CNS Practical
Case studies on
Biochemical &Microbiological
Examination of CSF

CENTRAL NERVOUS SYSTEM BLOCK
2020-2022

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CASE 1

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).

What is your provisional clinical diagnosis?

A. Meningitis

B. Brain abscess

C. Encephalitis

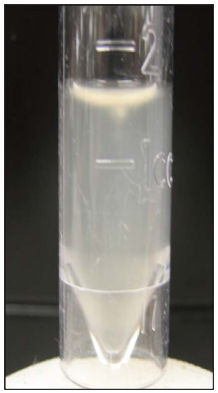
D. URTI

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

Follow up 1

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

CASE 1: LUMBER PUNCTURE RESULTS

CSF	Patient's results	Normal range
Appearance	Turbid 	Clear 
WBCs and differential	8.320 per mm^3 Mainly polymorphonuclear leucocytes (84%)	Few (<5 cells/mm^3)
Protein	5.0	01-0.4 g/L
Glucose	1.3	3.0-4.5 mmol/L
Chloride	110	115-130 mmol/L

What is your provisional diagnosis?

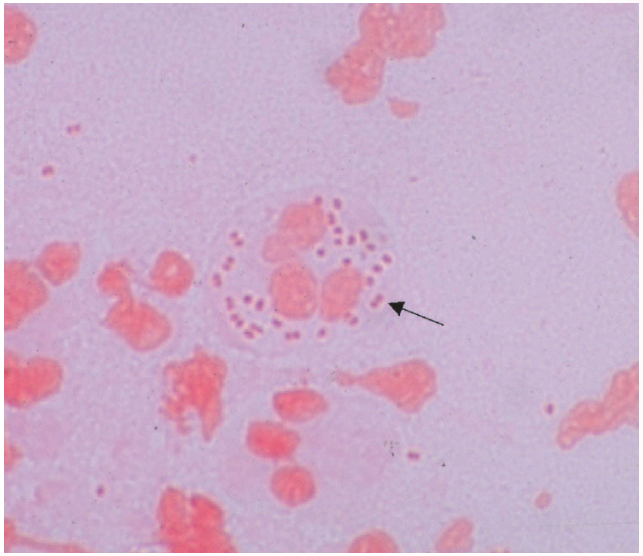
A. Fungal Meningitis

B. Parasitic Meningitis

C. Viral Meningitis

D. Bacterial Meningitis

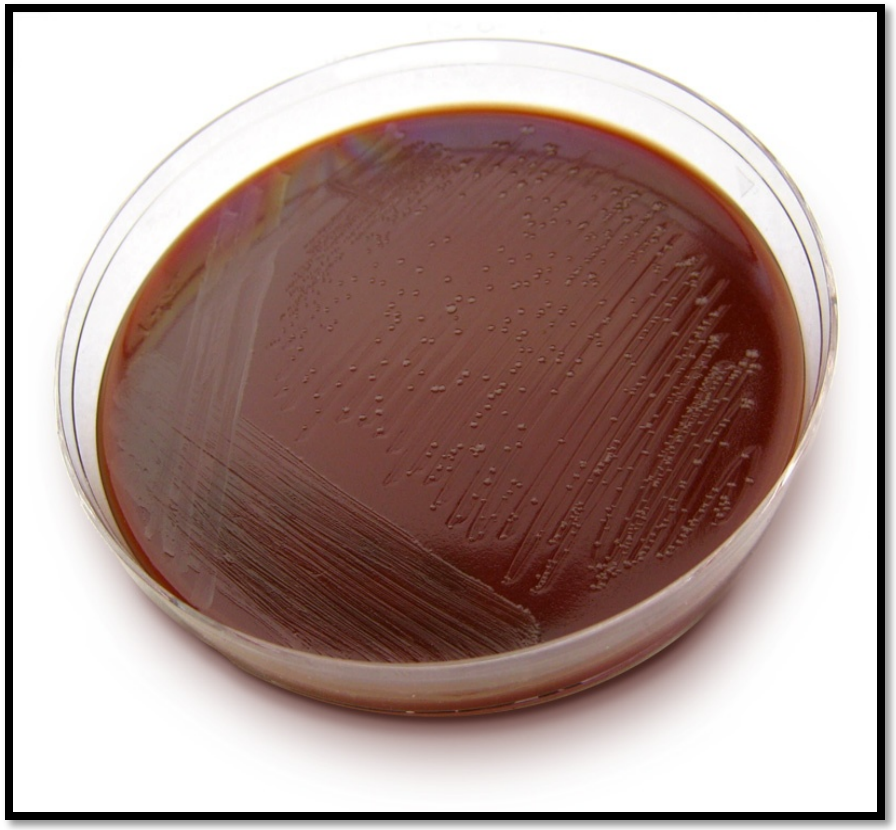
Follow up 2



Microscopic Appearance

Gram stained smear from CSF showing :

gram negative intracellular diplococci + many pus cells



What is the most likely organism?

A. *Streptococcus pneumoniae*

B. *Staphylococcus aureus*

C. *Mycobacterium tuberculosis*

D. *Neisseria meningitidis*

Follow up 3

Which of the following antibiotic combination is recommended as empiric treatment in such a case?

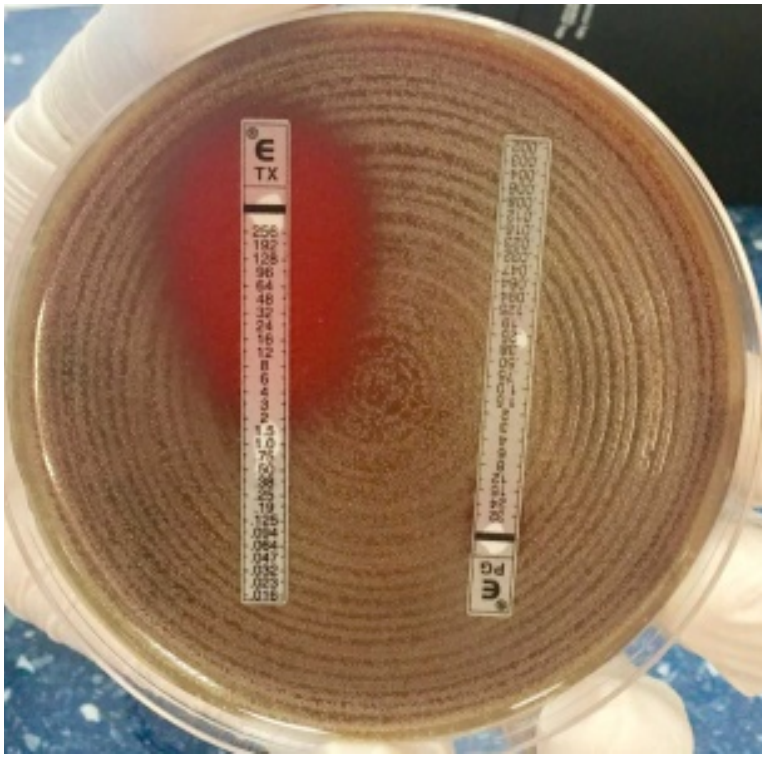
A. Ceftriaxone + vancomycin

B. Ceftriaxone + Gentamicin

C. Ampicillin + Vancomycin

D. Penicillin + Gentamicin

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



Final Diagnosis

Bacterial meningitis

Neisseria meningitidis

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 lumber puncture.

The results of the lumber 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	01-0.4 g/L
Glucose	3.7	3.0-4.5 mmol/L
Chloride	100	115-130 mmol/L

What is the most likely type of infection? Justify your answer.

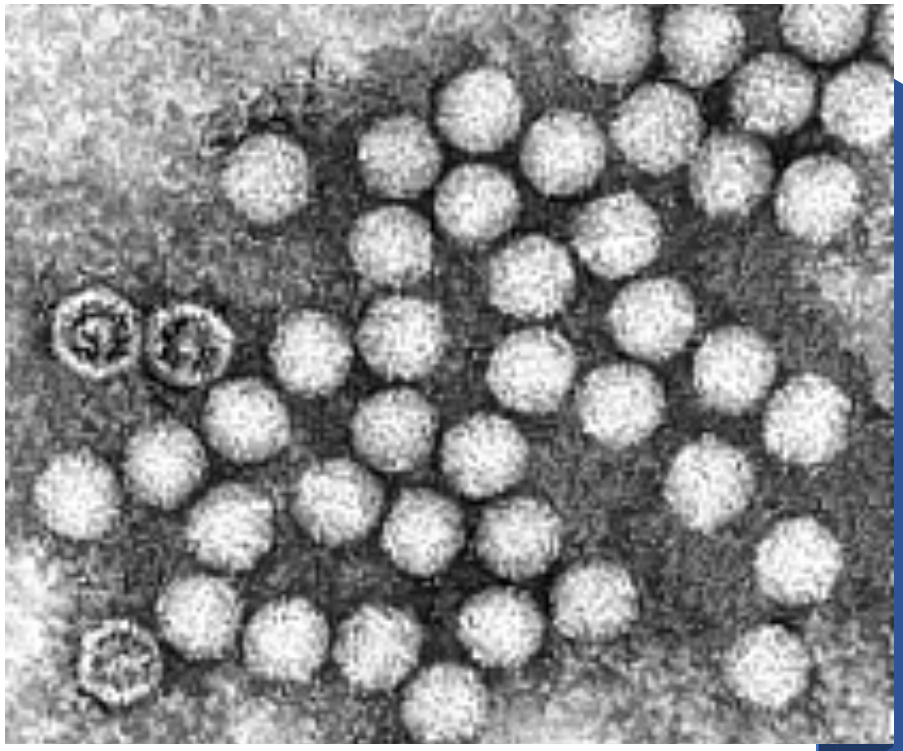
A. Fungal infection

B. Viral infection

C. Bacterial infection

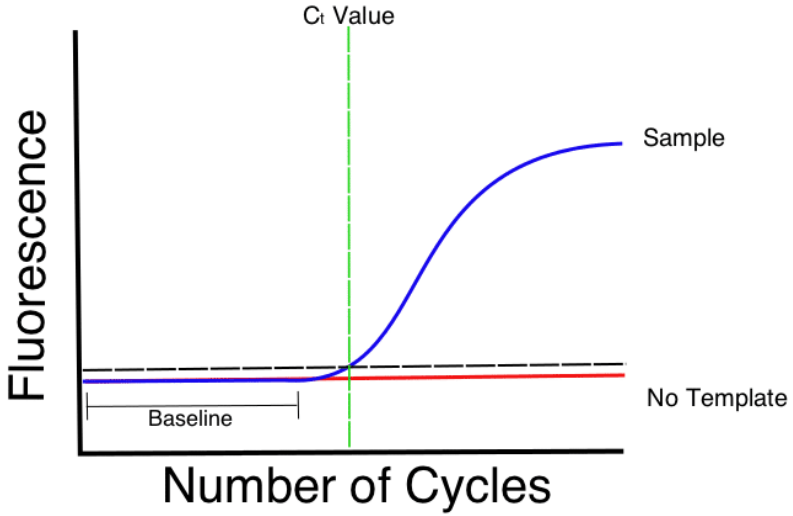
D. Mycobacterium tuberculosis

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



Microbiological Finding

Electron Micrograph of Enterovirus



Microbiological Finding

CSF Molecular testing is positive for

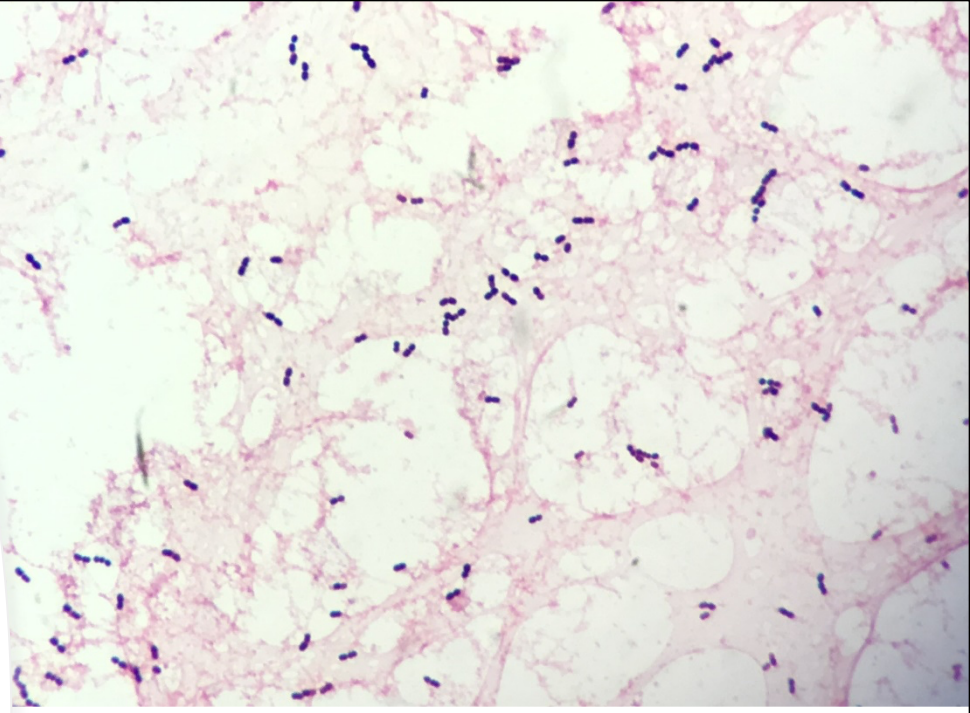
Enterovirus

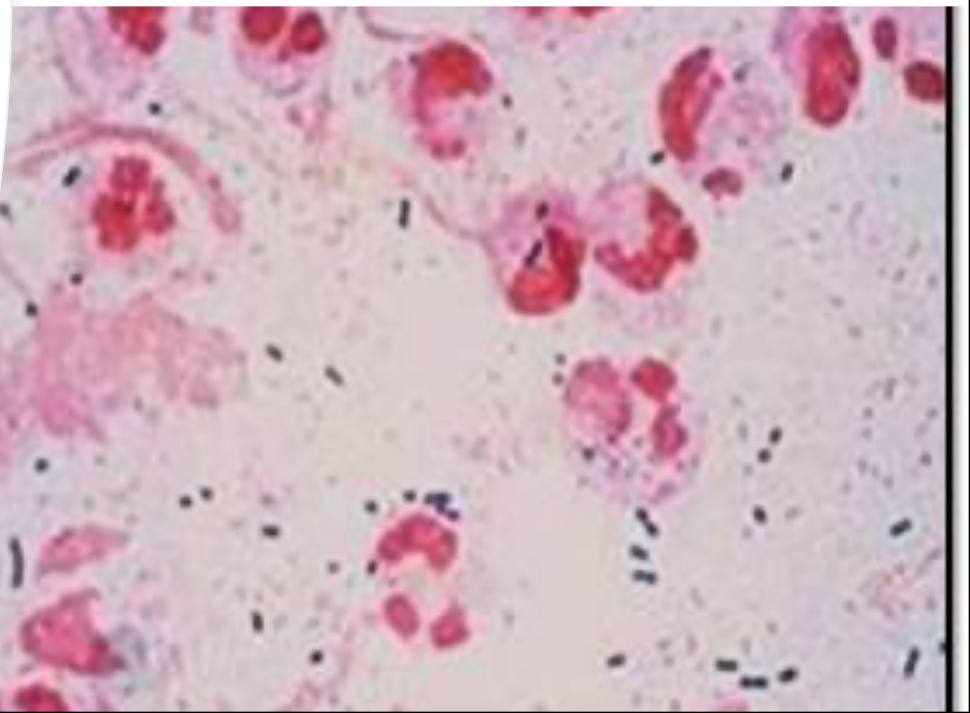
Case 3

- A 38-year old male, not known to have any medical illness, in his usual state of health, he was visiting his family after which he felt tired and went to his house. He's bother was trying to call him several times and was found to be on the floor with LOC as he was not answering them, he was closing his eyes with his bilateral upper limbs contracted As per the brother. The patient complained of headache 2 days back. Physical Exam Vitals & Measurements T: 38.2 °C (Axillary), HR: 102, RR: 24, BP: 106 / 53, SpO2: 100% WT: 90 kg, kg GCS: (E=1, V=2, M4). Rigid neck, pupils:2-3 mm with sluggish reaction to light.
- **Assessment/Plan** 38 years old male, not known to have any medical illness, presented with decreased LOC along with documented high-grade fever in the ER. LP done by ER Team.

CSF Microscopic Appearance

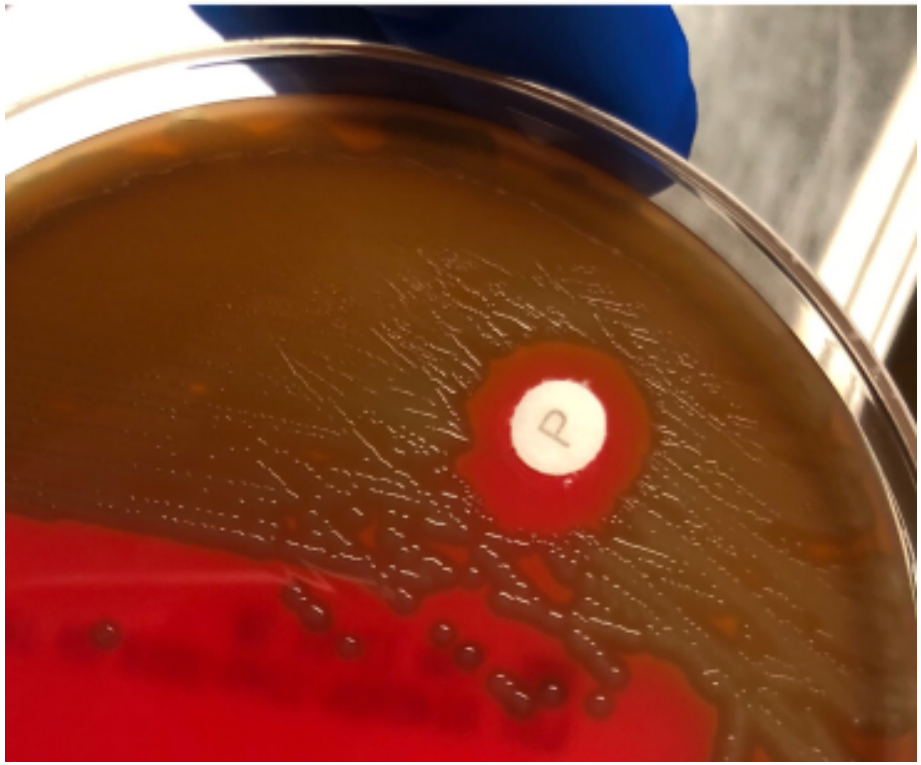
- Direct gram stain of a CSF deposit shows gram-positive diplococcic with lanceolate shape and polymorphneoclear leucocytes





Culture on blood agar
Alpha-hemolytic colonies

Optochin Sensitive Alpha-Hemolytic Streptococci

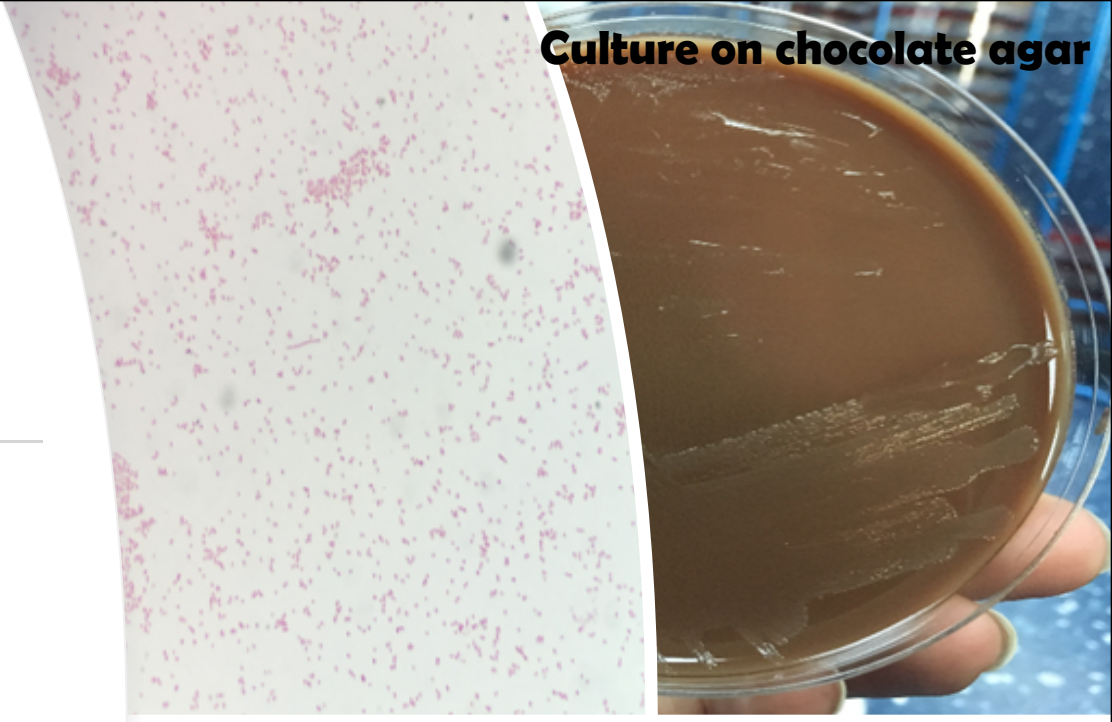


Final Diagnosis
Bacterial meningitis

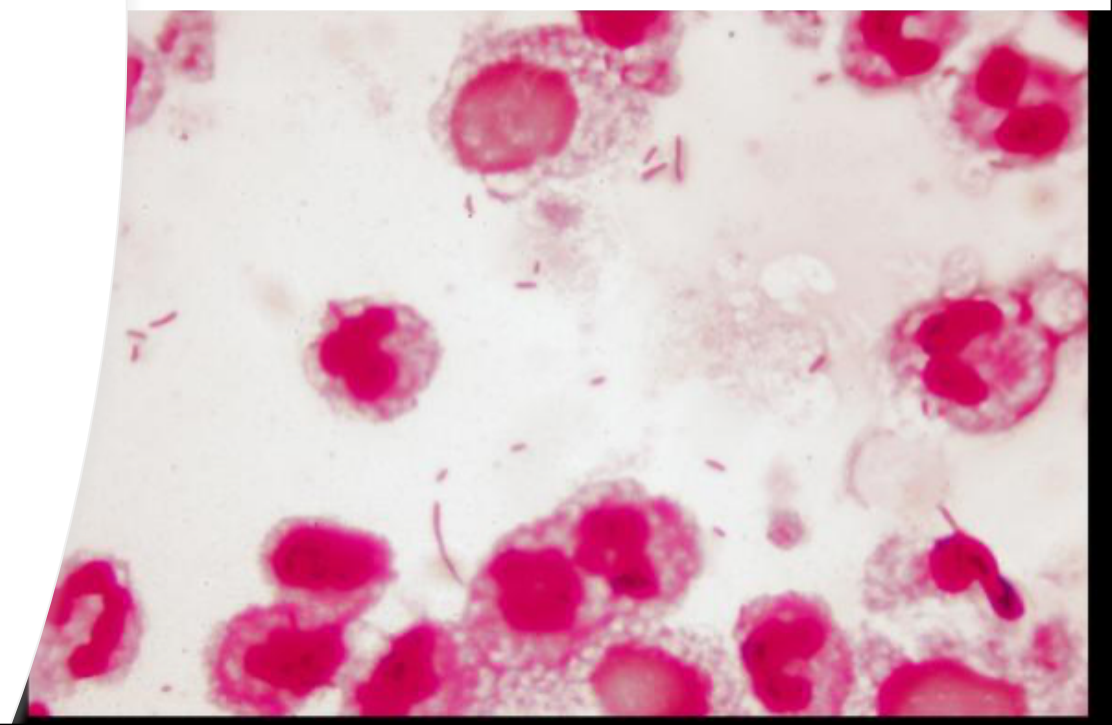
Pneumococcal Meningitis

Case 4

- A 3-year old normal child became acutely ill, with temperature (40°C). She had neck stiffness and vomiting. There was no rash or bruising but the left ear drum was inflamed. The clinical diagnosis of *meningitis* was confirmed, and blood and cerebrospinal fluid (CSF) samples were taken immediately, and intravenous antibiotics started. The CSF showed increased numbers of neutrophil leucocytes and a few Gram-negative coccobacilli. Culture on chocolate agar is shown. The full blood count showed high neutrophil count and high C-reactive protein.



Culture on chocolate agar

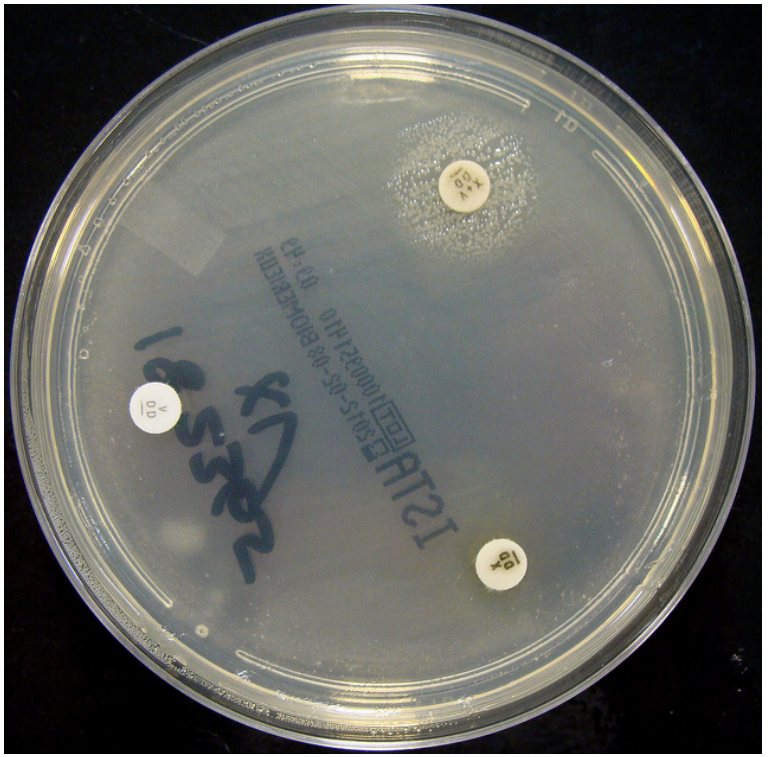


Microscopic Apearance

Direct gram stain of a CSF deposit shows Gram-Negative pleomorphic coccobacilli.

Identification of H. influenzae

- Culture on Nutrient agar
- H. influenzae :Growth around XV factors(requires both factors XV)
- no growth around X or V alone

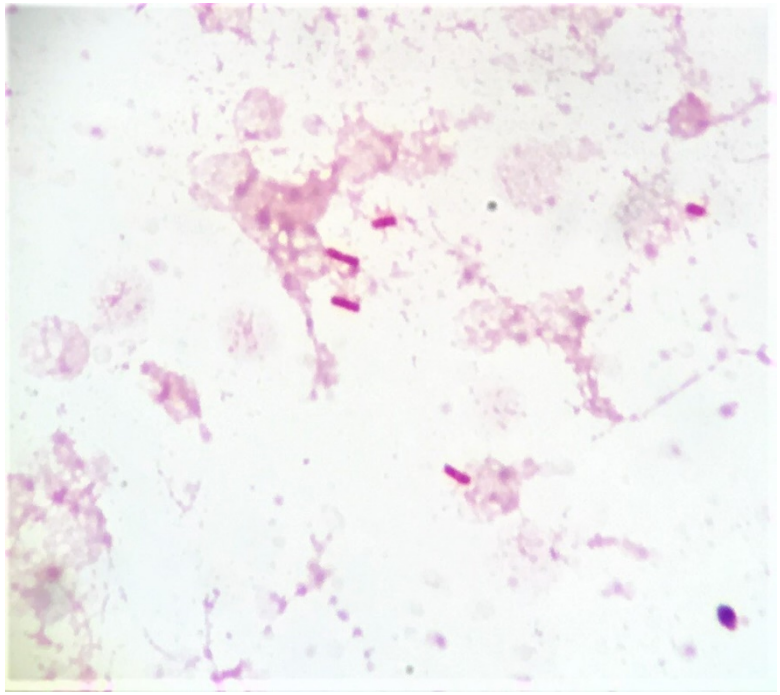


Final Diagnosis
Bacterial meningitis

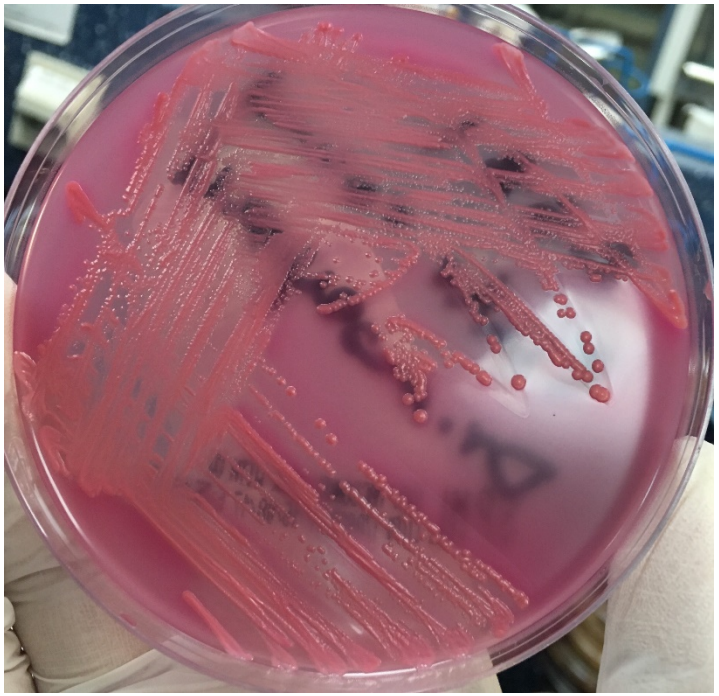
Hemophilus influenzae

Bacterial meningitis

E. coli



Gram-Negative Bacilli



Culture on MacConkey agar

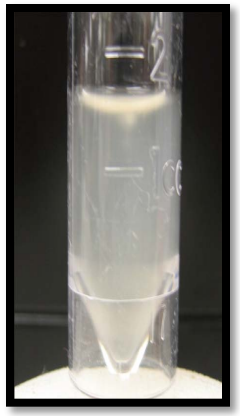
E. coli appear pink as they ferment lactose

CASE 5

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	115	115-130 mmol/L

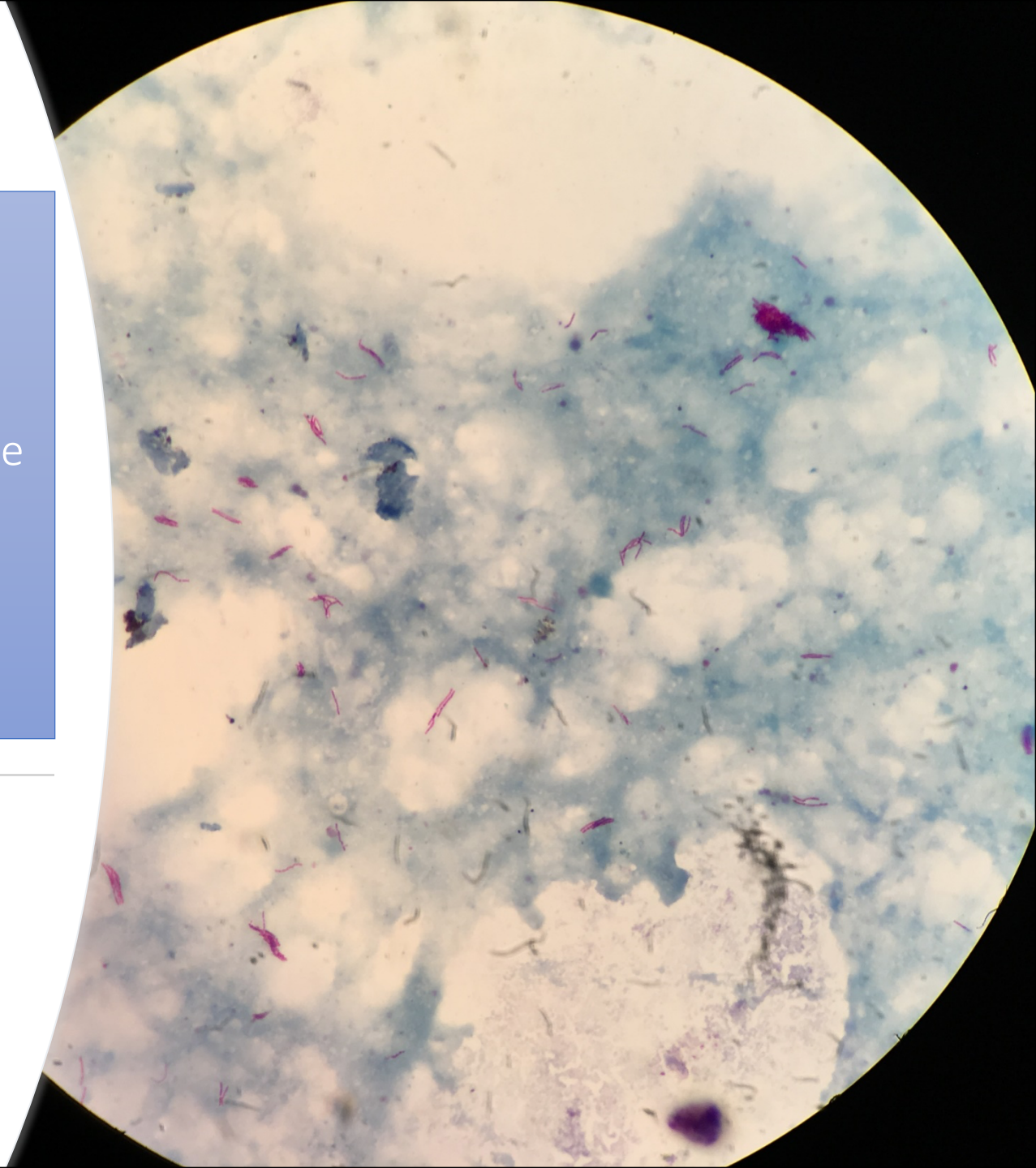
What is the most likely infection responsible? What is your justification?

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

What further investigation would you like to do at this stage? (State 3)

Bacterial meningitis:
Mycobacterium tuberculosis

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



Culture on Lowenstein – Jensen medium

Colonies or growth is Rough, Tough and Buff

Mention the 4 first line anti TB drugs.

Final Diagnosis
Bacterial meningitis:
Mycobacterium tuberculosis