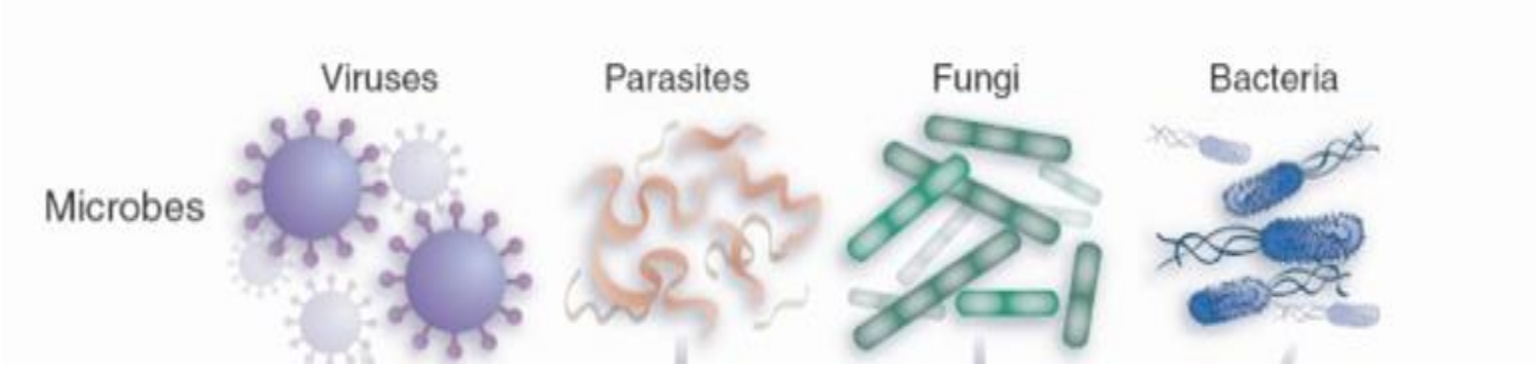
MICROBIOLOGY PRACTICAL CLASS

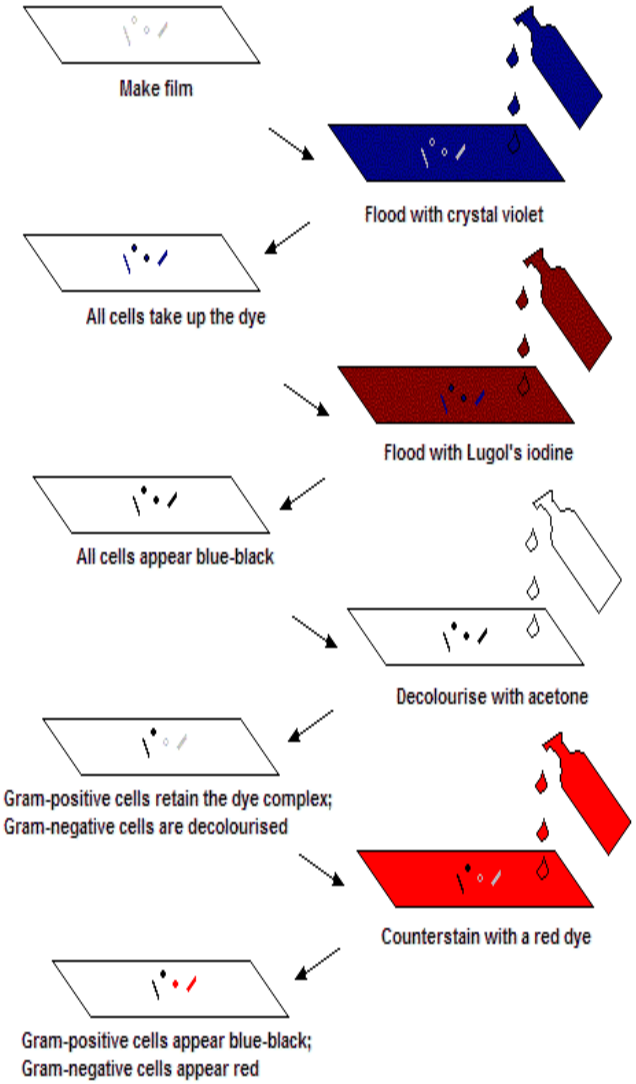
FOUNDATION BLOCK (2015)

Dr.Malak M. El-Hazmi

MICROBIOLOGY



Clinical Bacteria



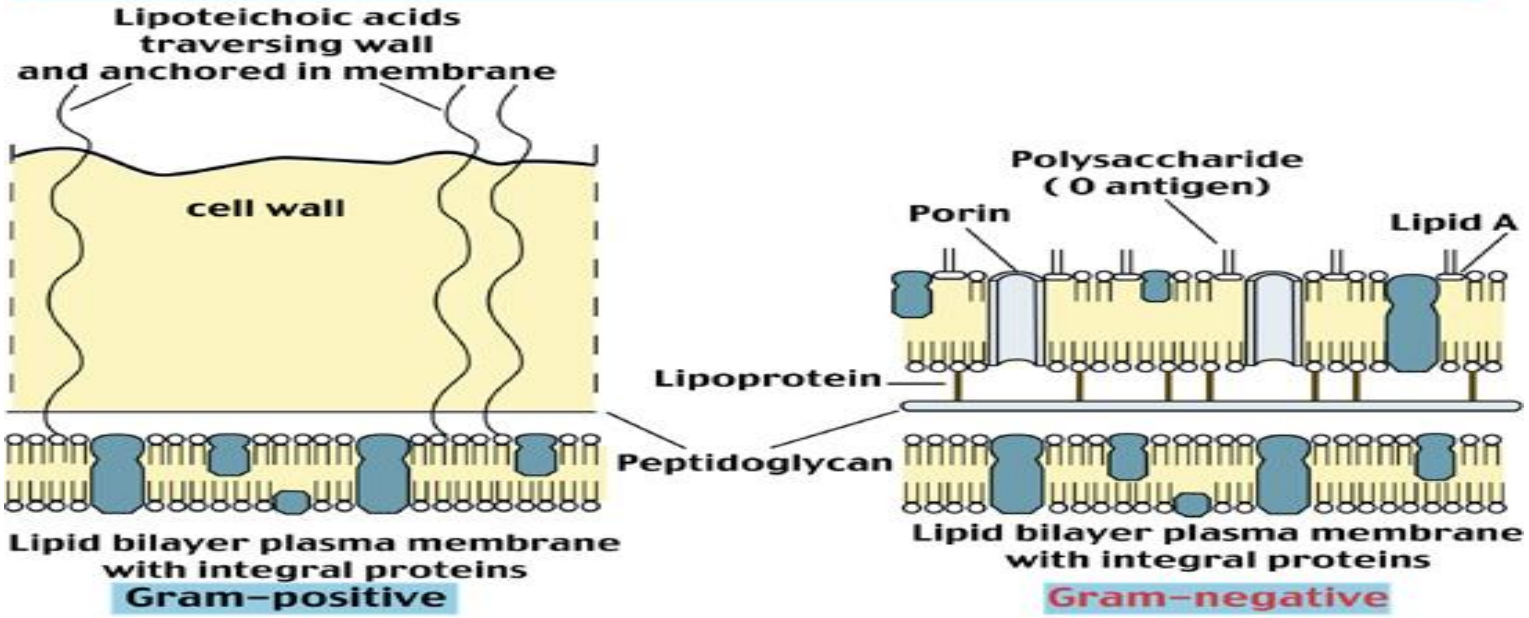

G+ bacilli

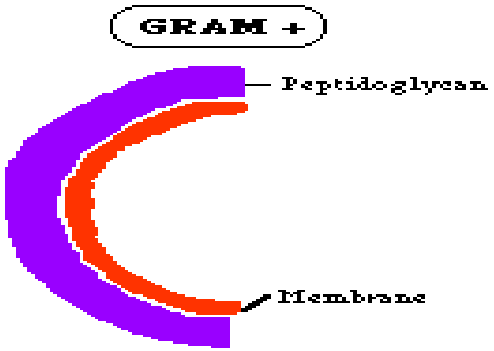

G- bacilli

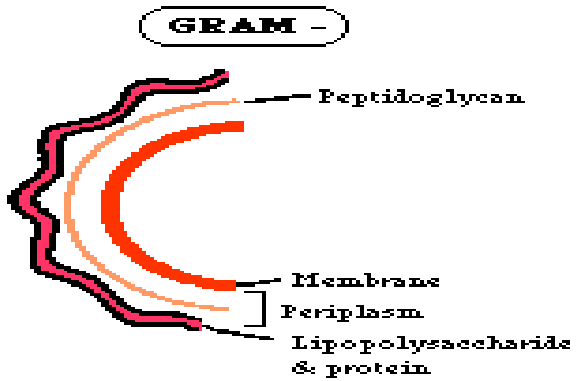

G+ cocci


G- cocci

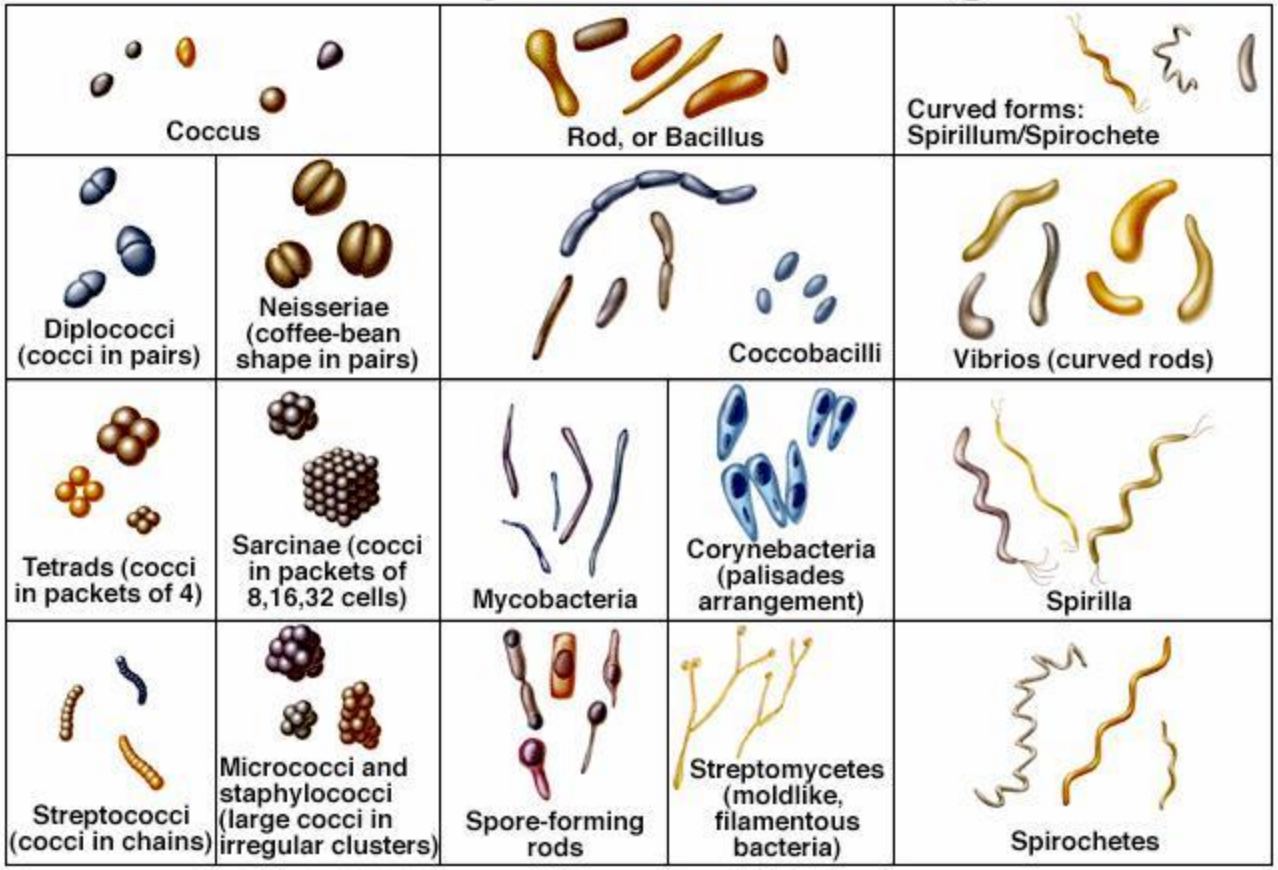
BACTERIAL CELL WALLS

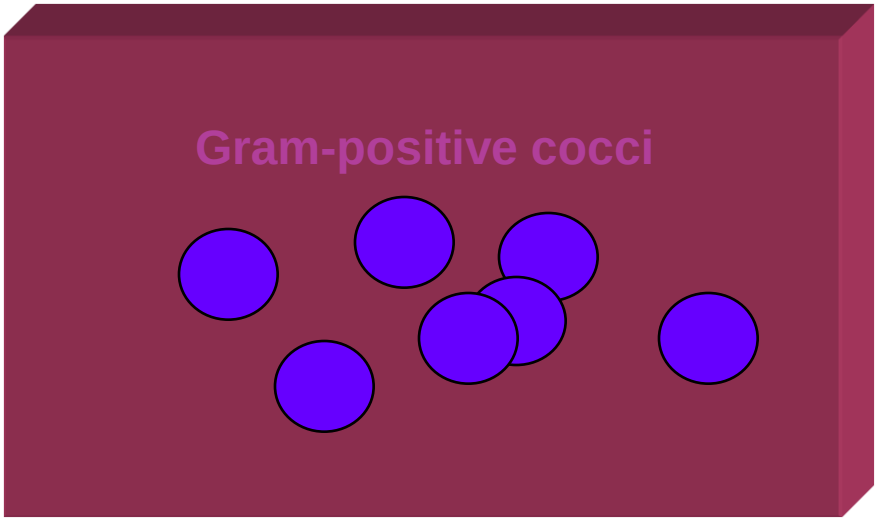


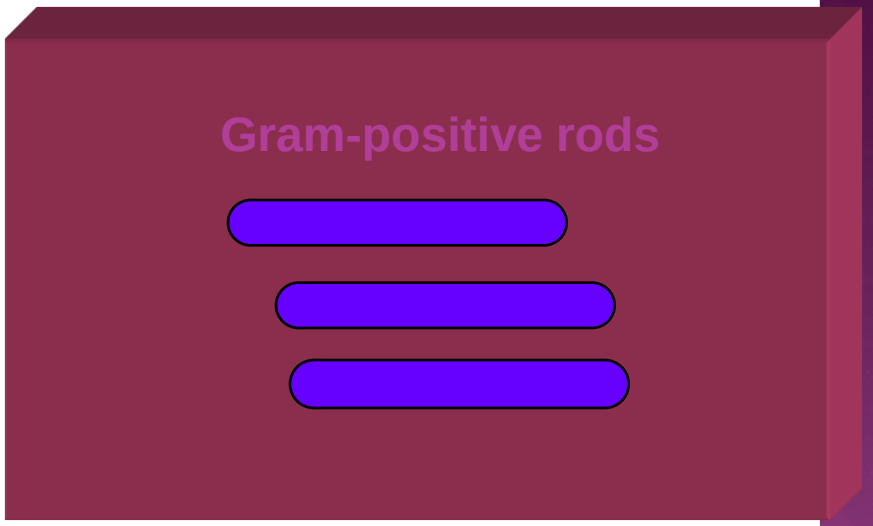


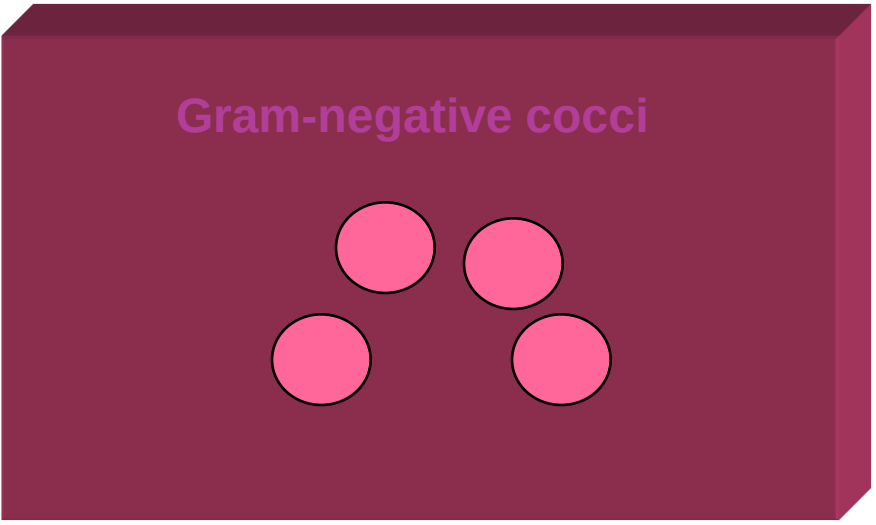


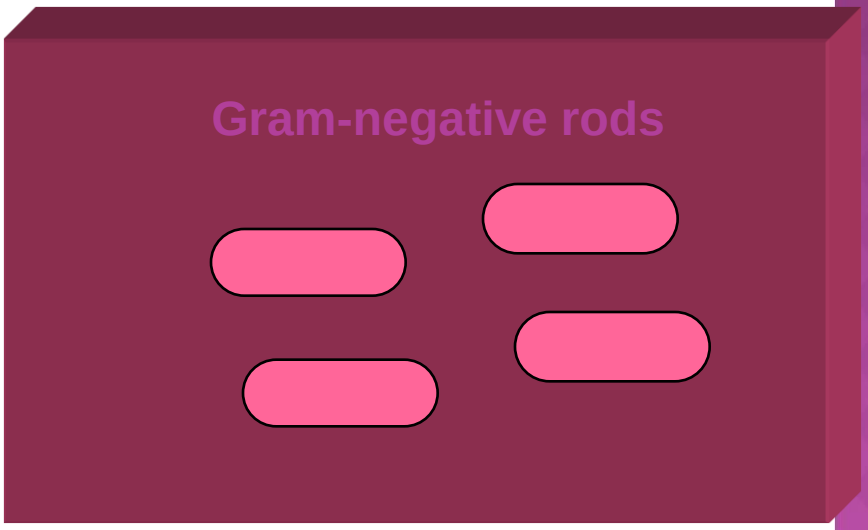
Bacterial shapes and arrangements

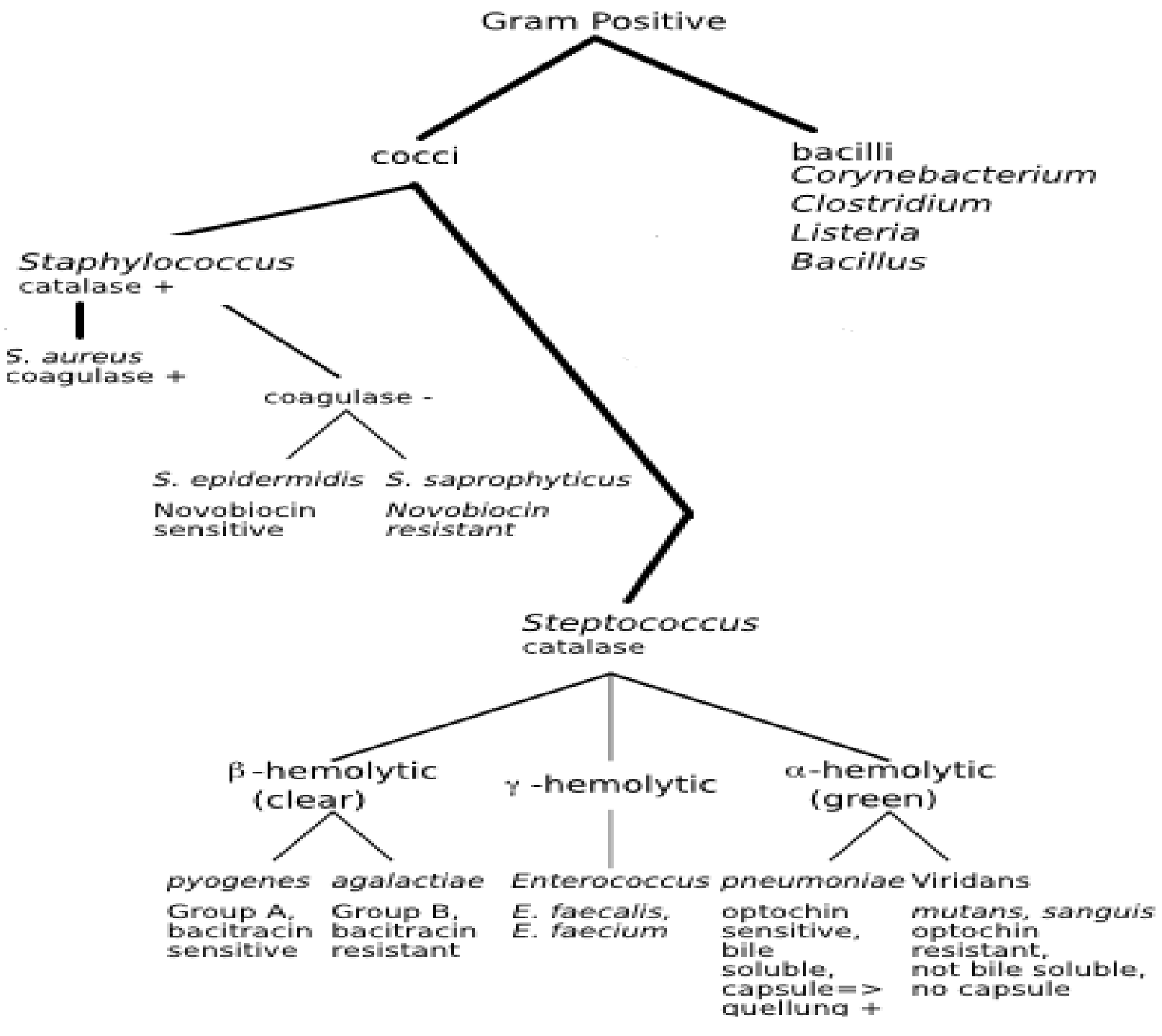


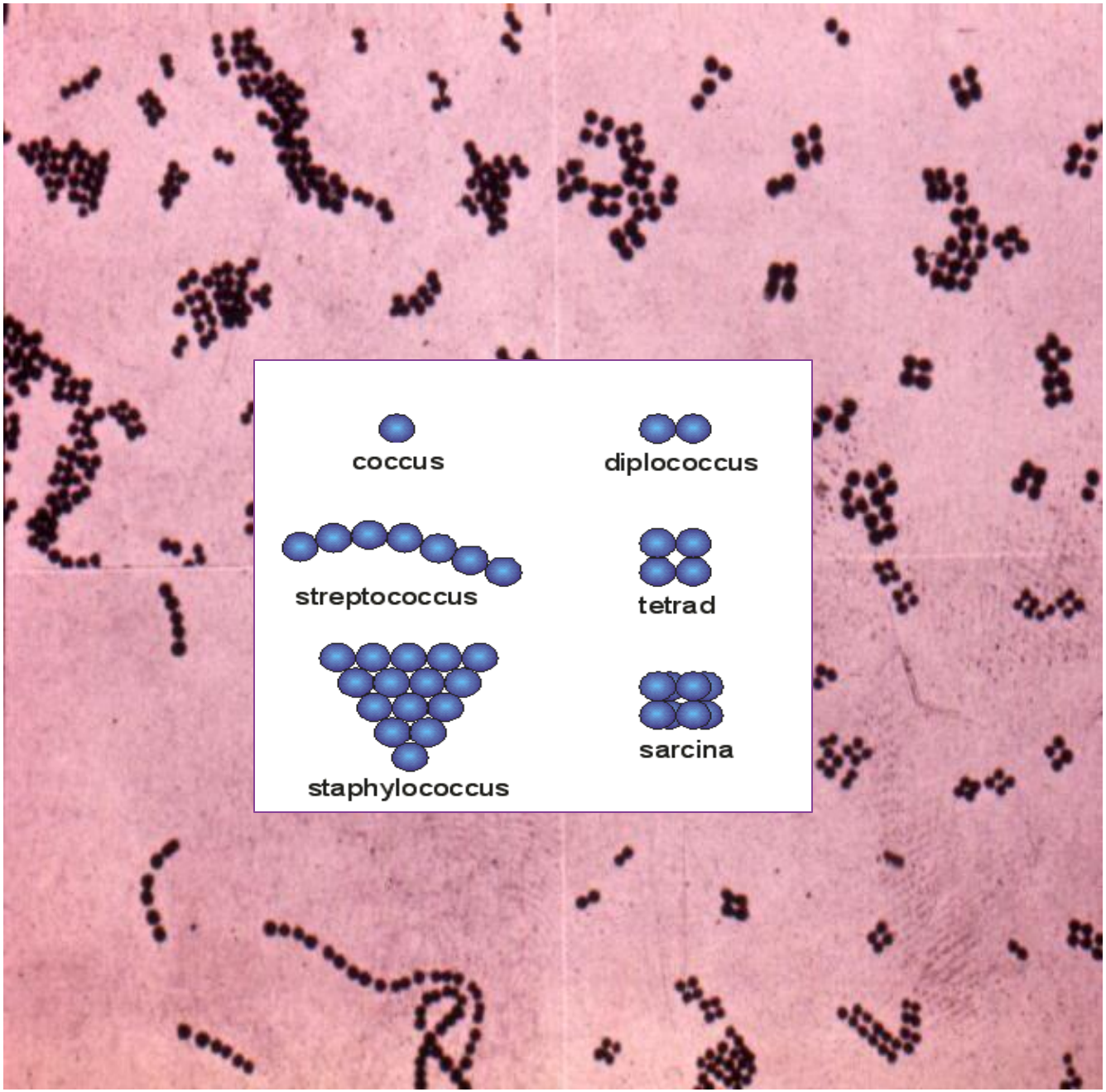

Gram-positive cocci

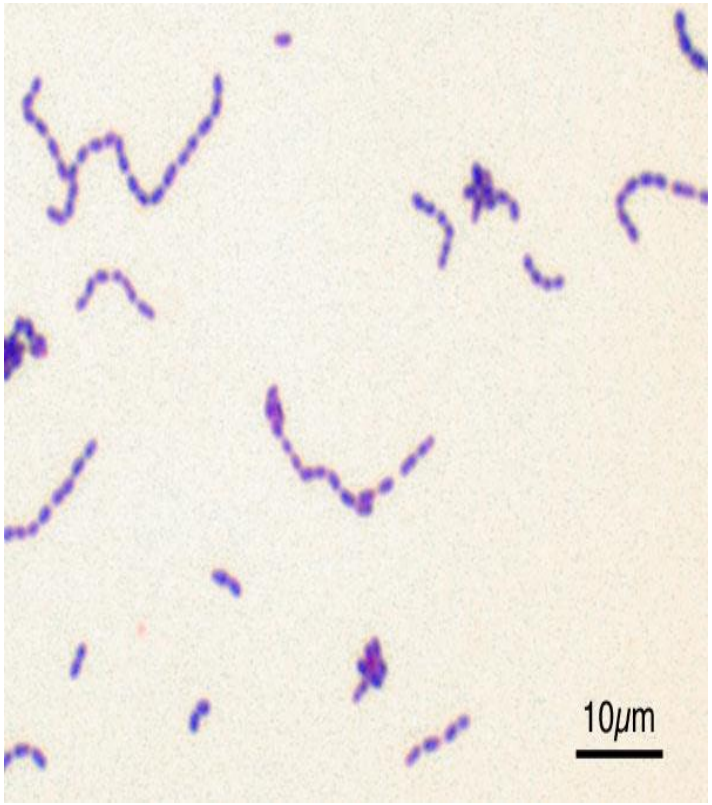

Gram-positive rods

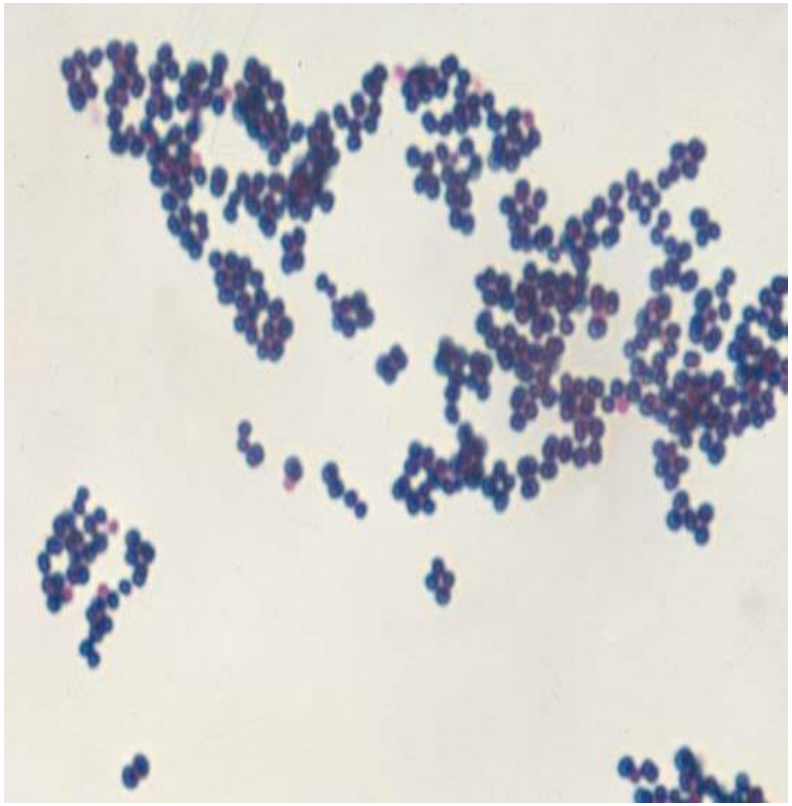

Gram-negative cocci


Gram-negative rods


Gram Positive
cocci
bacilli
Corynebacterium
Clostridium
Listeria
Bacillus
Staphylococcus
catalase +
S. aureus
coagulase +
coagulase -
S. epidermidis
Novobiocin sensitive
S. saprophyticus
Novobiocin resistant
Steptococcus
catalase
β -hemolytic (clear)
γ -hemolytic
α-hemolytic (green)
pyogenes
Group A, bacitracin sensitive
agalactiae
Group B, bacitracin resistant
Enterococcus
E. faecalis, E. faecium
pneumoniae
optochin sensitive, bile soluble, capsule=> quellung +
Viridans
mutans, sanguis
optochin resistant, not bile soluble, no capsule


coccus
diplococcus
streptococcus
tetrad
staphylococcus
sarcina





Gram positive cocci in chain

Streptococci

Gram positive cocci in clusters

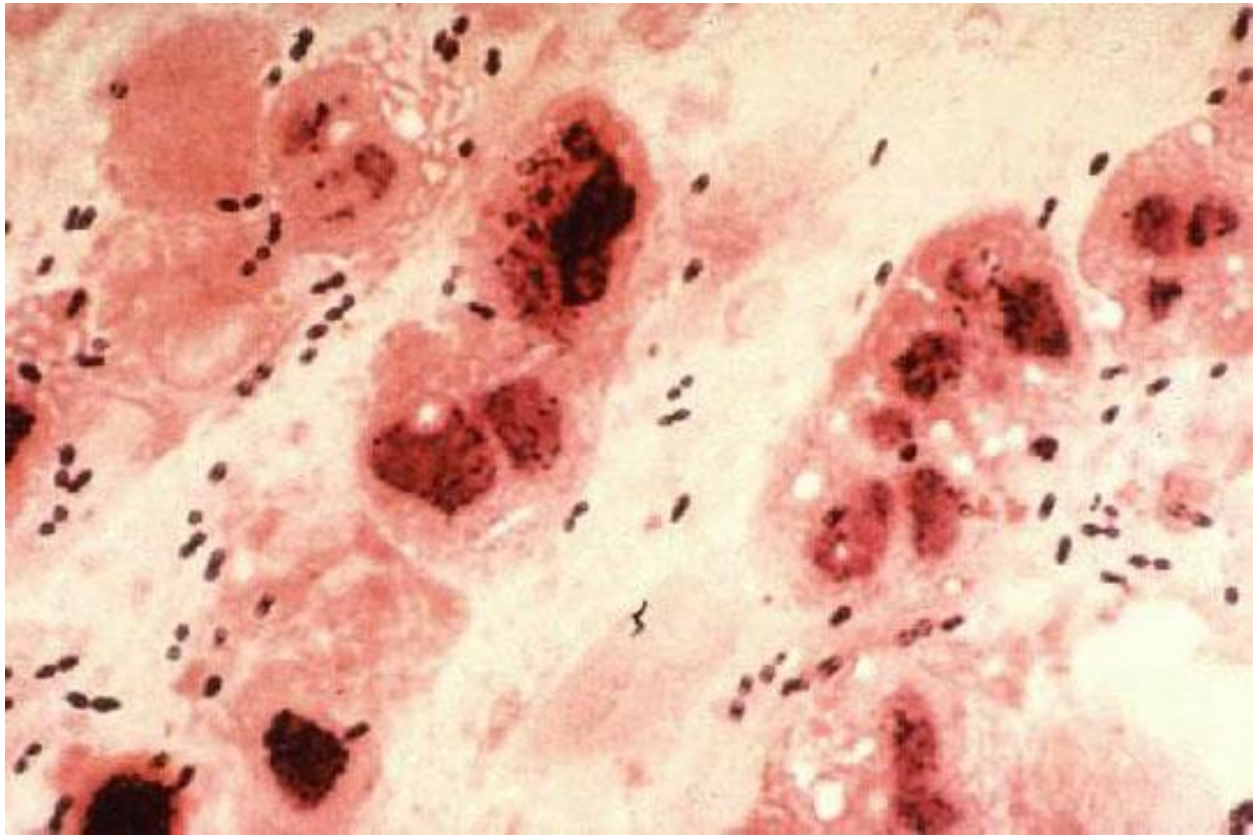
Staphylococci

Rx

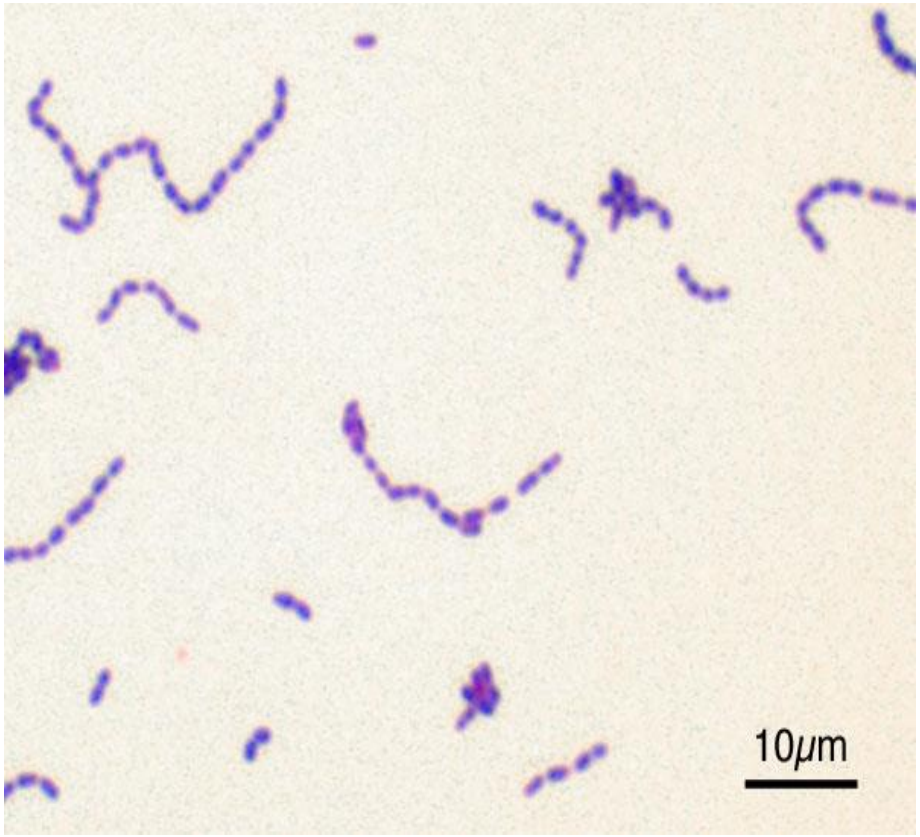
Penicillin
Cephalosporin

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

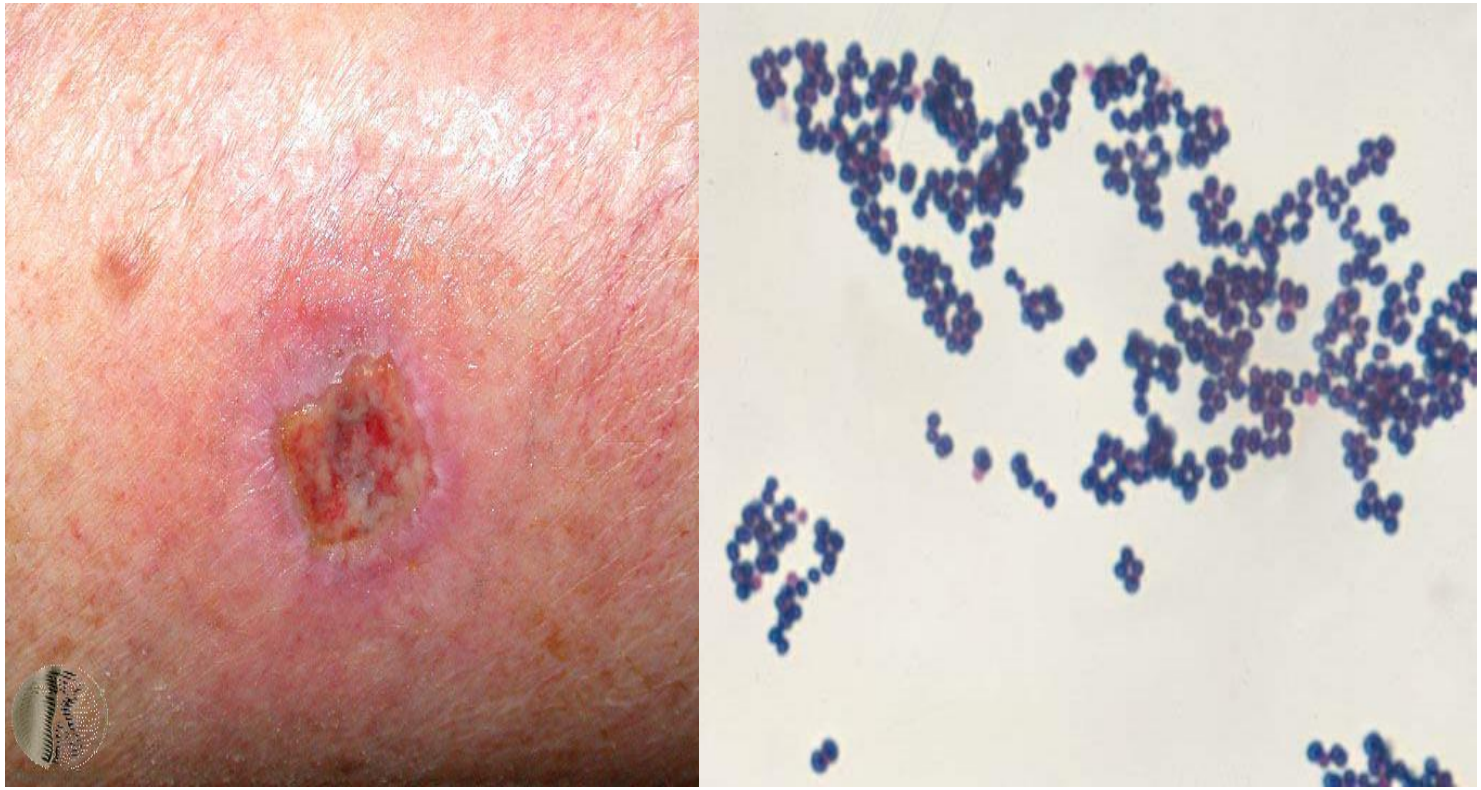


This is a bacterium isolated from a child with sore throat and tonsillitis .

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.

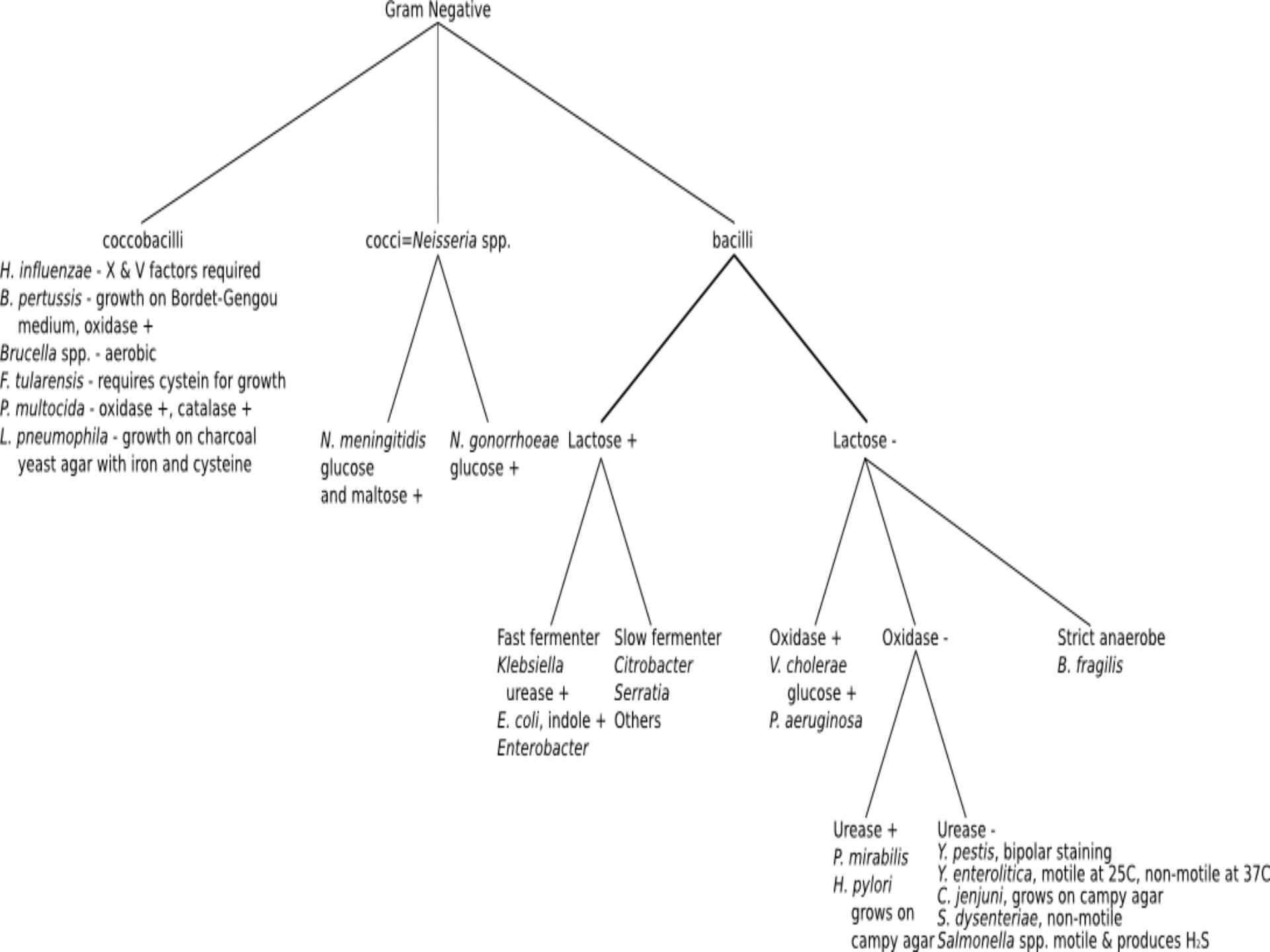


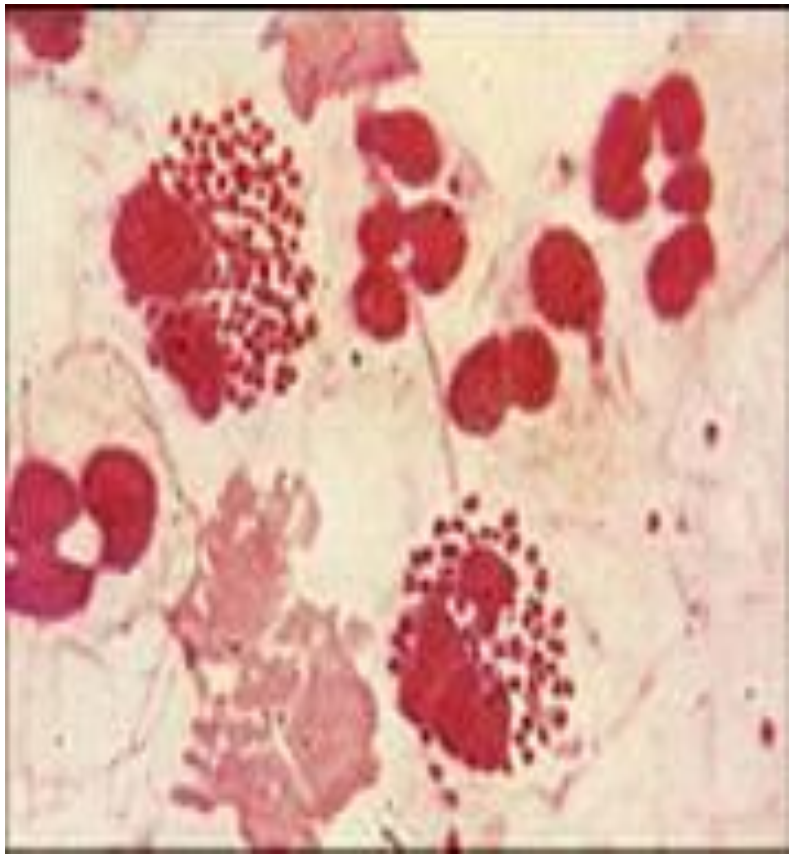
Describe what you see in the slide above.

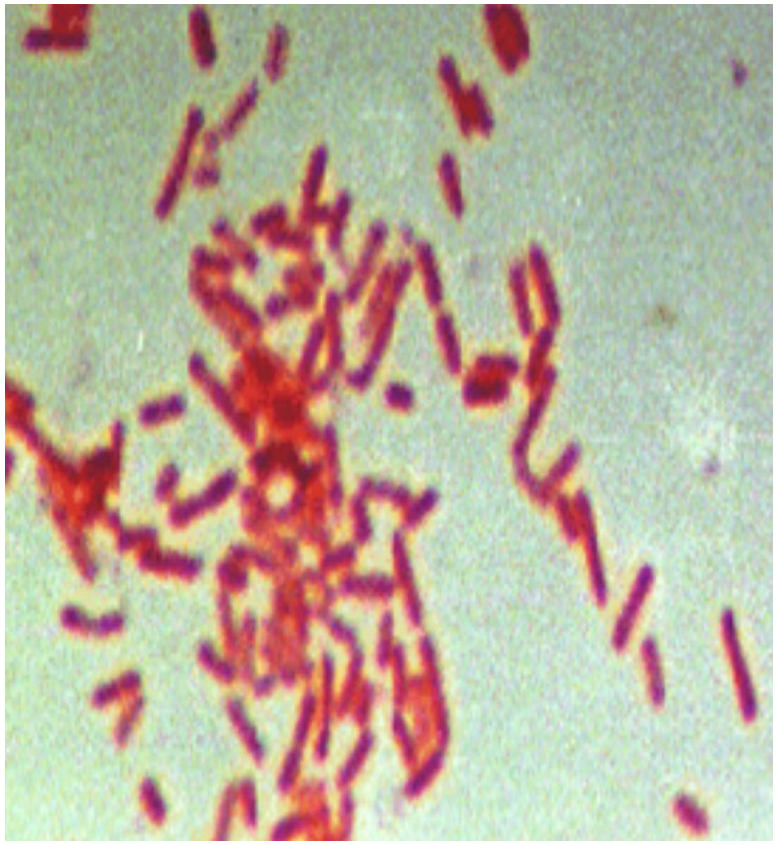
Gram-positive cocci in clusters

What is the likely organism ?

Staphylococcus aureus


Gram Negative
coccobacilli
cocci=*Neisseria* spp.
bacilli
H. influenzae - X & V factors required
B. pertussis - growth on Bordet-Gengou medium, oxidase +
Brucella spp. - aerobic
F. tularensis - requires cystein for growth
P. multocida - oxidase +, catalase +
L. pneumophila - growth on charcoal yeast agar with iron and cysteine
N. meningitidis glucose and maltose +
N. gonorrhoeae glucose +
Lactose +
Lactose -
Fast fermenter *Klebsiella* urease + *E. coli*, indole + *Enterobacter*
Slow fermenter *Citrobacter* *Serratia* Others
Oxidase + *V. cholerae* glucose + *P. aeruginosa*
Oxidase -
Strict anaerobe *B. fragilis*
Urease + *P. mirabilis* *H. pylori* grows on campy agar
Urease - *Y. pestis*, bipolar staining *Y. enterolitica*, motile at 25C, non-motile at 37C *C. jenjuni*, grows on campy agar *S. dysenteriae*, non-motile *Salmonella* spp. motile & produces H_2S





Gram negative cocci

(Diplococci)

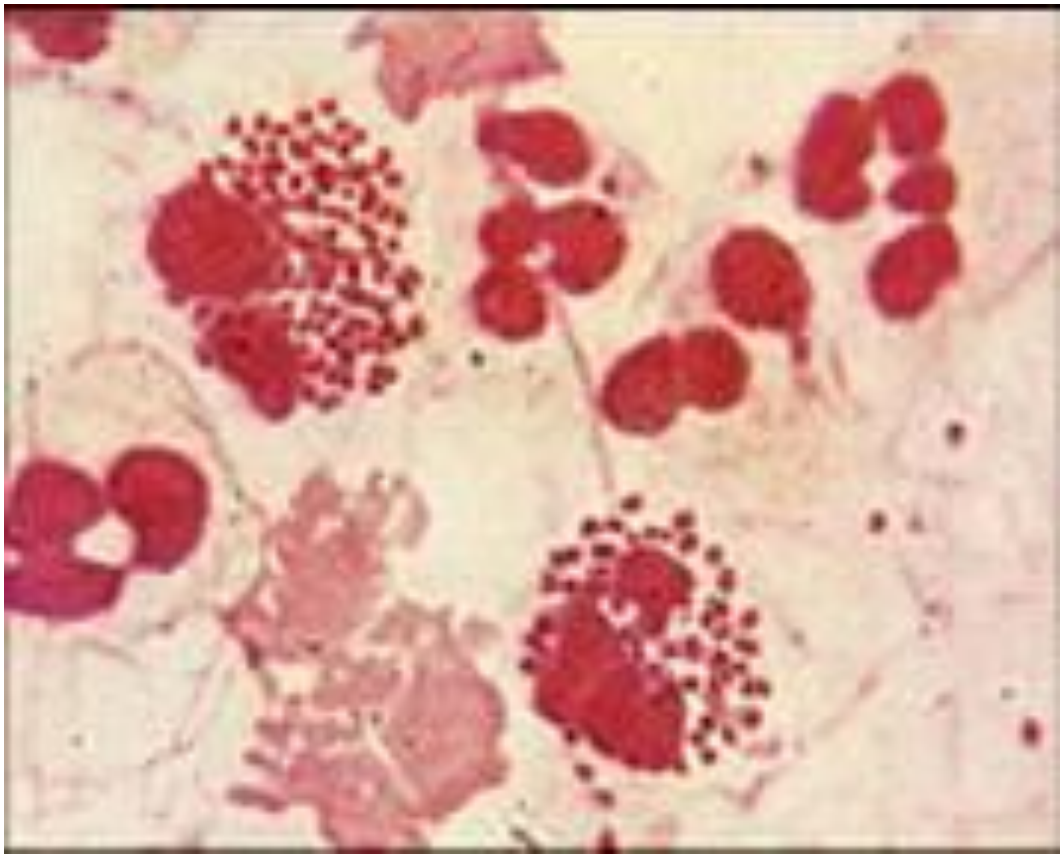
e.g Neisseria

Gram negative bacilli

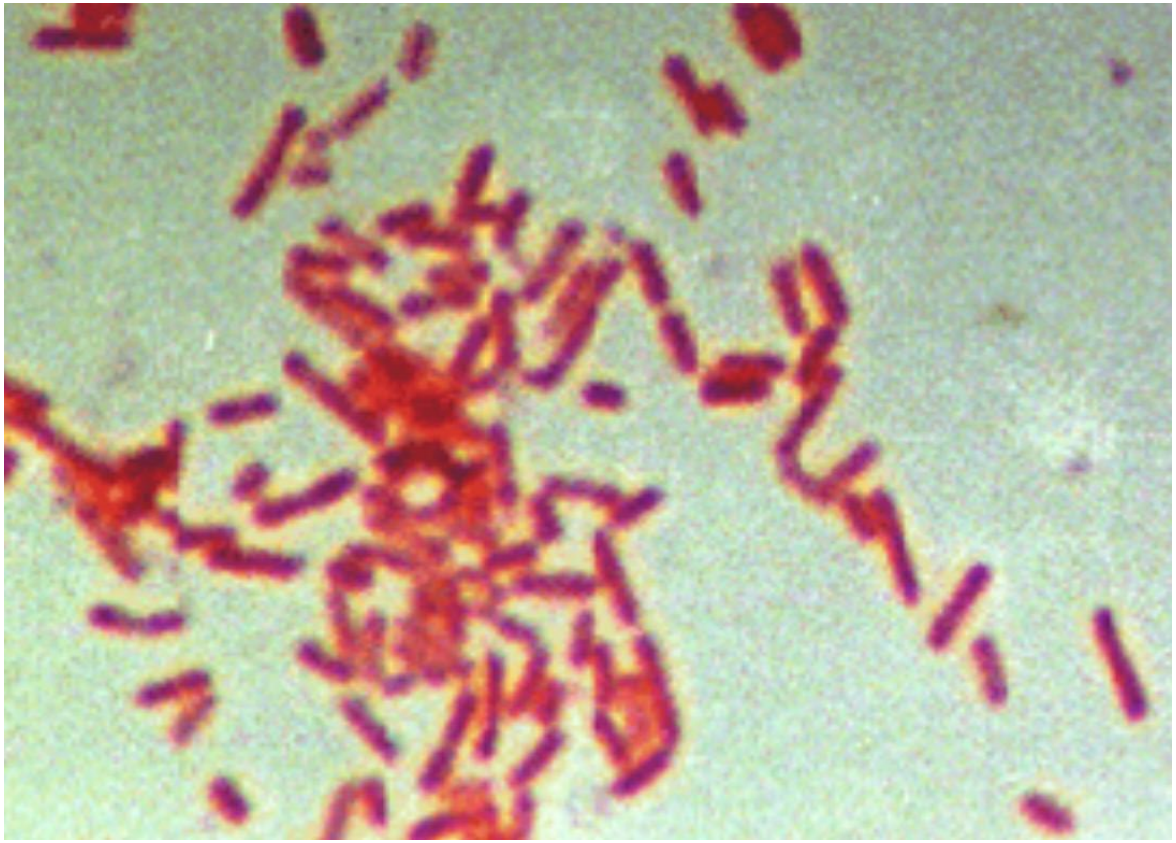
e.g E. coli

Salmonella

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

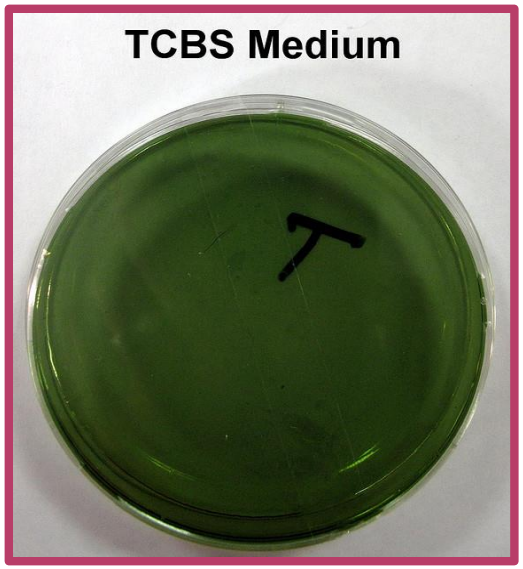
Describe its shape **bacilli (rods)**

Microbial growth or culture media

a general culture medium

an enriched medium

a differential medium

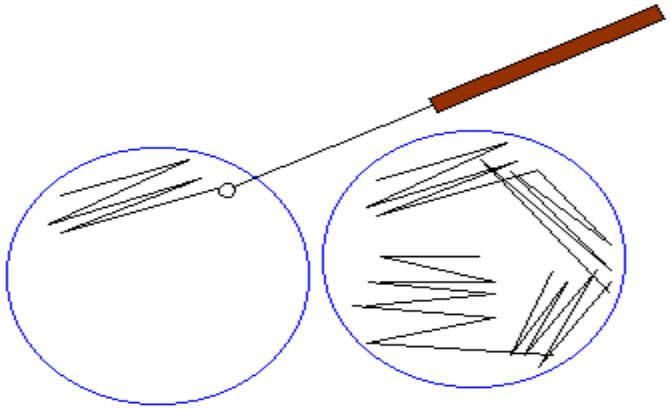


Thiosulphate citrate bile salt sucrose (TCBS) **is a selective medium**

Type	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 numbers of desired microbes to detectable levels.

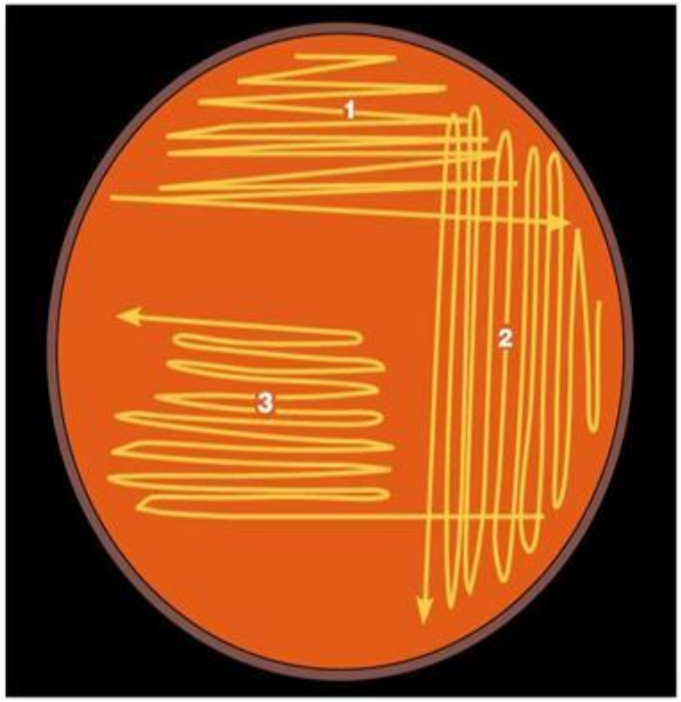
INOCULATION

STREAKING

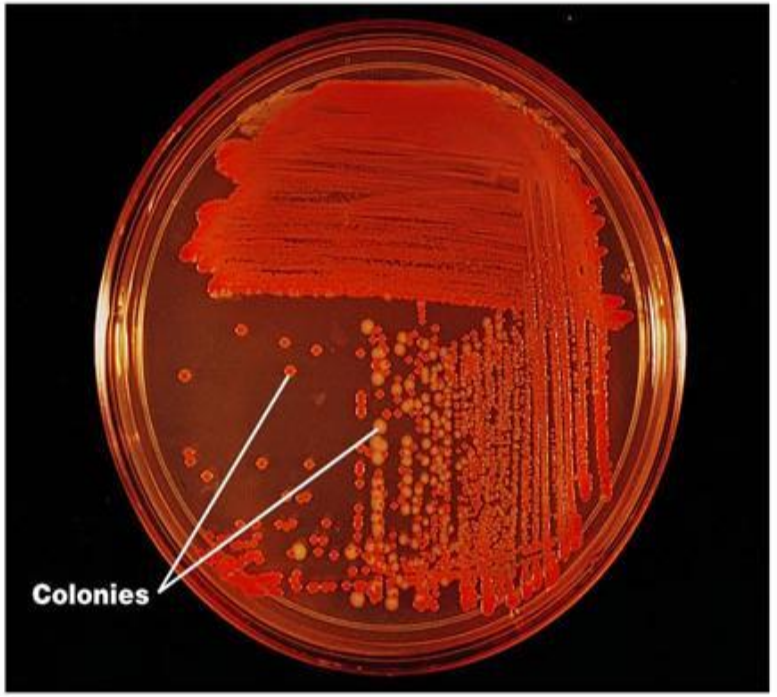


INCUBATION

Laboratory Incubator

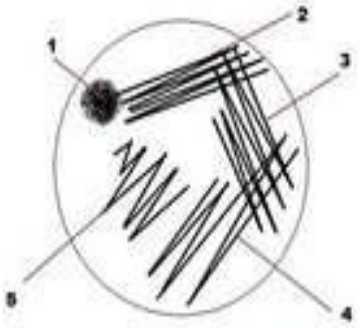


(a) The direction of streaking is indicated by arrows. Streak series 1 is made from the original bacterial culture. The inoculating loop is sterilized following each streak series. In series 2 and 3, the loop picks up bacteria from the previous series, diluting the number of cells each time. There are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



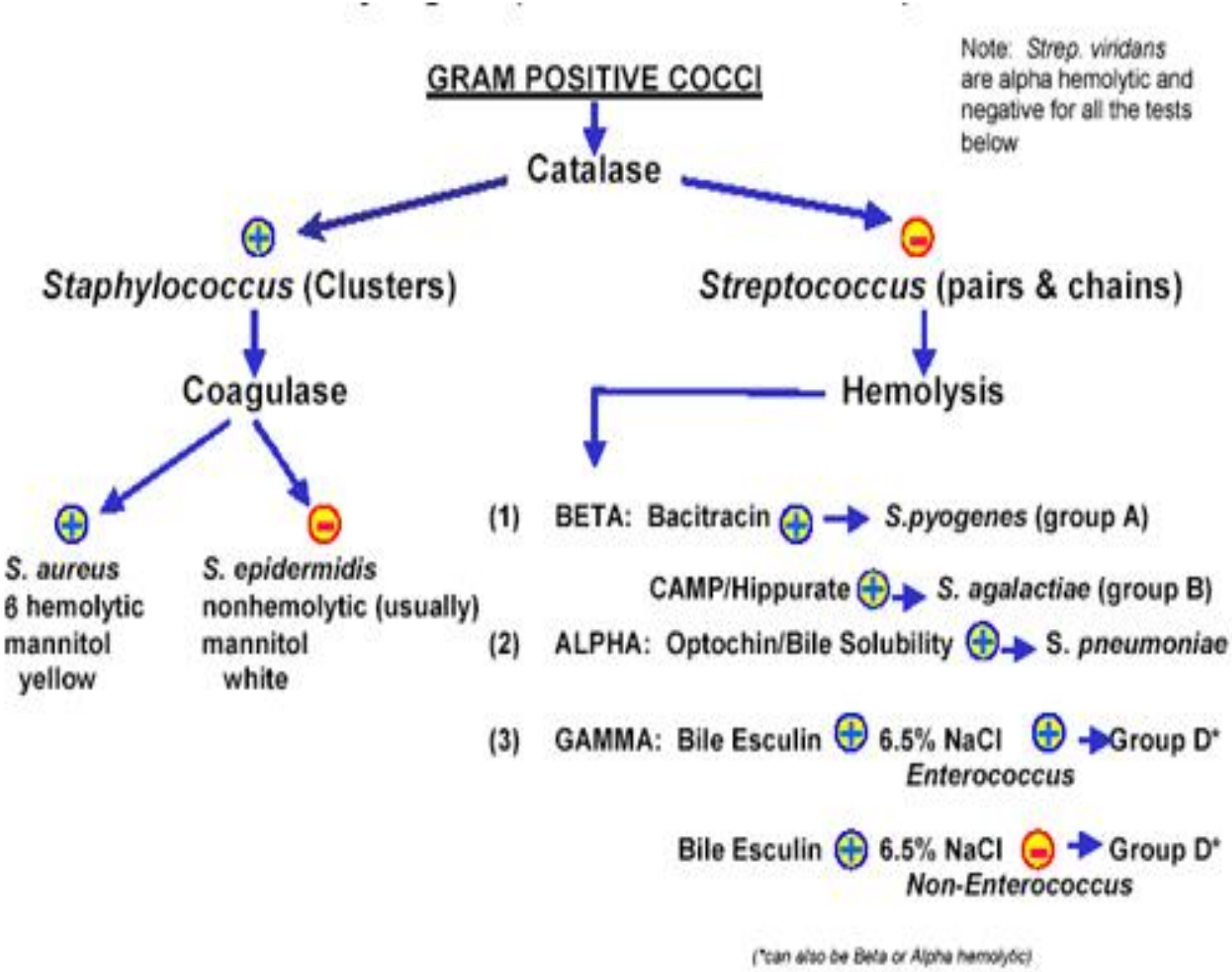
(b) In series 3 of this example, notice that well-isolated colonies of bacteria of two different types, red and yellow, have been obtained.

Figure 6.10 - Overview



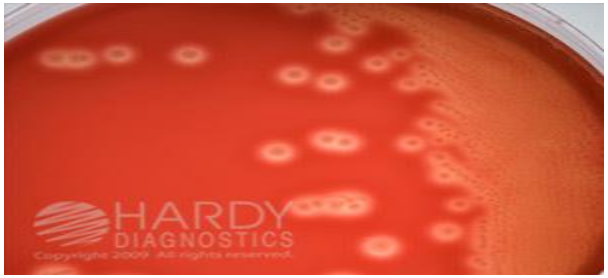
Blood agar

This is a general culture medium used for culture of bacteria.

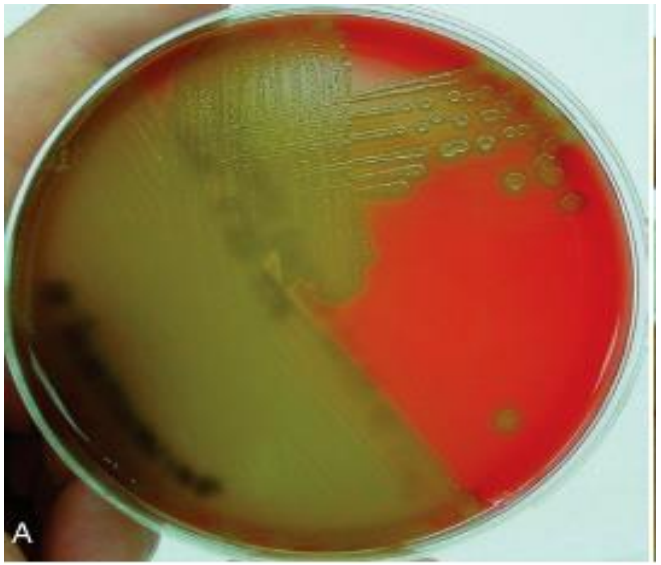

GRAM POSITIVE COCCI
Note: Strep. viridans are alpha hemolytic and negative for all the tests below
Catalase
Staphylococcus (Clusters)
Streptococcus (pairs & chains)
Coagulase
Hemolysis
S. aureus
6 hemolytic
mannitol
yellow
S. epidermidis
nonhemolytic (usually)
mannitol
white
(1) BETA: Bacitracin → S.pyogenes (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

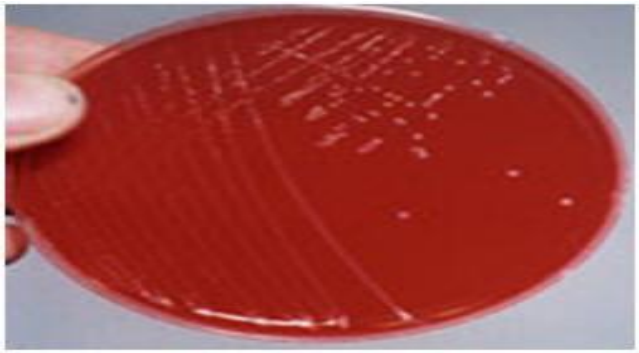
Beta-hemolytic *Streptococcus* colonies



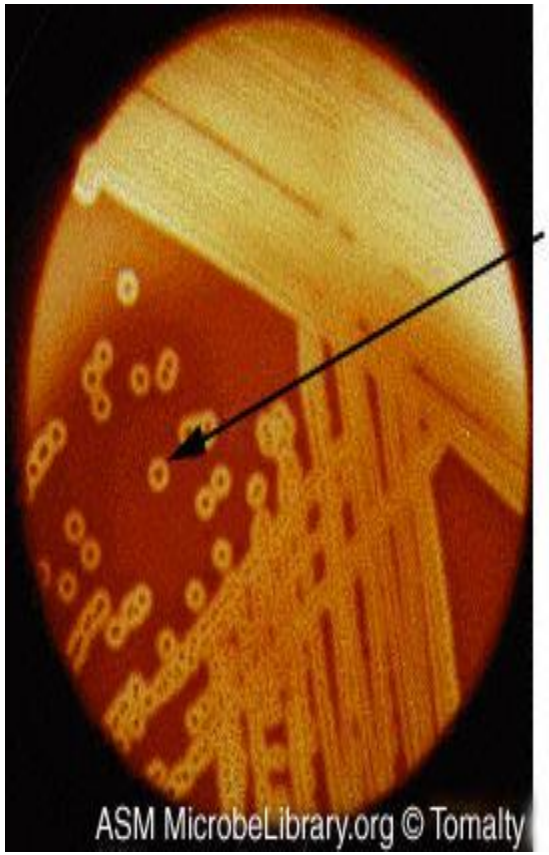
Alpha-hemolytic *Streptococcus* colonies



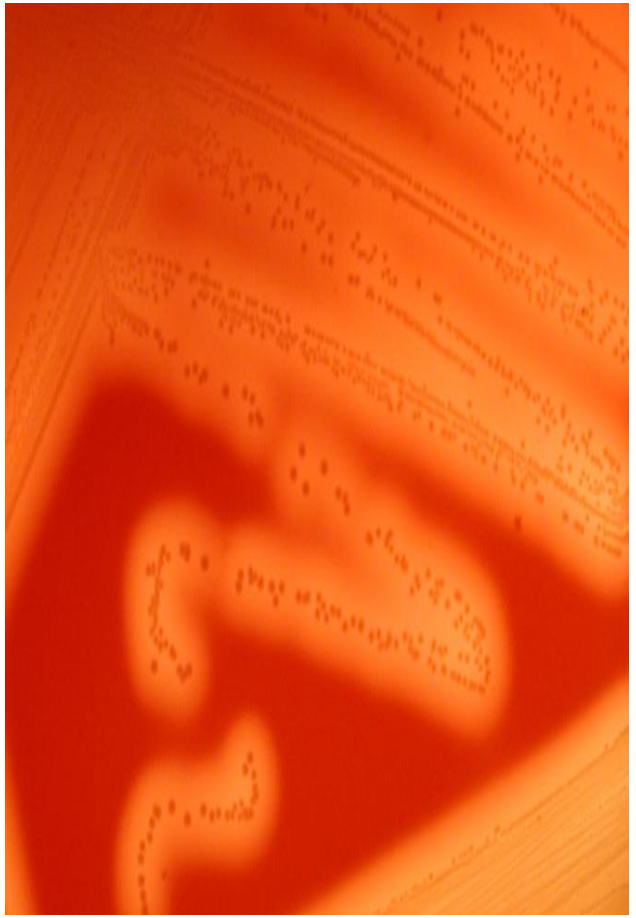
Gamma-hemolytic *Streptococcus* colonies



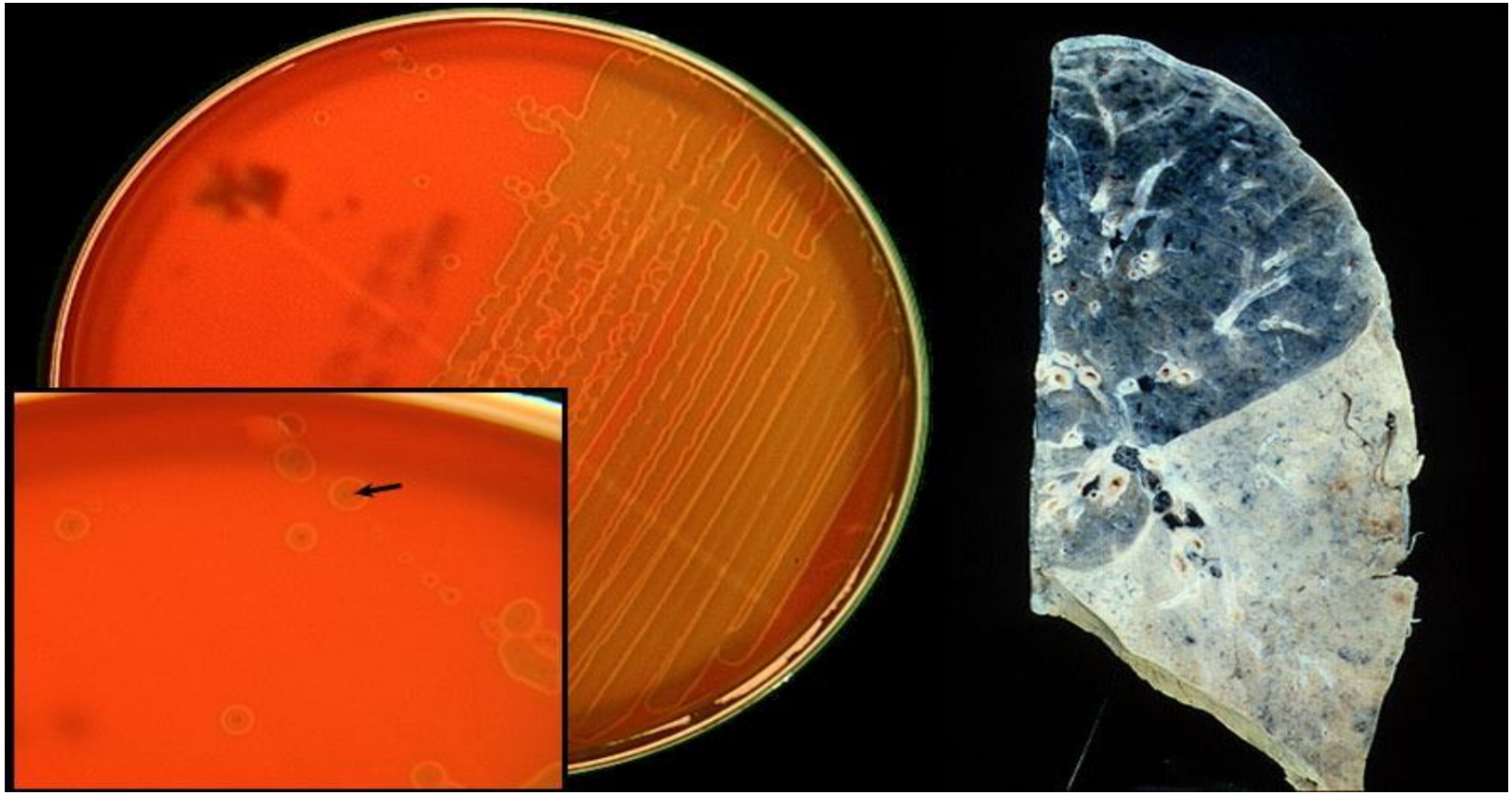
This is a blood agar growing beta hemolytic streptococci.



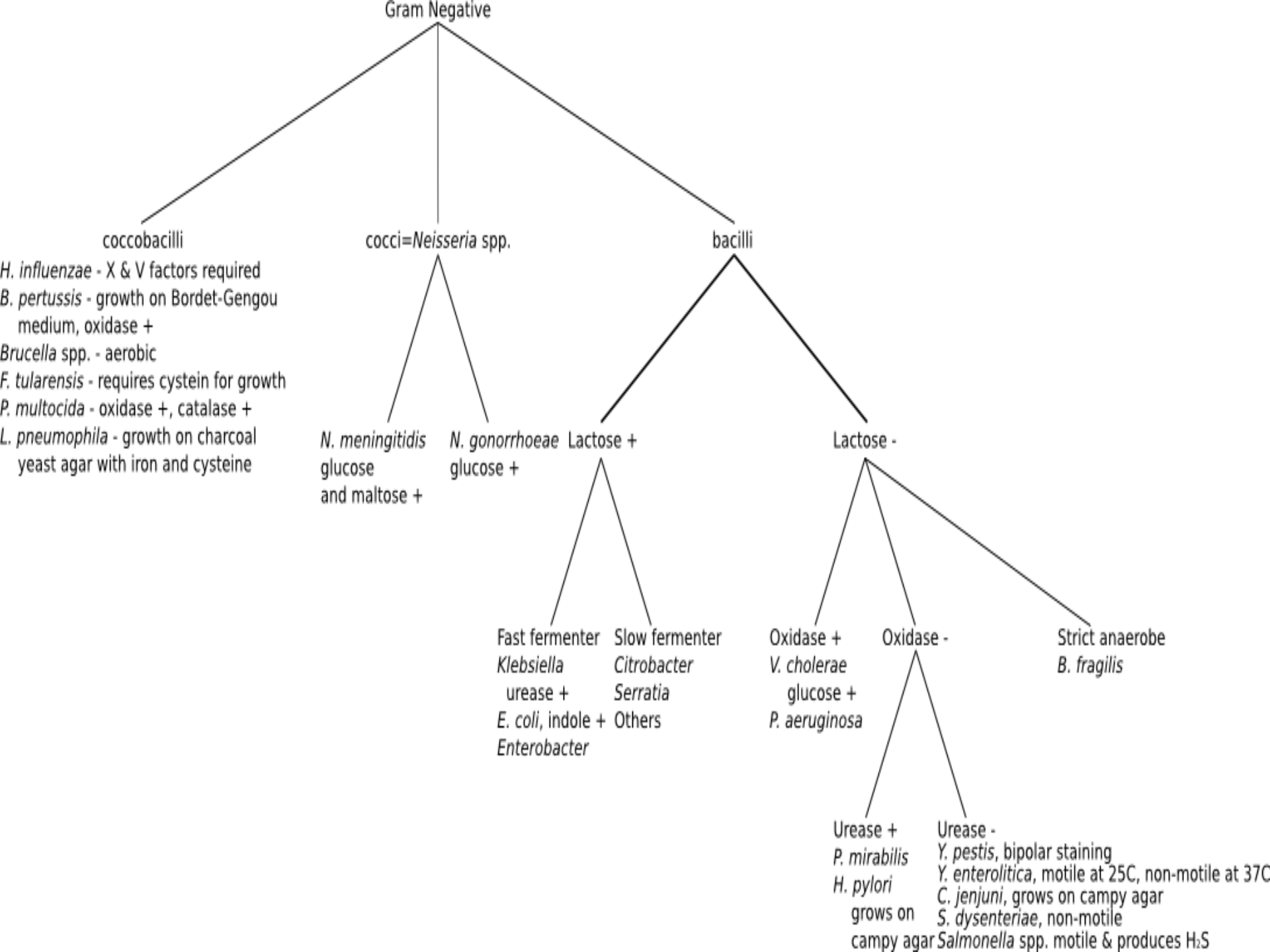
Note the clear zone of beta-hemolysis surrounding the *Streptococcus* colonies when grown on blood agar.



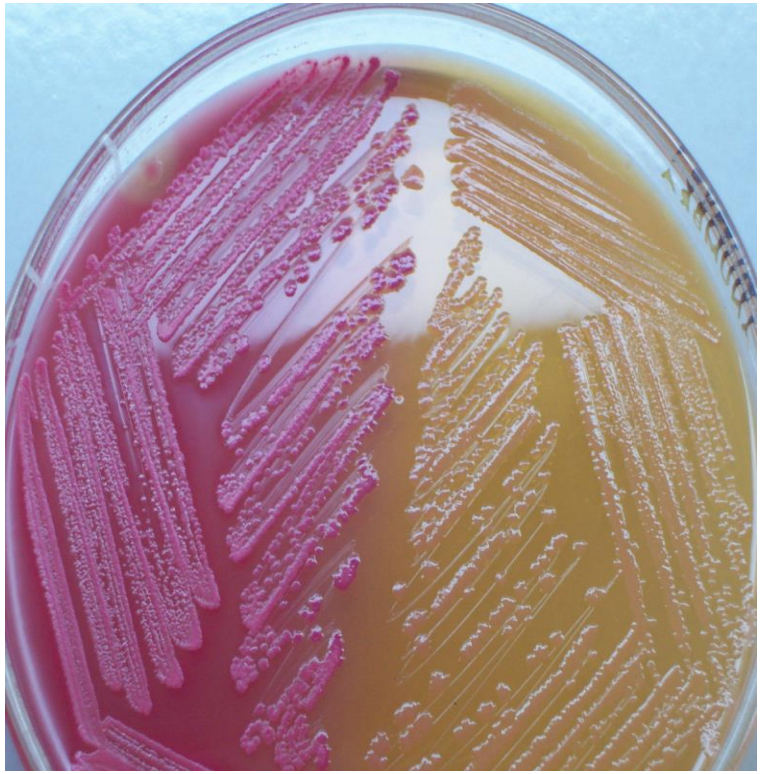
This culture was grown from a sputum specimen of a 60 year old man complaining of cough, fever and chest pain.

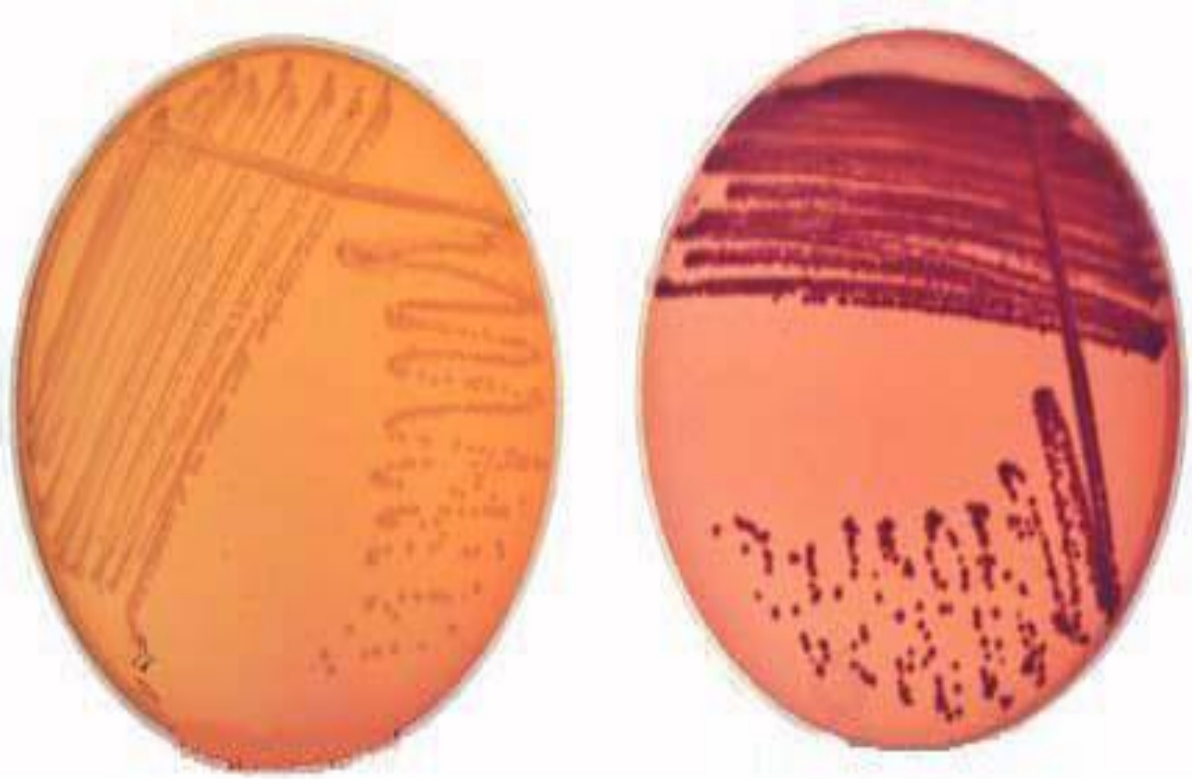


α hemolytic streptococci on blood agar


Gram Negative
coccobacilli
cocci=*Neisseria* spp.
bacilli
H. influenzae - X & V factors required
B. pertussis - growth on Bordet-Gengou medium, oxidase +
Brucella spp. - aerobic
F. tularensis - requires cystein for growth
P. multocida - oxidase +, catalase +
L. pneumophila - growth on charcoal yeast agar with iron and cysteine
N. meningitidis glucose and maltose +
N. gonorrhoeae glucose +
Lactose +
Lactose -
Fast fermenter *Klebsiella* urease + *E. coli*, indole + *Enterobacter*
Slow fermenter *Citrobacter* *Serratia* Others
Oxidase + *V. cholerae* glucose + *P. aeruginosa*
Oxidase -
Strict anaerobe *B. fragilis*
Urease + *P. mirabilis* *H. pylori* grows on campy agar
Urease - *Y. pestis*, bipolar staining *Y. enterolitica*, motile at 25C, non-motile at 37C *C. jenjuni*, grows on campy agar *S. dysenteriae*, non-motile *Salmonella* spp. motile & produces H_2S

MacConkey's agar showing both lactose and non-lactose fermenting colonies. Lactose fermenting colonies are pink whereas non-lactose fermenting ones are colourless or appear same as the medium.





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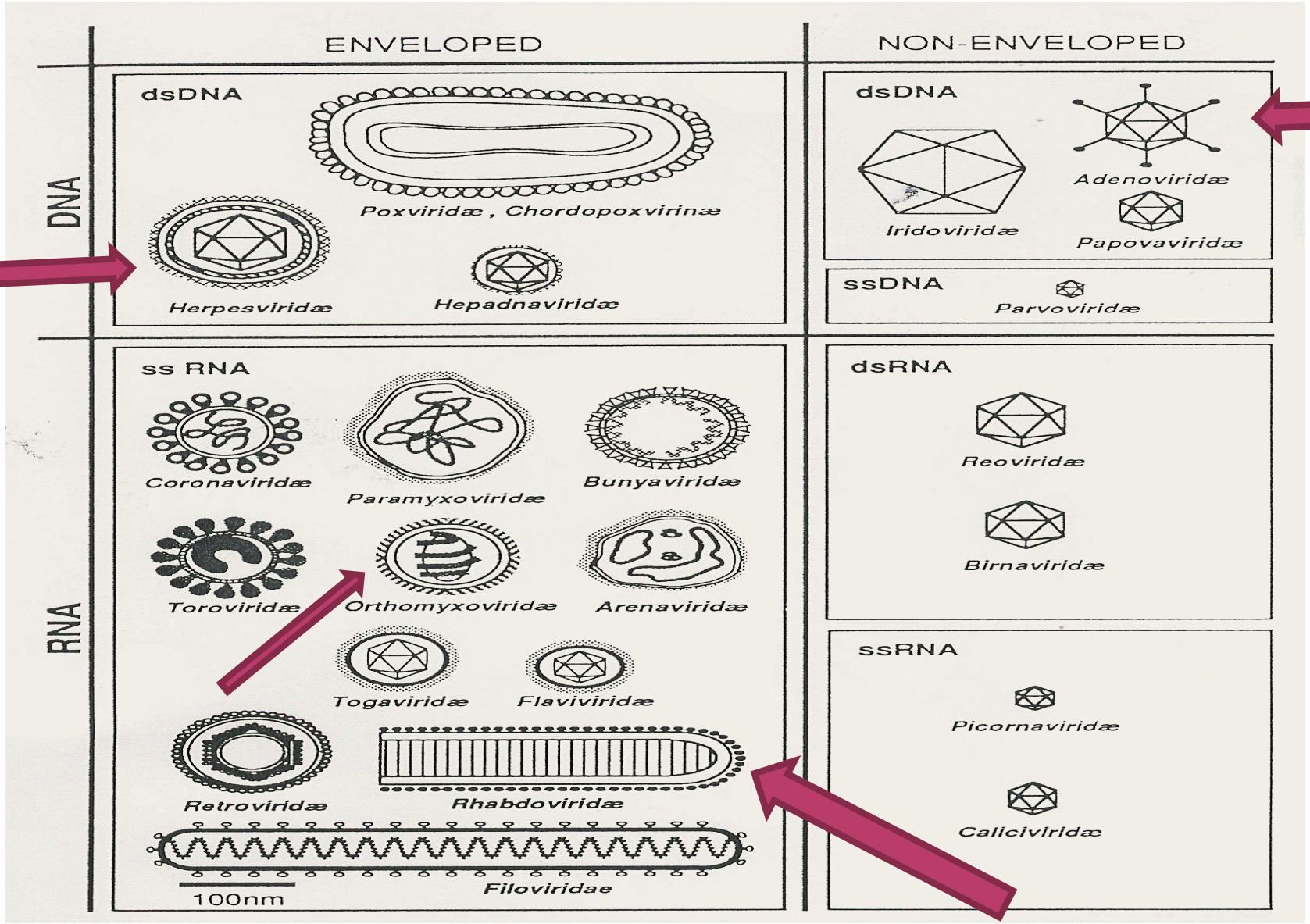
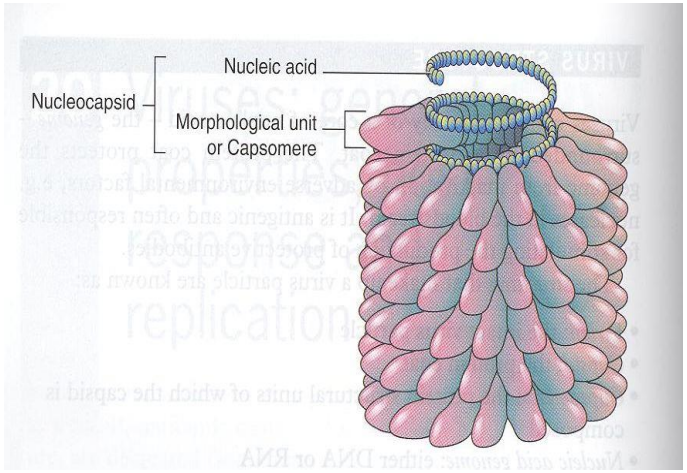
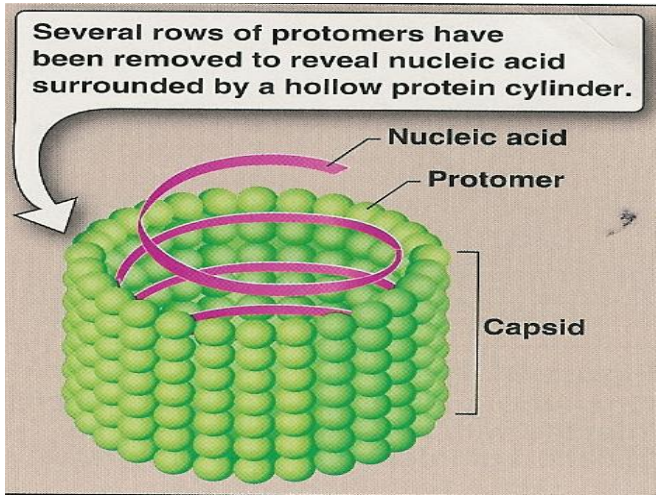
VIRUSES

Classification

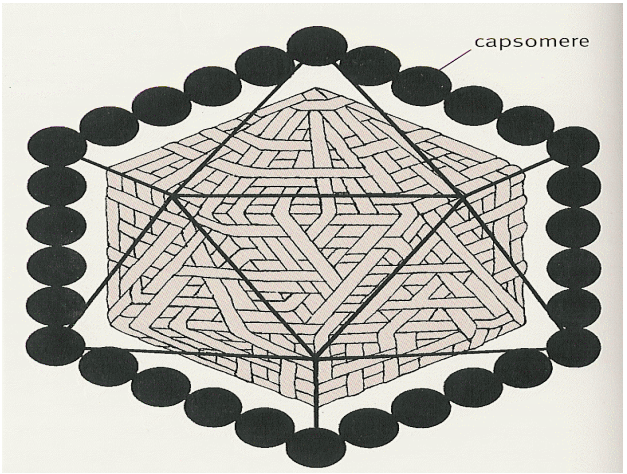


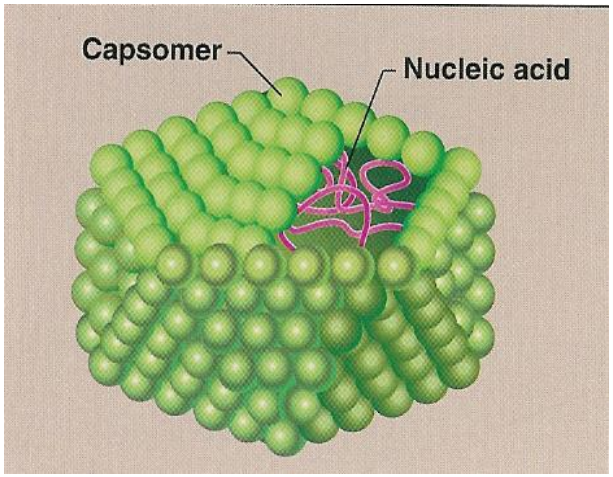
Helical Virus



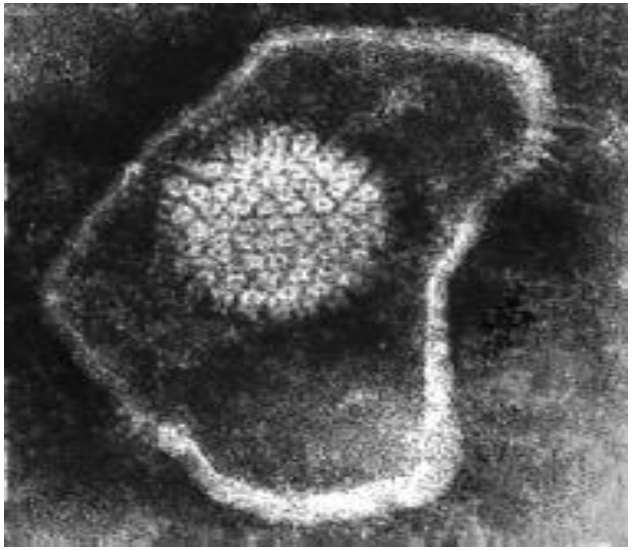


Icosahedral Virus

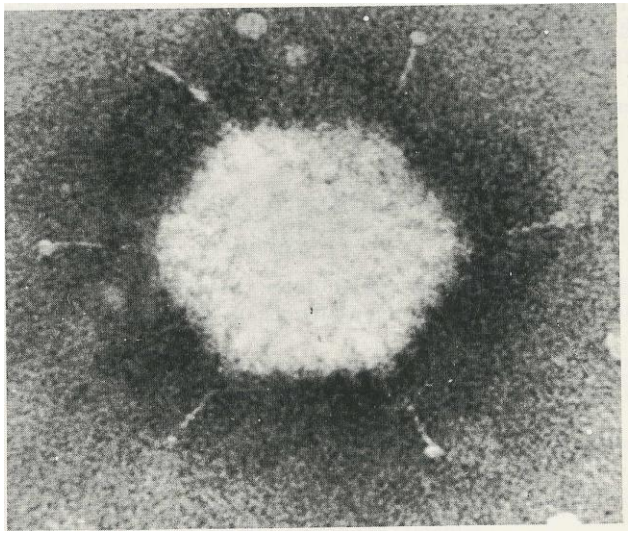




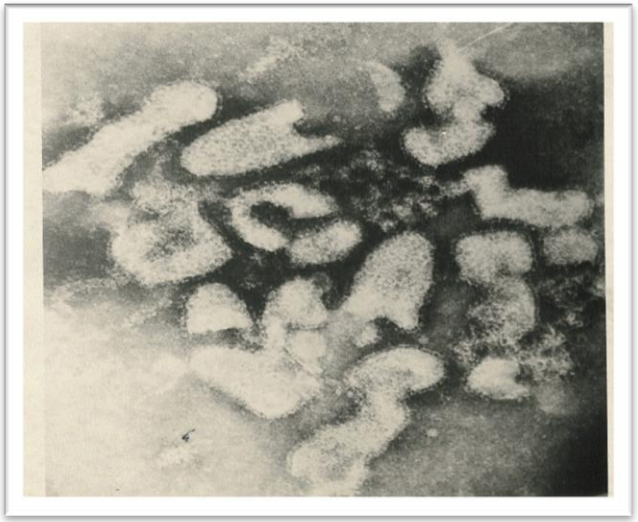
Electron microscopy ; electron micrographs



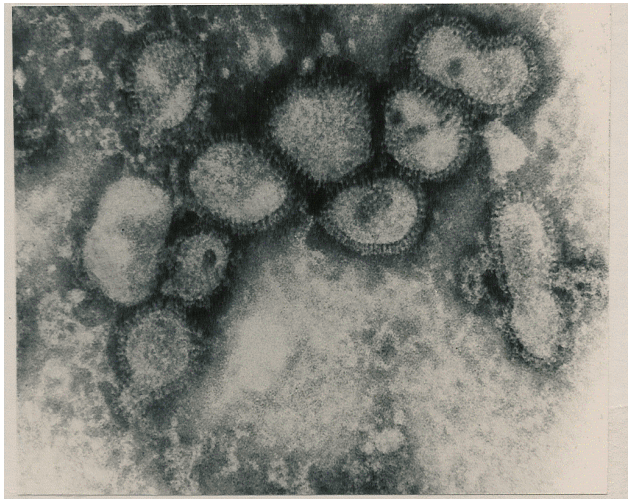
Herpes virus



Adenovirus

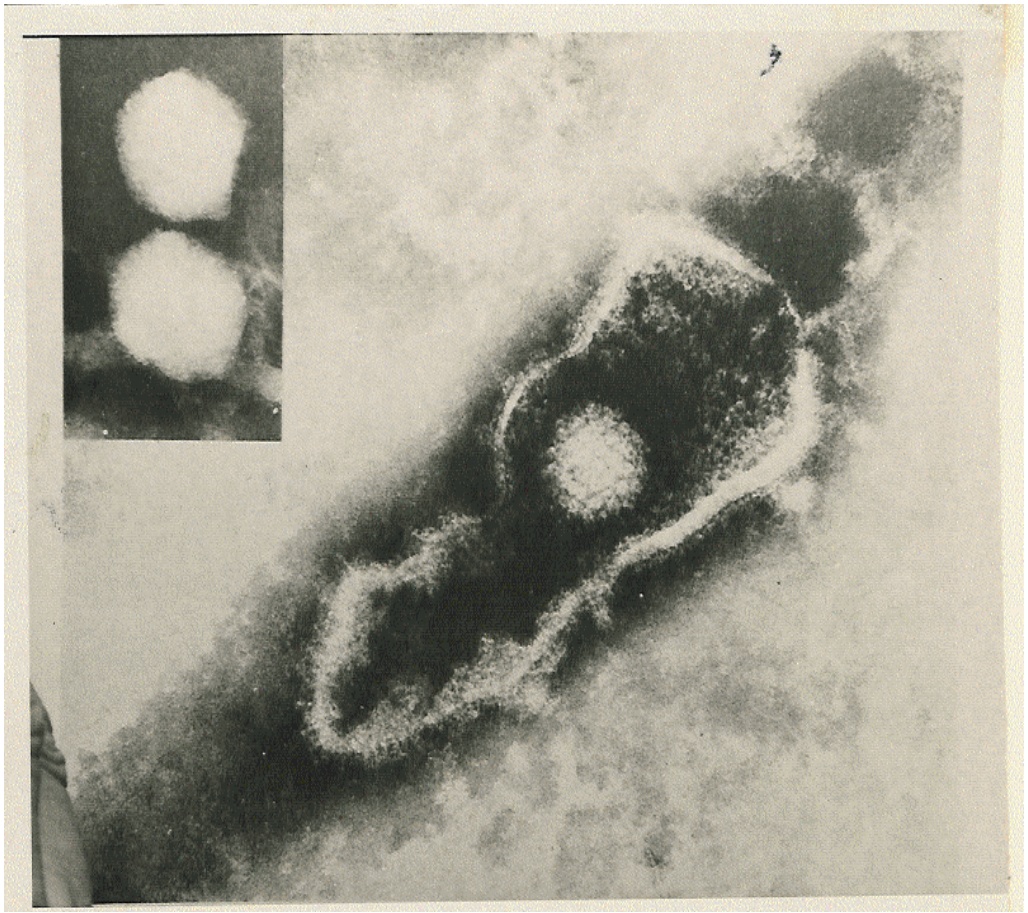


Rabies virus



Influenza Viruses

Herpes simplex virus -1 : Herpesviridae



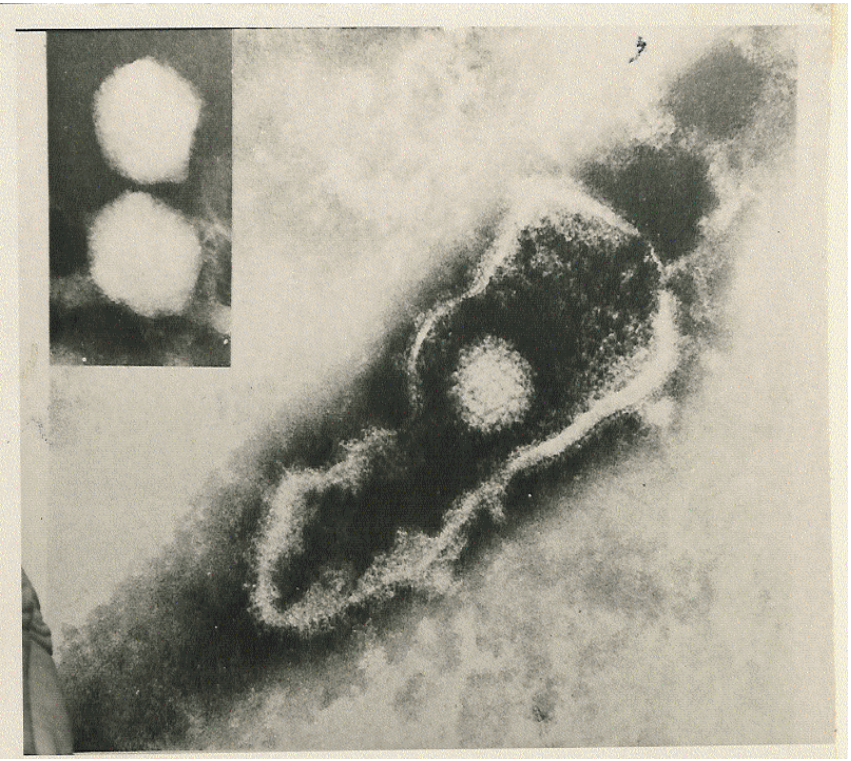
Enveloped virus

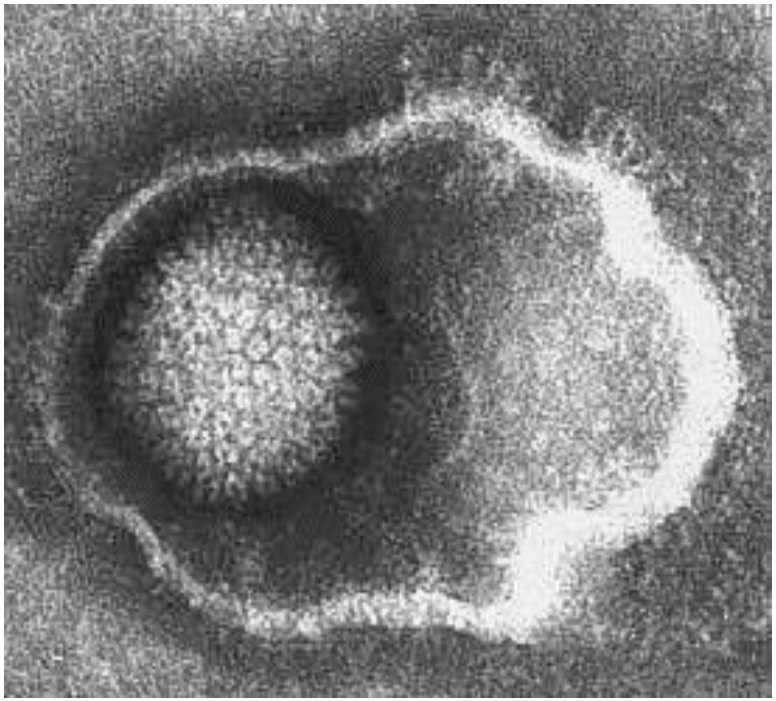
Icosahedral capsid

d.s DNA genome

Loose envelope

These are electron micrographs of a virus





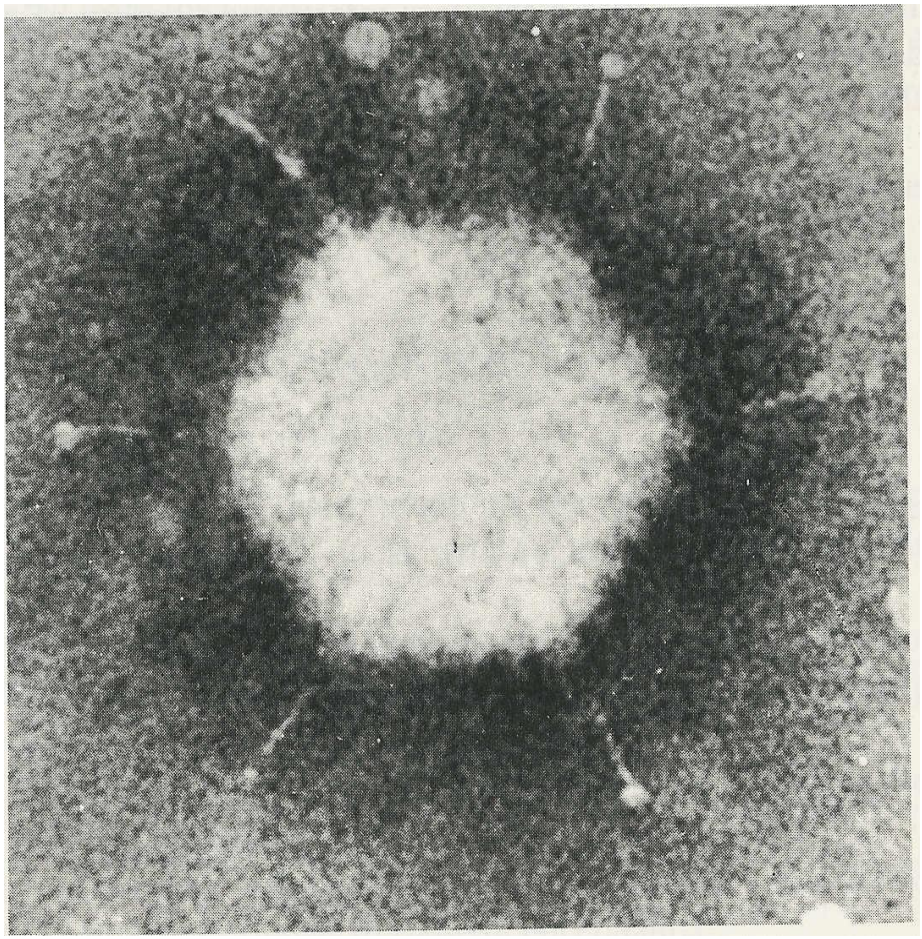
Q1: Name this virus

Herpes virus

Q2: Describe its structure.

Enveloped virus ,
Icosahedral capsid,
d.s DNA genome

Adenovirus : Adenoviridae



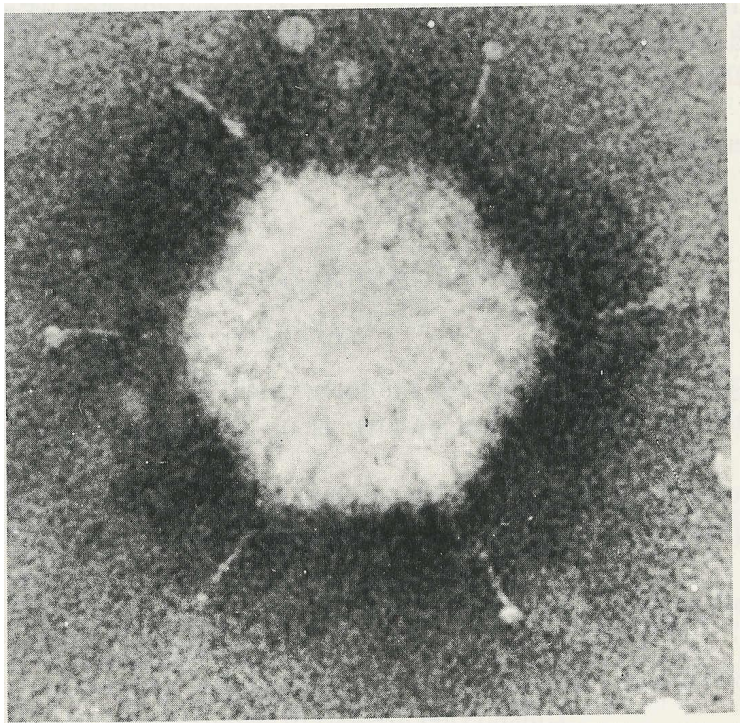
Only V with fiber

Nonenveloped virus

Icosahedral capsid

d.s DNA genome

This is an electron micrograph of a virus



Q1: Name this virus

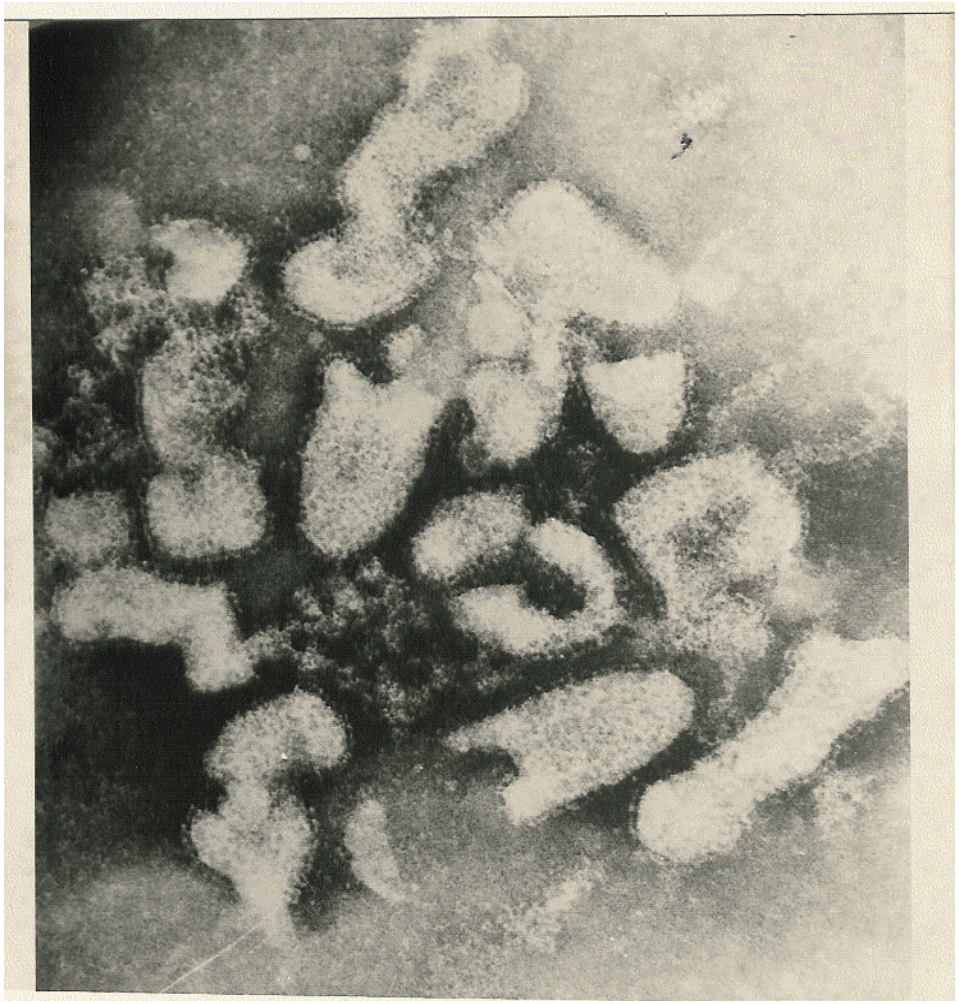
Adenovirus

Q2: Describe its structure.

Nonenveloped virus,

Icosahedral capsid & d.s DNA genome

Rabies virus: Rhabdoviridae



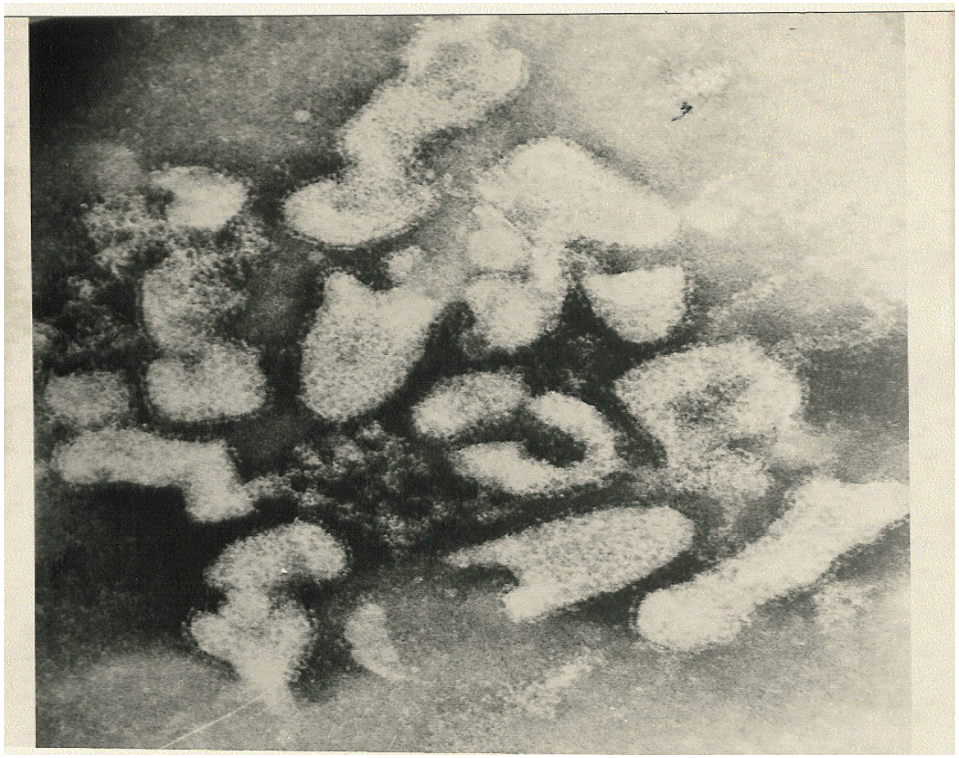
Bullet shape

Enveloped virus

Helical capsid

s.s RNA genome

This is an electron micrograph of a virus



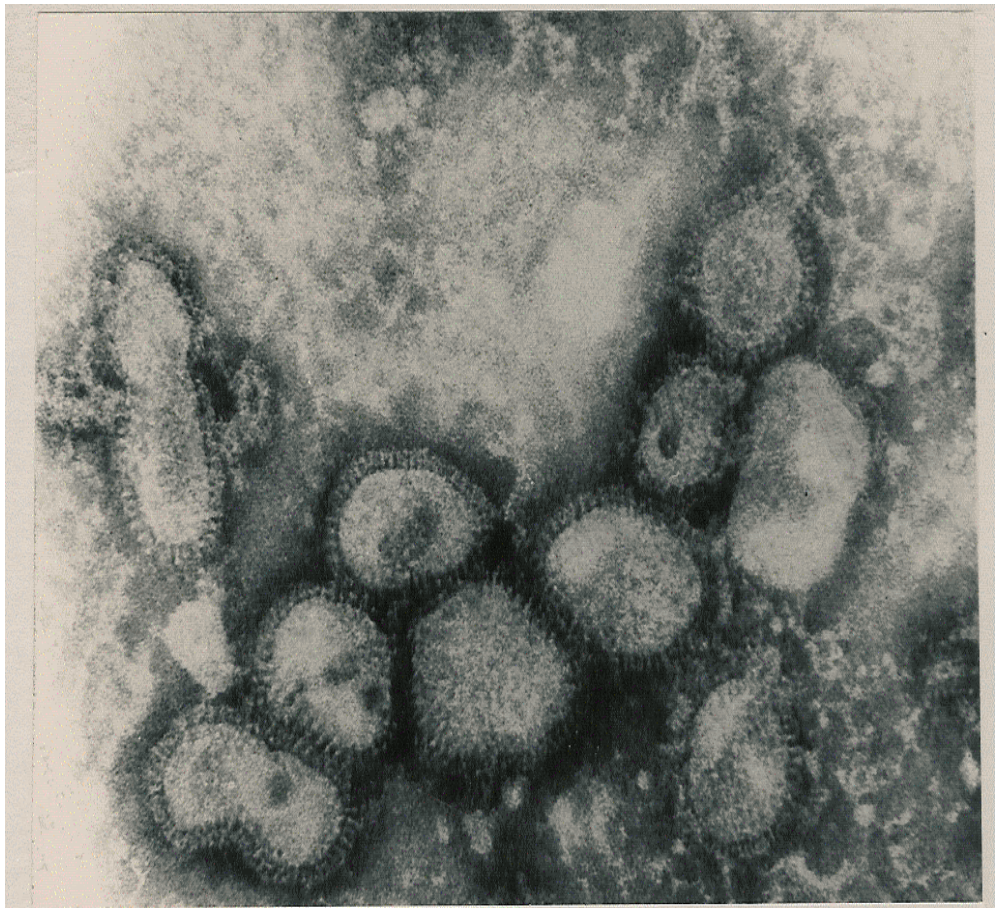
Q1: Name this virus

Rabies virus

Q2: Describe its structure.

Enveloped virus , Helical capsid & s.s RNA genome

Influenza Viruses : Orthomyxoviridae



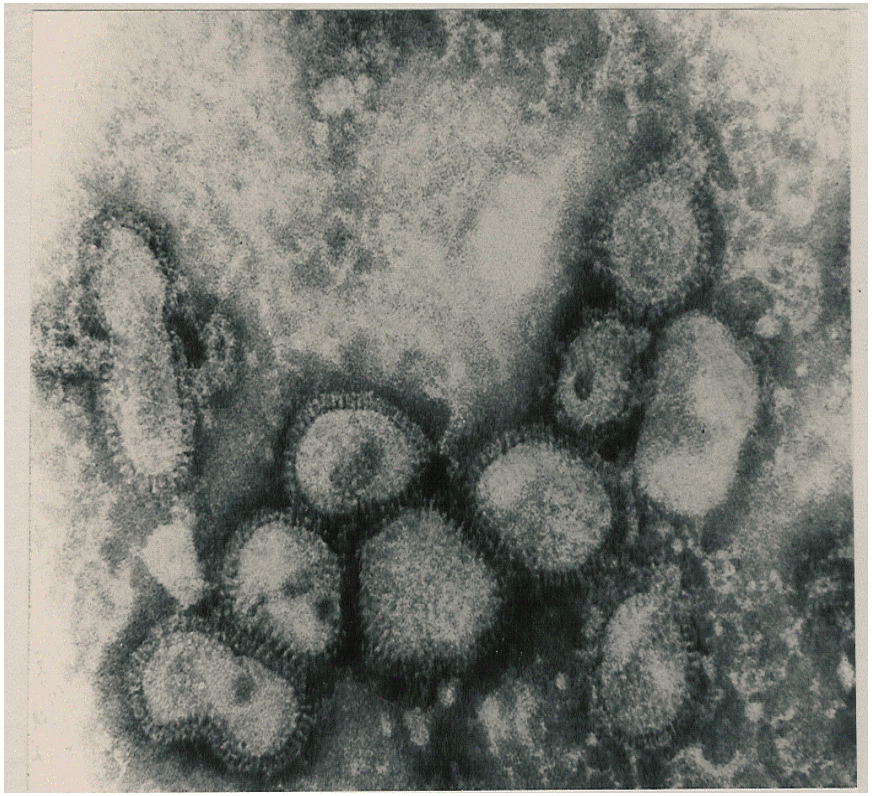
Enveloped V & spikes

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

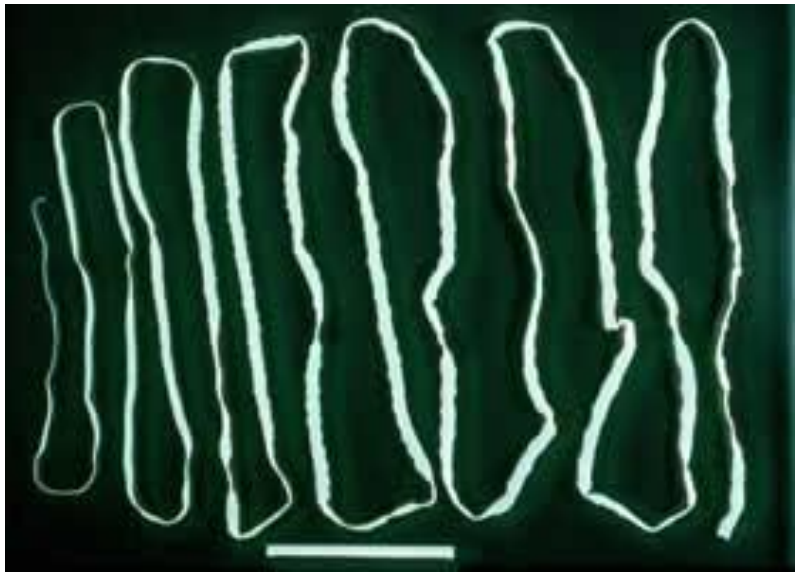
Enveloped Virus with spikes ,
Helical capsid ,Segmented s.s RNA

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

Ascaris lumbricoides (roundworm)

Ascaris adult



Taenia saginata

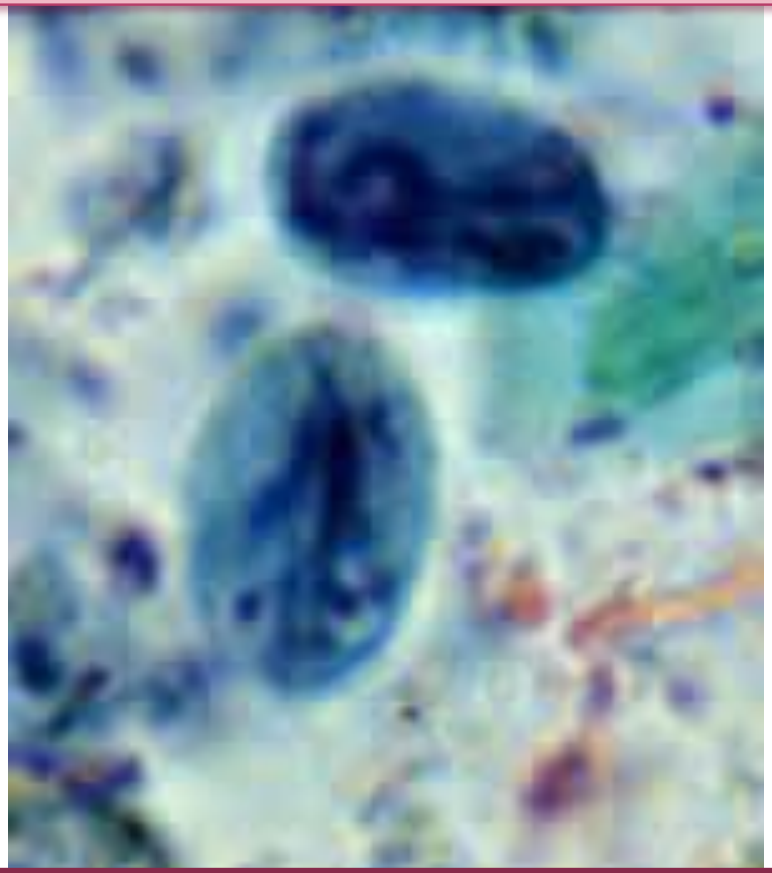
Cestodes

The Trematodes

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

ARTHROPODS OF MEDICAL IMPORTANCE

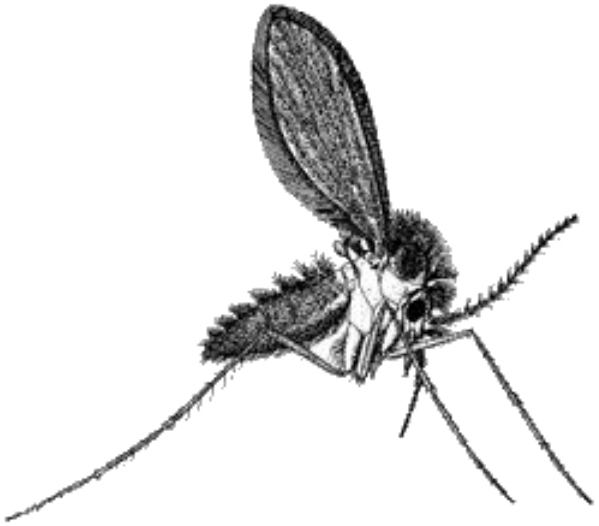
Class *Insecta* الحشرات	Class *Arachnida* العناكب	Class القشريات *Crustacea*
• Muscid flies:housefly,Tsetse fly • Myiasis-producing flies . • Mosquitoes البعوض: *Anopheles*, *Aedes* *Culex* • Sandfly ذباب الرمل (*Phlebotomus*) • Black fly(*Simulium*) • Fleas البراغيث • Lice(*Pediculus*,*Phthirus*) القمل • 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



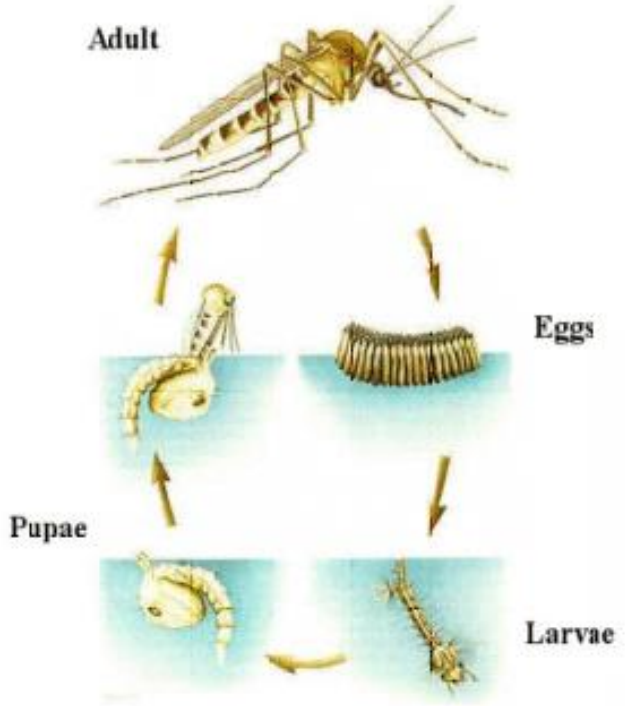
Mosquitoes :

Cosmopolitan , more than 3000 species.

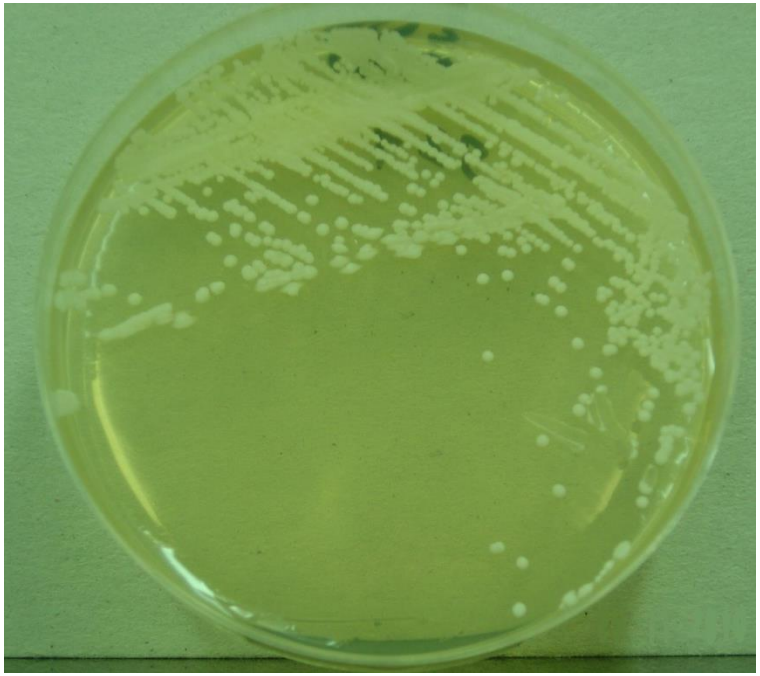
Larval and pupal stages always aquatic

Mouth parts in female adapted to piercing and sucking blood.

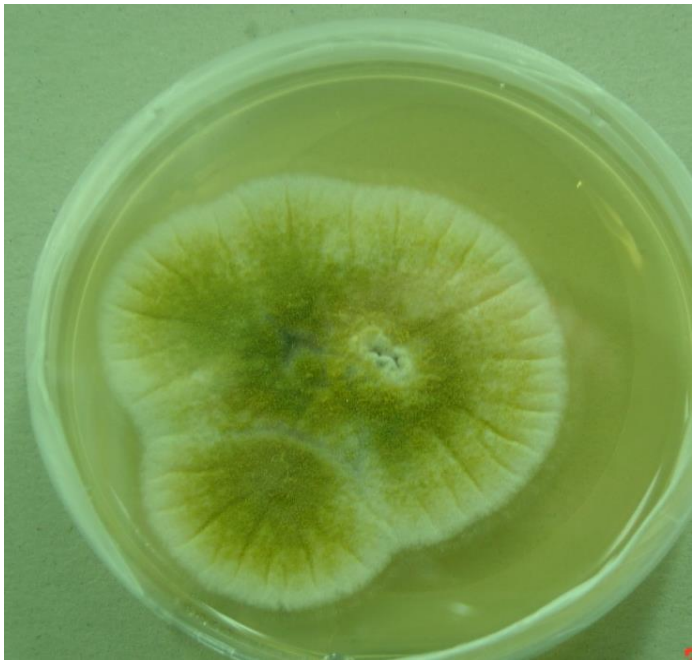
Genus and species distinguished by morphology of adult and deveopmetal stages.



Fungi can be divided to two types based on morphology



A



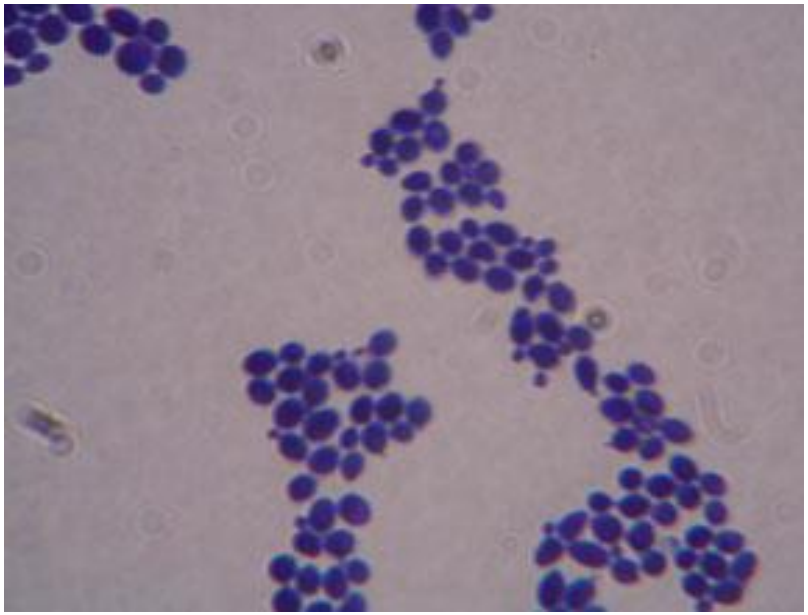
B

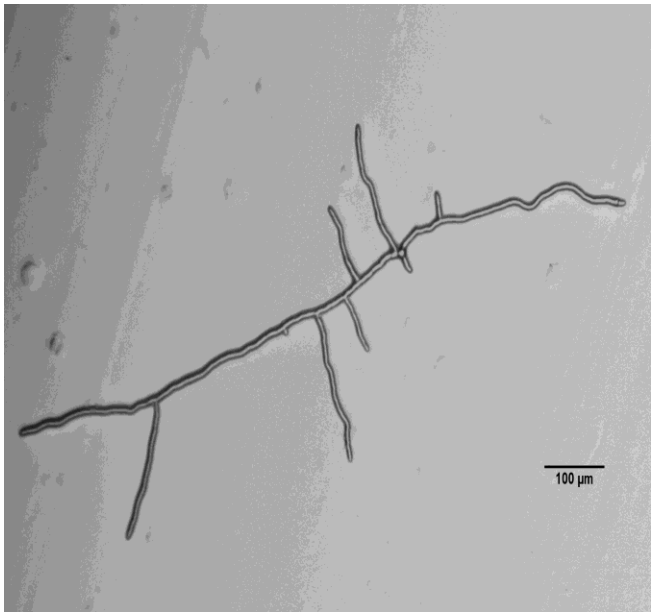
Based on morphology, name the two fungal structures in A and B?

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*

END