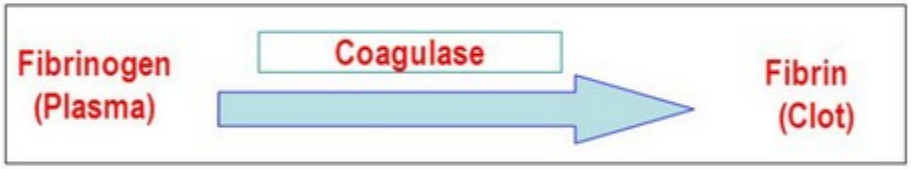


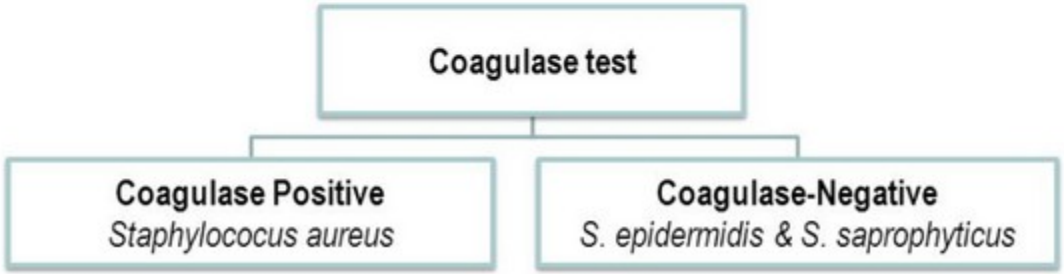
Coagulase enzyme test

Coagulase Test

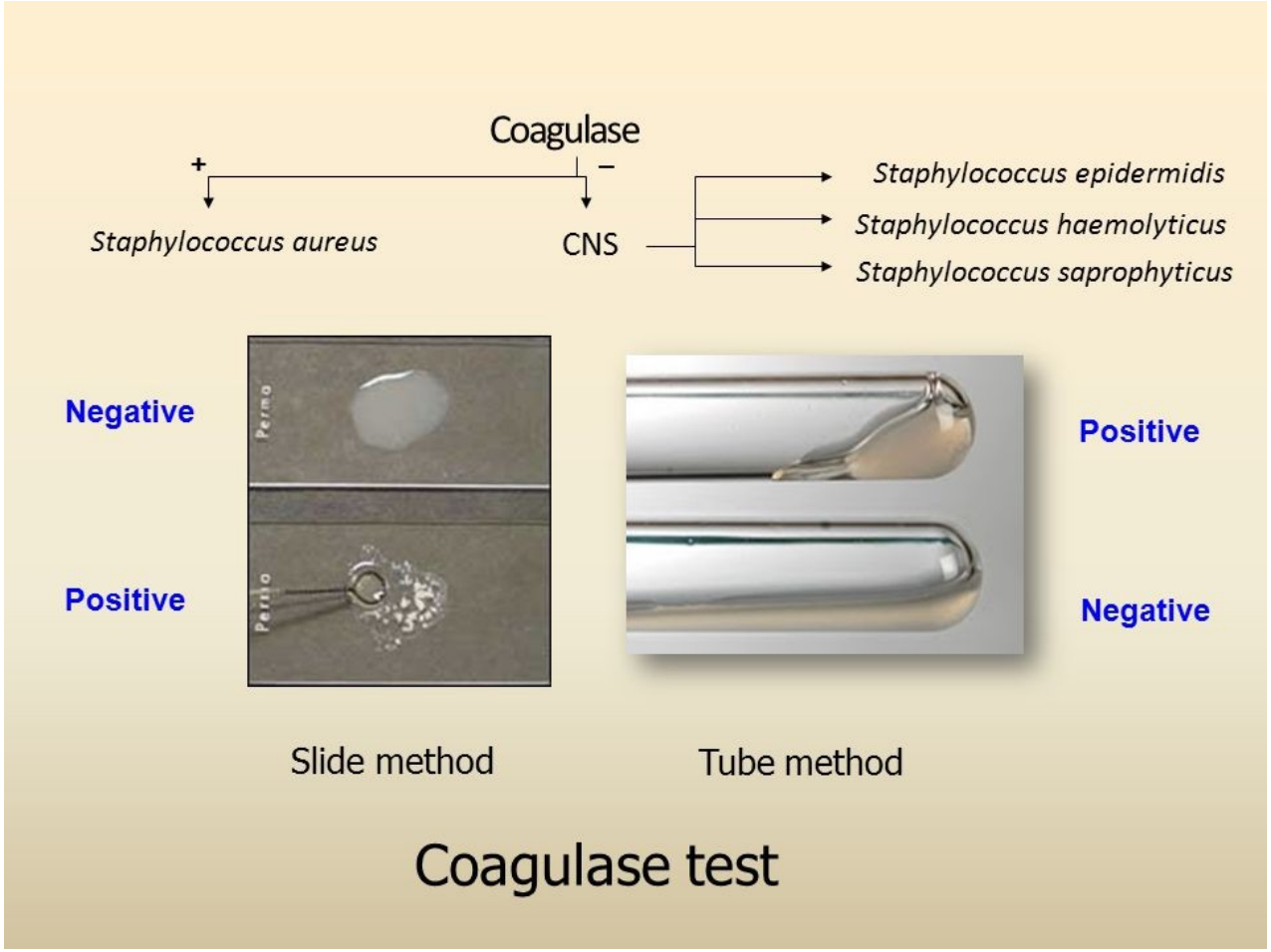
Principle:

- This test is used to differentiate between *S. aureus* (CPS) & other *Staphylococcus* species (CNS)
- This test is done by tube method or slide method





Coagulase enzyme test



Coagulase enzyme test

Coagulase Test

This test is used to identify the *Staphylococcus aureus*, which produces the enzyme coagulase

- Principle
  - Coagulase causes plasma to clot by converting fibrinogen to fibrin. Two types of coagulase are produced by most strains of *Staphylococcus aureus*
    - Free coagulase which converts fibrinogen to fibrin by activating a coagulase reacting factor present in plasma. Free coagulase is detected by clotting in the tube test
    - Bound coagulase (clumping factor) which converts fibrinogen directly to fibrin without requiring a coagulase reacting factor. It can be detected by the clumping of bacterial cells in the rapid slide test

- **Coagulase Negative**

  White colonies

  Usually non pathogenic

  Divided into 2 groups

➢ **Staph. epidermidis group**

Staph epidermidis, S. hominis

S. capitis, S. auricularis

S. haemolyticus, S.simulans

- **Staph. Saprophyticus**

  U.T.I in young females

  Uncomplicated cystitis

  Novobiocin resistant

Novobiocin susceptibility

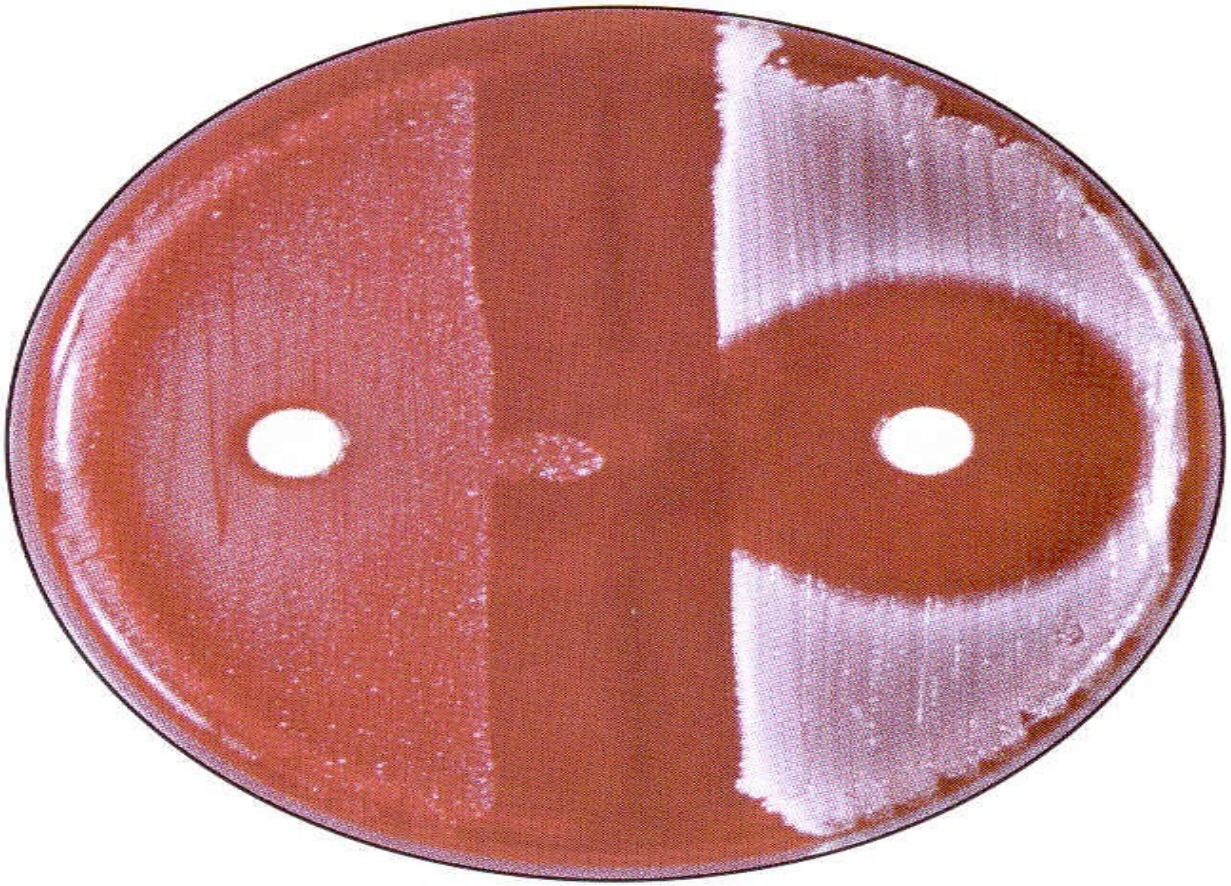


FIGURE 5-62 Novobiocin disk test on a sheep blood agar plate. *Staphylococcus saprophyticus* (R) is on the left; *Staphylococcus epidermidis* (S) is on the right.

Staphylococcus aureus

- **Culture:**

- Can grow easily on ordinary media, not fastidious
- Optimum temp 35C^{o} (15—40C^{o})
- Facultative anaerobe, good growth under aerobic conditions.
- Ph 7.2 (6.8—7.4)

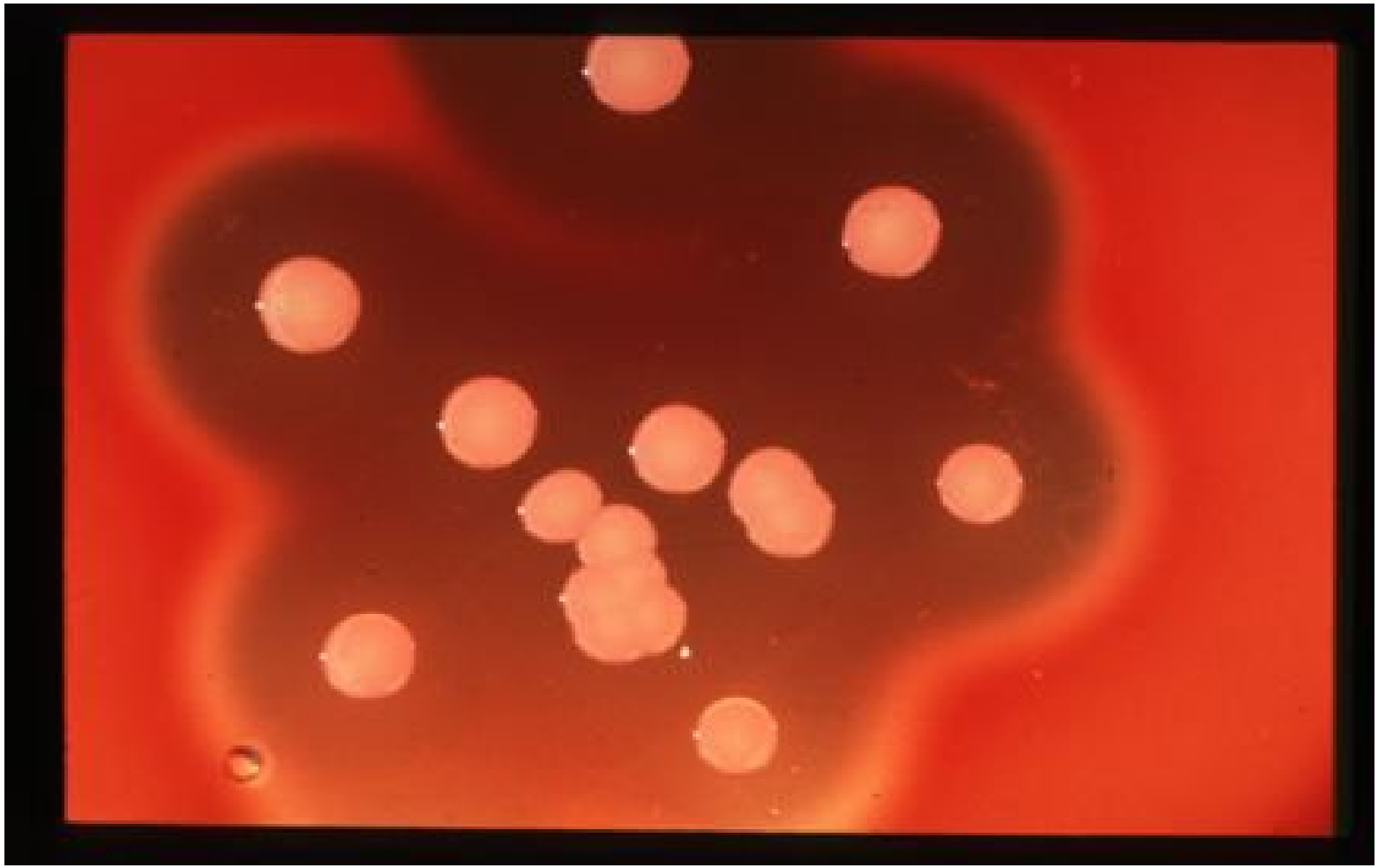
Media:

- Nutrient agar, Blood agar, glucose broth.

Colonies: round 1—2 mm raised, convex, opaque, Smooth shiny surface, Soft, Golden yellow pigment

Beta haemolysis on blood agar

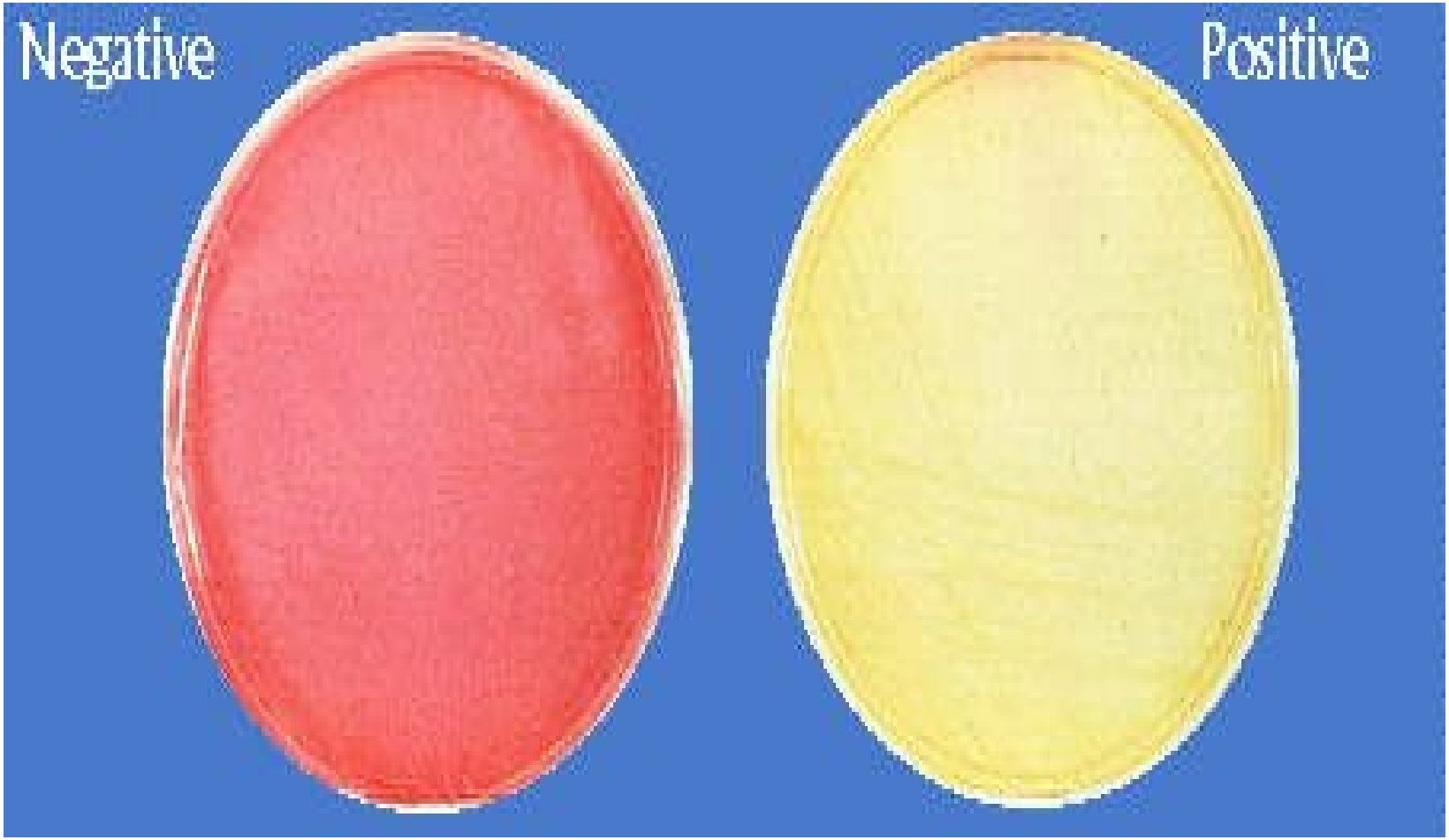
Beta haemolysis on blood agar



- Mannitol salt agar

  Used as selective medium to isolate from samples having mixed flora

Mannitol Salts Agar (MSA)



Biochemical Reactions

- Catalase +ve
- Oxidase -ve
- coagulase+ve
- Liquify gelatin
- Nitrates Nitrites

Viability

- Remain alive for months on agar media at room temp

- Resistant to usual antiseptics & antibiotics
- Methicillin resistant staphylococcus aureus (MRSA)

Toxins:

1. Haemolysins. (alpha - delta) (α ß,γ, δ)
2. Leucocidin
3 . Epidermolytic toxin
4. Toxic shock syndrome toxin -1 (TSST-1)
5. Enterotoxin

Enzymes:

1. Coagulase
2. Hyaluronidase
3. Staphylokinase
4. Geletinase

5. Protease
6. Lipase
7. Penicillinase
8. DNase
9. Catalase

Toxins:

. **Haemolysins**. (Alph- delta) (α ß,γ, δ)

- **α haemolysin** produces pores in cell membrane of red cells and lyses them.
- It is responsible for zone of beta haemolysis seen around S. aureus colonies
- It is dermo necrotic on subcutaneous injection
- It is also potent neurotoxin

- **ß haemolysin** is a sphingomyeilnase which acts on sphingomyeiln and causes lyses of RBCs.

➢ γ, δ also cause lyses of RBCs acting as surfactants

- **Leucocidin**

- This toxin forms pores in cell membrane which alter cellular permeability
- It causes swelling and lyses of polymorphs having direct toxic effect
- it also causes degranulation of cytoplasm

- **Epidermolytic toxin (Exfoliative toxin)**

➢ This toxin has proteolytic activity and dissolves mucopolysaccharide matrix of epidermis resulting in intra epithelial splitting of cellular links in stratum granulosum

➢ It results in blistering and generalized desquamation Painful rash appears and areas if skin slough off in small children

- **Toxic shock syndrome toxin -1 (TSST-1)**

- Same as enterotoxin F.
- It is a superantigen stimulating release of large amounts of IL-1,IL-2 and TNF
- It causes extensive rash, shock and multisystem involvement

- **Enterotoxin**

- There are six types A---F
- Food poisoning
- It is a superantigen.
- Heat stable and resists action of gut enzymes
- Vomiting and diarrhoea without fever occur as a result of ingestion of preformed toxin

Enzymes:

- **Coagulase**

- Indicator of pathogenicity
- Lays down fibrin barrier which is impermeable to leucocytes
- Gives the organisms protection from phagocytosis
- Fibrin layer gives protection even if ingested by leucocytes.

- **Hyaluronidase (spreading factor)**

➢ Brings about destruction of hyaluronic acid, the ground substance matrix of connective tissue.

➢ It spreads the infection to adjacent tissues

- **Staphylokinase**

➢ This enzyme activates plasminogen to plasmin

➢ It is fibrinolytic and fibrin clot is broken down allowing spread of infection

- **Geletinase**

Brings about liquefaction of gelatin

Protease

- It has proteolytic properties
- It produces rapid necrosis of tissues including bone

- **Lipase**

- It is lipolytic activity
- It helps spread the organisms in cutaneous and subcutaneous tissues

.Penicillinase (Beta lactamase)

- It acts by opening up Beta lactam ring of Penicillins causing resistance to these antibiotics

- **DNase (deoxyribonuclease)**

- Indicator of pathogenicity
- Destroys DNA

Catalase

- It inactivates toxic hydrogen peroxide and free radicals
- It provides protection to the organisms after ingestion by polymorphs

Antigenic structure

1. Capsule
2. Peptidoglycan
3. Teichoic acid
4. Protein A

- **Capsule**

- _It prevents ingestion of organisms by polymorphs

- It may also promote adherence to the host cells and prosthetic devices

- **Peptidoglycan**

- It acts like endotoxin
- It is chemotactant for neutrophils
- It stimulates complement & coagulation cascade

.Teichoic acids

- Unique to staphylococci
- Helps adherence to mucosal surfaces

- **.Protein A.**

➢ Major protein in the cell wall

➢ It binds to the FC portion of IgG at the

complement binding site, thereby preventing the activation of complement

➢ Phagocytosis is greatly reduced

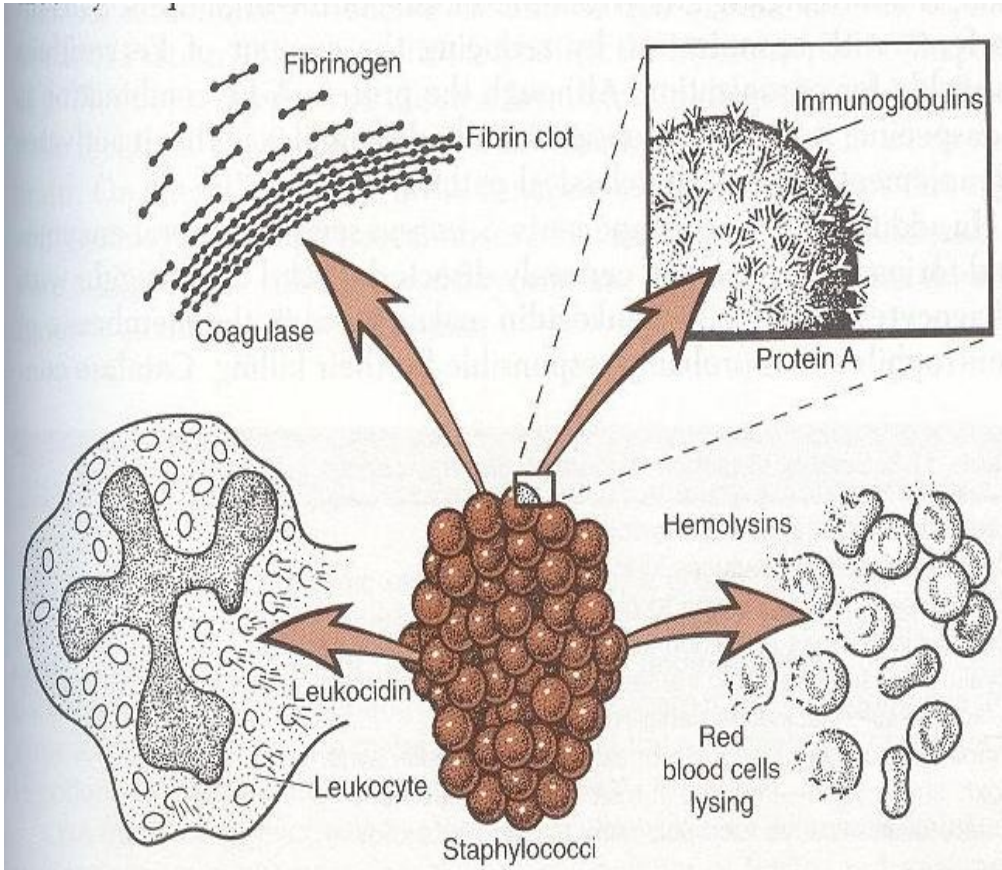


Figure 11.3. Virulence properties of *S. aureus* in pus and abscess formation.

Transmission:

- Direct, Hand Contact
- Air borne
- Endogenous

Pathogenesis:

- Nose- Natural home of staph aureus-40 to 50% normal human nasal carriers
- 5-10% persons skin carriers especially axilla & perinium

- Found on clothing, bed linen & furniture

- Also found as normal flora of Resp and Gastrointestinal tract.

- Invasion after adhesion
- Multiplication
- Toxins & enzymes
- Inflammation Acute
- Repair

Pathology

- **Localised Abscess:**
- _Hair follicles involved
- Tissue necrosis
- Fibrin around lesion
- Accumulation of inflammatory cells-mostly neutrophils
- Fibrous tissue

- Liquifaction of lesion at centre-Abscess
- Pointing in direction of least resistance
- Filling of cavity with granulation tissue
- Spread through lymphatics/ blood
- Healing

Infections

- Skin lesions
  - Abscess
  - Pustules
  - Boils
  - Carbuncles
  - Impetigo

- Folliculitis
- Paronychia
- Styes
- Blephritis

Metastatic Infections

- Bacteremia
- Osteomyelitis

  disease of growing bone
- Pulmonary and cardiovascular infection

Diagnosis

- **Specimens:**
- Pus, Sputum, Faeces/ Vomitus, Blood, Urine, CSF, Aspirate
- Culture, Nutrient/ Blood Agar
- Staining Gram+ve
- Catalase+ve
- Mannitol+ve

- Coagulase+ve
- DNase+ve
- SEROLOGY—No particular value
- Phage typing- For epidemiology
- Nasal/ Perineal Swabs – For carriers

Coagulase Negative staphyloccoci (CONS)

- A large group of related species of staphylococci
- Colonies are non pigmented, white in colour
- Coagulase negative
- DNase negative

Common contaminant of clinical specimens

Opportunistic pathogens

Produce no toxins

Secrete an exopolysaccharide slime called
extra cellular slime substance (ESS)

- ESS forms a biofilm on plastic surface and bind to fibronectin of plastic catheters and canulae

- The biofilm protects organisms from antimicrobical agents and other immune mechanisms

- Adherent bacteria persist on foreign bodies and evade host defenses

Cause Infections of

1. Indwelling devices
2. Intravenous catheters
3. Haemodialysis shunts
4. CSF shunts

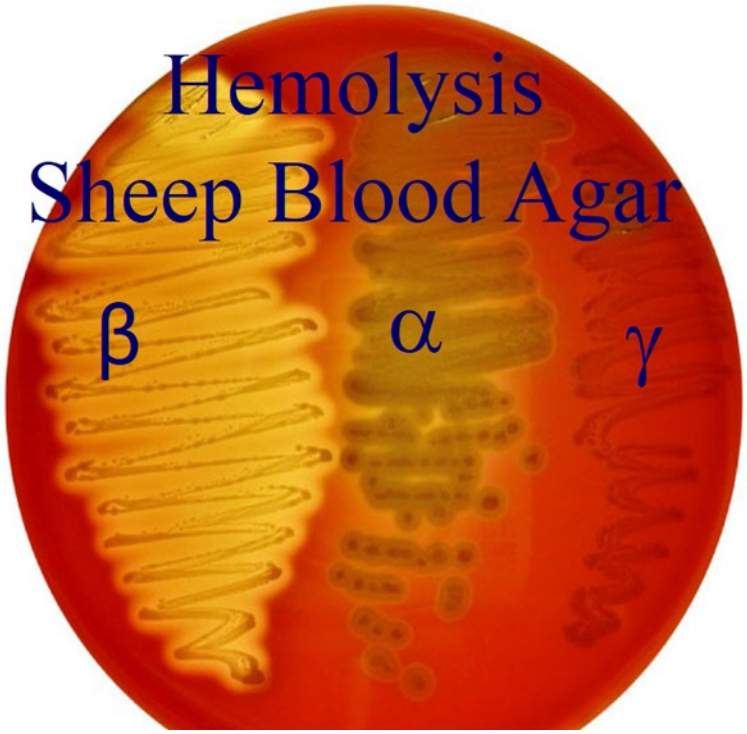
5.Peritoneal dialysis catheters

6. Pace maker wires/electrodes

7. Prosthetic joints, cardiac valves

8. Vascular grafts

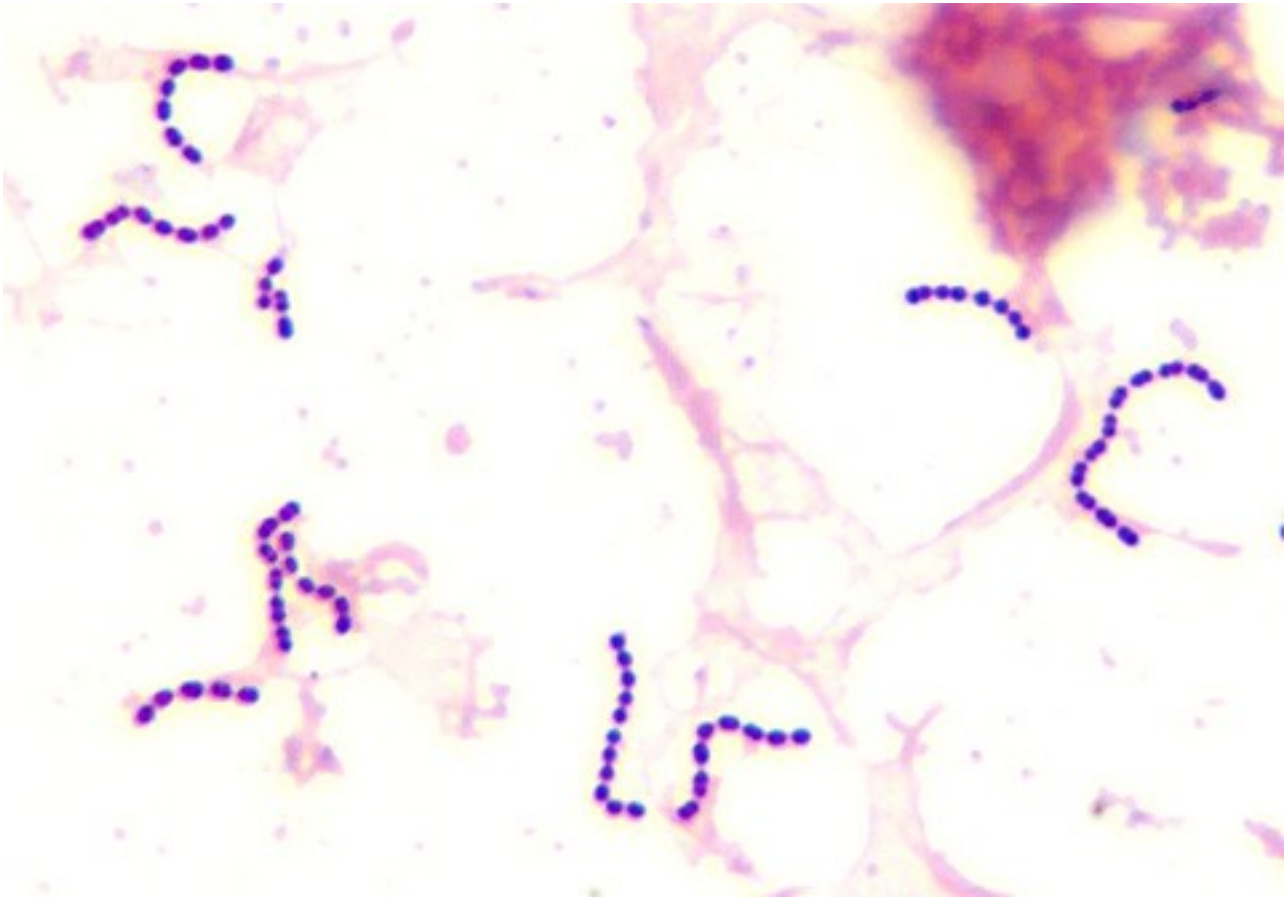
9. Breast implants


Hemolysis
Sheep Blood Agar
β
α
γ

Streptococcus

- Family: Streptococcaceae
- Genus: 1) Streptococcus
- 2) Enterococcus
- Wide distribution in nature
- Found in milk, dairy products, water, dust.
- In man & animals found in throat, mouth, intestines, genital tract.

- Spherical to ovoid
- .5—1μ in size
- Occur in chains
- Catalase—ve
- Fastidious in growth (Blood)
- Facultative anaerobe/ Anaerobe



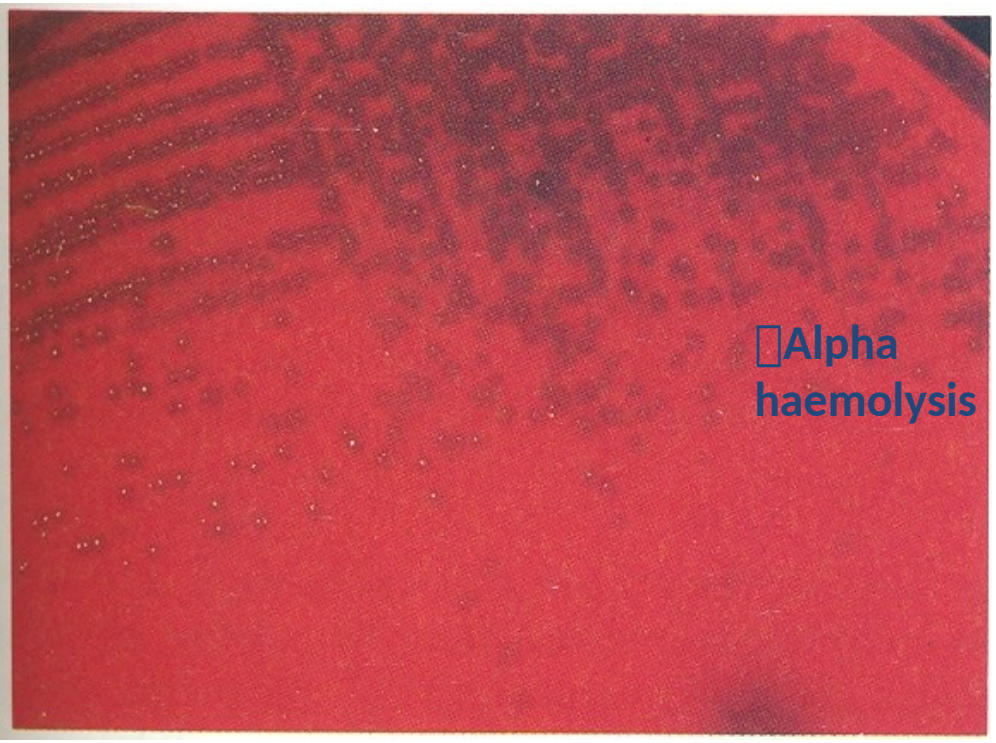
Classification

1. By Haemolysis

2. By Serology

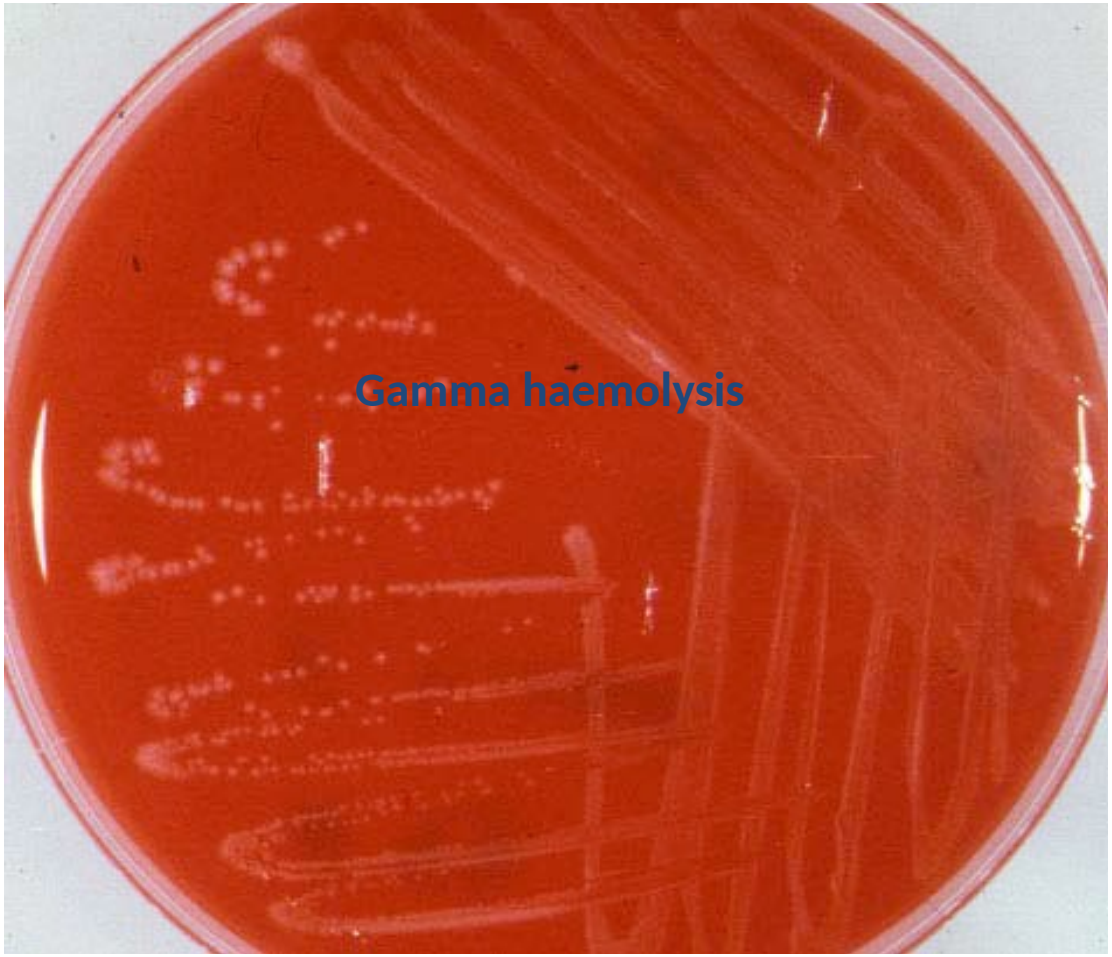
By Haemolysis:

- β heamolytic
- α haemolytic
- γ haemolytic (Non haemolytic)



Alpha haemolysis

Beta haemolysis


Gamma haemolysis

By Serology

1. Lancefield groups A—H & K—U

   Specific C.hydrates. (C. substance)

2. Griffith types of group ‘A’ (M. proteins)

M. Protein

- The most important virulence factor
- Determines the serotype of S. pyogenes
- It protrudes from the outer surface of the cell and interferes with ingestion by phagocytes
- There are approximately 80 serotypes based on the M protein

1.Haemolytic group.(β haemolysis)

- Strept. pyogenes A
- Strept. agalactiae B
- Strept. equi C
- Strept. canis G
- Strept. porcinus E
- Group L spp L

Viridans Group (α/ γ)

- Strept. sanguis H
- Strept. milleri F (C G)
- Strept. salivarius K
- Strept. mitior O (K,M)
- Strept. lactis N

Enterococci

- E. feacalis D
- E. faecium D
- E. durans D

Lancefield grouping: Streptococci

Classification - Lancefield

Lancefield realized that all species in each "group" generally (and conveniently) shared clinically significant properties such as type of hemolysis, normal host, body system or tissue where indigenous, etc. For example:

- Group A - *S. pyogenes*: human upper respiratory
- Group B - *S. agalactiae*: human urogenital
- Group C - *S. zooepidemicus*: from animal products
- Group D - *S. faecalis*: bile-resistant, fecal origin

Streptoccus pyogenese

- Most important pathogen
- Isolated only form man
- 20% carried in throat of normal children
- Lower rate in adults.

- Spherical, 0.5 1 μ in diameter
- Gram positive
- Occur typically in chains
  (sometimes singly or in pairs)
- Non sporing, non-motile
- Capsulated (Hyaluronic acid)

Culture:

- Facultative anaerobe
- Optimum temp 37C^{o} (22—42 C^{O})
- Fastidious, grow poorly on ordinary media
- Improved on addition of blood, tissue fluid, serum & glucose

- On blood agar small, translucent, less than 1mm, round
  smooth edge & slightly convex colonies
- Small droplets of fluid like
- Surrounded by area of clear β haemolysis.
- Bacitracin sensitive

Toxins

. Streptolysin O & S

Streptolysin O

- Oxygen labile exotoxin
- Readily undergoes oxidation to an inactive form.
- Protein in nature (M WT 60,000)
- Produces haemolysis seen when growth deep in the medium.

- Strongly antigenic and antibodies against it are formed

- Quantitative estimation of antibodies called Antistreptolysin O titre (ASOT)

- ASOT more than 200 units abnormal

- **Streptolysin S**
- Responsible for haemolytic zone around streptococcal colonies on the surface of blood agar plates

- Protein in nature (M W T 20,000)

- Not antigenic

- **Erythrogenic (Pyrogenic toxin /Dick toxin)**
- Three types A,B & C.
- Protein in nature
- Heat stable
- Produced by some strains
- Causes scarlet fever
- Fever with extensive rash
- Antigenic

- Pyrogenic exotoxin A is responsible for some cases of streptococcal Toxic Shock Syndrome (TSST)
- Being superantigen stimulates huge amounts of cytokines like IL-1, IL-2 & TNF
- Produces shock and multiorgan involvement
- Pyrogenic exototoxin B is a protease rapidly destroying tissues and causes necrotizing fasciitis

Enzymes

- **Streptokinase**
- Converts plasminogen to plasmin

- Active fibrinolytic agent

- Can be used to treat venous thrombosis, pulmonary emboli and coronary artery thrombosis

- **2.Deoxyribnuclease (Streptodornase)**
- Breaks down DNA

- Responsible for serous character of streptococcal pus and spreading character of streptococcal infections

- **Hyaluronidase**
- Splits hyaluronic acid an important component of ground substance of connective tissue

- Aids in spreading infection

- Antigenic

- **Proteinase**

Produced in early sages of infection

Destroys many proteins

Helps in recovery

INFECTIONS OF STREPTOCOCCUS PYOGENES

. ACUTE SORE THROAT

2. SCARLET FEVER

3.SUPERFICIAL INFECTIONS

4. IMPETIGO

5. ERYSIPELAS

6. Septicemia
7. Meningitis
8. Brain abscess
9. Ac.arthritis
10. Acute endocarditis

DIAGNOSIS:

- **Throat Swab**
- **Deep nasal swab**
- **Pus**
- **Blood**
- **Serum**
- **High vaginal swab**

- **Smears- Gram stain**
- **Culture –Bacitracin sensitive**
- **Antigen detection test**
- **Serology**
- **ASOT, Anti DNase, Anti M, Antistreptokinase**

INFECTIONS OF GROUP B STREPTOCOCCI (S. AGALACTIAE)

- **Some women become colonized with this organism in vagina and rectum**

- **Colonization of vagina results to infect the new born during delivery or inutero when membranes rupture prematurely**

- **New born may also get infected after birth**

Neonatal Infections:

- **Disease in new born is of two types**

1. **Early onset disease**
2. **Late onset disease**

1 Early onset disease (within first 5 days)

- **Septicemia**
- **Pneumonia**
- **Meningitis**

- **2. Late onset disease (7days to 3 months)**
- **Meningitis.**

- **Post partum infection in women**
- **(Endometritis, Bacteremia)**

Group C & G Infections

- **Pharyngitis**
- **Pneumonia**
- **Cellulitis**
- **Soft tissue infections**
- **Bacteremia, Endocarditis**

Enterococci (Group D)

1. Enterococcus faecalis

2. Enterococcus faecium

- **Occur as commensals in the intestine of man and animals**
- **Diseases caused by enterococci**
- **UTI**
- **Bacteremia**
- **Wound infection**

- **Puerperal sepsis**
- **Liver abscess**
- **Perinephric abscess**
- **Endocarditis**
- **Neonatal meningitis**

Viridans Group (α heamolytic/oral)

1. **Streptococcus mutans**
2. **Streptococcus sanguis**
3. **Streptococcus milleri**
4. **Streptococcus anginosus**

Most constitute part of normal mouth and upper respiratory tract flora

Diseases caused by viridans streptococci

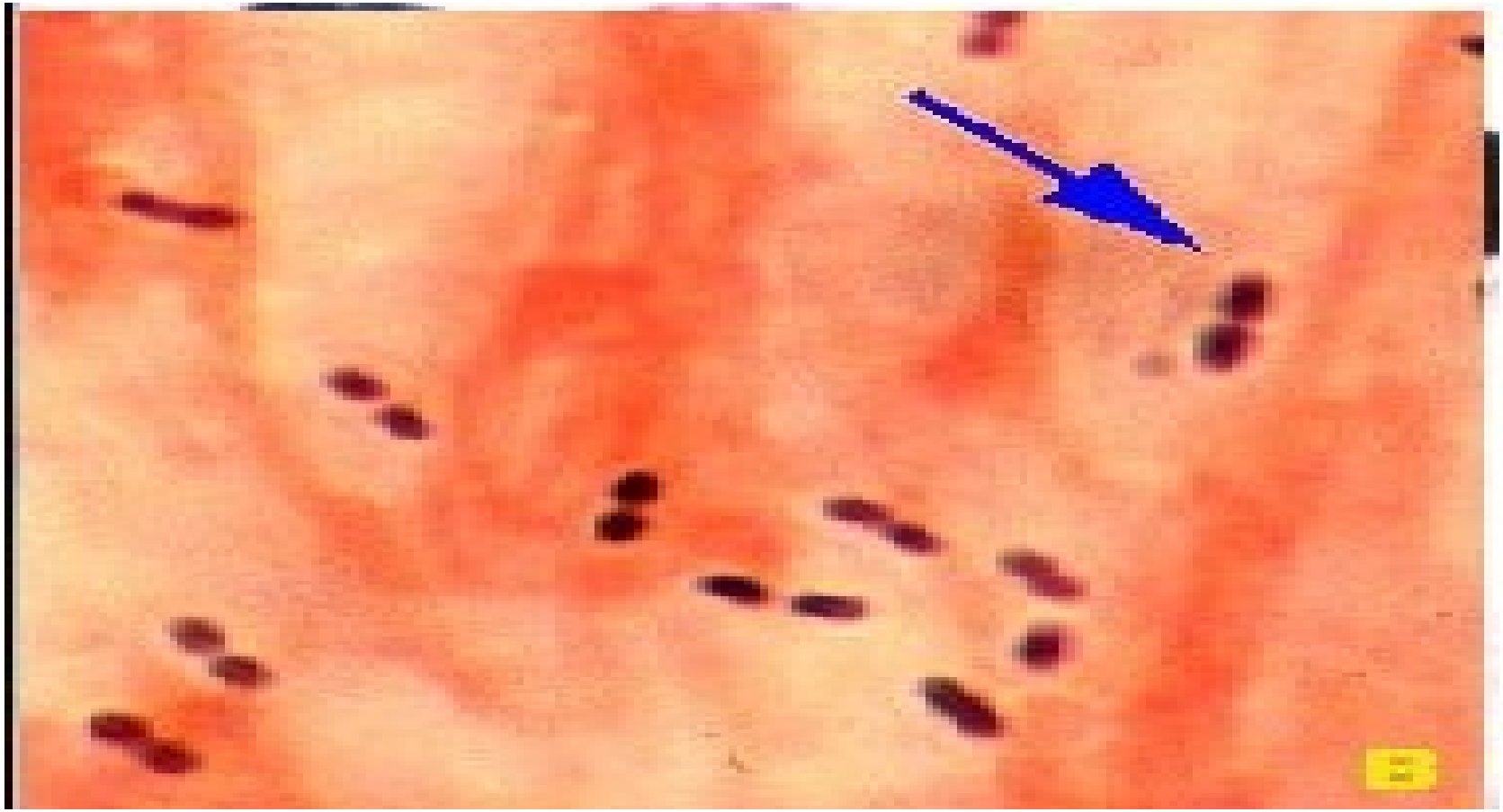
- Subacute bacterial endocarditis (SBE)
- Dental caries
- Sinusitis
- **Brain abscess**
- **Liver abscess**
- **Meningitis**

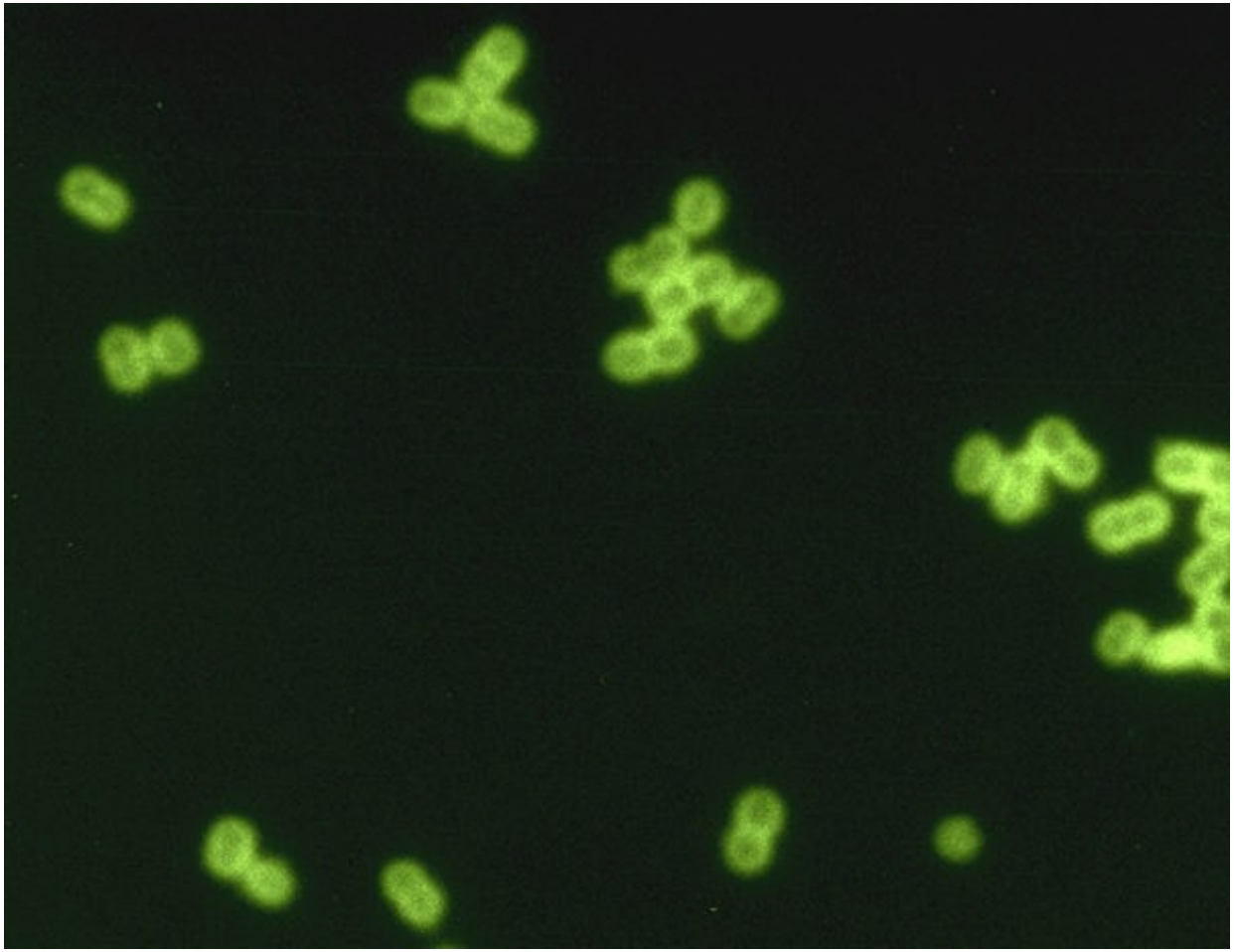
STREPTOCOCCUS PNUMONIAE (PNEUMOCOCCUS)

- **Morphology:**
- Diplococci, broader ends apposed, distal ends narrowed

- Also single or short chains

- Gram positive





- On prolonged incubation G –ve due to autolysis
- Size 1 µ (.25---1.25 µ)
- Non motile, Non sporing
- Capsulate

Culture:

- Optimum temp 37 C^{o} (25—40 C^{o})
- PH 7.6 ---7.8
- Facultative anaerobe
- 5---10 % CO2 improves growth

- Poor growth on simple media
- Requires blood, serum or glucose
- Blood agar– best medium
- Colonies small, round, some what

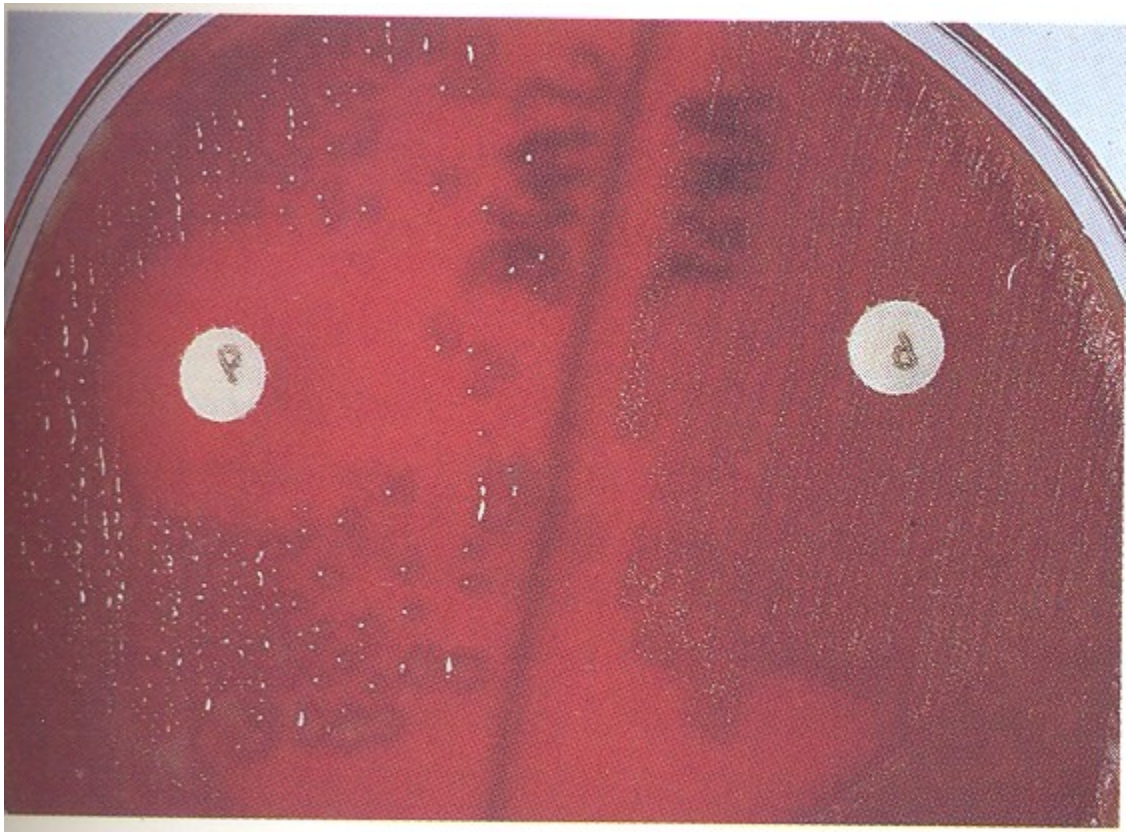
  flattened, transparent

- After 48 hrs margins raised
- Alpha haemolysis around colonies
- Some types produce large mucoid colonies
- Autolysis increased by surface active agents (bile salts)

- Bile solubility test
- Optochin sensitivity test
- Turbidity in broth
- Virulent for mice

Bile solubility test


P
D



Antigenic Structure:

- Capsular polysaccharide
- M. Proteins
- C. Polysaccharide
- Metabolites: Pnumolysin, Leucocidin
  IgA protease

Pathogenicity:

- None of metabolites toxic
- Capsule retards phagocytosis
- Ability to multiply in tissues
- Inflammation –out pouring fibrinous, proteinaceous material into alveoli
- Red cells+ WBC’s

Infections:

. Lobar pneumonia

2. Sinusitis

3. Otitis media

4. Osteomyelitis

5. Arthritis

Meningitis

7. Endocarditis

8. Peritonitis

9. Conjunctivitis

Lobar pneumonia

- Pneumococcus is the major cause of community

acquired bacterial pneumonia of lobar type in humans

- Infection is endogenous, bacteria are aspirated form

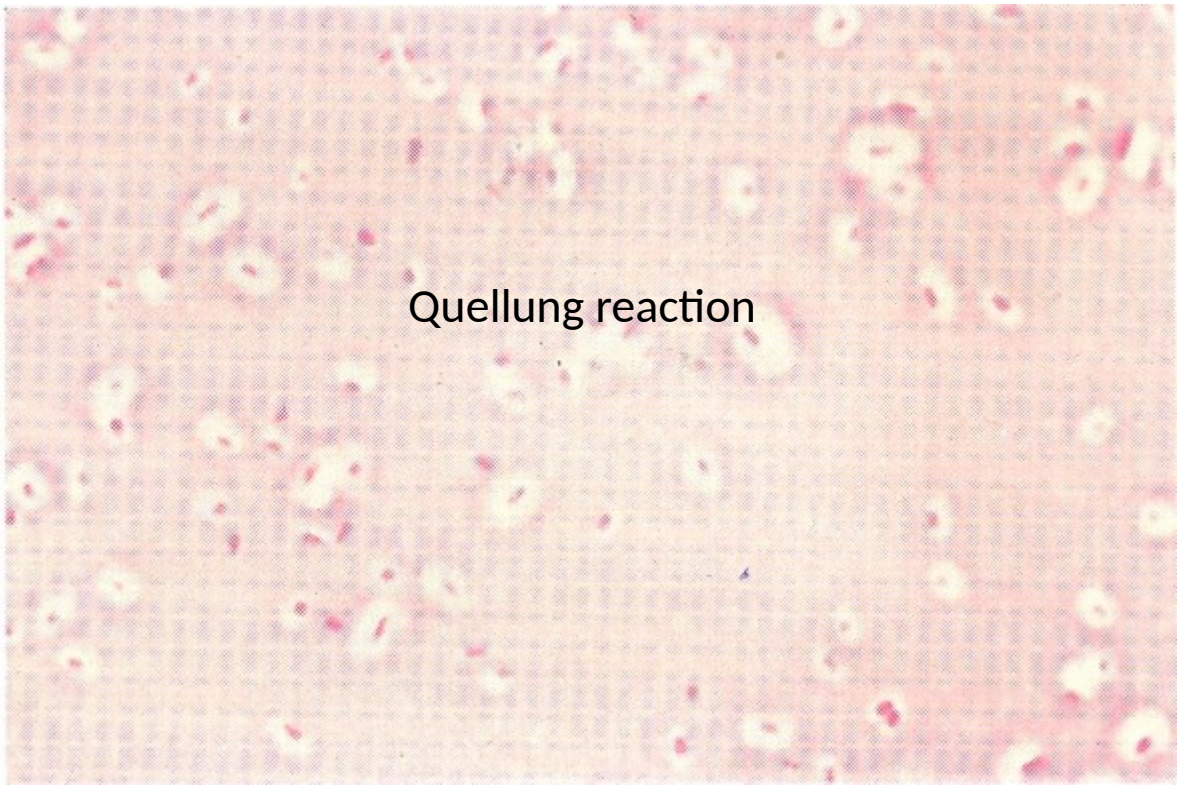
throat of normal children and adults

Diagnosis:

- **Specimens:**
  - Sputum
  - Blood
  - CSF
  - Aspirates

TESTS

- **Stained Smear**
- **Culture**
- **Capsule swelling test (Quellung Reaction)**
- **Animal inoculation**


Quellung reaction

NEISSERIA

Family: Neisseriaceae

Genus: Neisseria

SPECIES:

N. meningitidis (Meningococcus)

N. Gonorrhoeae (Gonococcus)

General Characters- Neisseria

- **Morphology:**

❖ **Gram negative**

❖**Diplococci**

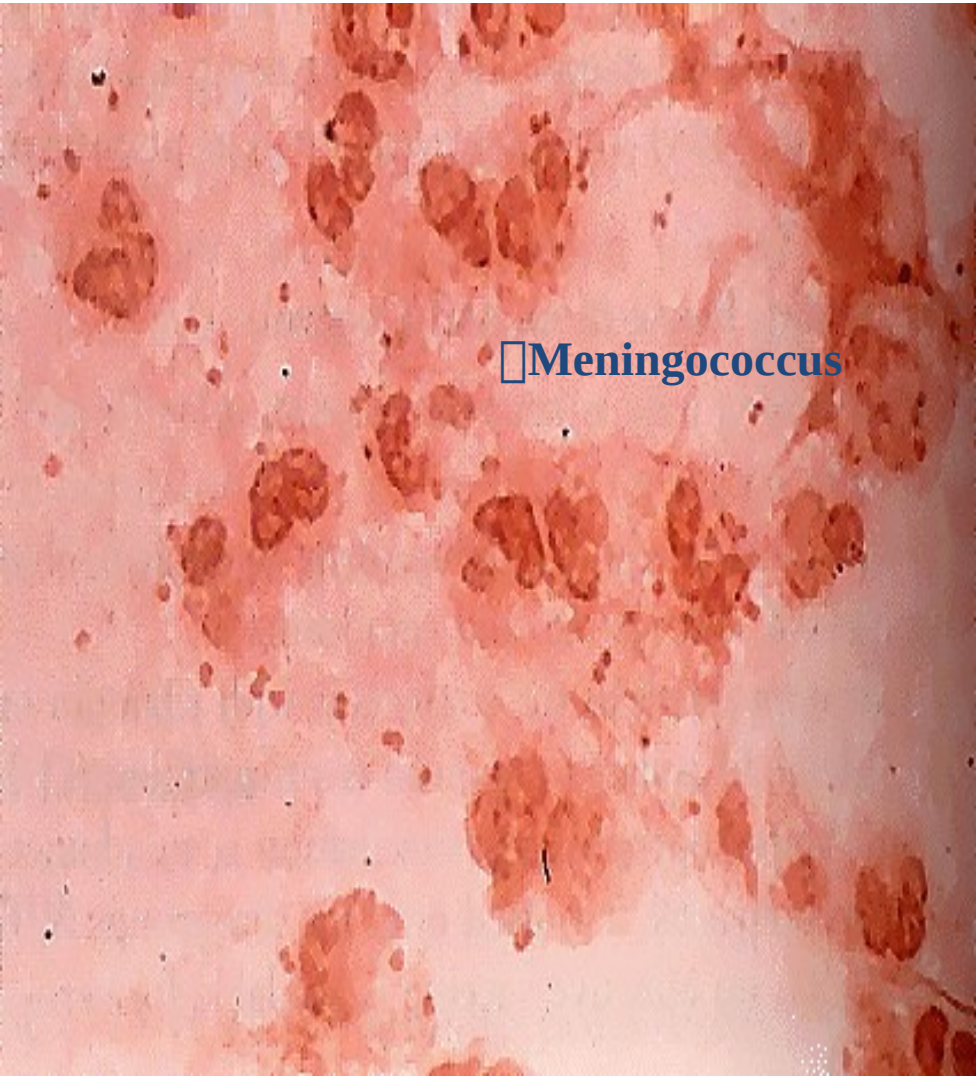
❖**.8 µm in diameter (.8-1)**

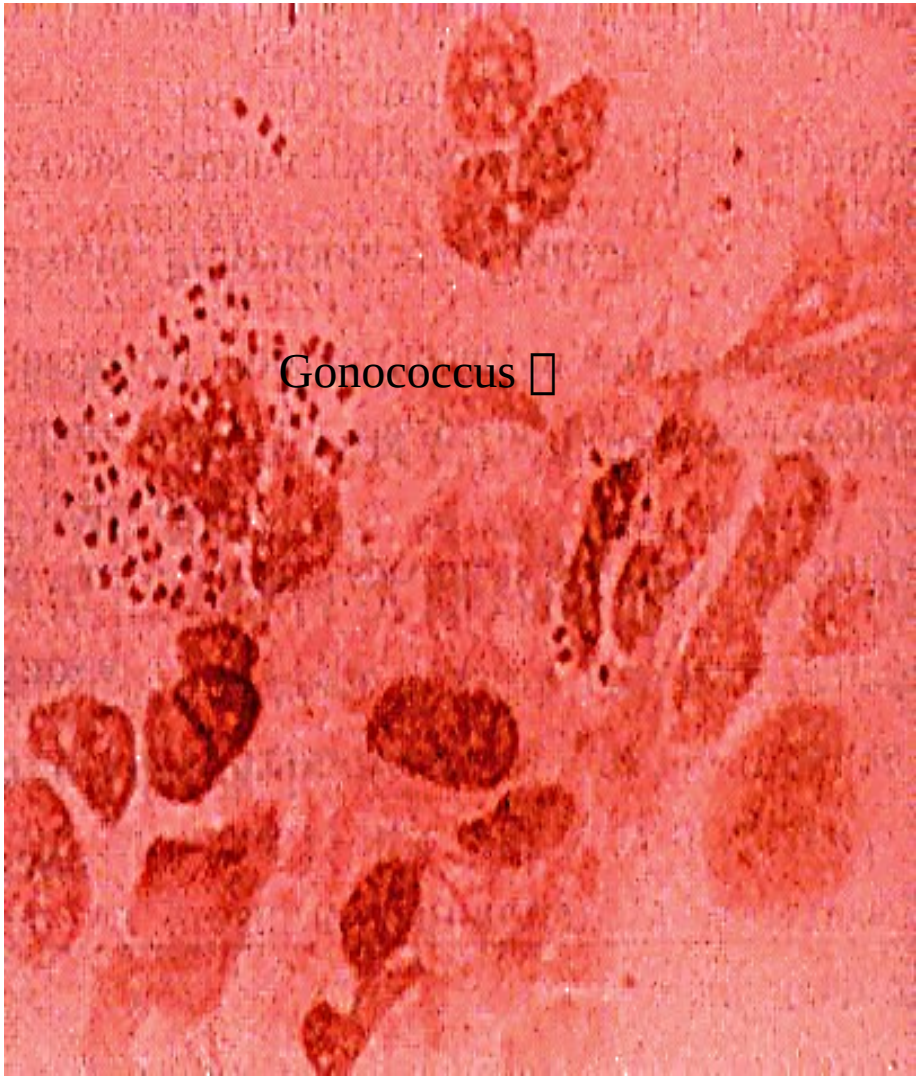
❖**Kidney shaped (bean)**

❖**Flat/ concave sides adjacent**

- **Pathogenic species found within polymorphs mostly.**
- **Non-pathogenic outside**
- **Non motile**

- **Fimbriated**
- **Non sporing**
- **Meningococcus capsulated**
- **Gonococcus non capsulated**


Meningococcus


Gonococcus

Culture:

- **Strict aerobe**
- **Growth improved in 5-10% Co_2**
- **Optimum temp 37 C^o PH 7.4—7.6**
- **Moisture improves growth**
- **No growth on ordinary media**

- **Enriched media required**
- **Blood, serum, tissue fluids**
- **Chocolate agar most suitable medium**
- **Made by heating blood agar to 80 C^{o}**

Selective Media:

- **Mueller- Hinton medium**
- **Modified New York City (MNYC) medium**
- **Modified Thayer – Martin medium**

- **Gonococcus more delicate with exacting requirements**

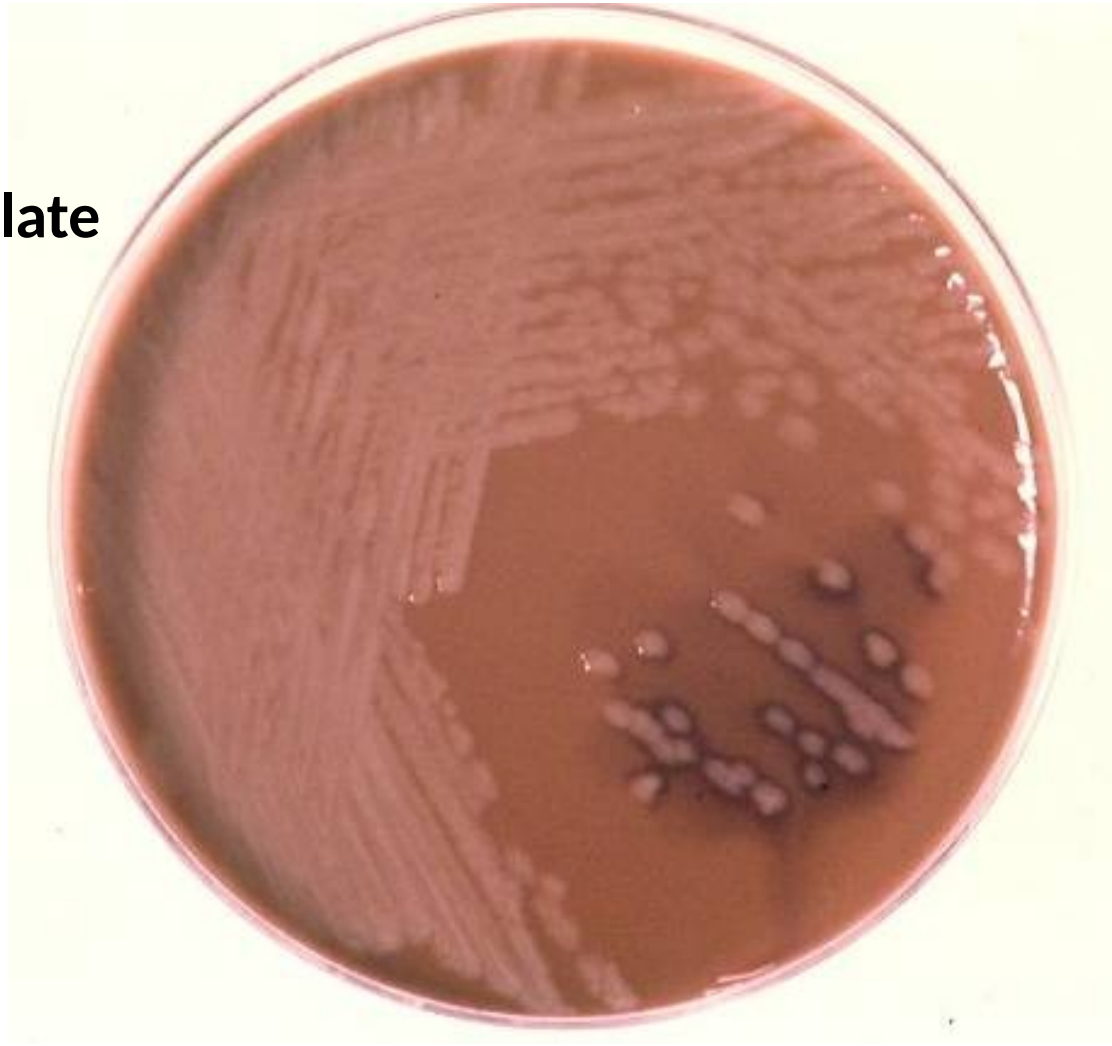
- **Some strains require particular amino acids, bases or vitamins**

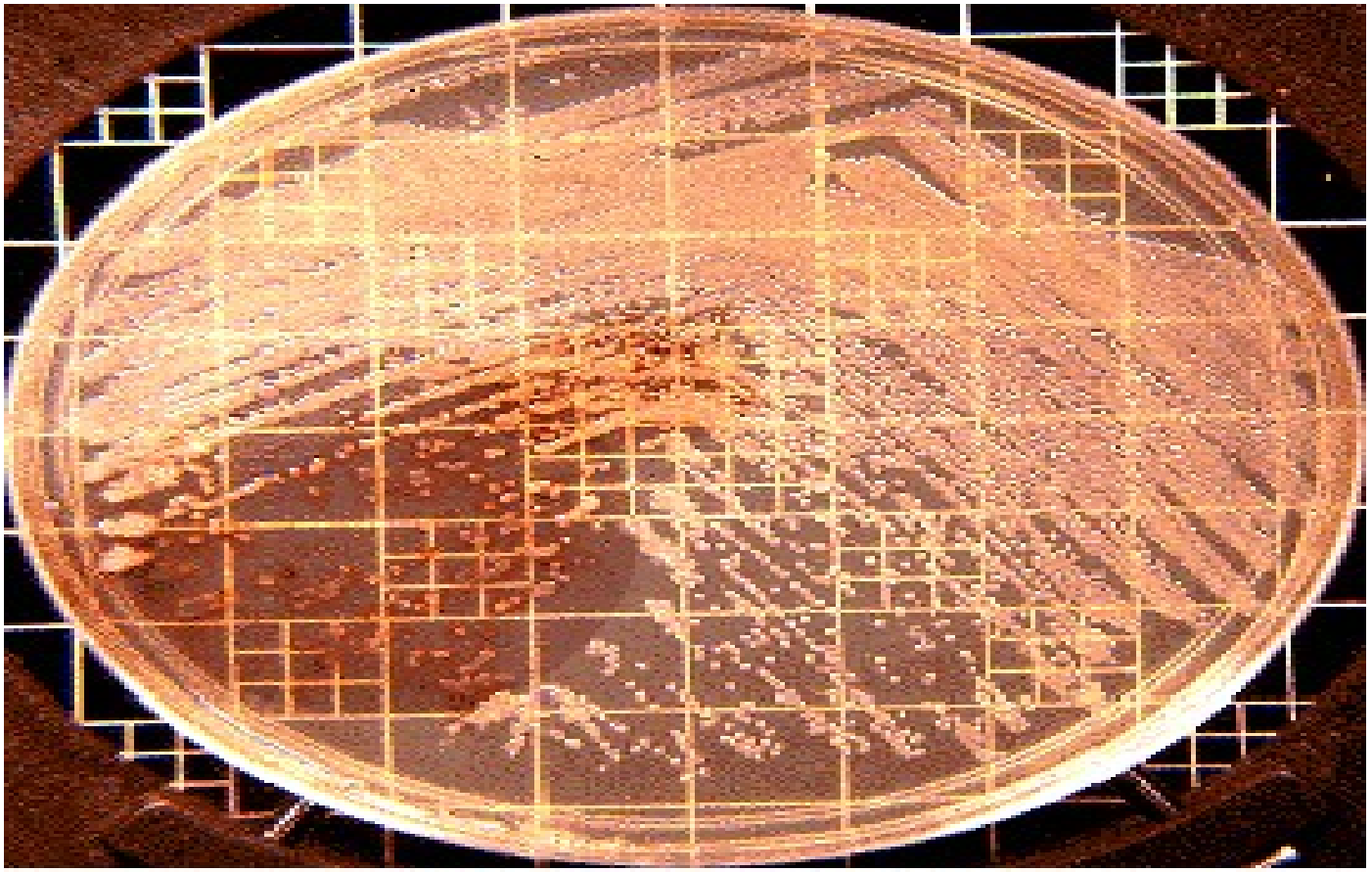
- **In 48 hrs colonies Round, convex, grayish white, glistening, raised, 1—2 mm in diameter of Meningococcus**

- **Smaller 0.5—1mm of Gonococci**

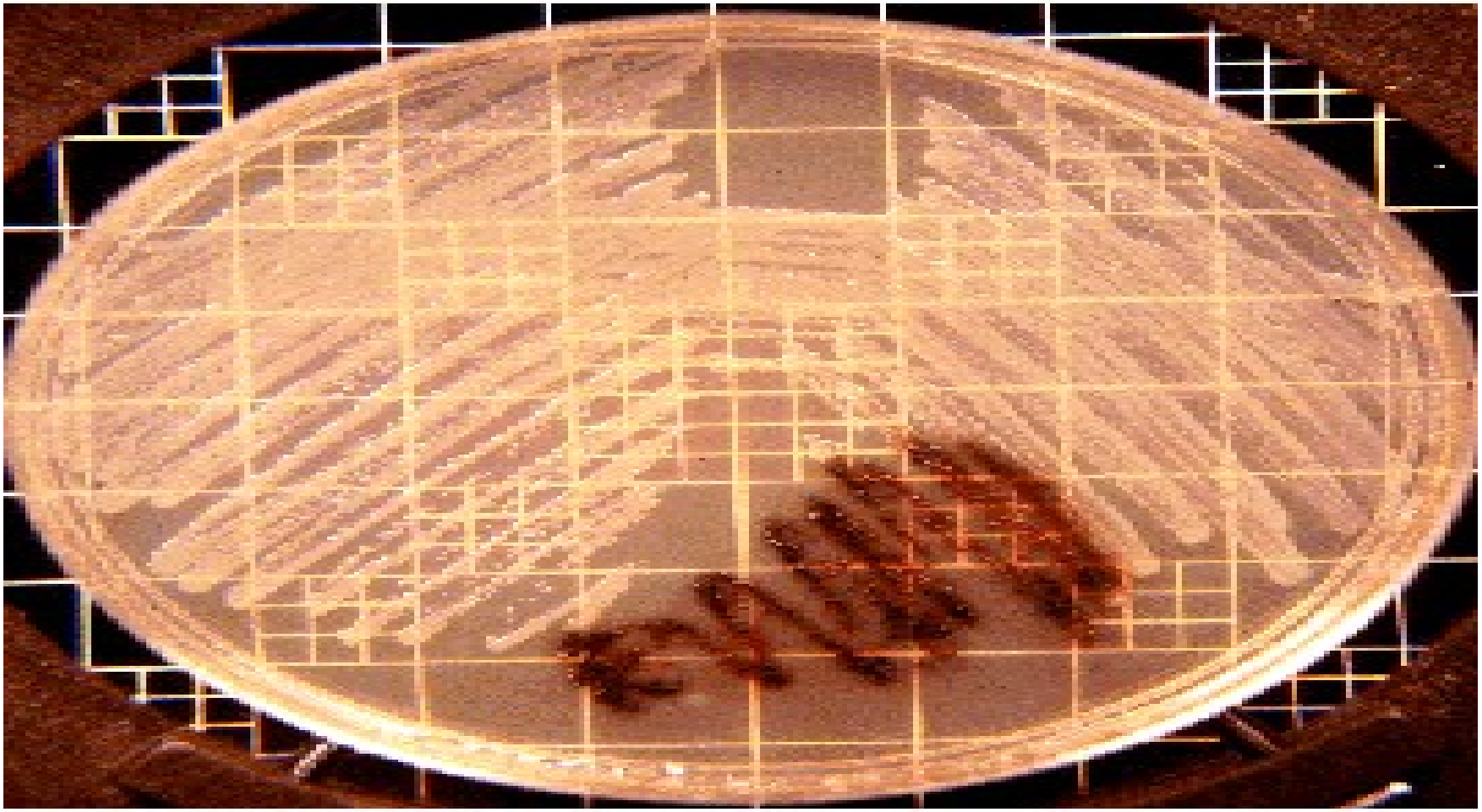
- **Non pathogenic opaque, brittle & wrinkled colonies, some pigmented**

Meningococcus – chocolate agar





Neisseria meningitidis
NewYork City (NYC) agar,(antibiotics+) /CO2



Neisseria gonorrhoeae, oxidase+
New York City (NYC) agar,(antibiotics+)/CO2

Biochemical Reactions

- **Oxidase +ve (strong)**
- **Catalase +ve**
- **Lactose –ve**
- **Surose –ve**

- **Glucose +ve**
- **Maltose +ve (Meningococcus)**
- **Maltose –ve (Gonococcus)**


VWR
GLUCOSE
Maltose
SUCROSE

Viability

- **Delicate**
- **Die quickly by drying**
- **Moist heat at 55 C^{o} kills in less than 5 min**
- **Very sensitive to usual antiseptics**

Antigenic Structure Gonococci

- **Pili (fimbriae) Helps in adherence to host cells**

Outer membrane proteins include

1. Porin protein - Por (protein I) form pores for entry and exit of small molecules

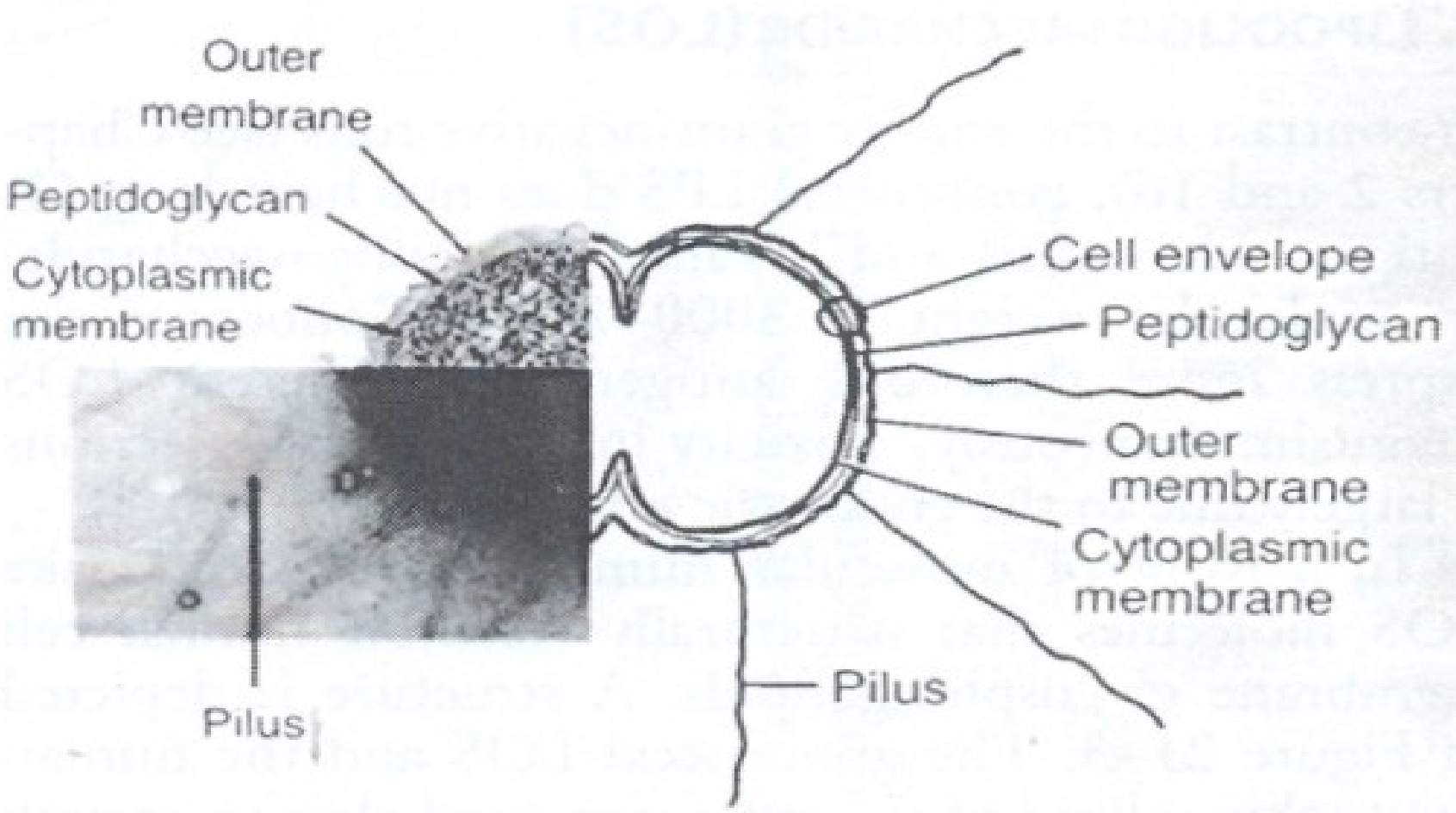
2. Opacity protein- Opa (protein II)helps in adhesion to host cekk.

. Reduction modifiable protein – Rmp
(Protein III) forms pores

- Lipooligosaccharide (LOS) contains lipid A and core polysaccharide without repeat units, acts as endotoxin
- Ig A Protease This enzyme destroys IgA the local antibody

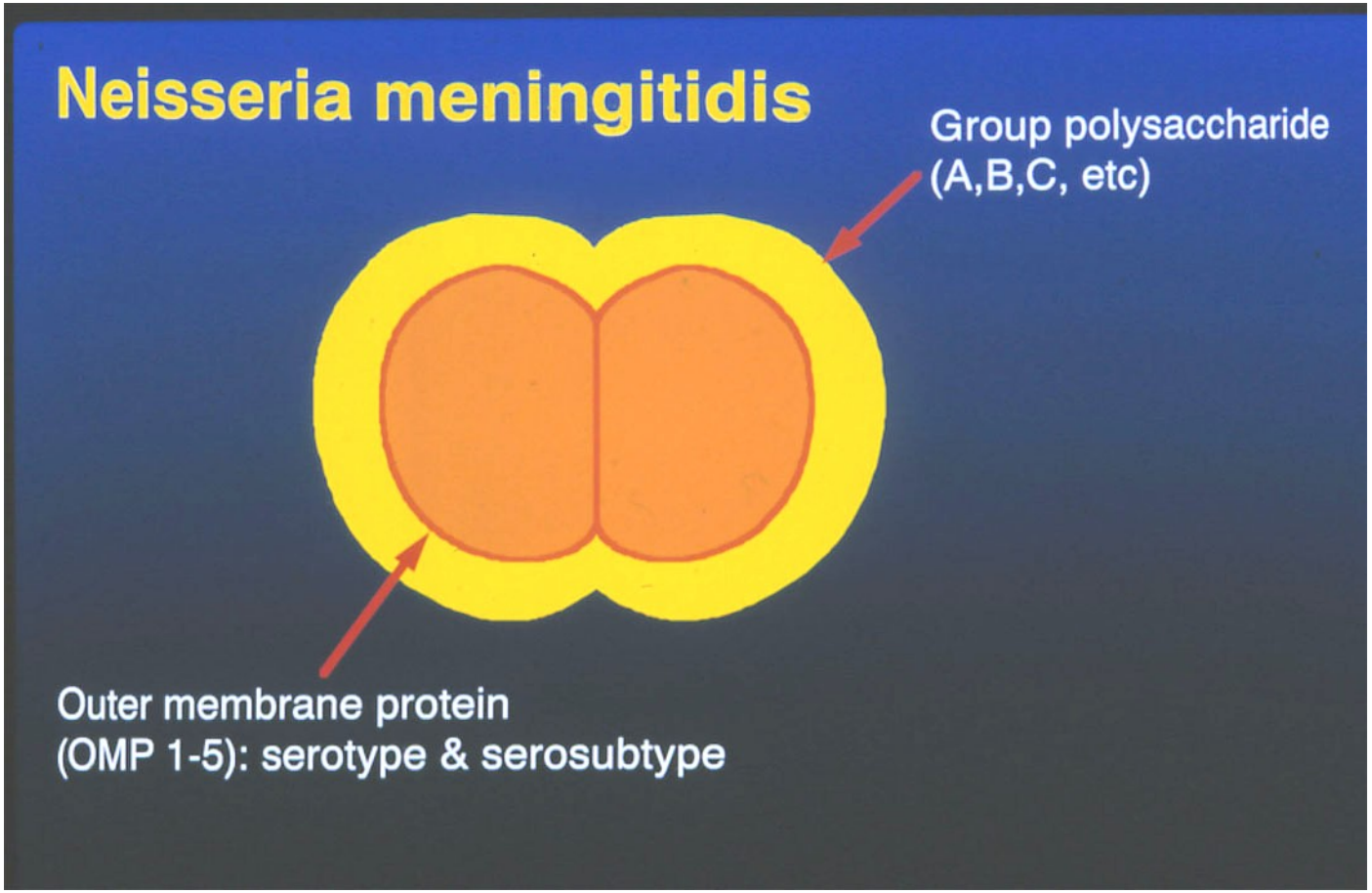
- **<u>Antigenically heterogeneous</u>**

Gonococcus is heterogeneous antigenically to avoid host defenses. It is capable to change its surface antigens (fimbriae, Opa & LOS) by frequently switching from one antigenic form to other. This is done by gene rearrangement


Outer
membrane
Peptidoglycan
Cytoplasmic
membrane
Pilus
Cell envelope
Peptidoglycan
Outer
membrane
Cytoplasmic
membrane
Pilus

Meningococci

- **Capsular poly saccharide (13 groups)**
- **Outer membrane proteins like gonococci**
- **Ig A protease**
- **Lipopolysaccharide (LPS)**



Cell wall structure – Meningococcus

Diseases By Gonococci

- **Gonorrhoea**

A. In males

- **Acute urethritis leading to**

1. **Epididymitis**

2. **Epididymo-orchitis**

3. Prostatitis

4. Periurethral abscess

5. Oropharyngeal infections

6. Rectal infections

- **B. In females:**

Cervicitis leading to

1. Urethritis

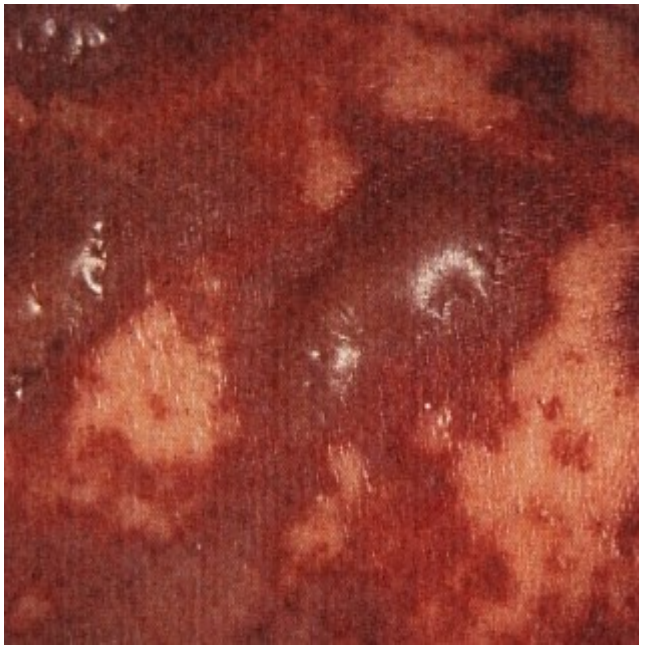
2. Salpingitis

3. Infertility

4.Vulvovaginitis in girls

OPHTHALMIA NEONATORUM

❖Bacteremia leading to
❖ Disseminated gonococcal infection (DGI)

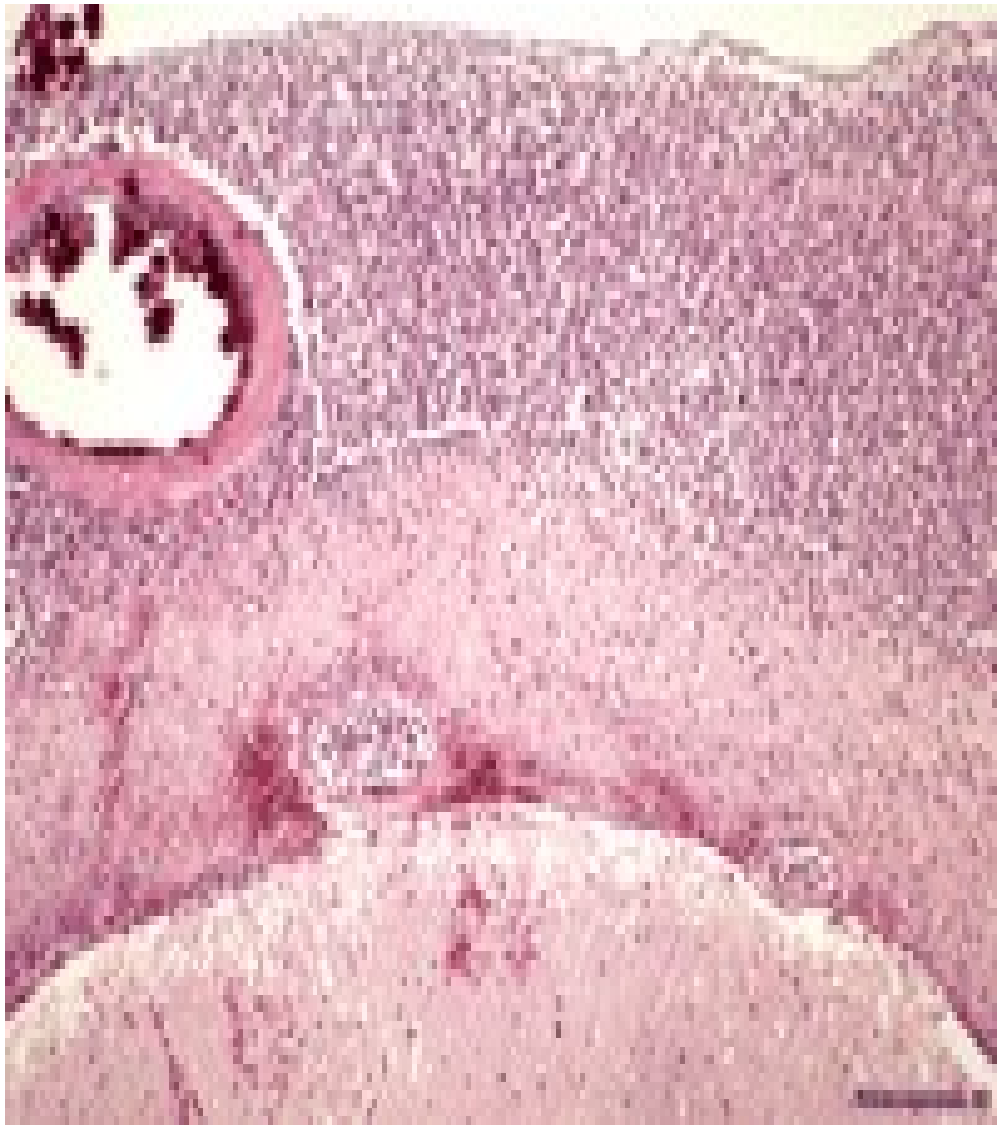


❖Hgic skin lesions

- Tenosynovitis
- Arthritis
- Meningitis
- Endocarditis

Meningococcus

1. **Meningitis (A,B,C,Y,w—135)**



2. Meningococcemia

- Small haemorrhagic skin lesions called ‘petechiae’ appearing on trunk and extremities

- These may coalesce and form areas of cutaneous hemorrhagic necrosis

Petechial haemorrhages

3. Fulminent meningococcemia
(Waterhouse- Friderichsen Syndrome)

- **Acute haemorrhage and necrosis of adrenal glands**
- **Fever, extensive rash, adrenal insufficiency, shock and death**

4. Osteomyelitis

5. Arthritis

6. Pericarditis

7. Endophthalmitis

Diagnosis: (Meningococcus)

Specimens:

CSF for

- **Microscopy**
- **Chemistry**
- **Culture.**
- **Blood for culture**

- **Aspirate from skin lesion for microscopy & culture**
- **Pus from infected joint for culture**
- **Throat/ nasopharyngeal swabs for carriers**

Culture

- Moist, Co_2 enriched incubation
- Chocolate agar
- Modified Thayer Martin
- Mueller Hinton
- Modified New York city

Biochemical Reactions

Glucose +ve

Oxidase +ve

Maltose +ve

Serology

- Antigen detection in CSF
- Serotying of isolate

Diagnosis (Gonococci)

- **Specimens:**

❖ **Urethral swab**

❖ **Cervical swab**

❖ **Rectal Swab**

❖ **Eye swab**

❖ **Throat swab when required**

For Microscopy & Culture

In DG1

- Blood
- Swab of skin lesions
- Aspirate of joint

Culture:

- Direct inoculation
- Amies transport medium
- Selective media (MNYC)
- Oxidase + ve
- Glucose + ve
- Maltose - ve

Serology:

- Direct FAT on colonies
- Co-agglutination
- PCR
- ELISA
- DNA Probe