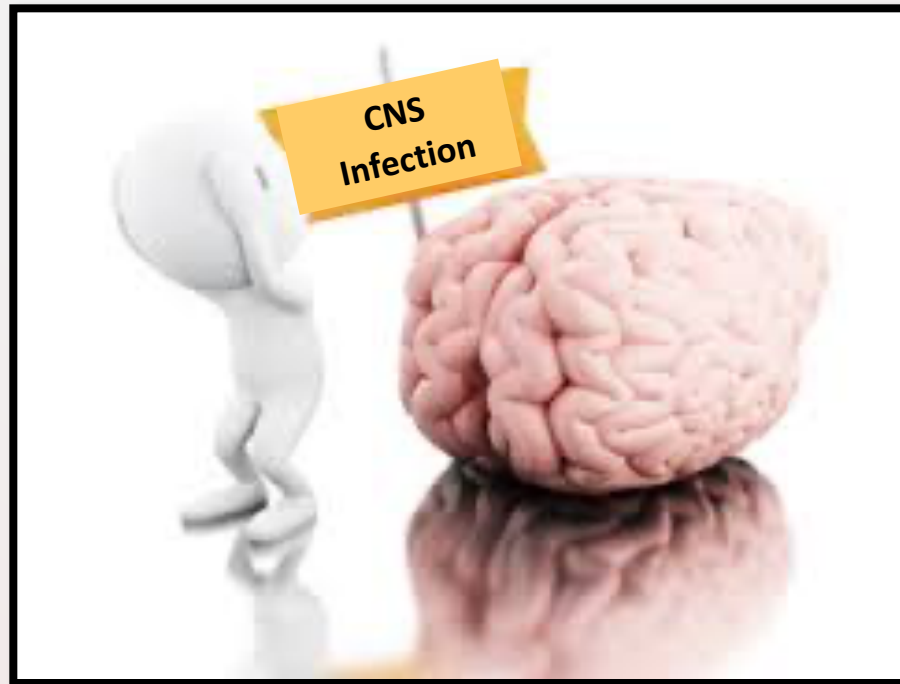


Integrated CNS Practical

Biochemical & Microbiological

Examination of CSF

CENTRAL NERVOUS SYSTEM BLOCK
2017-2018



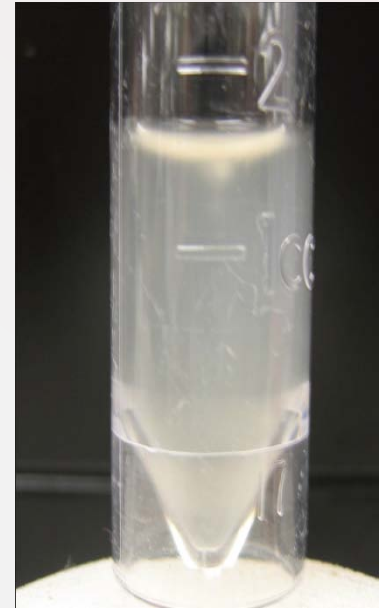
Dr. Fawzia Al-Otaibi
Dr. Khalifa Binkhamis

A 15-year-old healthy male visited emergency room presenting with fever, headache, vomiting and drowsiness. Physical examination showed **decreased level of consciousness, neck stiffness, skin rash** and **high temperature (38°C)**. Cerebrospinal fluid (CSF) examination revealed opening pressure of 210 cm H₂O.

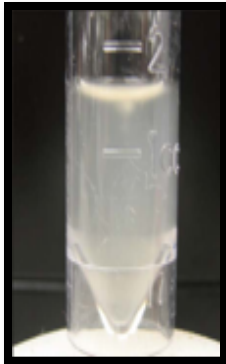

The doctor in the emergency department takes a detailed history and conducts a clinical examination. Because of clinical findings, he decides to do a lumbar puncture. **The results of the lumbar puncture are shown below:**



Normal and turbid CSF



CASE 1: LUMBER PUNCTURE RESULTS

CSF	Patient's results	Normal range
Appearance	Turbid 	Clear 
WBCs and differential	8,320 per mm³ Mainly polymorphonuclear leucocytes (84%)	Few (<5 cells/mm³)
Protein	5.0	01-0.4 g/L
Glucose	1.3	3.0-4.5 mmol/L
Chloride	110	115-130 mmol/L

QUESTION 1:

What is your diagnosis?

.....
.....

QUESTION 2:

What is the most likely infection responsible?(Select only one)

- A. Mycobacterium Avium**
- B. Fungal infection**
- C. Parasitic infection**
- D. Viral infection**
- E. Bacterial infection**
- F. Trepanoma pallidum (Neurosyphilis)**
- G. Mycobacterium tuberculosis**

QUESTION 3:

What is your justification for your answer to question two?

.....
.....

QUESTION 4:

What further investigation would you like to do at this stage?

.....
.....

QUESTION 5:

Mention two of the recommended antibiotics that can be used as empiric treatment in such a case?.....

.....

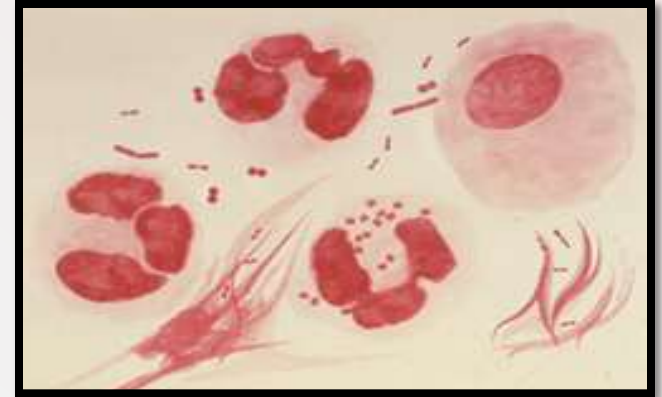
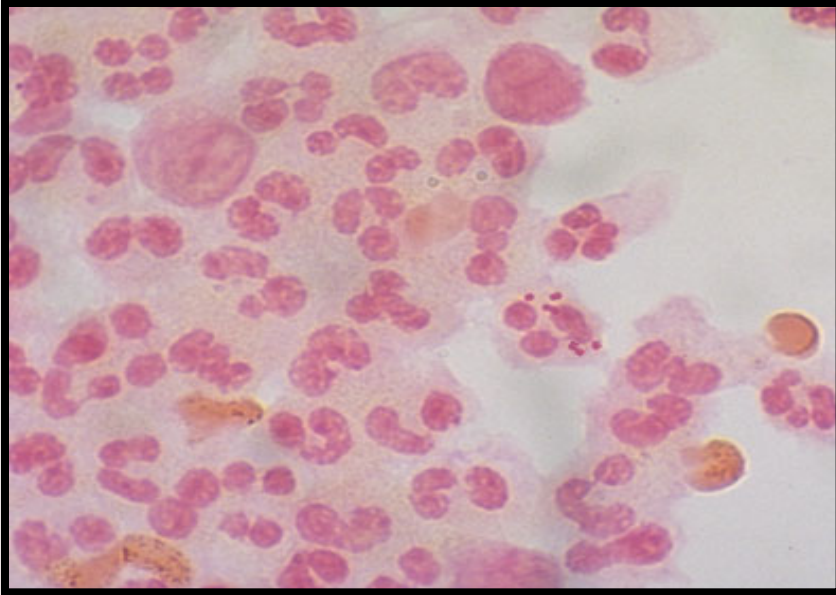
Microscopy of the cerebrospinal fluid •
showed gram -ve cocci.

The patient showed complete recovery •
after administration of ceftriaxone for 10
days.

The characteristic skin rash (purpura) of meningococcal septicemia, caused by *Neisseria meningitidis*



Bacterial meningitis: *Neisseria meningitidis*

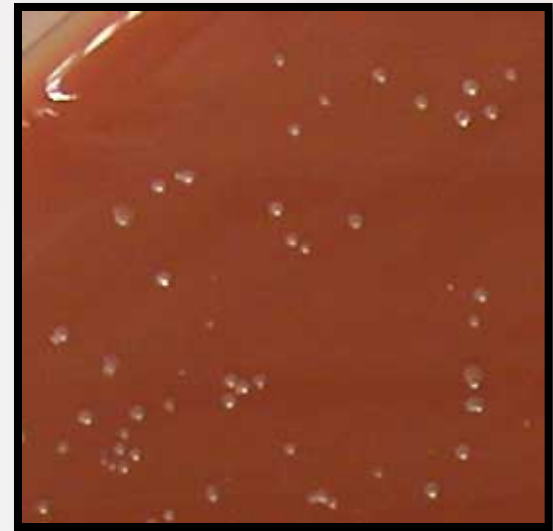
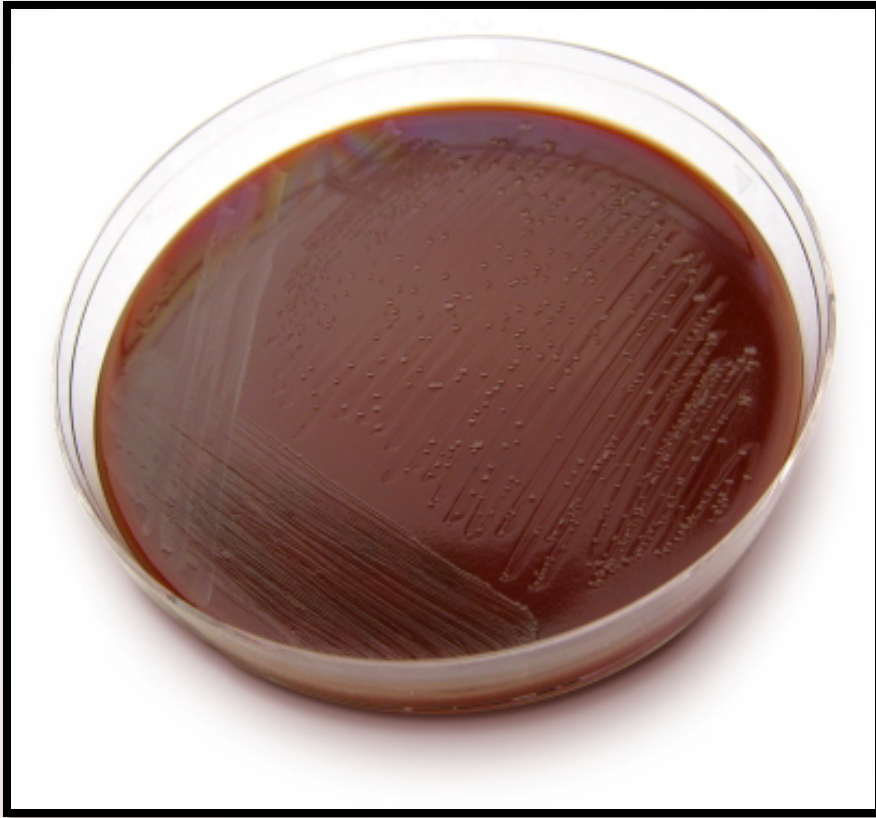


Microscopic Appearance

Gram stained smear from CSF deposit showing :
gram negative intracellular diplococci + many pus cells

Bacterial meningitis:

Neisseria meningitidis



Case Study

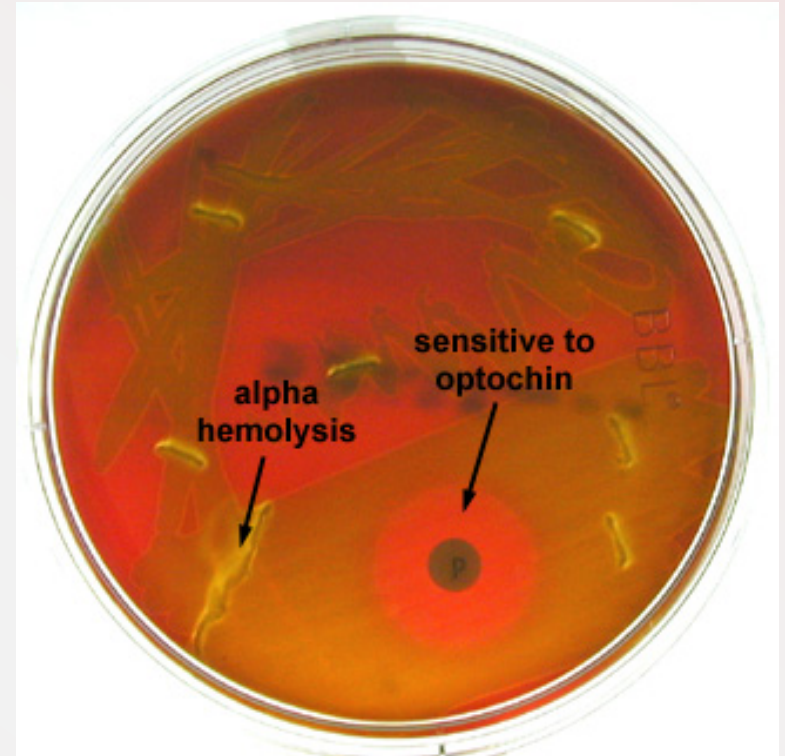
A 59 y.o. male farmer with sudden onset of fever, headache, neck stiffness and confusion

Peripheral Blood count:

12,800 WBCs/mm³ (73% neutrophils; 12% bands)

Cerebrospinal Fluid:

- 3520 WBC/mm³ (100% neutrophils)**
- Glucose: <1 mg/deciliter**
- Protein: 368 mg/deciliter**



Gray white, alpha-hemolytic colonies recovered on sheep blood agar with increased CO₂ from spinal fluid sediment was Optochin sensitive

Questions

What is your most likely diagnosis?

.....
.....
.....

What is the most probable pathogen isolated?

.....
.....
.....
.....

Questions

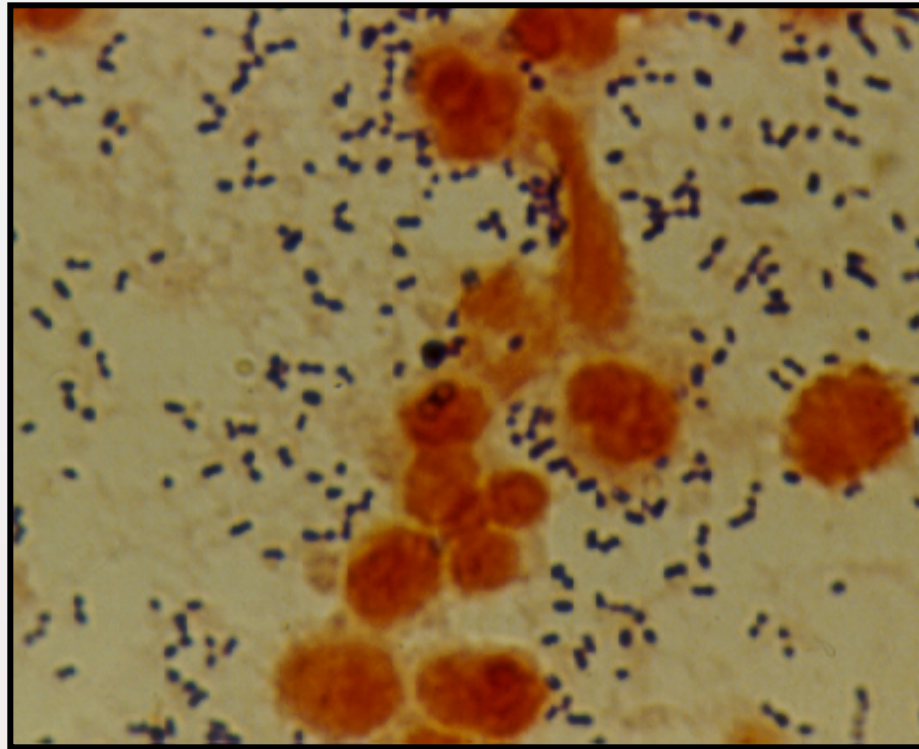
Mention two of the recommended antibiotics that can be used as empiric treatment in such a case?

.....

.....

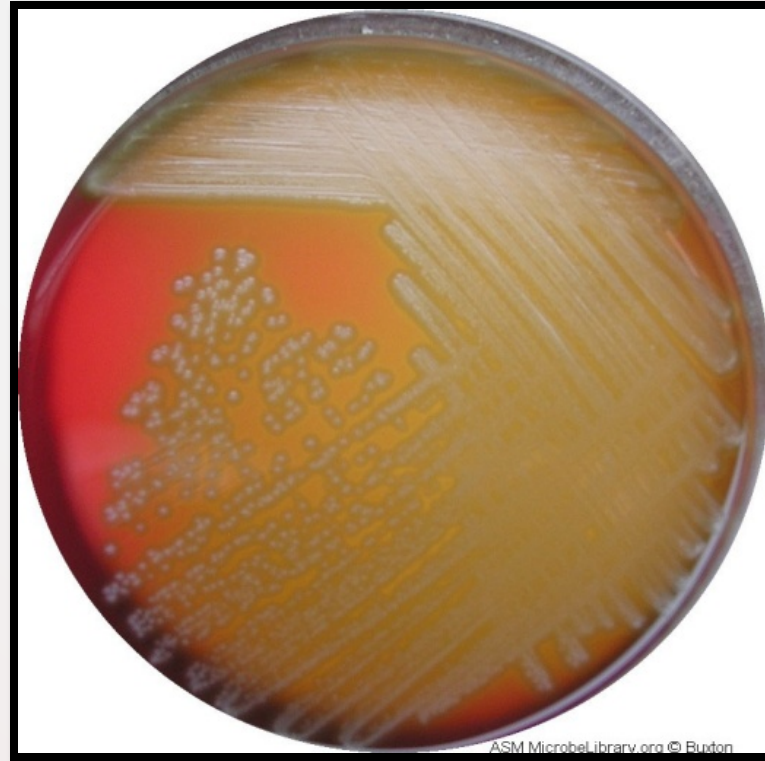
.....

Bacterial meningitis: Pneumococcal Meningitis



Direct gram stain of a CSF deposit shows gram-positive diplococci with lanceolate shape and polymorphnuclear leucocytes

Bacterial meningitis: **Pneumococcal Meningitis**



Culture on blood agar showing alpha-hemolytic colonies

Bacterial meningitis:
Pneumococcal Meningitis



OPTOCHIN SENSITIVE ALPHA-HAEMOLYTIC STREPTOCOCCI

Bacterial meningitis:
***H. influenzae* Meningitis**

Mainly caused by *Hemophilus influenzae*
type b

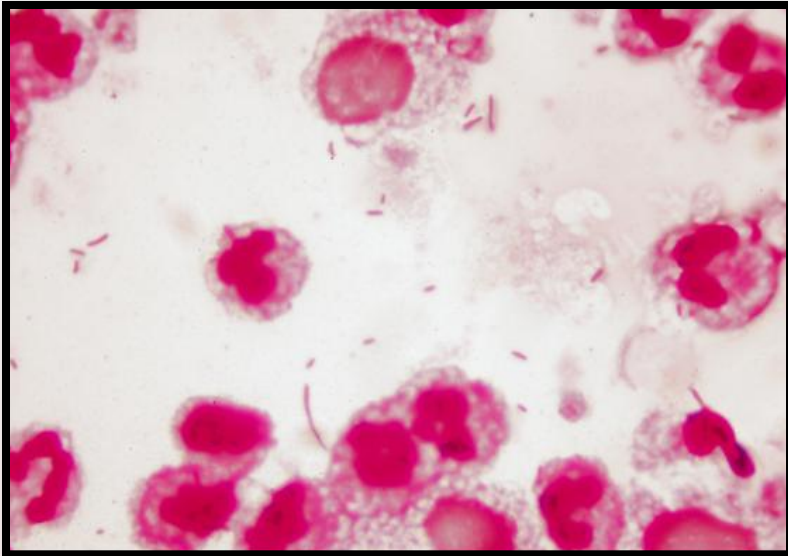
Gram negative coccobacilli

Requires X & V growth factors for growth

The optimum growth temperature is 35°C -
37°C in 5% CO₂

Bacterial meningitis:

H. influenzae

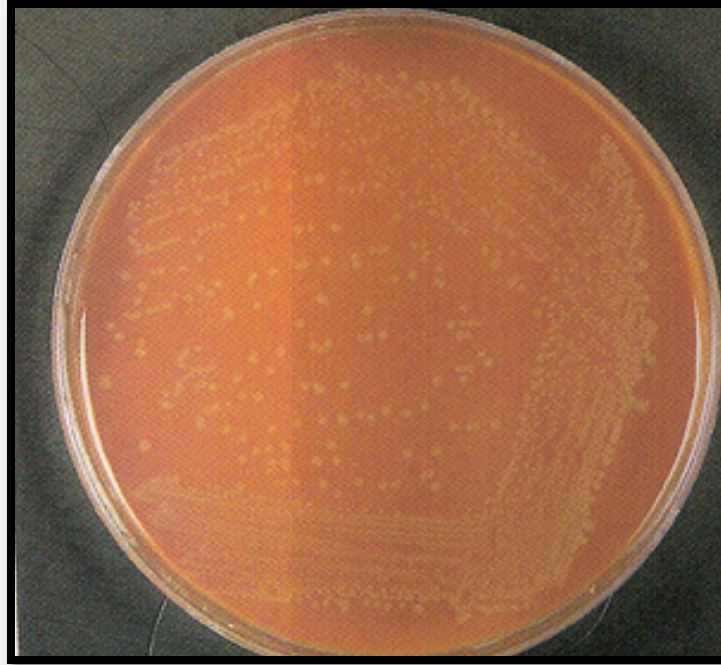


Microscopic Appearance

Direct gram stain of a CSF deposit shows Gram-Negative pleomorphic coccobacilli with many polymorphnuclear leucocyte

Bacterial meningitis:

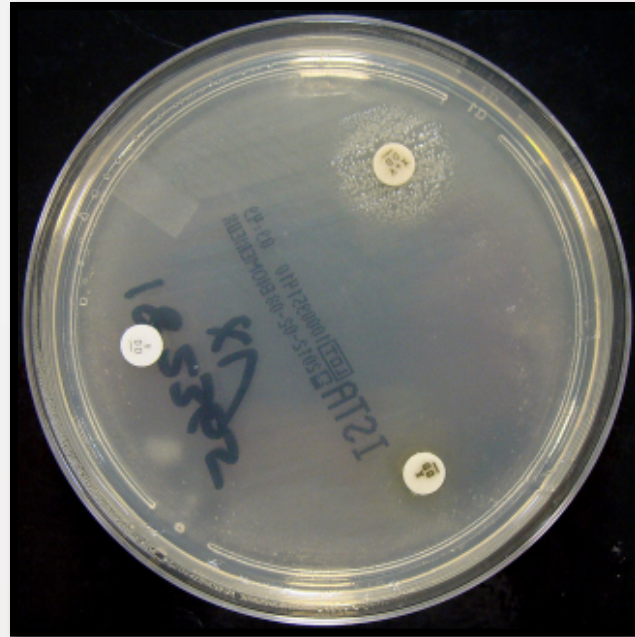
H. influenzae



Culture on chocolate agar

Bacterial meningitis:

H. influenzae

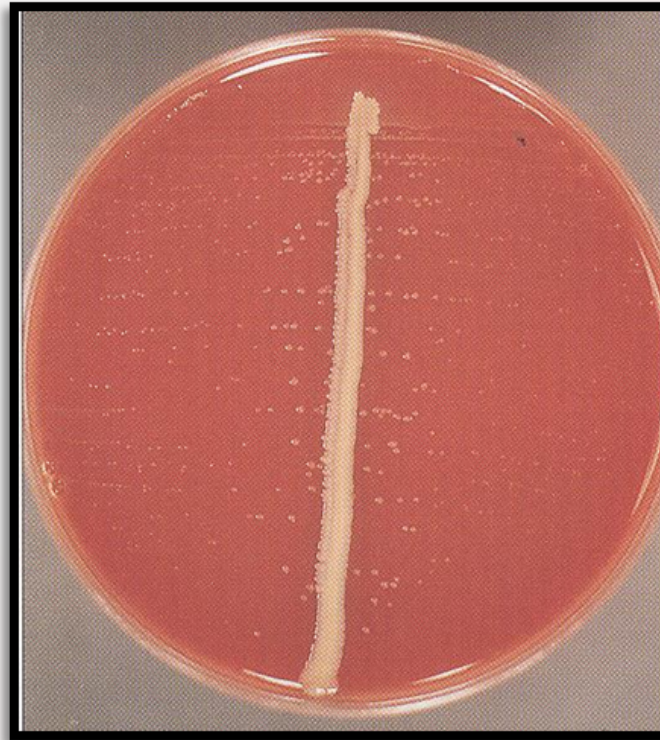


Culture on Nutrient agar

H. influenzae :Growth around XV factors(requires both factors XV)

no growth around X or V alone

Bacterial meningitis: *H. influenzae*

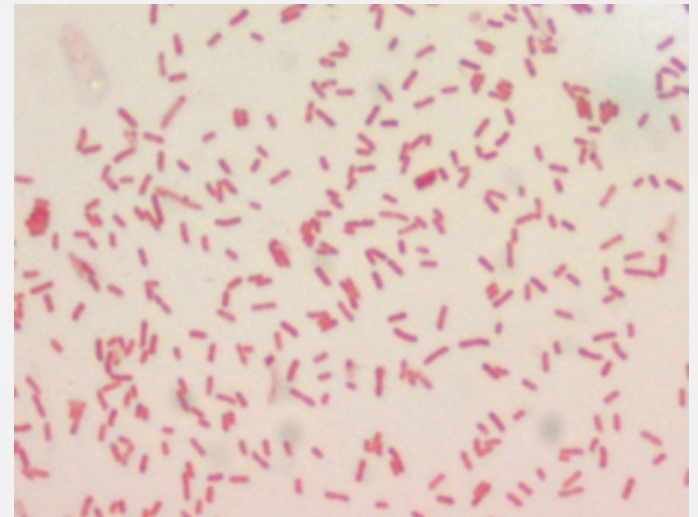
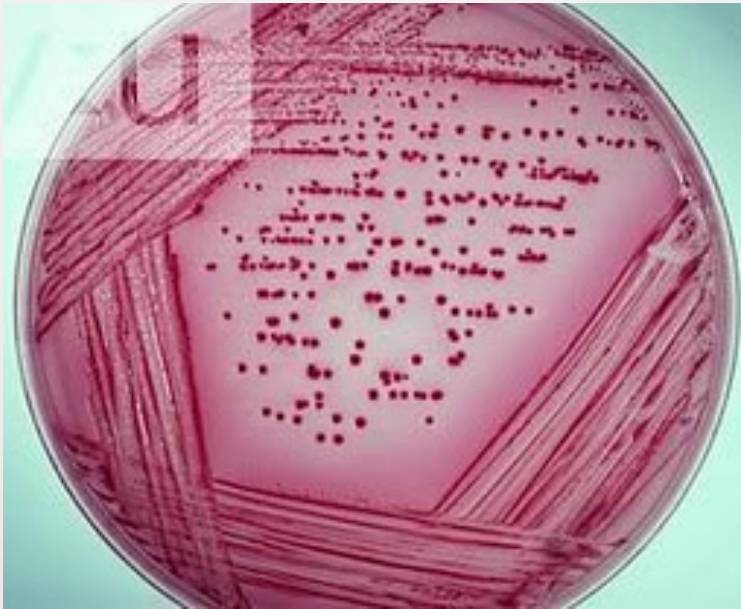


Culture on Blood agar

Growth on blood agar showing **satellitism** adjacent to a streak of *S. aureus*. *S. aureus* producing surplus factor increasing growth of adjacent *H. influenzae*

Bacterial meningitis: *E. coli*

Neonatal meningitis is most common due to
Colonization of infants with *E. coli* at delivery is



Escherichia coli on MacConkey
agar plate: appear pink as
they ferment lactose



gram negative bacilli

CASE 2

A 10-year old boy is brought to the emergency department (A&E) at King Khalid Hospital accompanied by his mother. He has fever, headache, and vomiting for the last 2 days. Clinical examination confirmed that he has meningeal irritation. The doctor decided to do a lumbar puncture.

The results of the lumbar puncture are shown below:

CASE 2: LUMBER PUNCTURE RESULTS

CSF	Patient's results	Normal range
Appearance	Clear 	Clear 
WBCs and differential	100 per mm ³ Mainly lymphocytes (80%)	Few (<5 cells/mm ³)
Protein	0.5	0.1-0.4 g/L
Glucose	3.7	3.0-4.5 mmol/L
Chloride	115	115-130 mmol/L

QUESTION 1:

What is your most likely diagnosis?

.....
.....

QUESTION 2:

What is the most likely infection responsible?(Select only one)

- A. Mycobacterium Avium**
- B. Fungal infection**
- C. Parasitic infection**
- D. Viral infection**
- E. Bacterial infection**
- F. Trepanoma pallidum (Neurosyphilis)**
- G. Mycobacterium tuberculosis**

Question 3:

Justify your answer to question two?

.....

.....

.....

QUESTION 4:

What further investigation would you like to do at this stage?

.....

.....

.....

Microbiological Finding

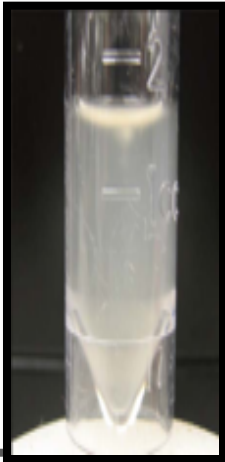

CSF Molecular testing is positive for
Enterovirus •

CASE 3

A **65-year-old** is referred from a general practitioner because of **headache, fever, excessive sweating at night**, and **weight loss over the last 4-5 months**. He has **lost his appetite for food**. On examination, there is neck rigidity. Laboratory tests including blood count, serum and electrolytes, blood urea, creatinine and blood culture are all normal. The doctors decides to do a lumber puncture.

The results of the lumber puncture are shown in the next slide:

CASE 3: LUMBER PUNCTURE RESULTS

CSF	Patient's results	Normal range
Appearance	Turbid 	Clear 
WBCs and differential	300 per mm ³ Mainly lymphocytes	Few (<5 cells/mm ³)
Protein	0.8	0.1-0.4 g/L
Glucose	2.0	3.0-4.5 mmol/L
Chloride	110	115-130 mmol/L

QUESTION 1:

What is your most likely diagnosis?

.....
.....
.....

QUESTION 2:

What is the most likely infection responsible?(Select only one)

- A. Fungal infection**
- B. Parasitic infection**
- C. Viral infection**
- D. Bacterial infection**
- E. Trepanoma pallidum (Neurosyphilis)**
- F. Mycobacterium tuberculosis**

QUESTION 3:

What is your justification for your answer to question two?

.....

.....

.....

QUESTION 4:

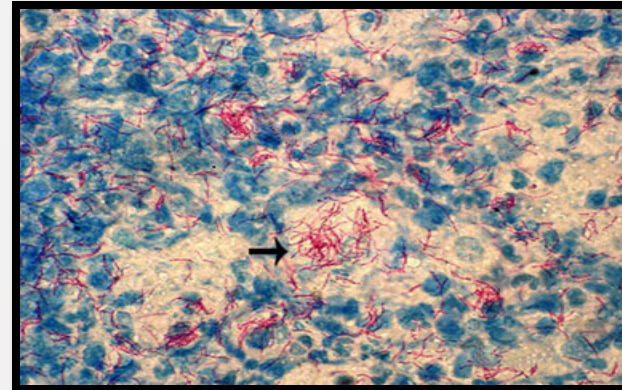
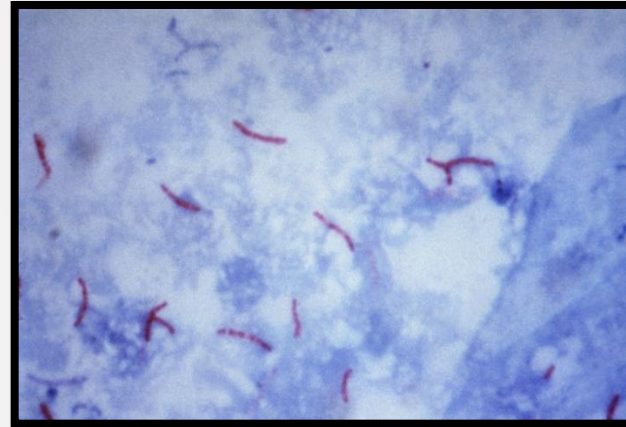
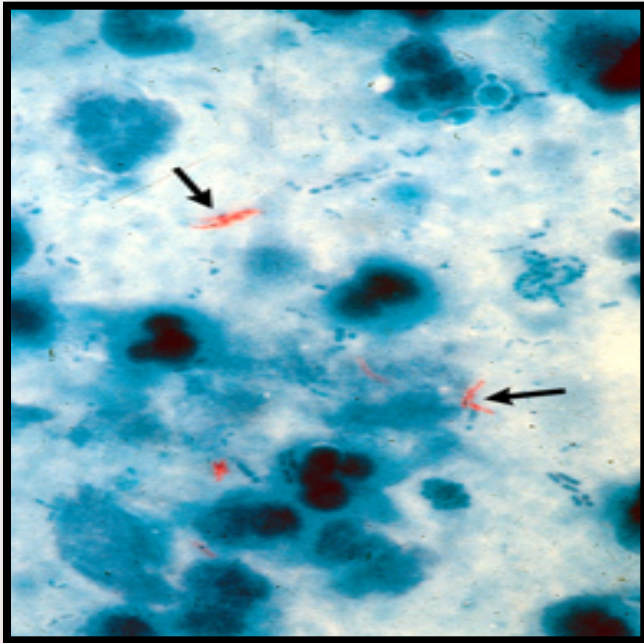
What further investigation would you like to do at this stage?

.....

.....

.....

Bacterial meningitis: ***Mycobacterium tuberculosis***



Microscopic Appearance

Direct Ziel – Neelsen Stained Smear of a CSF deposit shows
Acid – Fast Bacilli AFB

Bacterial meningitis:

Mycobacterium tuberculosis



Culture on Lowenstein – Jensen medium

Colonies or growth is Rough, Tough and Buff