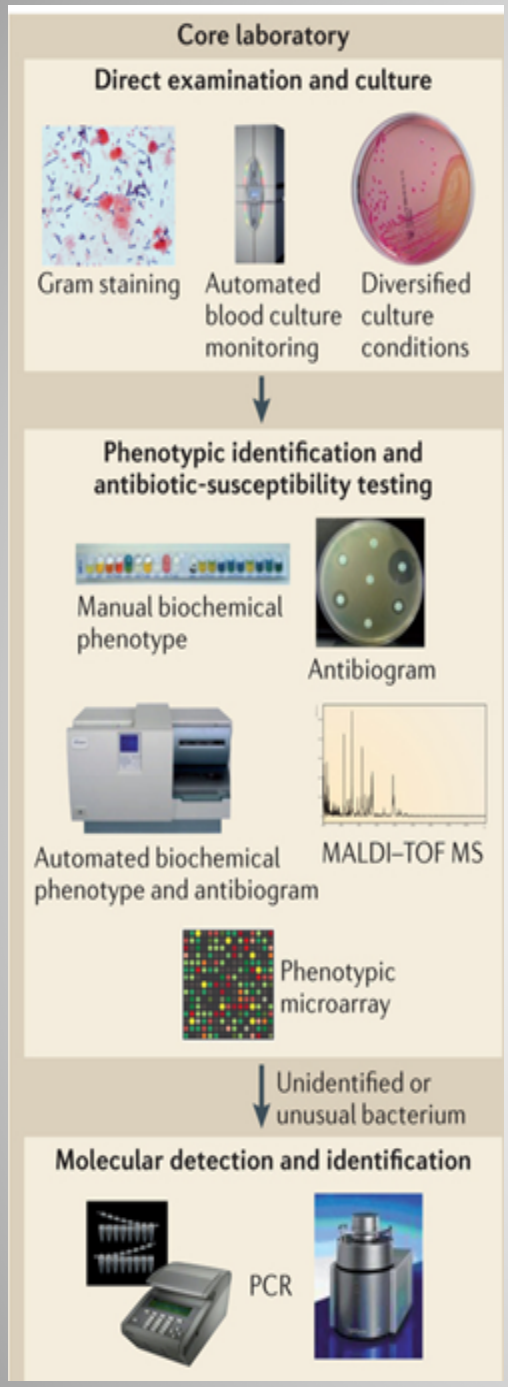
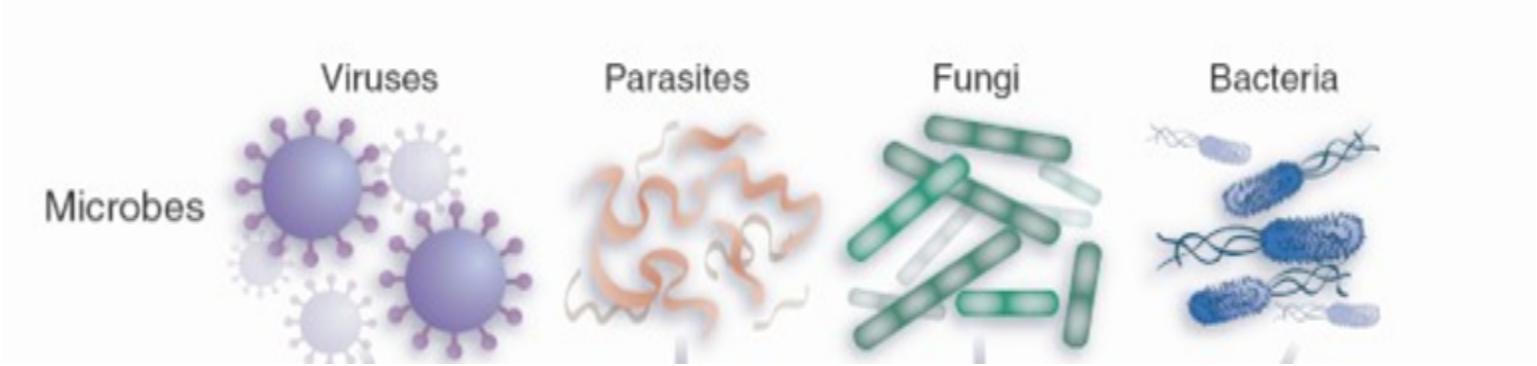


MICROBIOLOGY PRACTICAL CLASS

FOUNDATION BLOCK (2019)

Dr . Malak M. El-Hazmi

MICROBIOLOGY



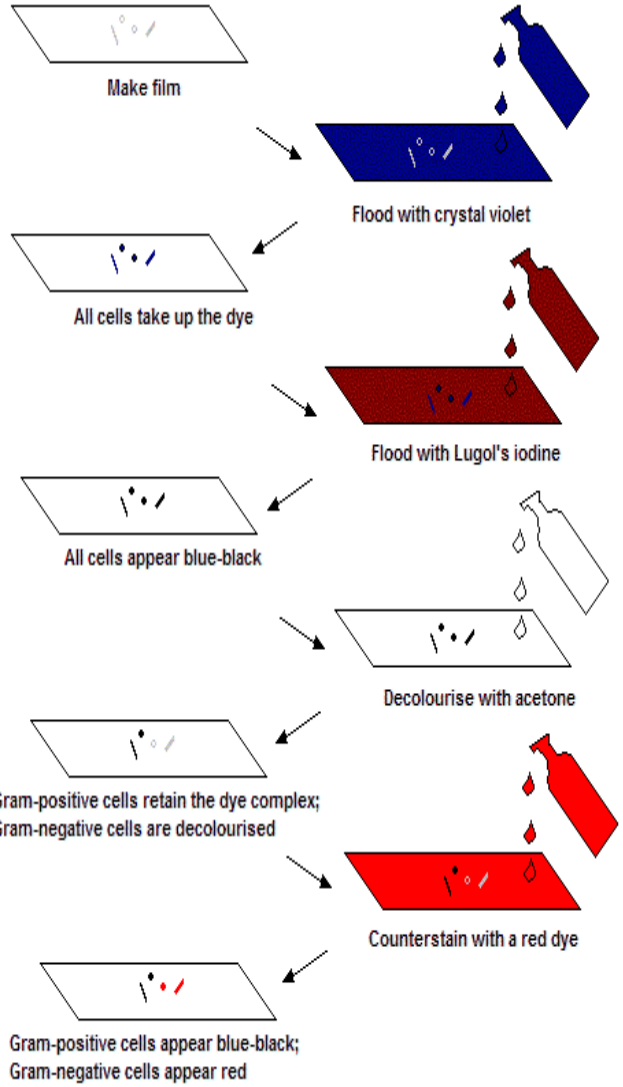
Laboratory diagnosis of infections . ID

- Microscopic examination.
- culture.
- Serological tests (Ab).
- Detection of Ag.
- Molecular method .

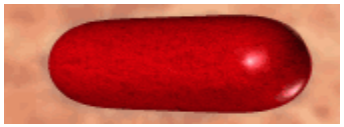
Types of specimens

BACTERIOLOGY

GRAM STAIN



G+ bacilli

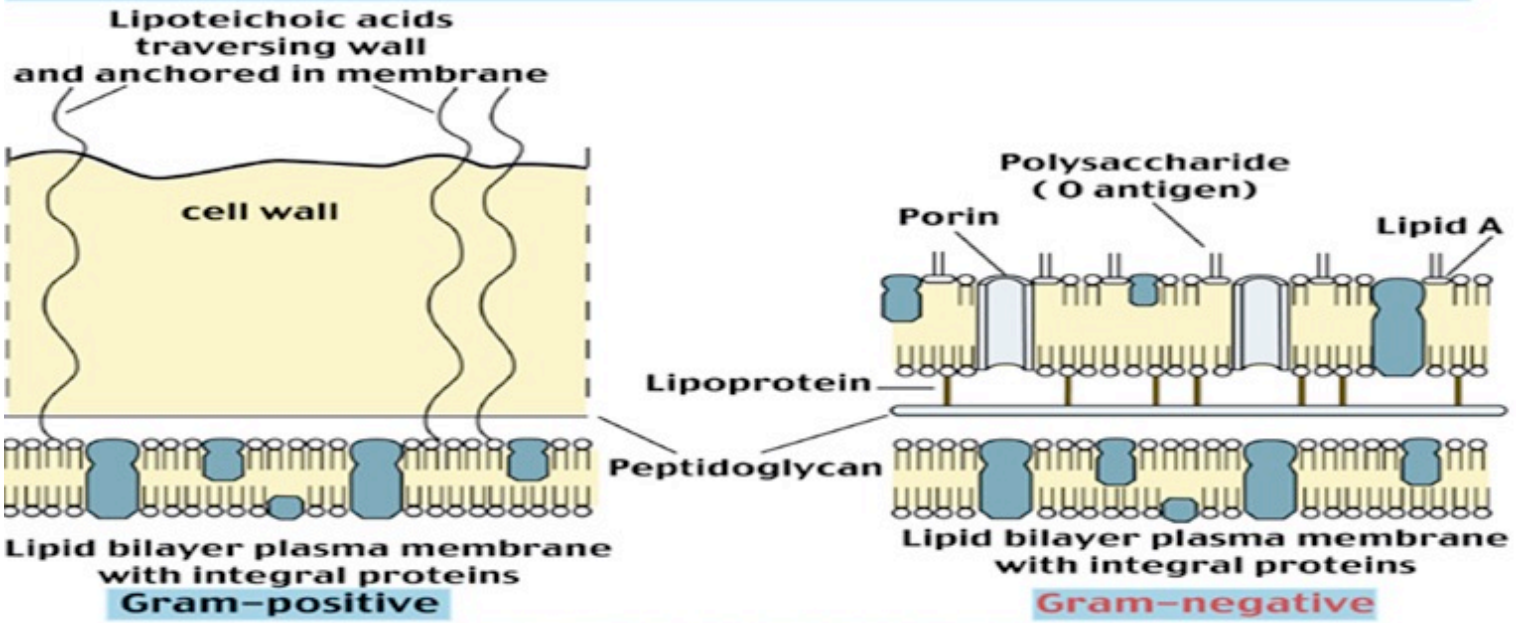


G- bacilli

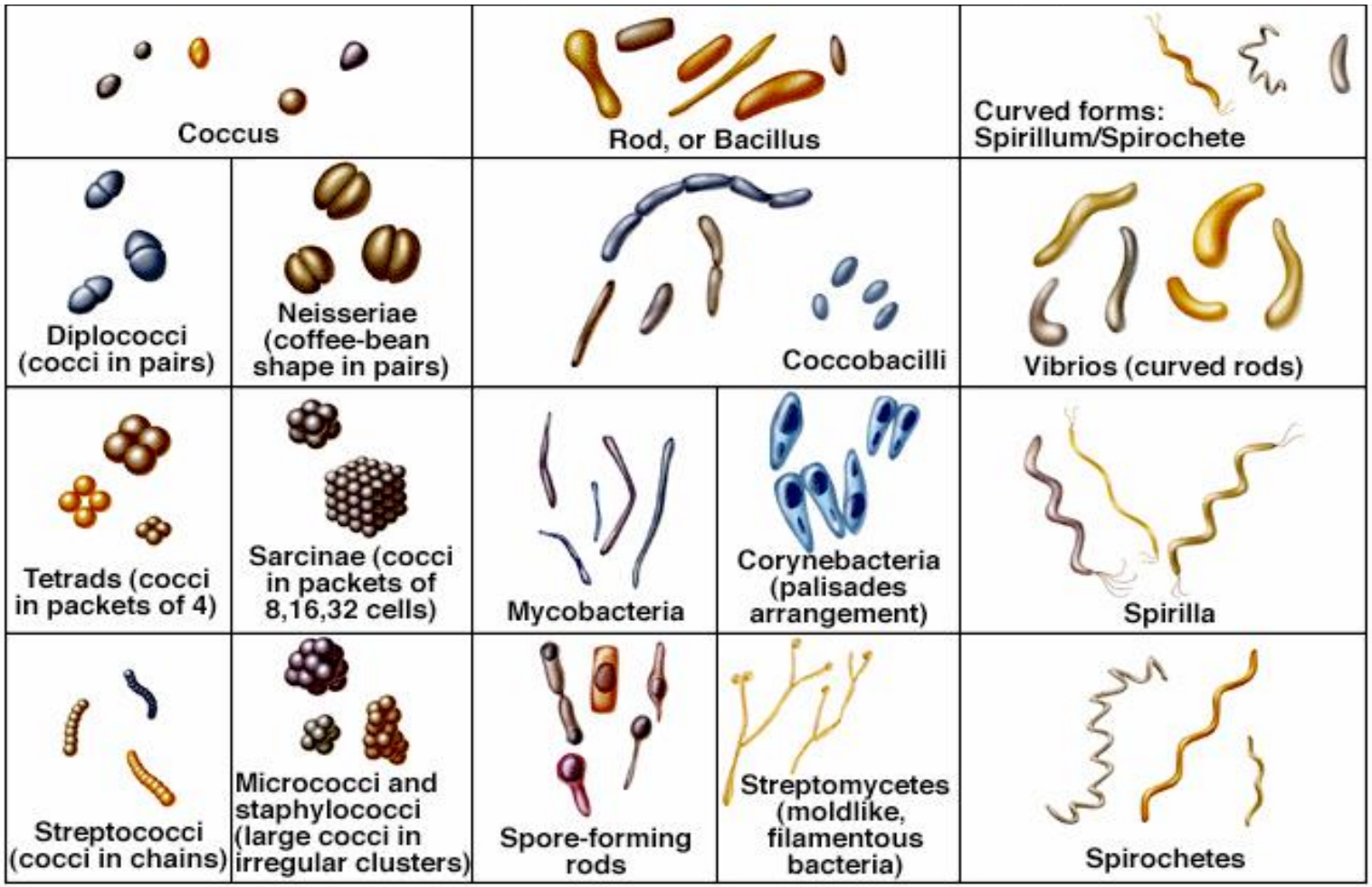
G+ cocci

G- cocci

BACTERIAL CELL WALL

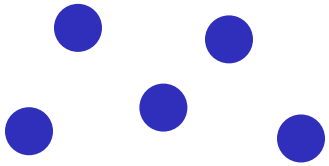


BACTERIAL SHAPES AND ARRANGEMENTS



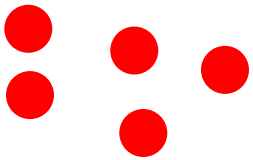
GRAM STAIN

Gram-positive cocci

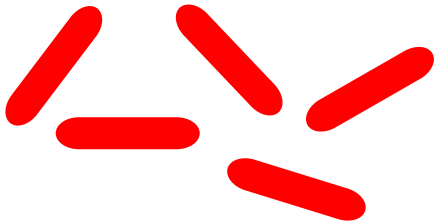


Gram-positive bacilli

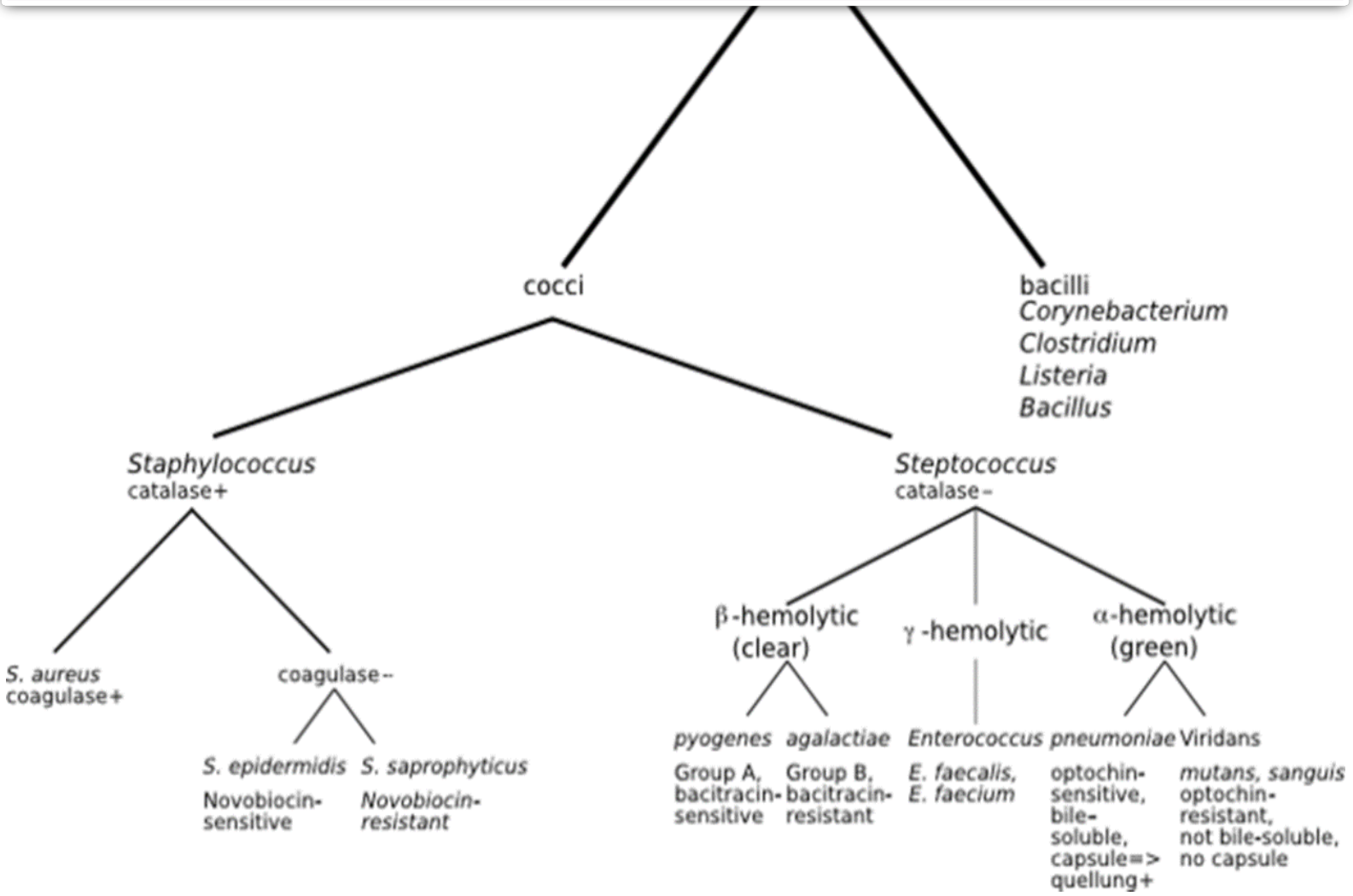
Gram-negative cocci



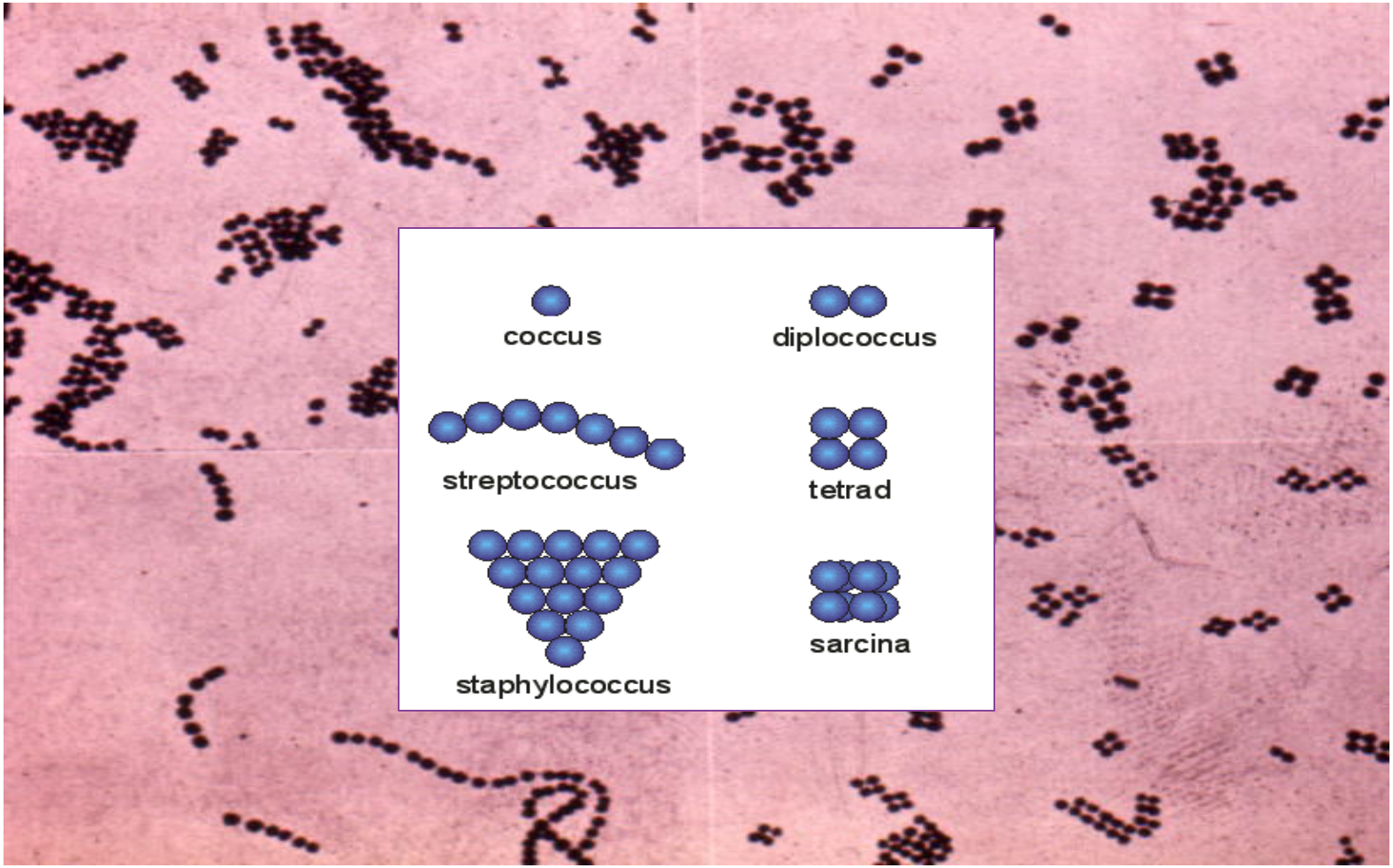
Gram-negative bacilli



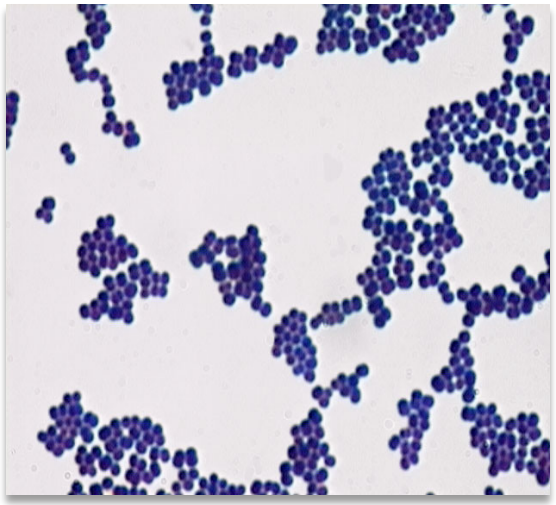
GRAM POSITIVE BACTERIA



GRAM POSITIVE COCCI



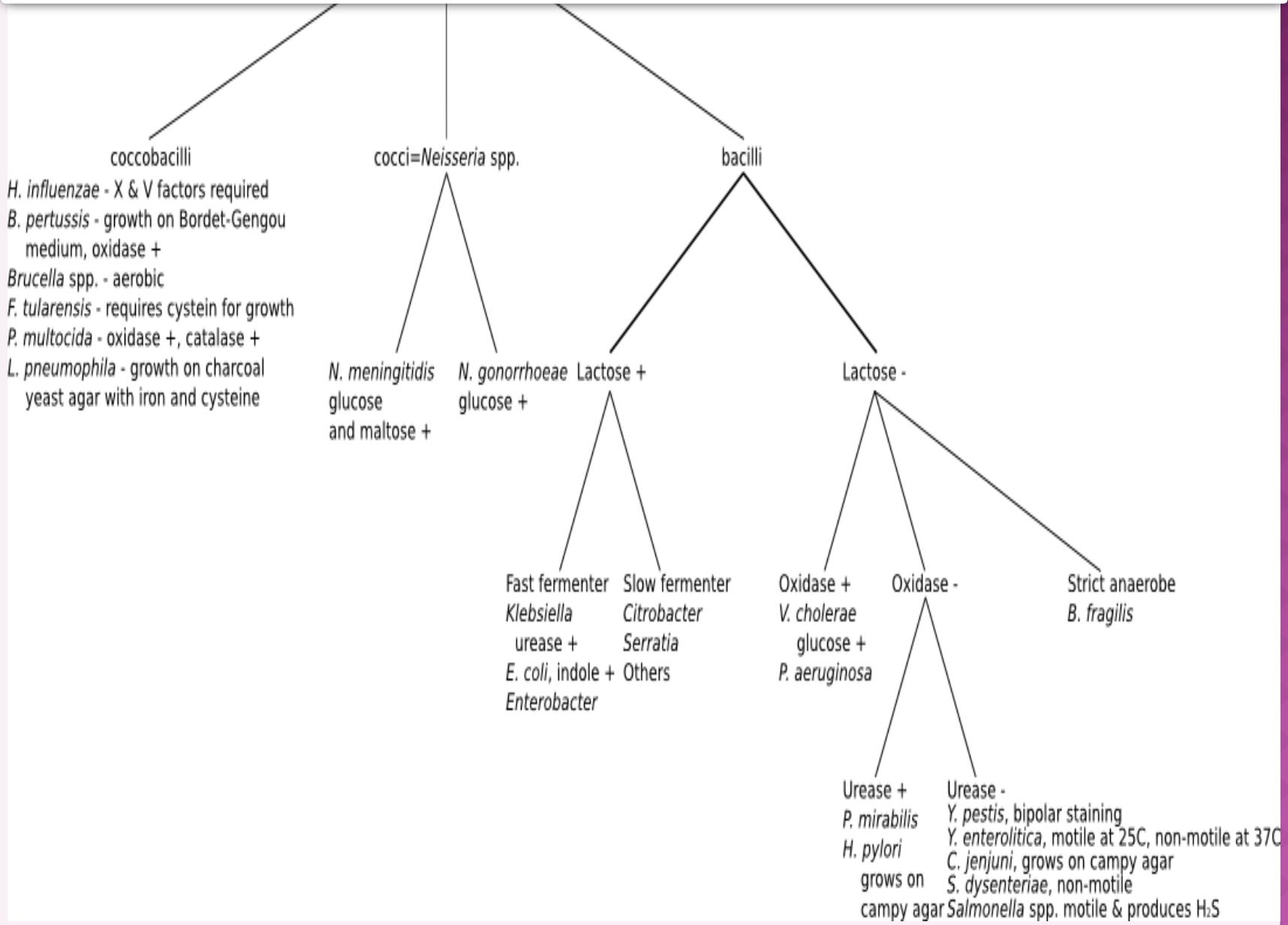
GRAM POSITIVE COCCI



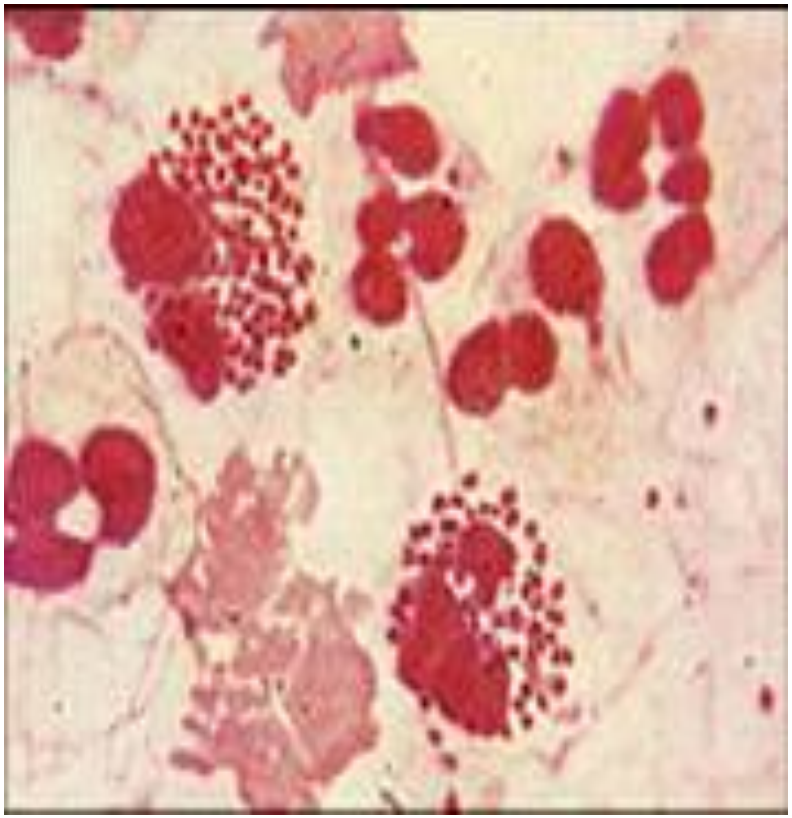
Gram positive cocci
in clusters
Staphylococcus

Gram positive cocci
in chain
Streptococcus

GRAM NEGATIVE BACTERIA



GRAM NEGATIVE BACTERIA



Gram negative cocci

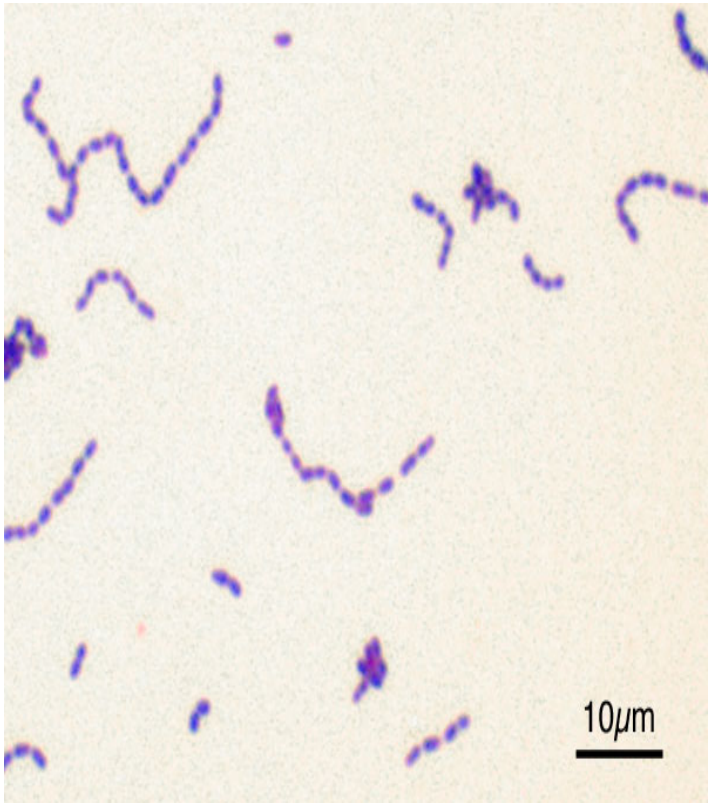
(Diplococci)

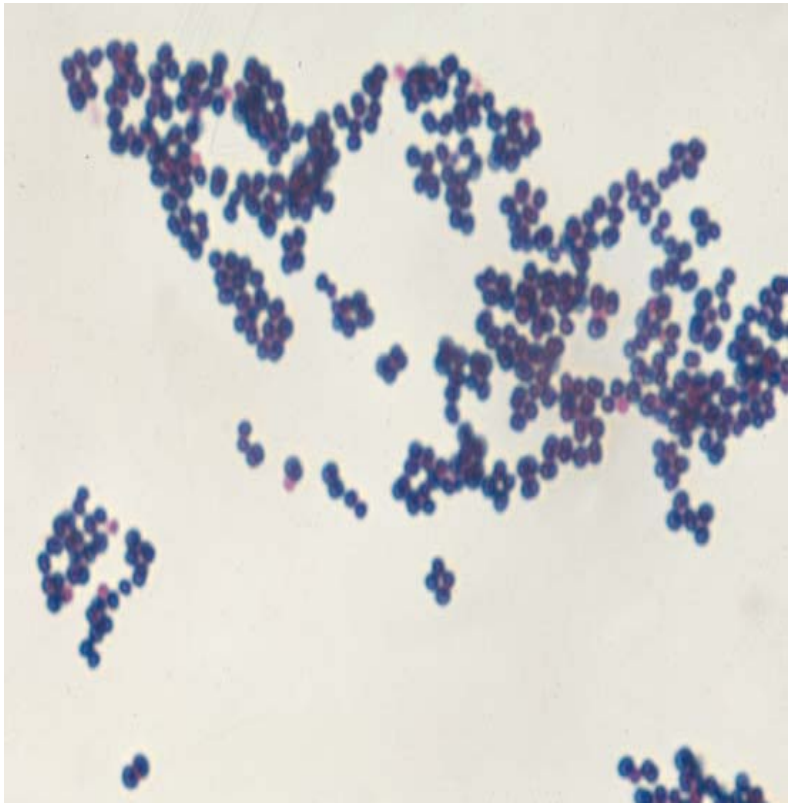
e.g Neisseria

Gram negative bacilli

e.g E. coli

Salmonella





Gram positive cocci in chain

Streptococci

Gram positive cocci in clusters

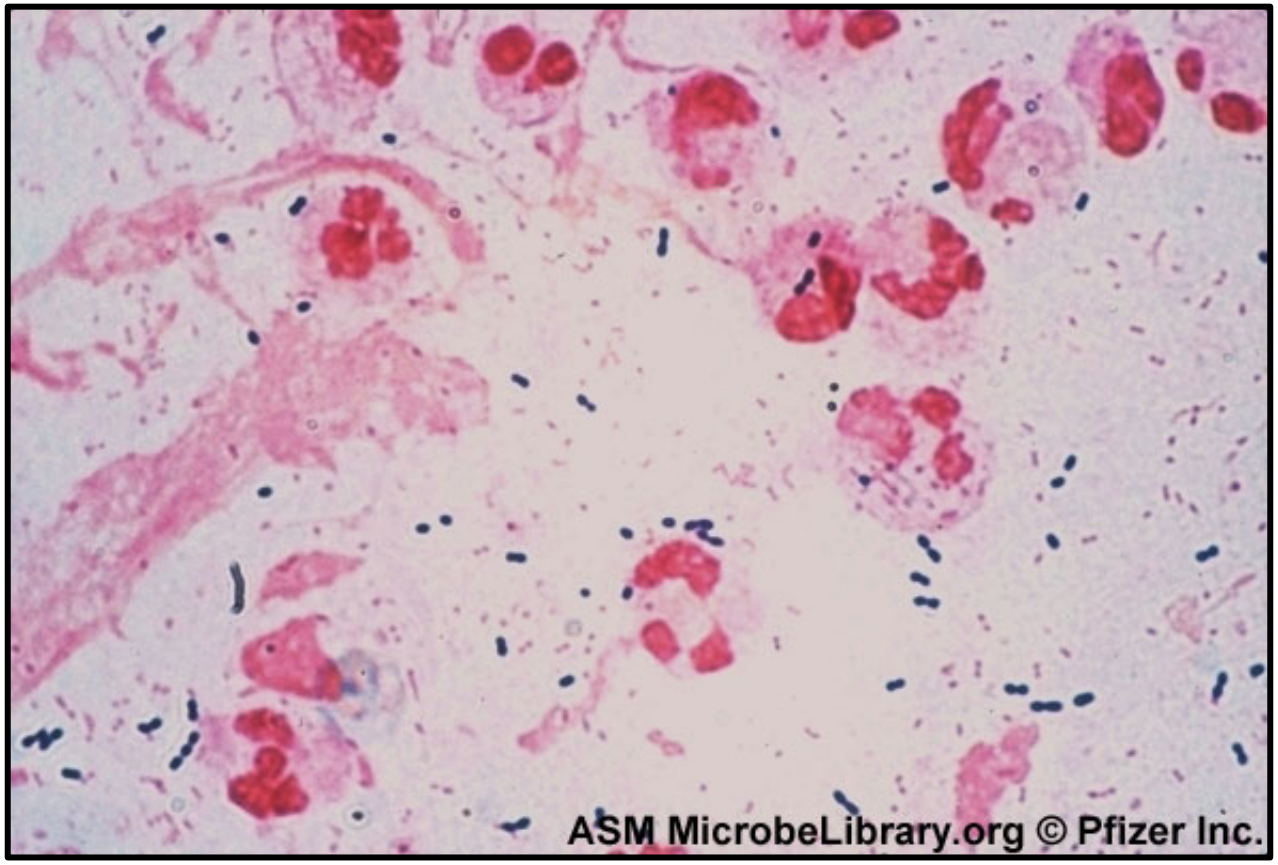
Staphylococci

Rx

Penicillin
Cephalosporin

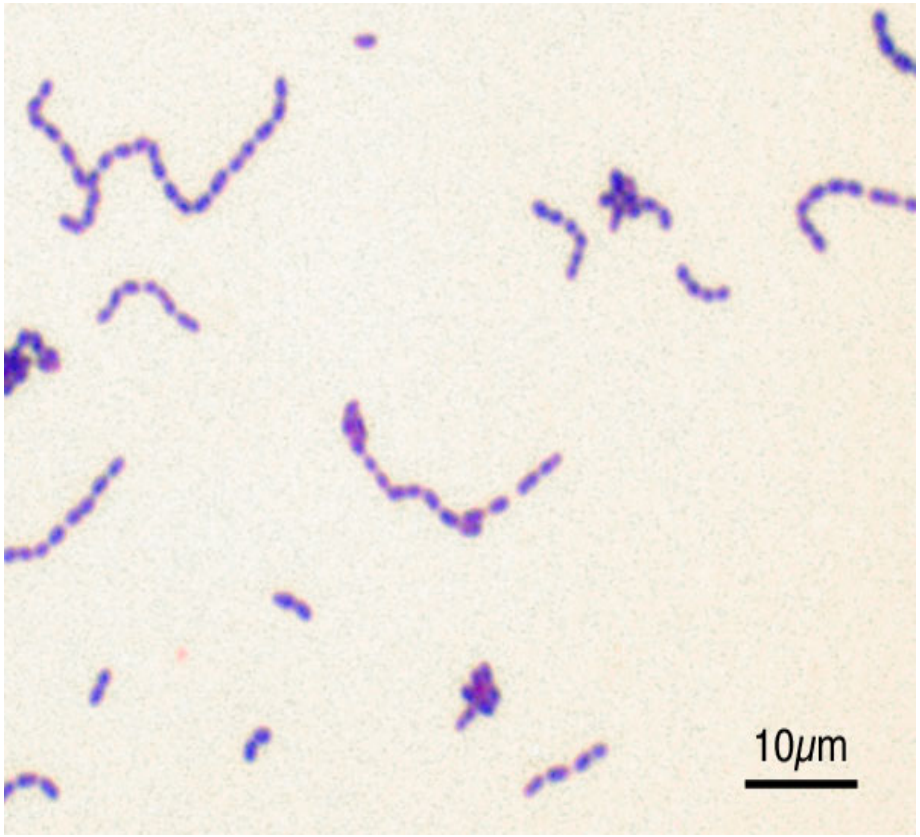
cloxacillin
Cephalosporin
if MRSA ⟶ vancomycin

A gram-stained smear of a CSF sample from a 3 year old child seen in the emergency department presenting with fever and neck stiffness.



Gram-positive diplococci & pus cells

Streptococcus pneumoniae

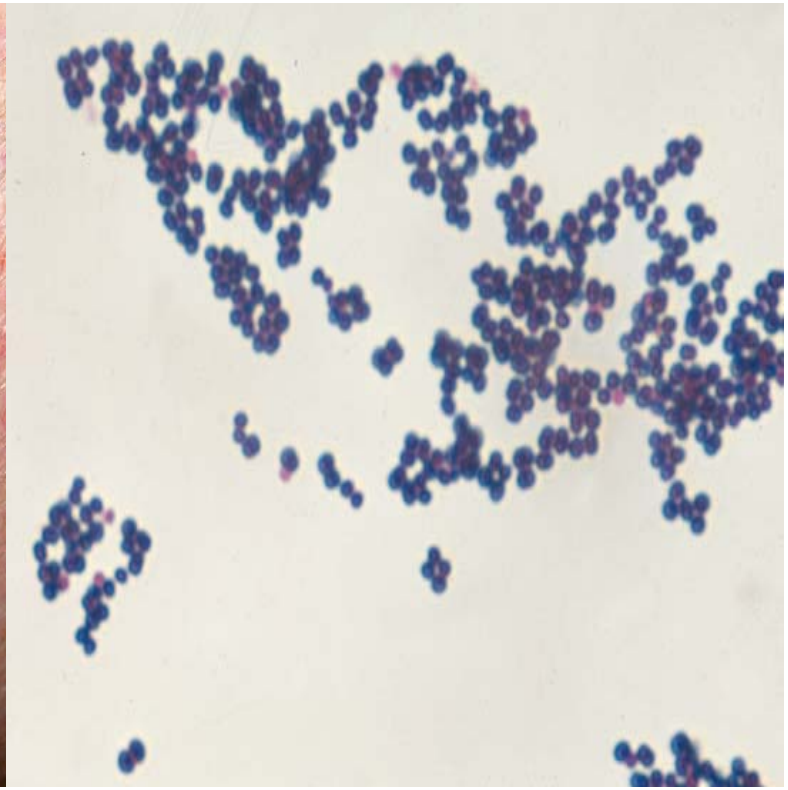


This is a bacterium isolated from a child with sore throat and tonsillitis .

A: Describe the Gram stain — Gram positive

B: Describe the shape and arrangement of the bacteria — Cocci in chains

Following is the Gram stained smear of an organism isolated from a wound infection.



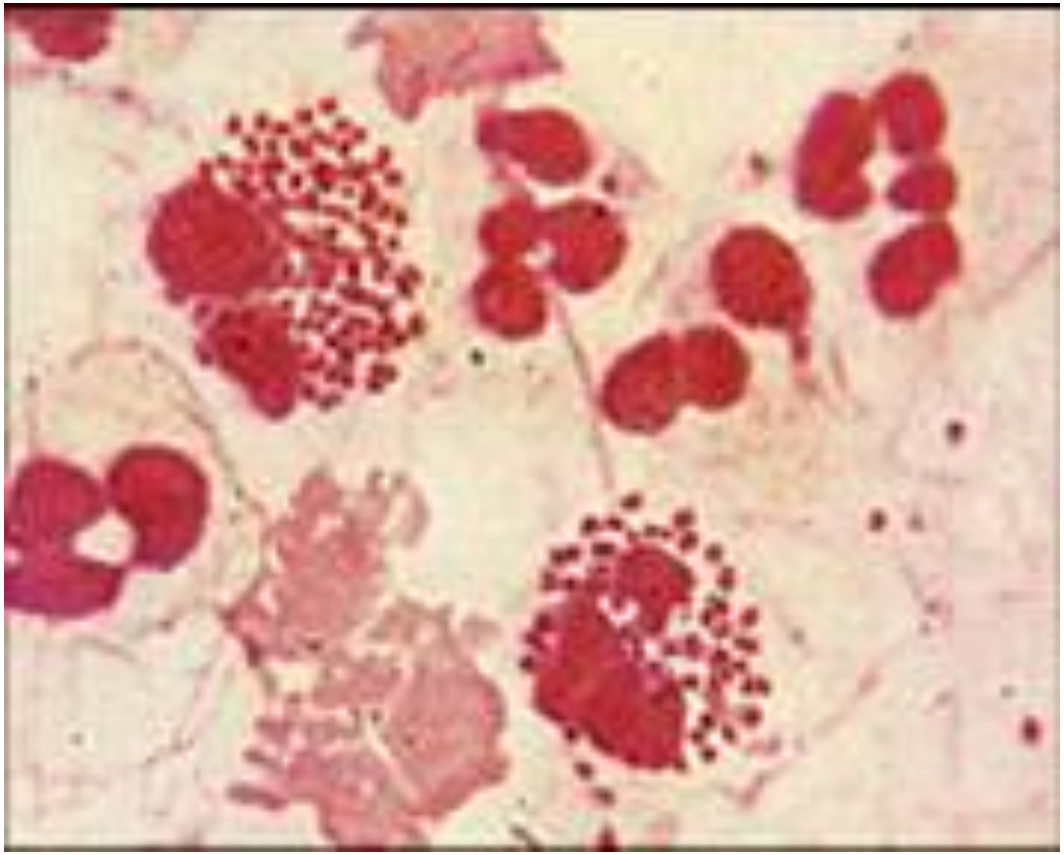
Describe what you see in the slide above.

Gram-positive cocci in clusters

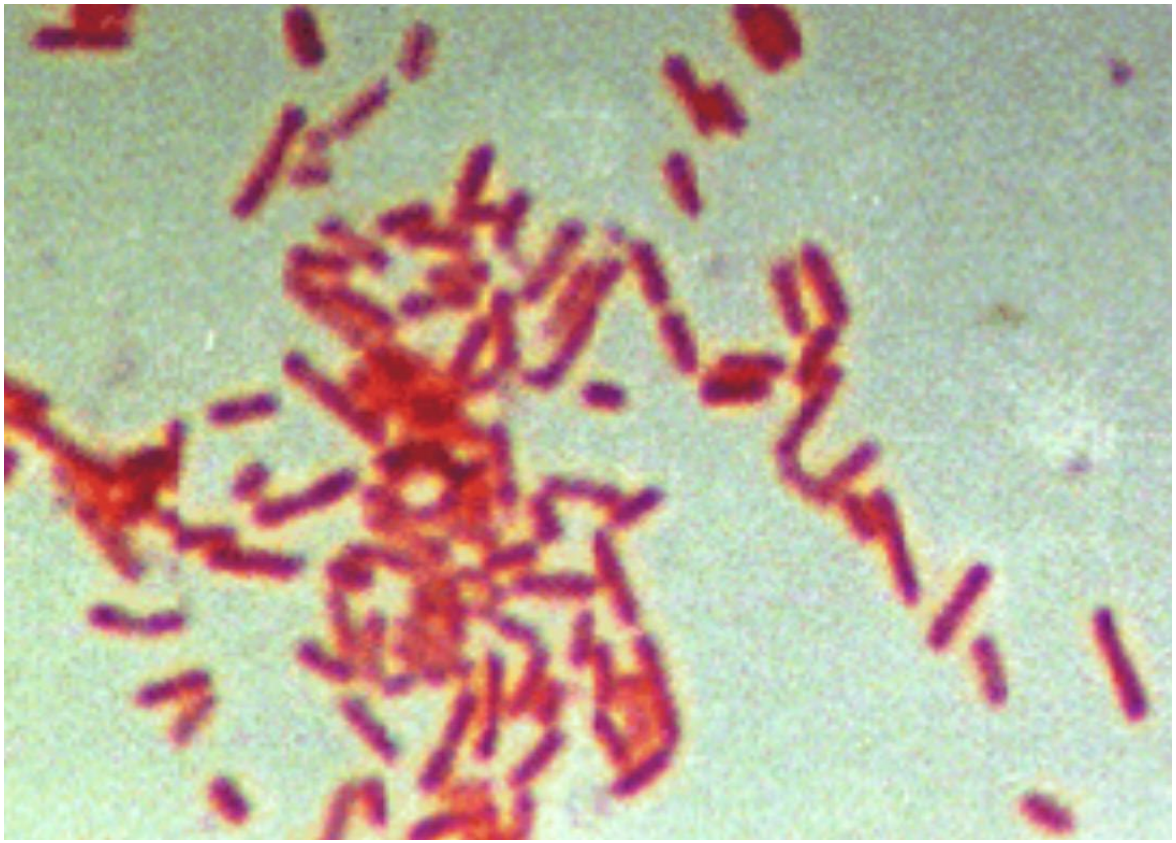
What is the likely organism ?

Staphylococcus aureus

Following is the Gram-stained smear of from urethra of a 25 –year old male complaining of urethral discharge



Describe the Gram stain of the intracellular bacteria	Gram negative
Describe the shape of the bacteria	cocci (diplococci)



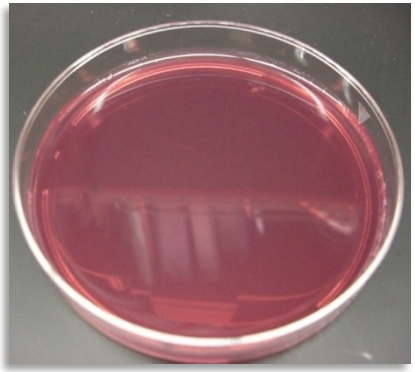
Describe the Gram stain of this organism: Gram negative

Describe its shape **bacilli (rods)**

BACTERIAL CULTURE MEDIA

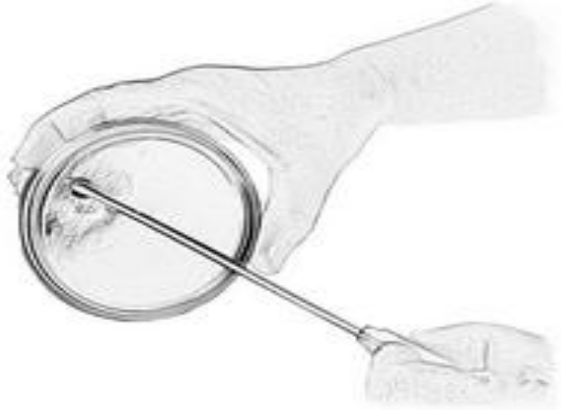
Type of Media	Purpose
Selective	Suppression of unwanted microbes; encouraging desired microbes.
Differential	Differentiation of colonies of desired microbes from others.
Enrichment	Similar to selective media but designed to increase number of desired microbes to detectable levels.

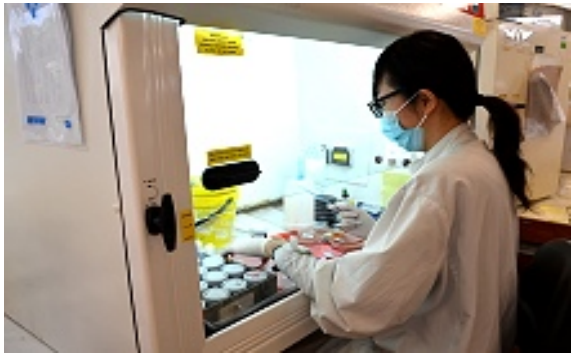
BACTERIAL CULTURE MEDIA

General culture medium (Blood Agar)	Enriched medium (Chocolate Agar)
	
Differential medium (MacConkey Agar)	**Selective medium (Thiosulphate citrate bile salt sucrose TCBS)**
	

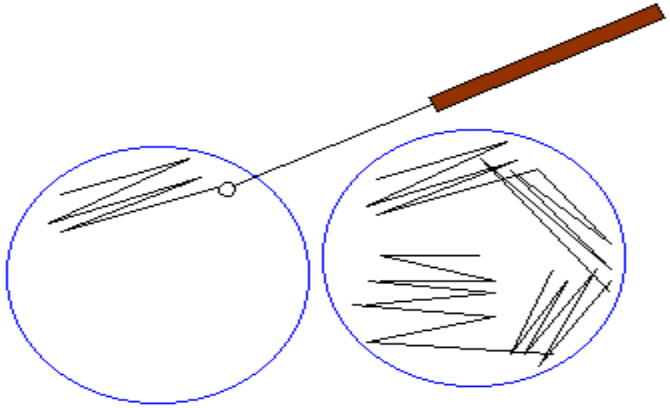
BACTERIA CULTURING

1-INOCULATION



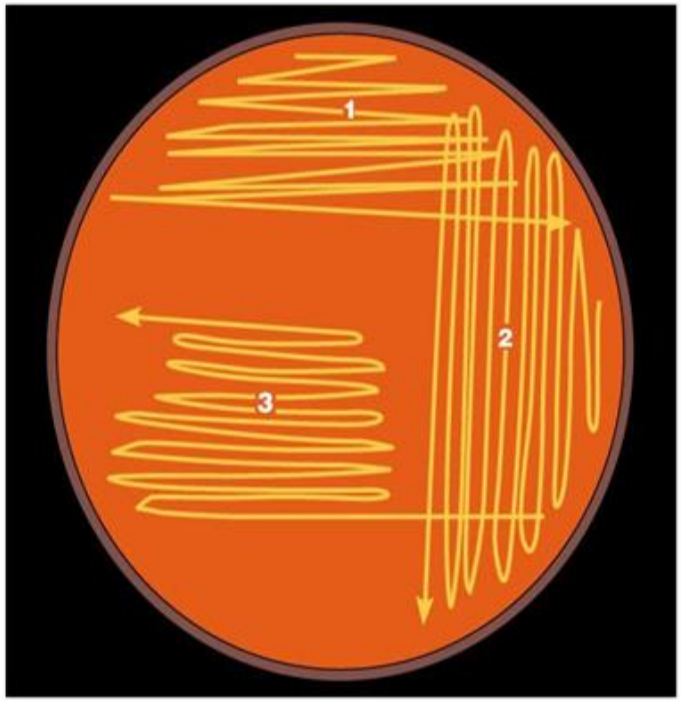


2-STREAKING

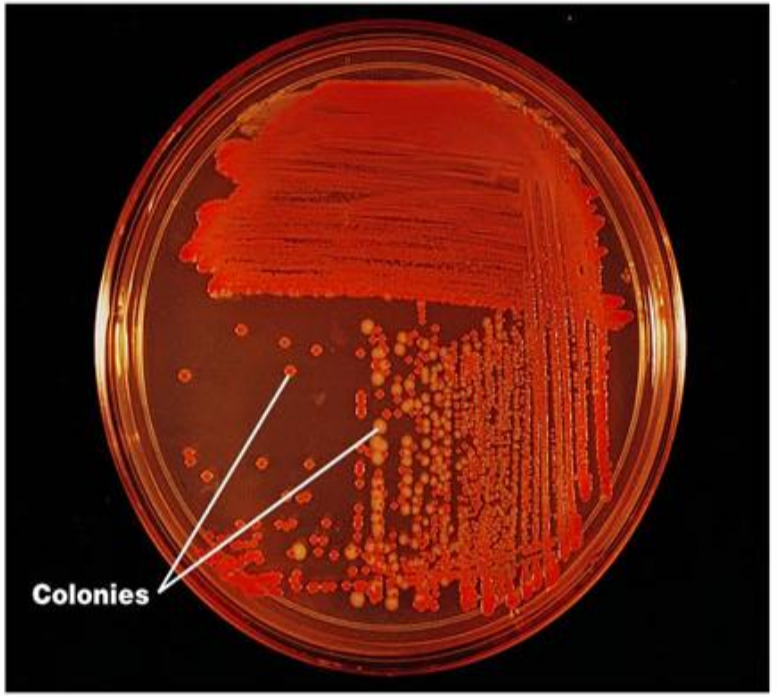


3-INCUBATION

Laboratory Incubator

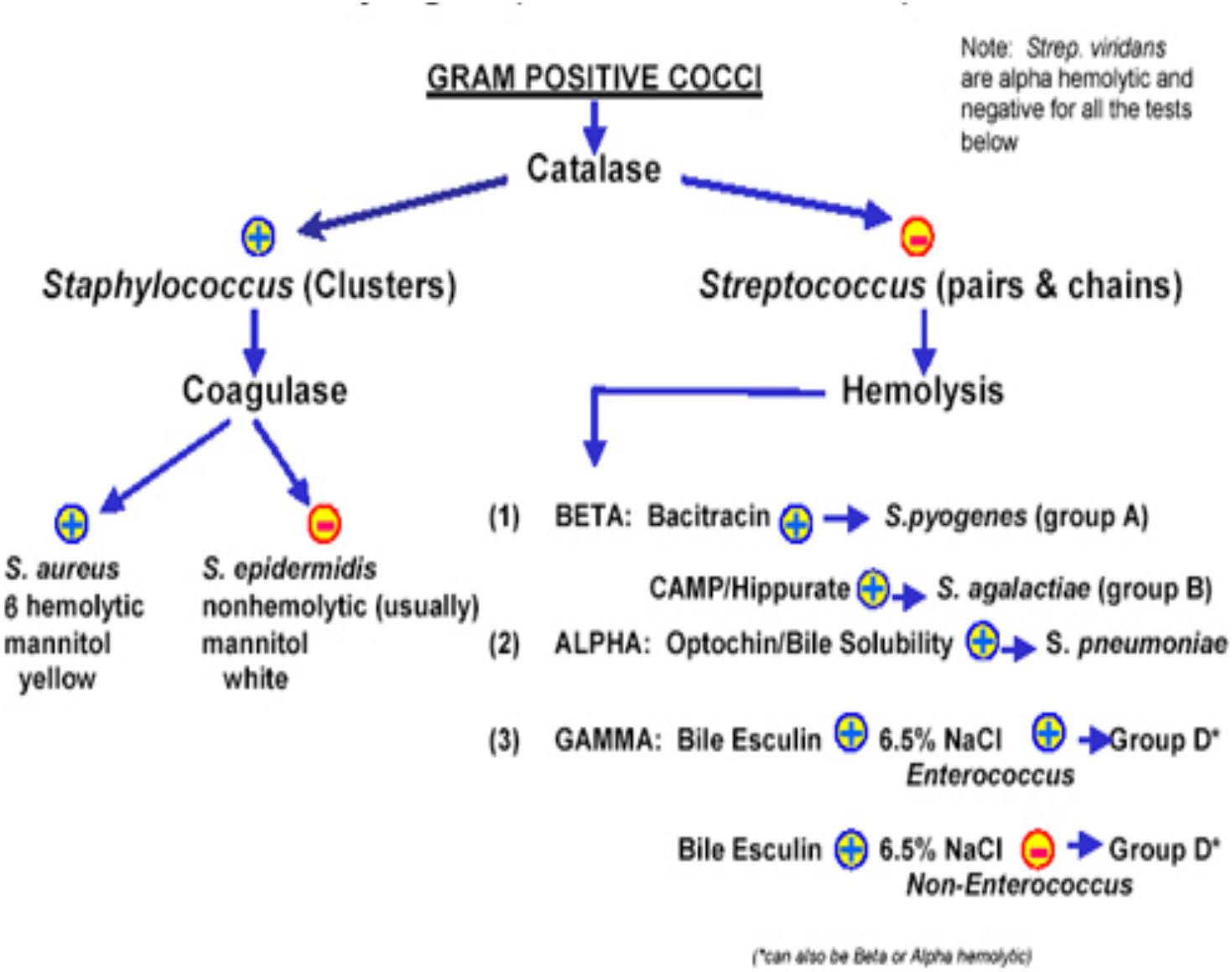


(a) The direction of streaking is indicated by arrows. Streak series 1 is made from the original bacterial culture. The inoculating loop is sterilized following each streak series. In series 2 and 3, the loop picks up bacteria from the previous series, diluting the number of cells each time. There are numerous variants of such patterns.



(b) In series 3 of this example, notice that well-isolated colonies of bacteria of two different types, red and yellow, have been obtained.

Figure 6.10 - Overview

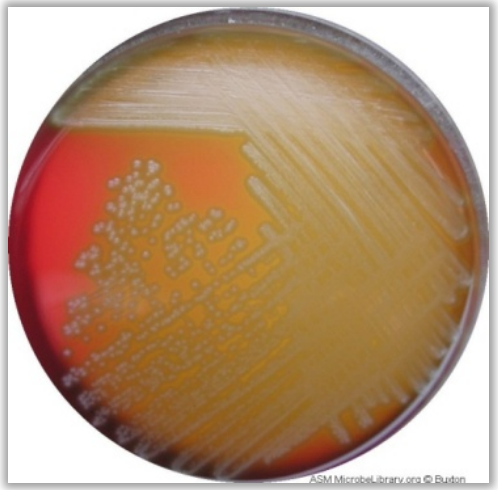

GRAM POSITIVE COCCI
Note: Strep. viridans are alpha hemolytic and negative for all the tests below
Catalase
Staphylococcus (Clusters)
Streptococcus (pairs & chains)
Coagulase
Hemolysis
S. aureus
ß hemolytic
mannitol
yellow
S. epidermidis
nonhemolytic (usually)
mannitol
white
(1) BETA: Bacitracin → S.pyogenes (group A)
CAMP/Hippurate → S. agalactiae (group B)
(2) ALPHA: Optochin/Bile Solubility → S. pneumoniae
(3) GAMMA: Bile Esculin 6.5% NaCl → Group D*
Enterococcus
Bile Esculin 6.5% NaCl → Group D*
Non-Enterococcus
(*can also be Beta or Alpha hemolytic)

Identification of streptococci by hemolytic reaction

Colonies are surrounded by clear zone of hemolysis complete hemolysis

Beta-hemolytic Streptococcus colonies

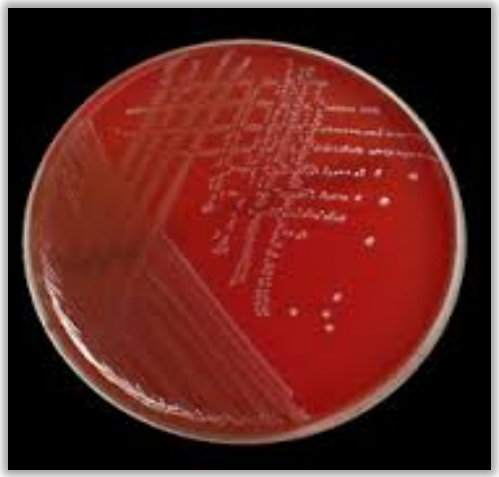
St. pyogenes



Colonies are surrounded by partial hemolysis with greenish color

Alpha-hemolytic Streptococcus colonies

St. pneumoniae



No haemolysis

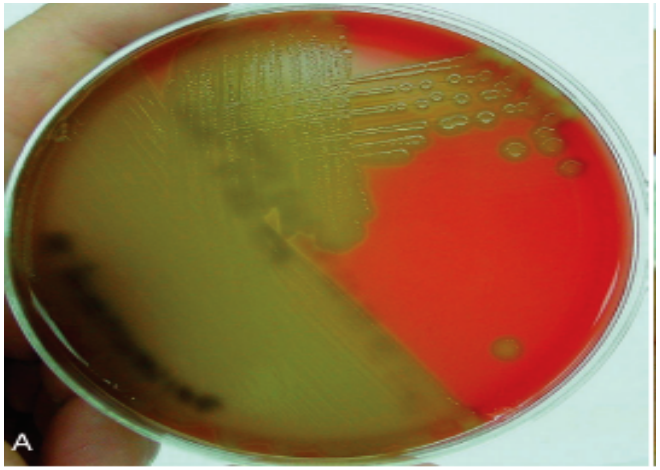
Gamma-hemolytic Streptococcus colonies

Enterococcus faecalis

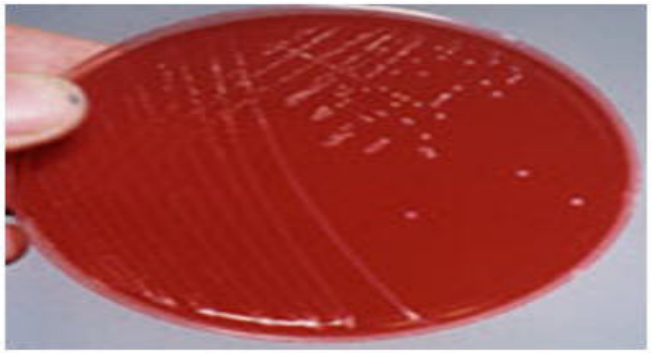
Identification of streptococci by hemolytic reaction

Beta-hemolytic *Streptococcus* colonies

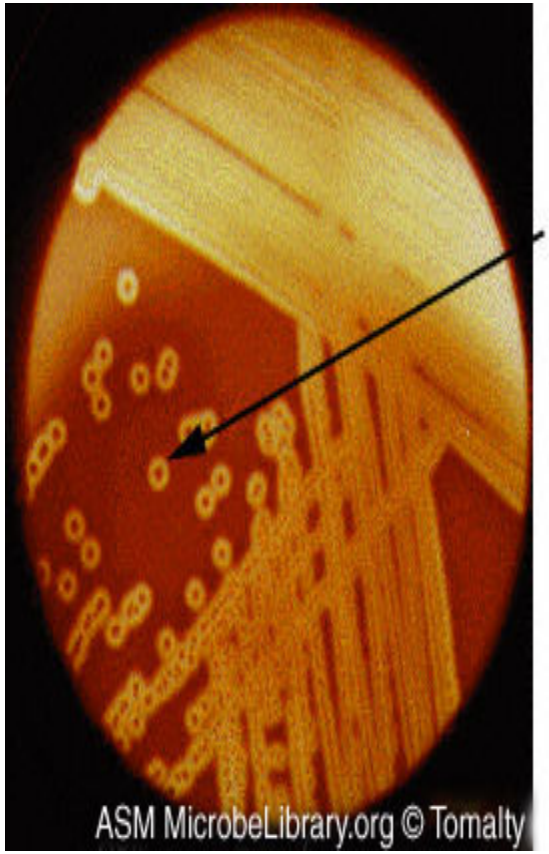
Alpha-hemolytic *Streptococcus* colonies



Gamma-hemolytic *Streptococcus* colonies

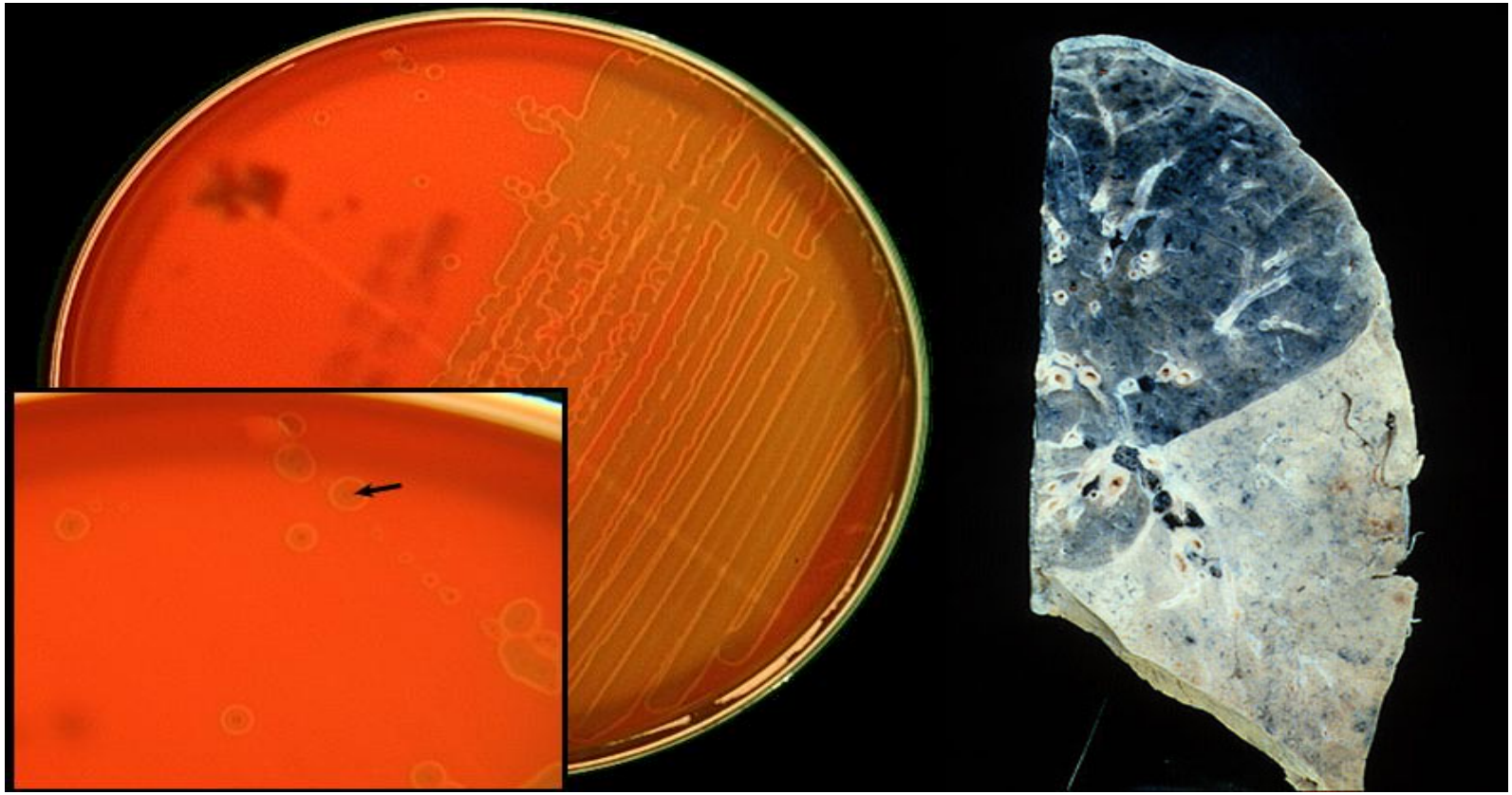


This is a blood agar growing beta hemolytic streptococci.



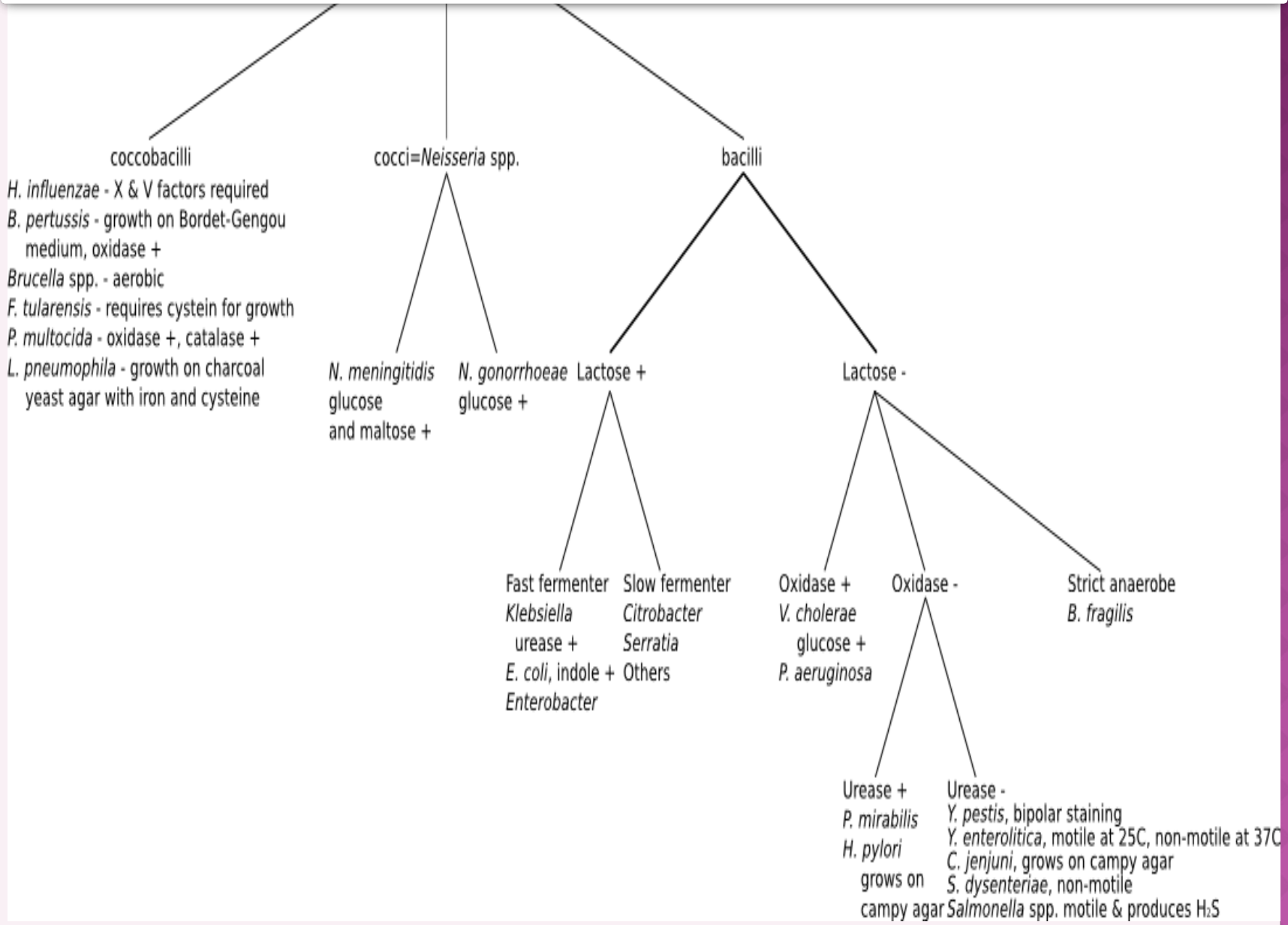
Note the clear zone of beta-hemolysis surrounding the *Streptococcus* colonies when grown on blood agar.

This culture was grown from a sputum specimen of a 60 year old man complaining of cough, fever and chest pain.



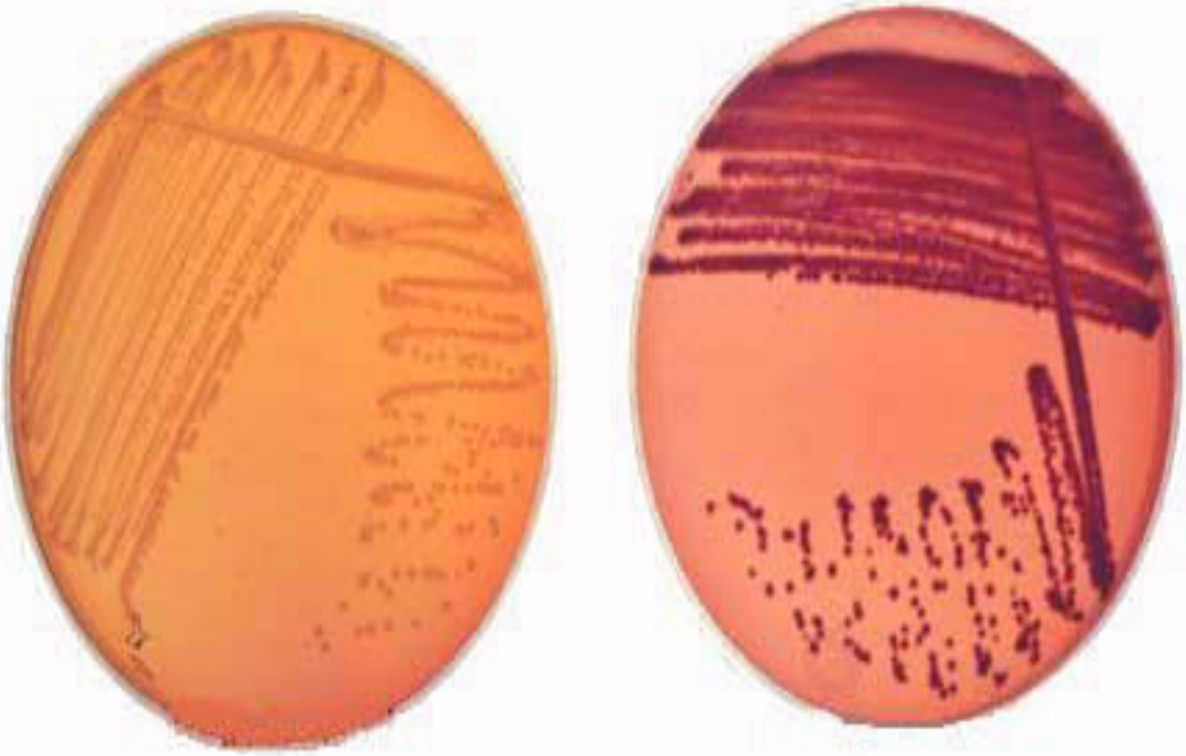
α hemolytic streptococci on blood agar

GRAM NEGATIVE BACTERIA



MacConkey's agar (DEFERENTIAL MEDIUM)

		
MacConkey's agar	Lactose fermenting colonies ***E. coli***	non-lactose fermenting colonies ***salmonella***

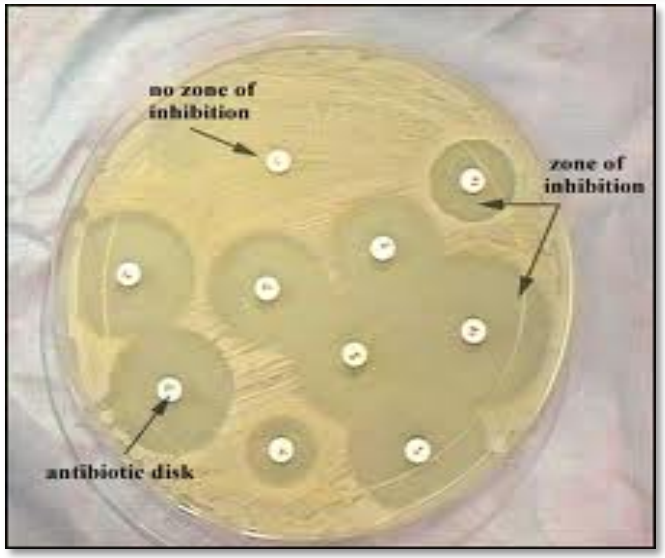


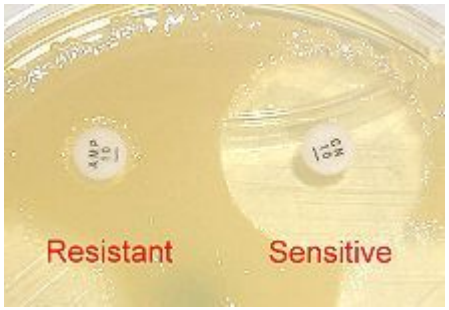
ASM MicrobeLibrary.org © Chamberlain

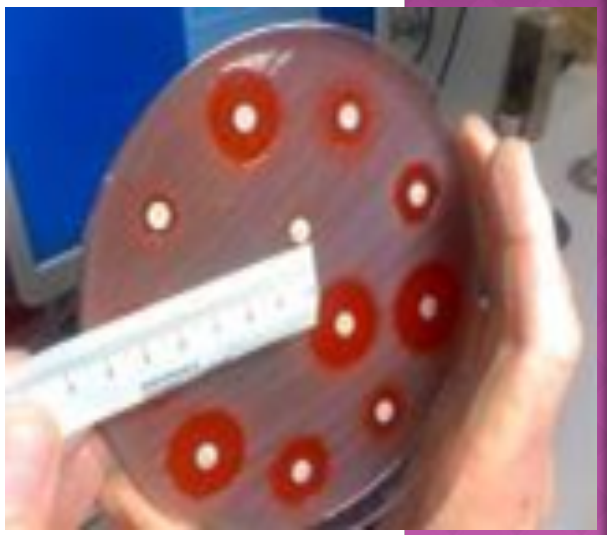
Biochemical testings

To confirm the identity of bacteria.

Antibiotic susceptibility testings



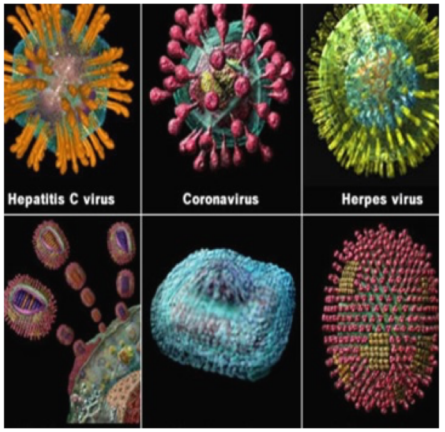




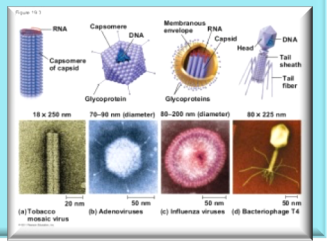
Automated instrument for identification and susceptibility testings

VITEK

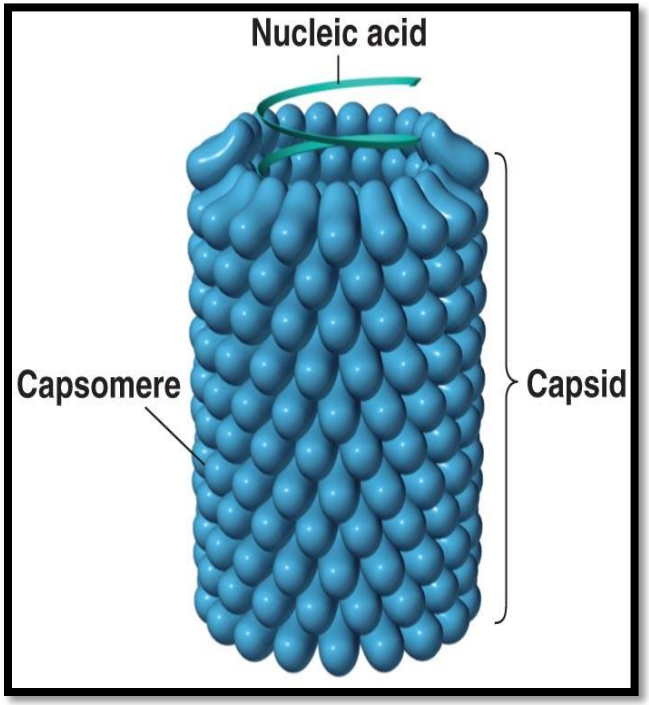
VIROLOGY



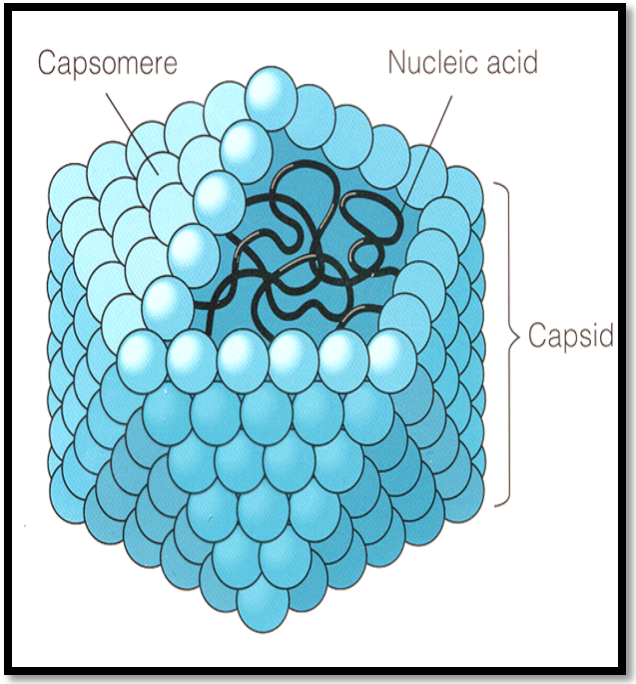
VIRAL STRUCTURE



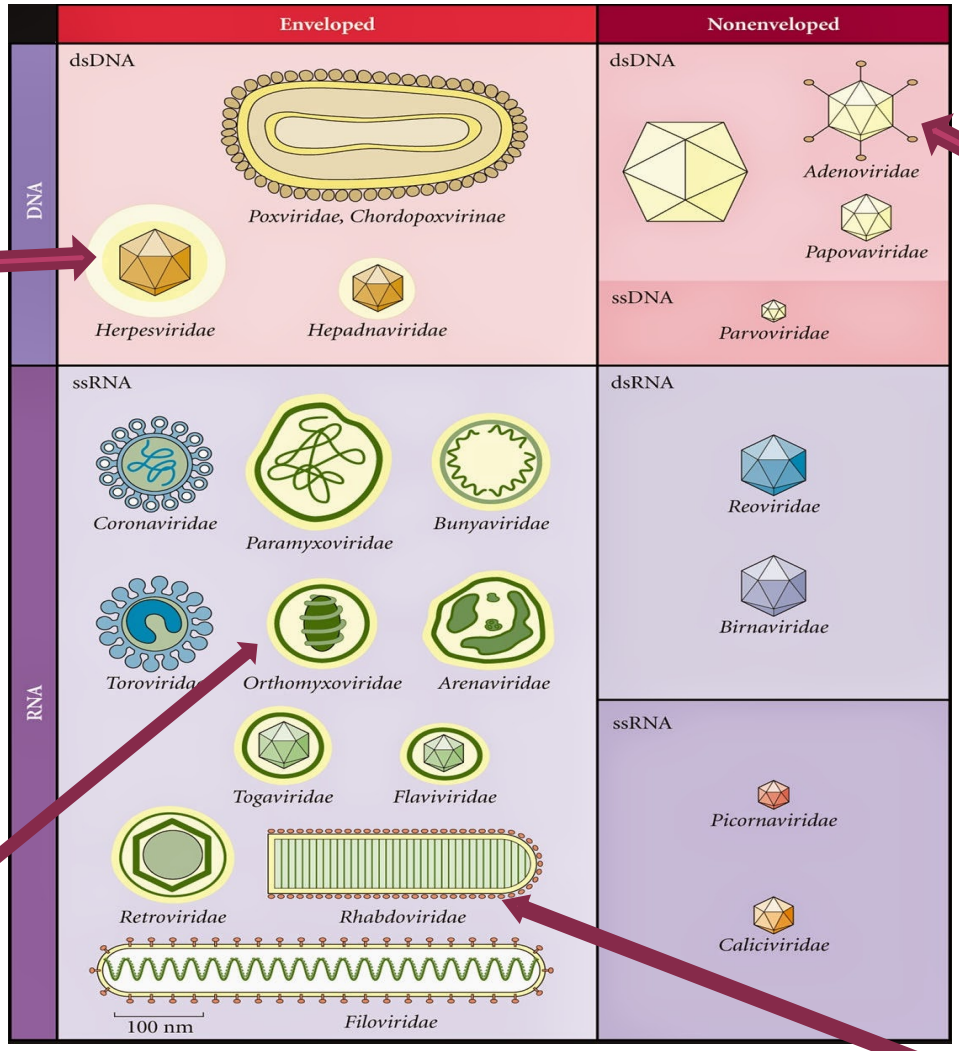
Helical Virus



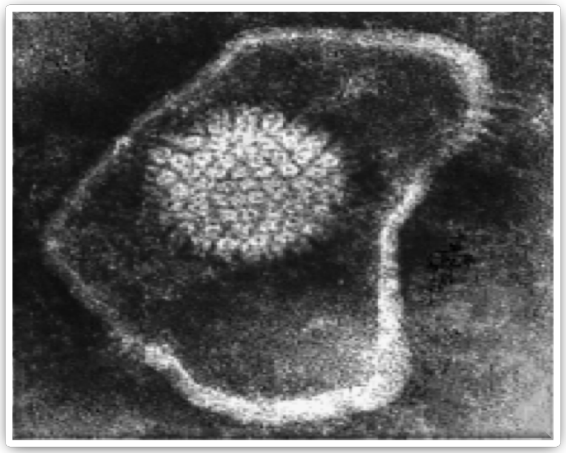
Icosahedral Virus



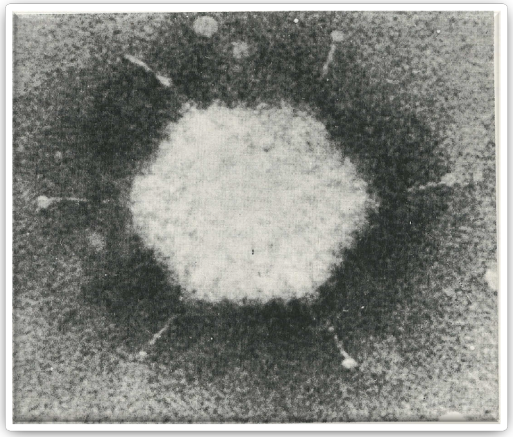
VIRAL CLASSIFICATION



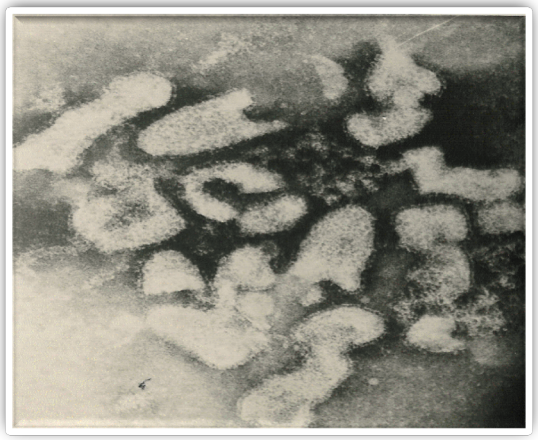
VIRAL ELECTRON MICROGRAPHS



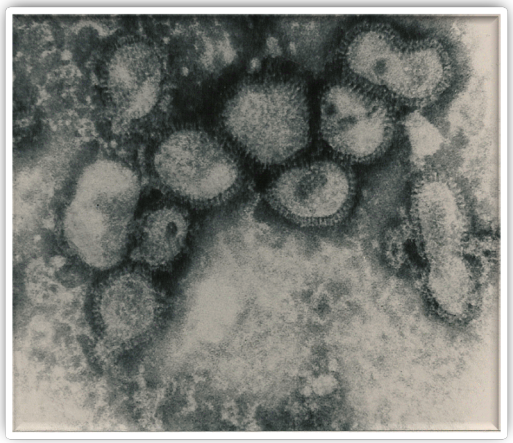
Herpes virus



Adenovirus

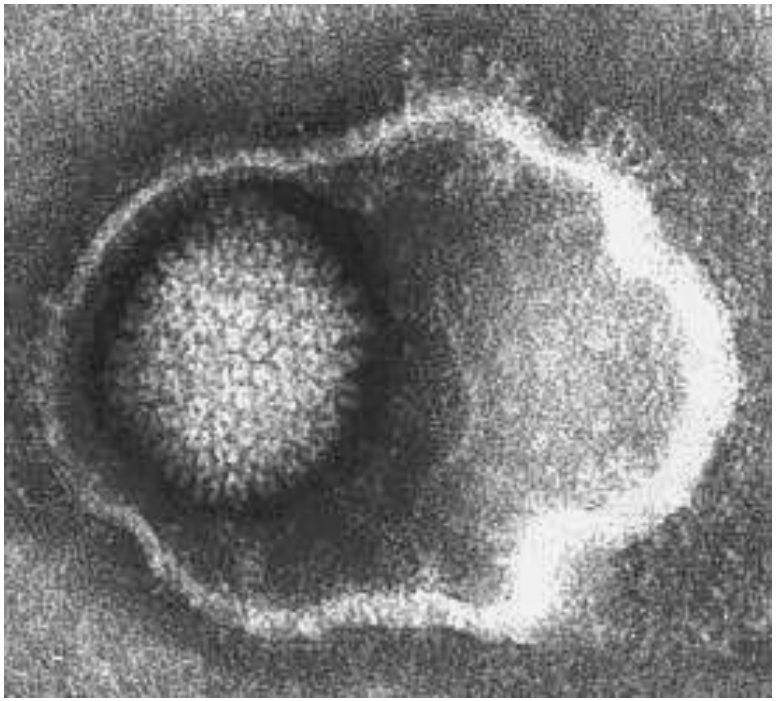


Rabies virus



Influenza Viruses

Herpes simplex virus -1 : Herpesviridae



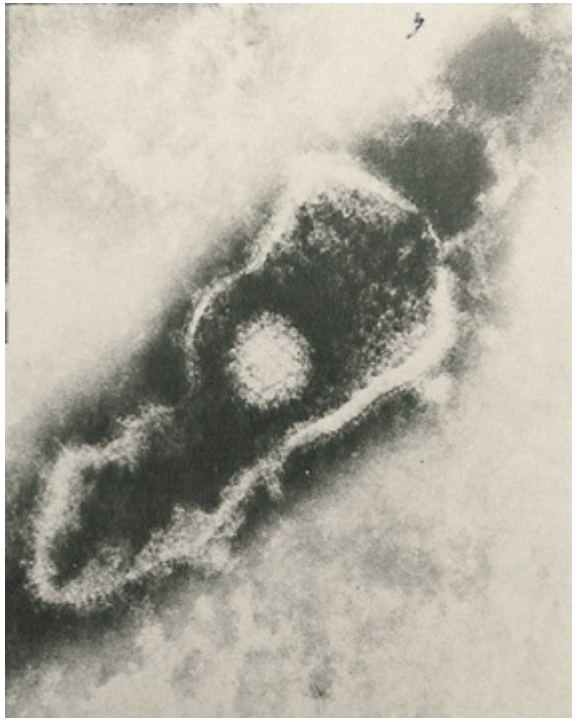
Enveloped virus

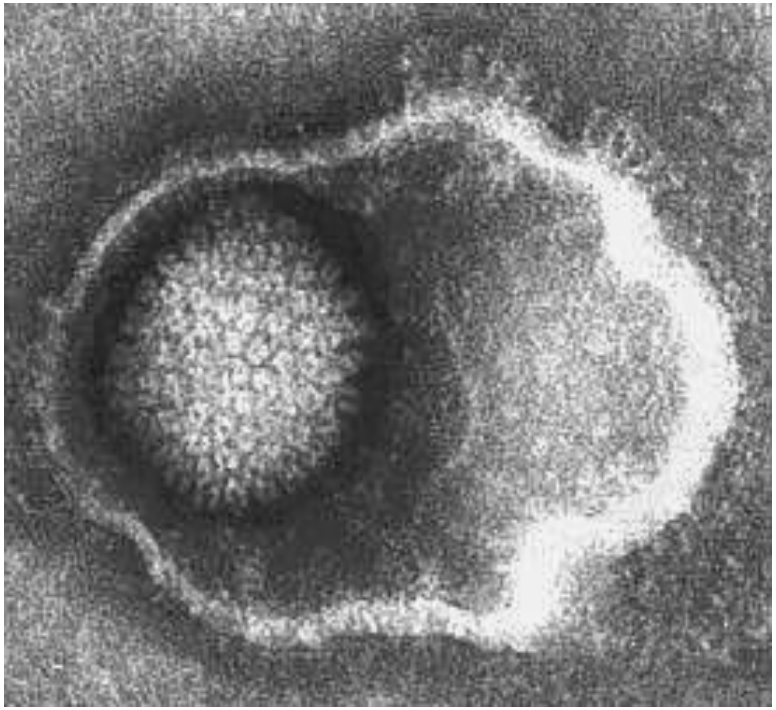
Icosahedral capsid

d.s DNA genome

Loose envelope

These are electron micrographs of a virus





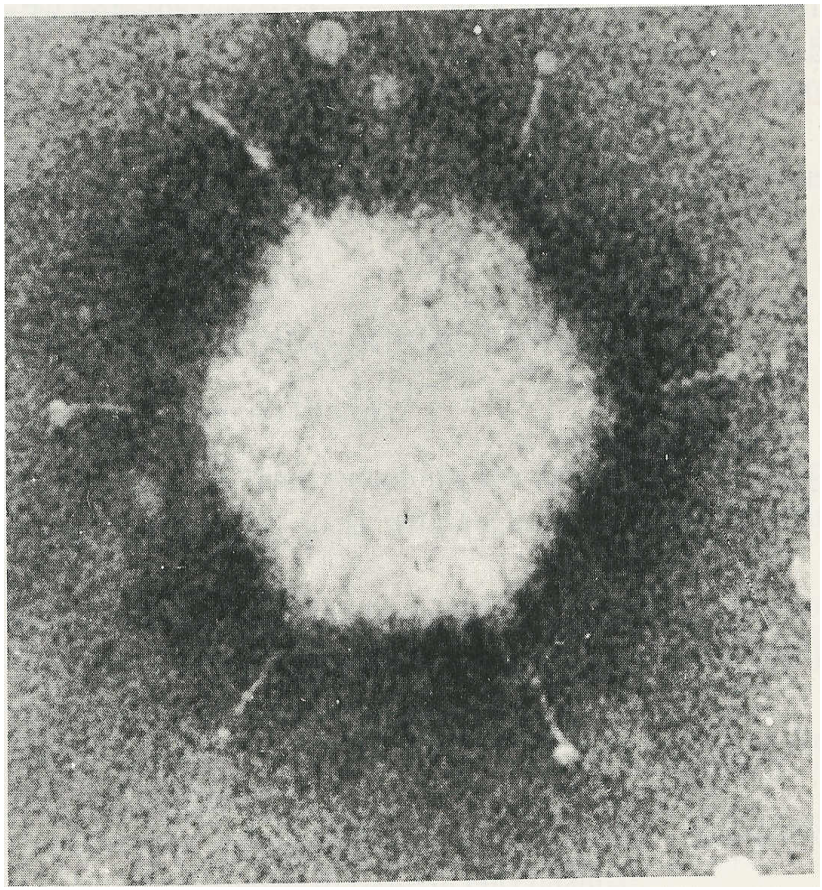
Q1: Name this virus

Herpes virus

Q2: Describe its structure.

Enveloped virus ,
Icosahedral capsid,
d.s DNA genome

Adenovirus : Adenoviridae



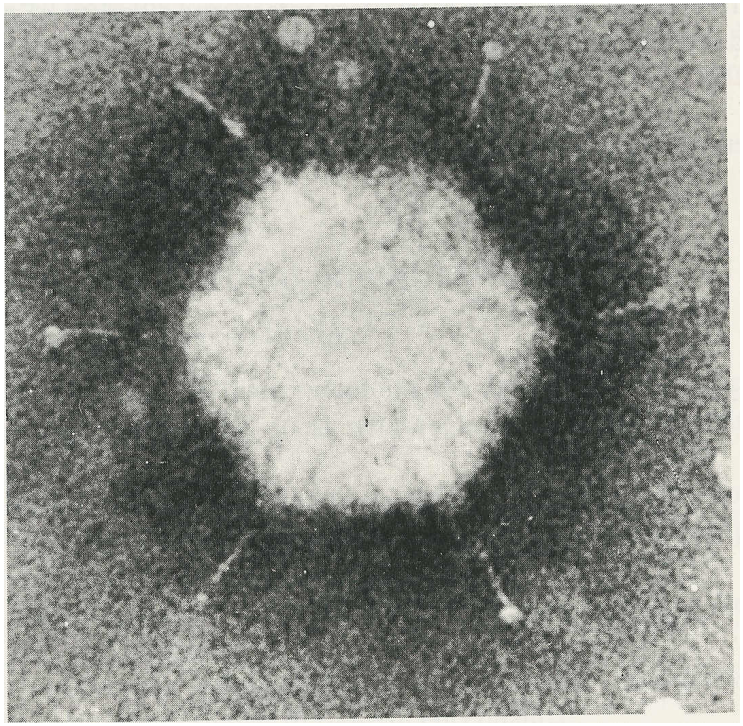
Only V with fiber

Nonenveloped virus

Icosahedral capsid

d.s DNA genome

This is an electron micrograph of a virus



Q1: Name this virus

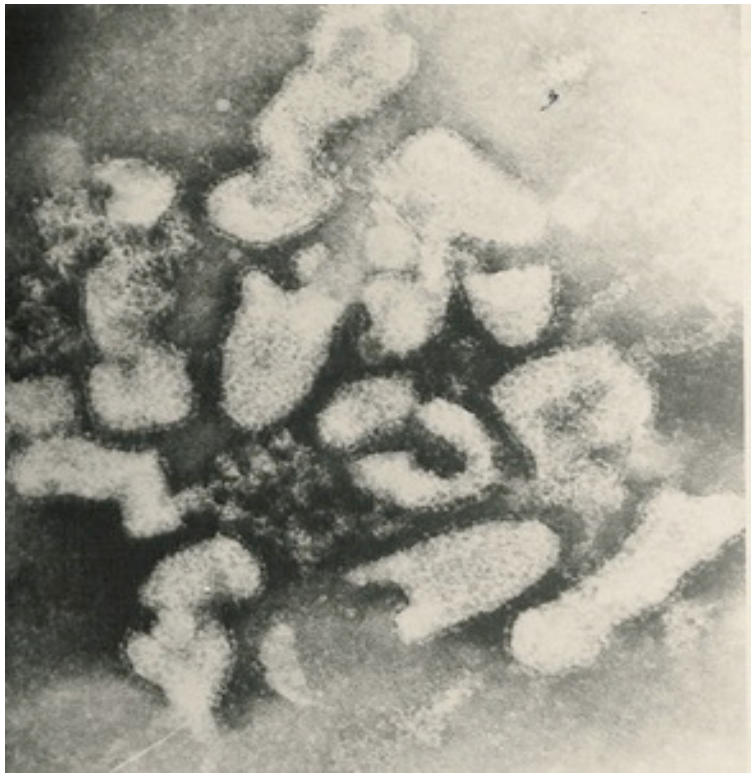
Adenovirus

Q2: Describe its structure.

Nonenveloped virus, with fiber

Icosahedral capsid & d.s DNA genome

Rabies virus: Rhabdoviridae



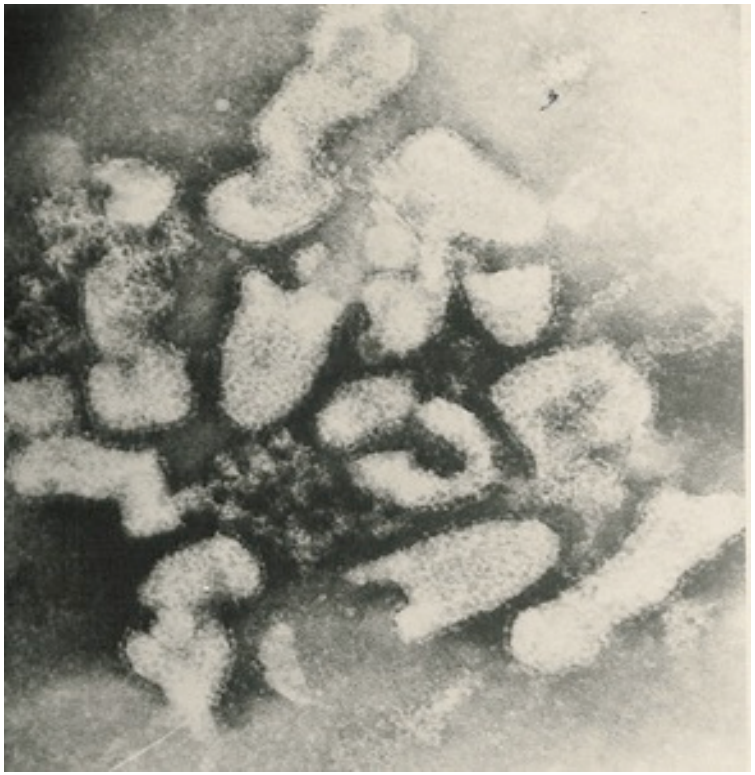
Bullet shape

Enveloped virus

Helical capsid

s.s RNA genome

This is an electron micrograph of a virus



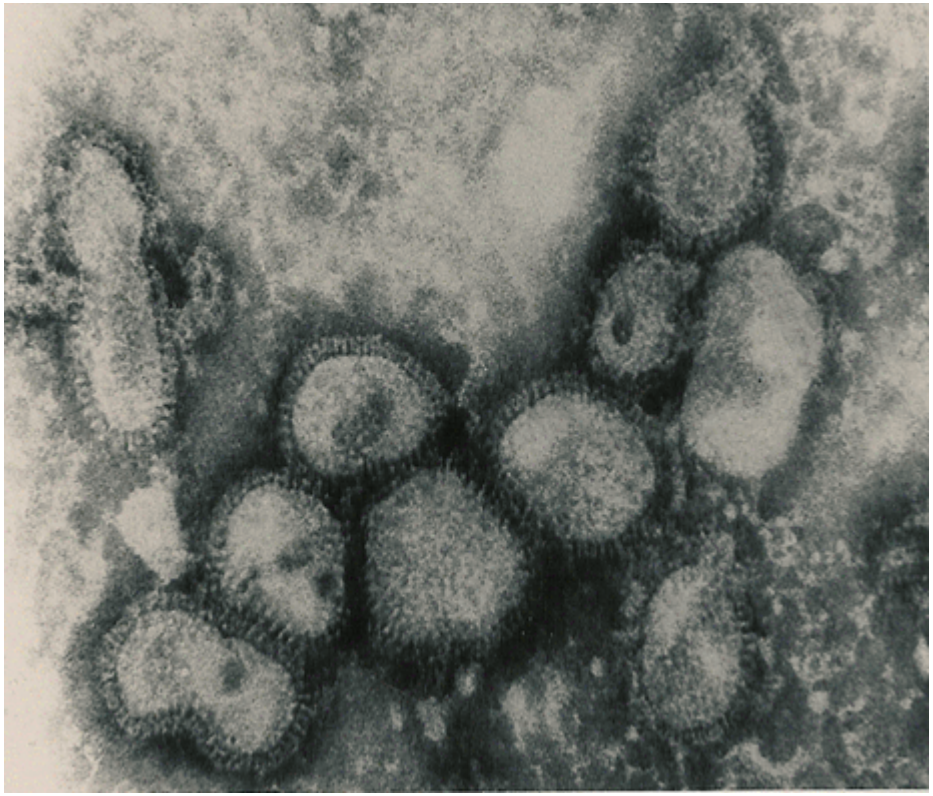
Q1: Name this virus

Rabies virus

Q2: Describe its structure.

Enveloped virus , Helical capsid & s.s RNA genome

Influenza Viruses : Orthomyxoviridae



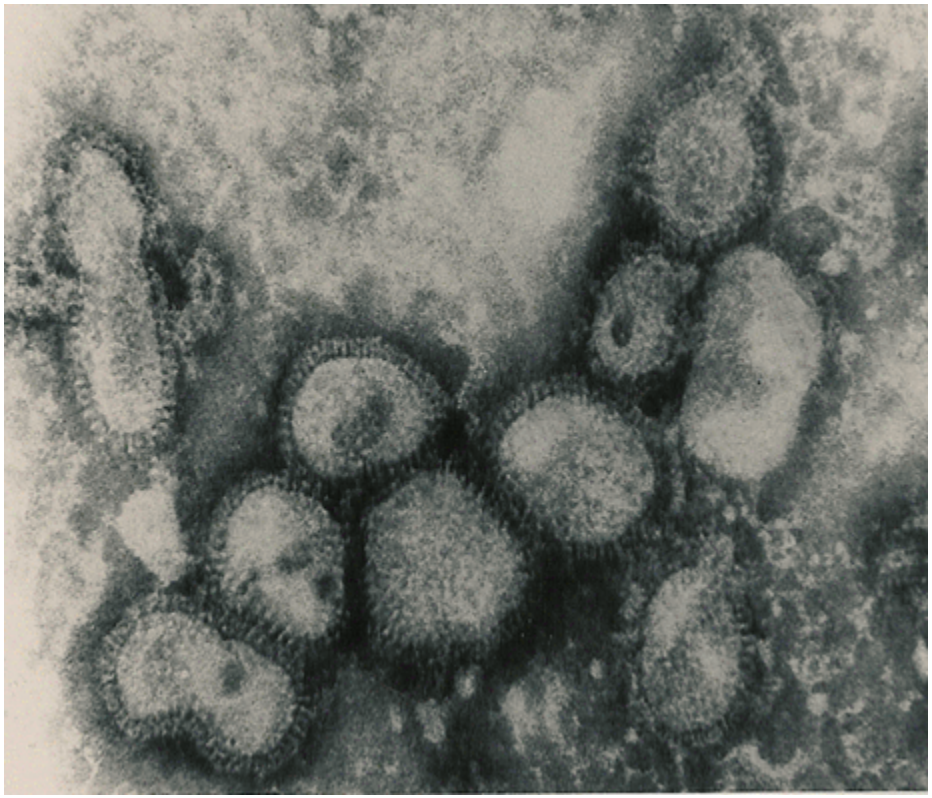
Enveloped V & spikes

Helical capsid

Segmented s.s RNA

Pleomorphic shape

This is an electron micrograph of a virus



Q1: Name this virus

Influenza Viruses

Q2: Describe its structure

Enveloped Virus with spikes ,
Helical capsid ,Segmented s.s RNA

PARASITOLOGY

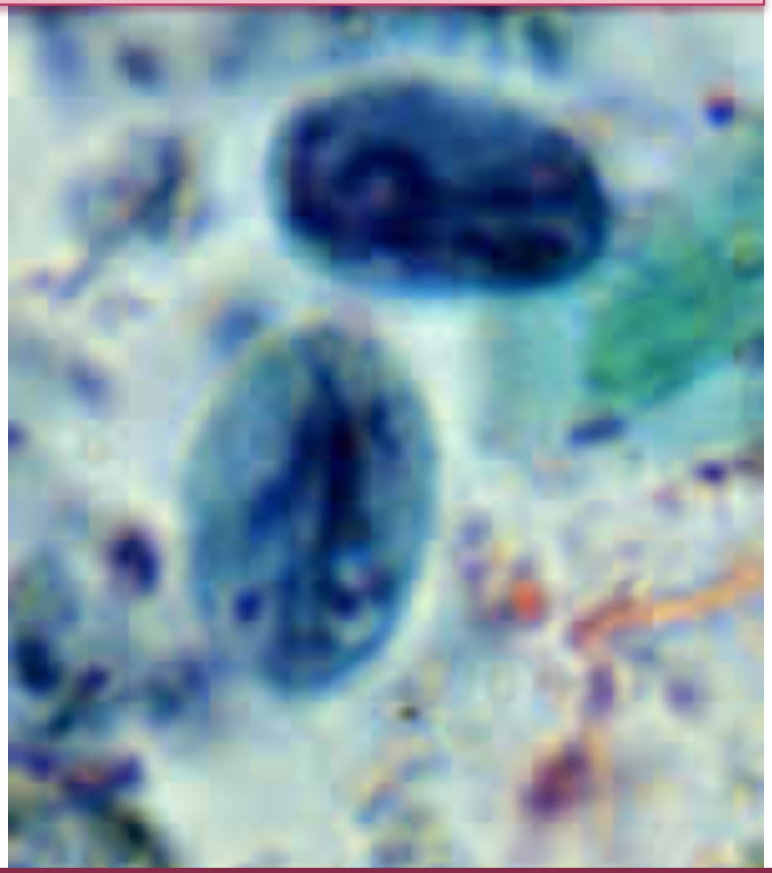
Classification of Parasites

Protozoa	Helminths
Unicellular **Single cell for all function**	**Mulicellular** **Specialized cells**
Amoebae: **move by psudobodia.** **Flagellates:** **move by flagella.** **Ciliates :** **move by cilia** **Apicomplexa** **(sporozoa) Tissue parasites**	**Round worms** **(Nematodes) cylindrical, unsegmented** **Flat worms** **1-Trematodes:** **leaf-like, unsegmented.** **2-Cestodes:** **tape-like, segmented**

Giardia lamblia trophozoite

Two nuclei,
each with central karyosome
Four pairs of flagella

Giardia lamblia cyst



- Mature, infective cyst, containing 4 nuclei
- Note a straight axoneme running longitudinally

Following is the microphotograph of an organism found in the upper part of the small intestine .

Name the Organism

Giardia lamblia

What is the Stage?

Trophozoite stage

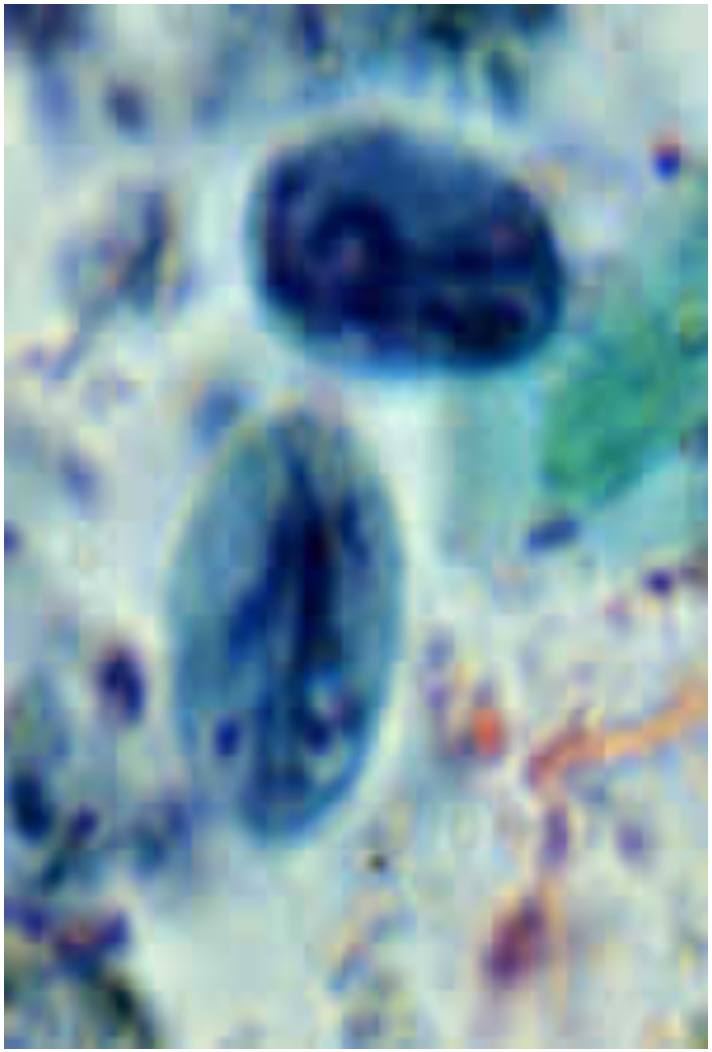
Following is the microphotograph of an organism found in stools

Name the Organism

Giardia lamblia

What is the Stage?

Cyst stage



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Nematodes

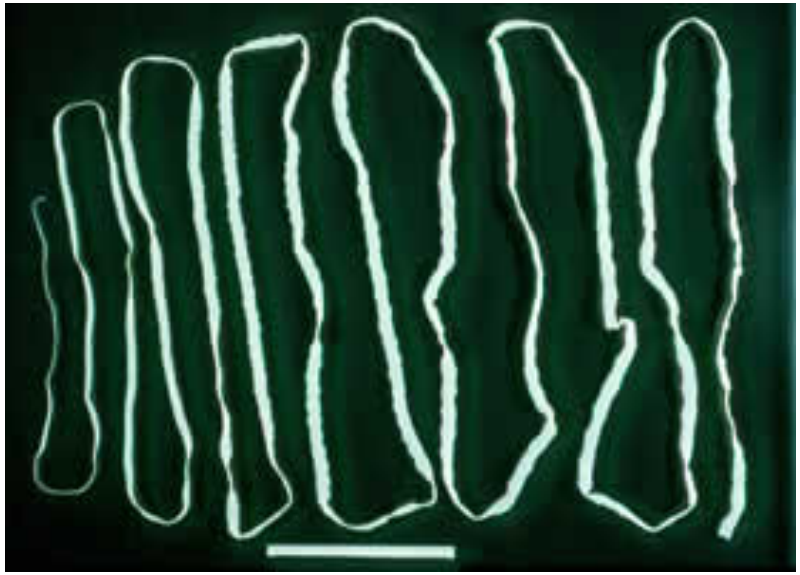
Ascaris lumbricoides (roundworm)

Ascaris adult

Cestodes

Taenia saginata

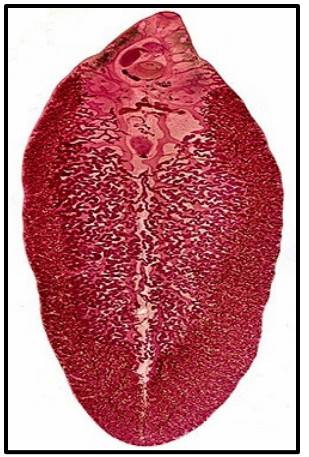
(tapeworm)



Trematodes

Fasciola hepatica

(Flukes)



ARTHROPODS OF MEDICAL IMPORTANCE

Class *Insecta* الحشرات	Class *Arachnida* العناكب	Class القشريات *Crustacea*
• Muscid flies:housefly,Tsetse fly • Myiasis-producing flies . • Mosquitoes البعوض: *Anopheles, Aedes Culex* • Sandfly ذباب الرمل (*Phlebotomus*) • Black fly*(Simulium)* • Fleas البراغيث • Lice(*Pediculus,Phthirus*) القمل • Bugs:*Cimex,Triatoma* البق • Bees النحل	• Scorpions العقارب • Spiders العناكب • Ticks: القراد hard, soft • Mites السوس -*Sarcoptes scabiei,* -dust mites	• Water flea *(Cyclops)*

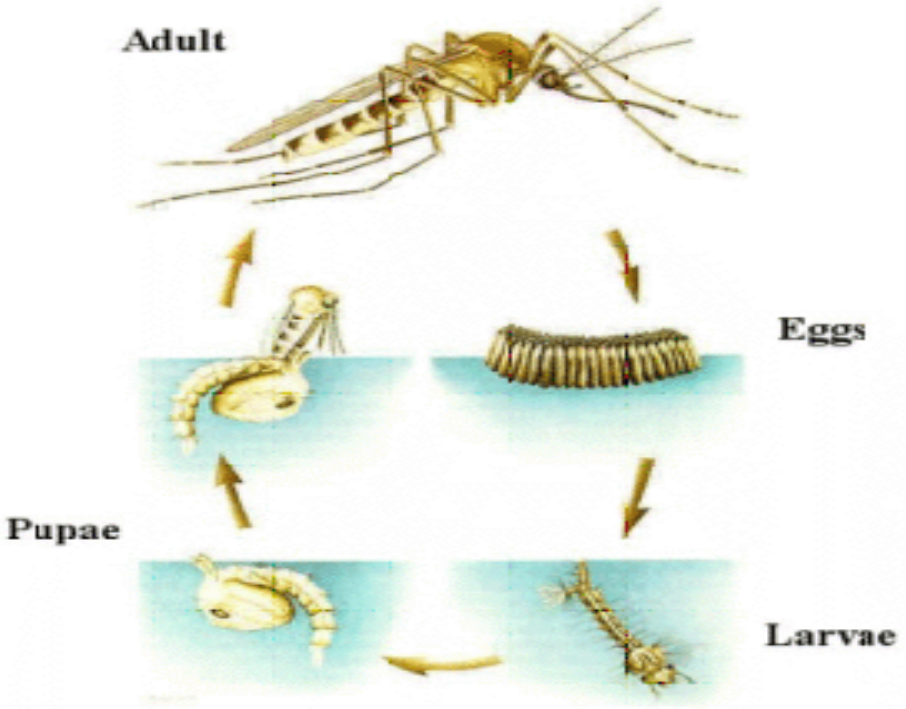
LICE

Louse(singular) , Lice (pleural)

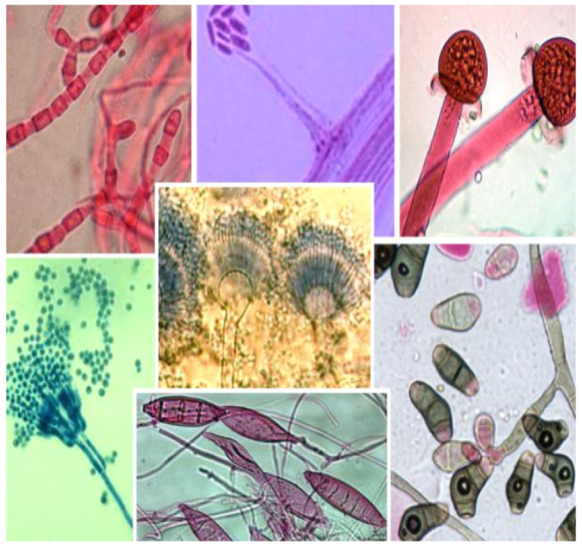
Pediculus humanus

Phlebotomus (sand fly)

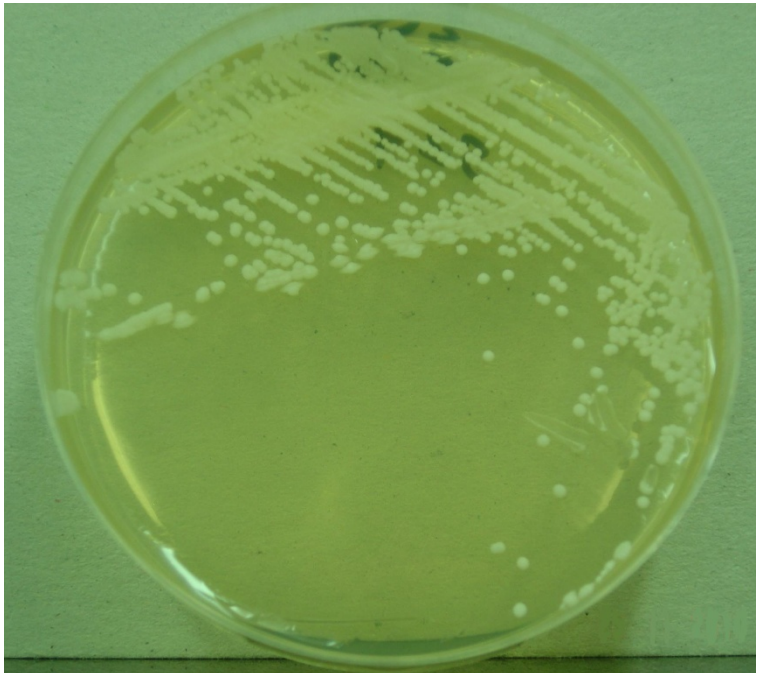
Mosquitoes :



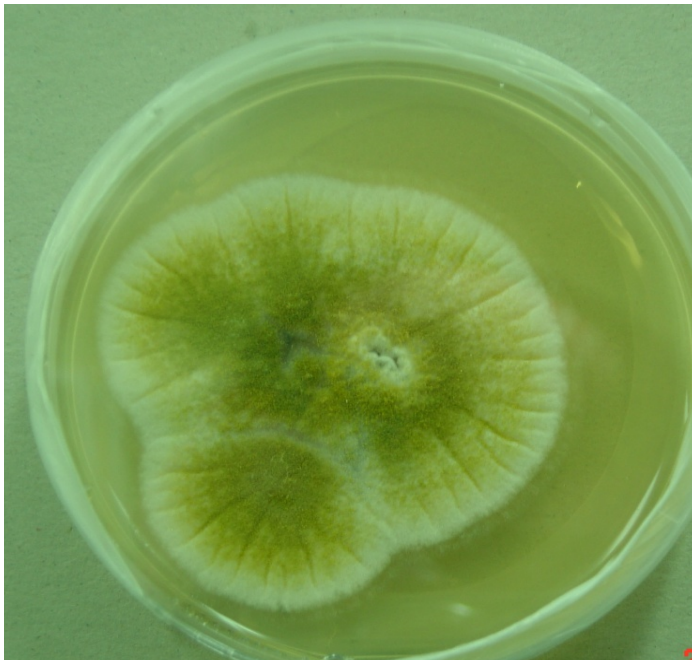
MYCOLOGY



Fungi can be divided to two types based on morphology



A



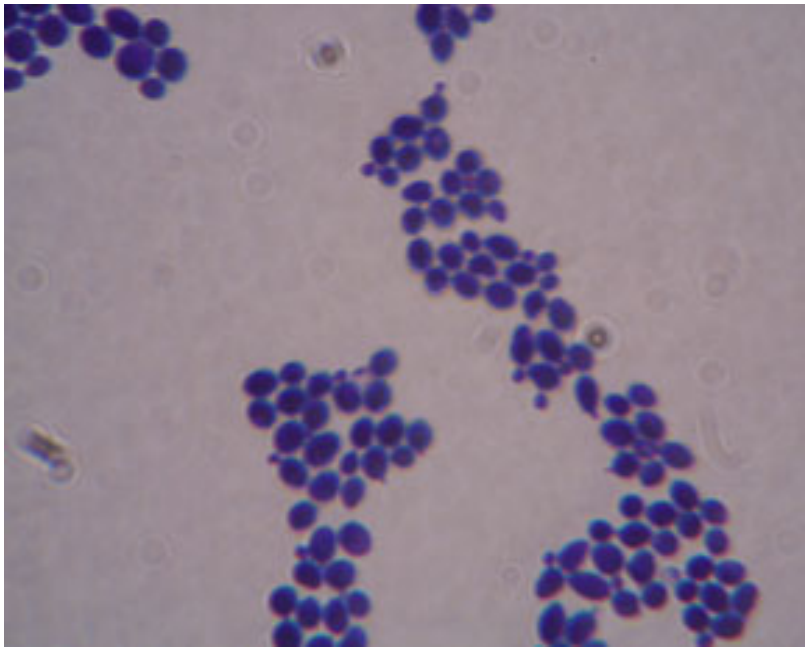
B

Based on morphology, name the two fungal structures in A and B?

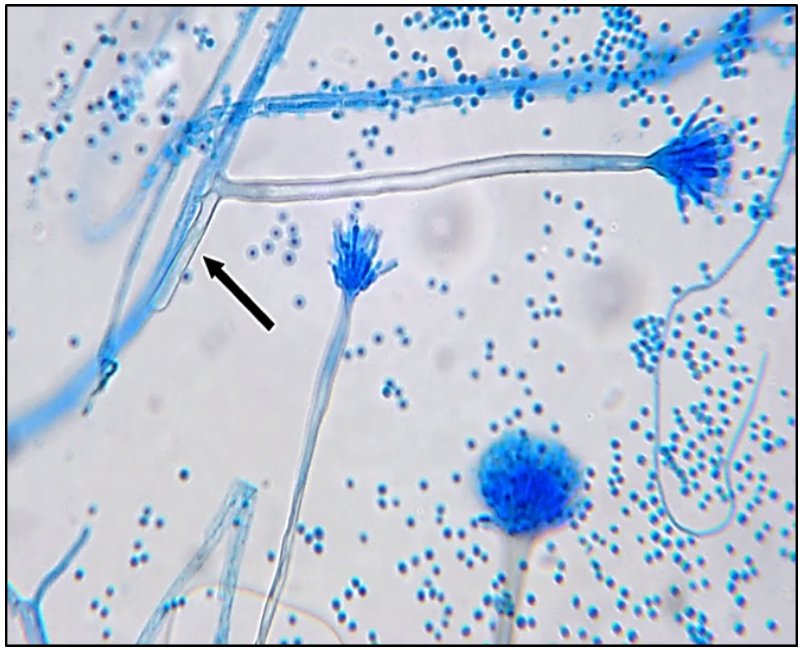
A: Yeast
e.g. *Candida*

B: Mould fungi
e.g. *Aspergillus*

Microscopic appearance of yeast and mould fungi



A



B

Name the two fungal structures in A and B?

A: Budding yeast cells
e.g. *Candida*

B: Branching Fungal hyphae
e.g. *Aspergillus*

B

END