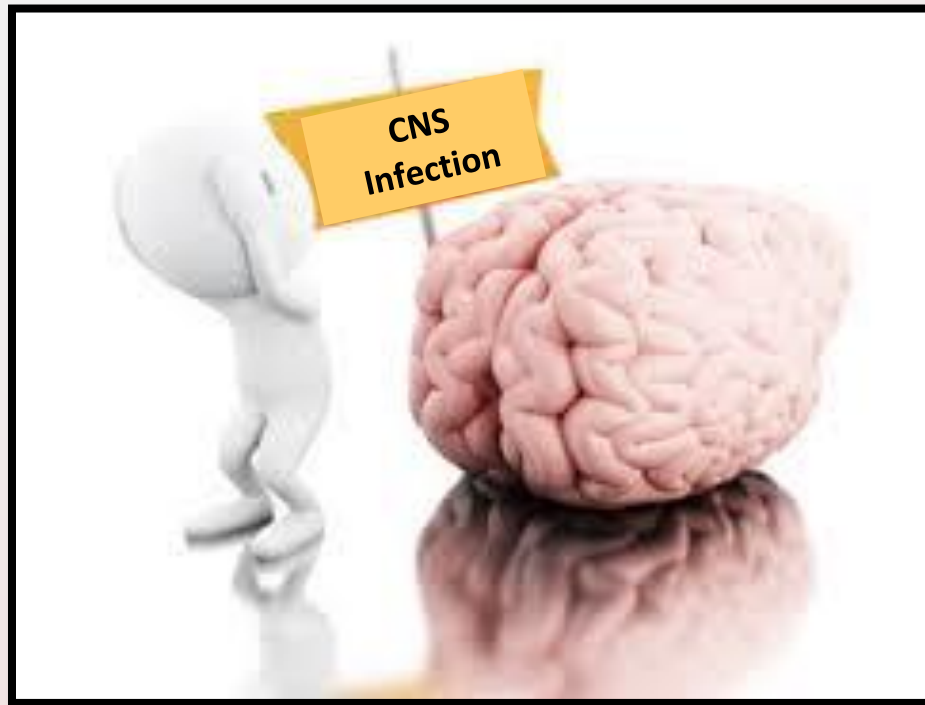


# **Integrated CNS Practical**

## **Biochemical & Microbiological Examination of CSF**

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**CENTRAL NERVOUS SYSTEM BLOCK**

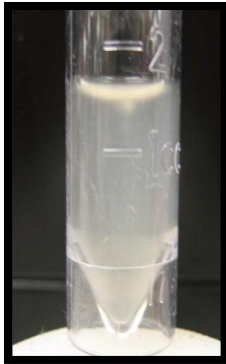

# CASE 1

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)**. Cerebrospinal fluid (CSF) examination revealed opening pressure of 210cmH<sub>2</sub>O. Microscopy of the cerebrospinal fluid showed gram -ve cocci. The patient showed complete recovery after administration of ceftriaxone for 10 days.

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:



# **CASE 1: LUMBER PUNCTURE RESULTS**

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

## **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?

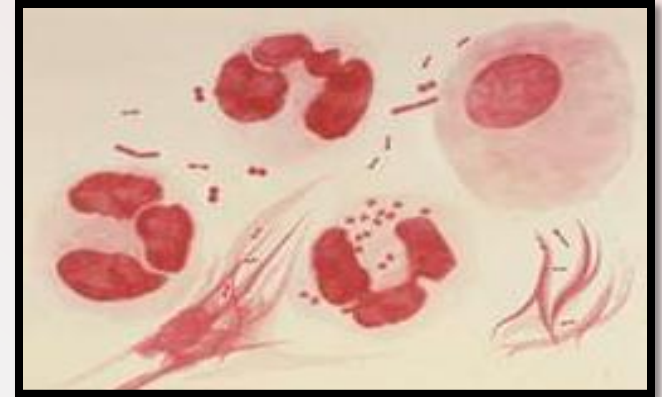
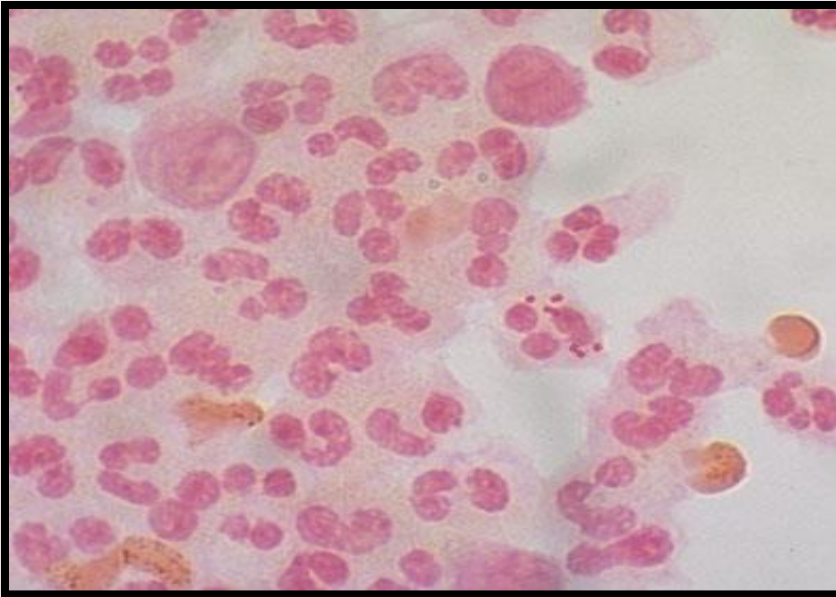
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**QUESTION 5:**

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

.....

# Bacterial meningitis: 1- *Neisseria meningitidis*



## Microscopic Appearance

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

# **Bacterial meningitis:**

## ***Neisseria meningitidis***



**Culture on Thayer-Martin agar**



# 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**

<b>CSF</b>	<b>Patient's results</b>	<b>Normal range</b>
<b>Appearance</b>	Clear 	Clear 
<b>WBCs and differential</b>	Few (<5 cells/mm <sup>3</sup> )	1200 per mm <sup>3</sup> Mainly lymphocytes (80%)
<b>Protein</b>	0.1-0.4 g/L	0.5
<b>Glucose</b>	3.0-4.5 mmol/L	2.7
<b>Chloride</b>	115-130 mmol/L	100

## **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:**

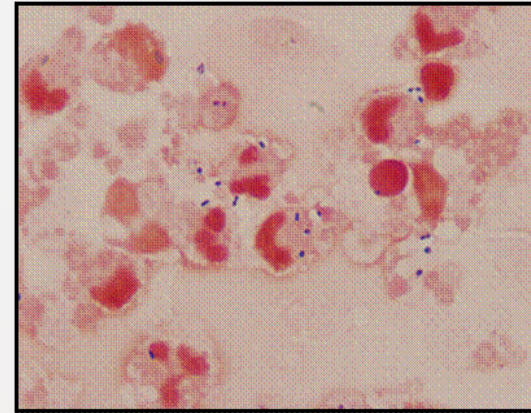
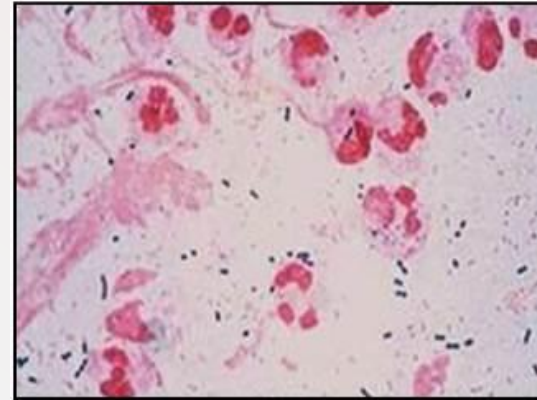
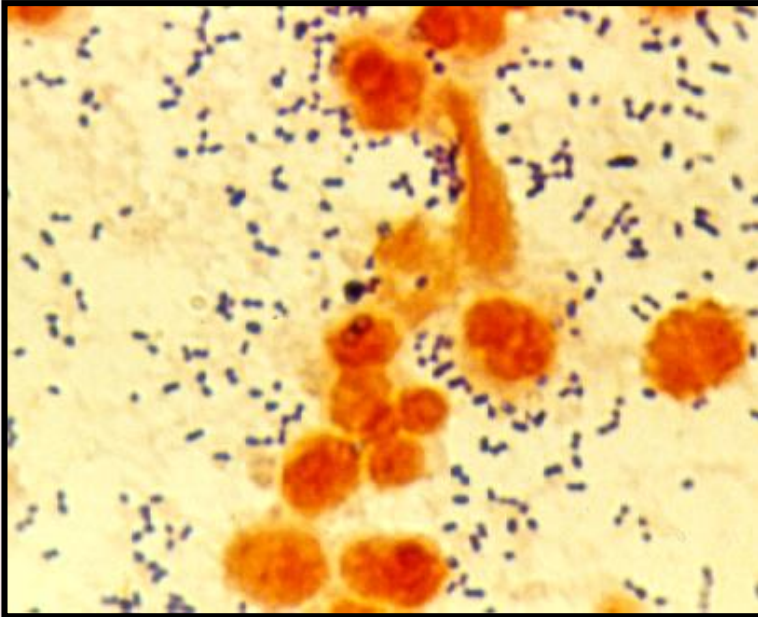
What further investigation would you like to do at this stage?

.....

.....

.....

# Bacterial meningitis: 2- *Pneumococcal Meningitis*

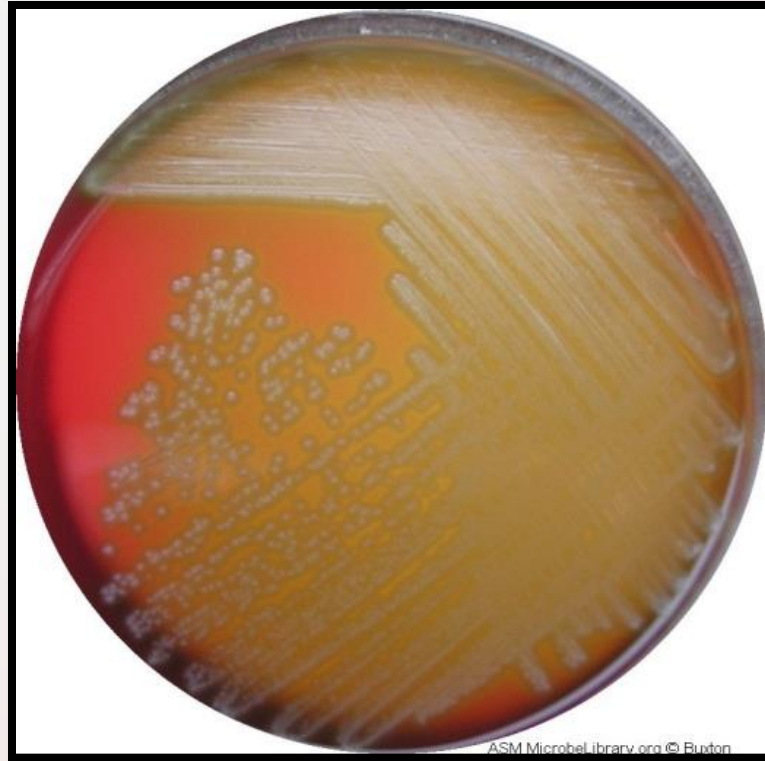


## Microscopic Appearance

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

# Bacterial meningitis:

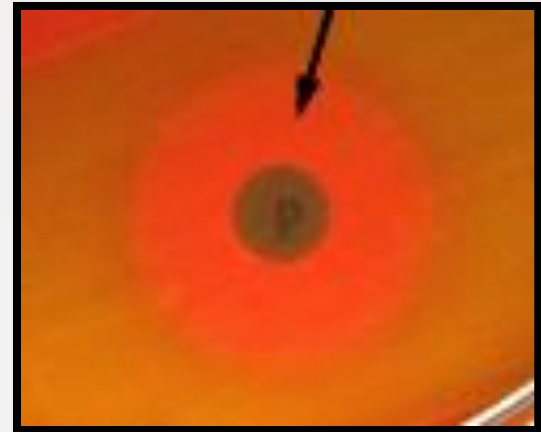
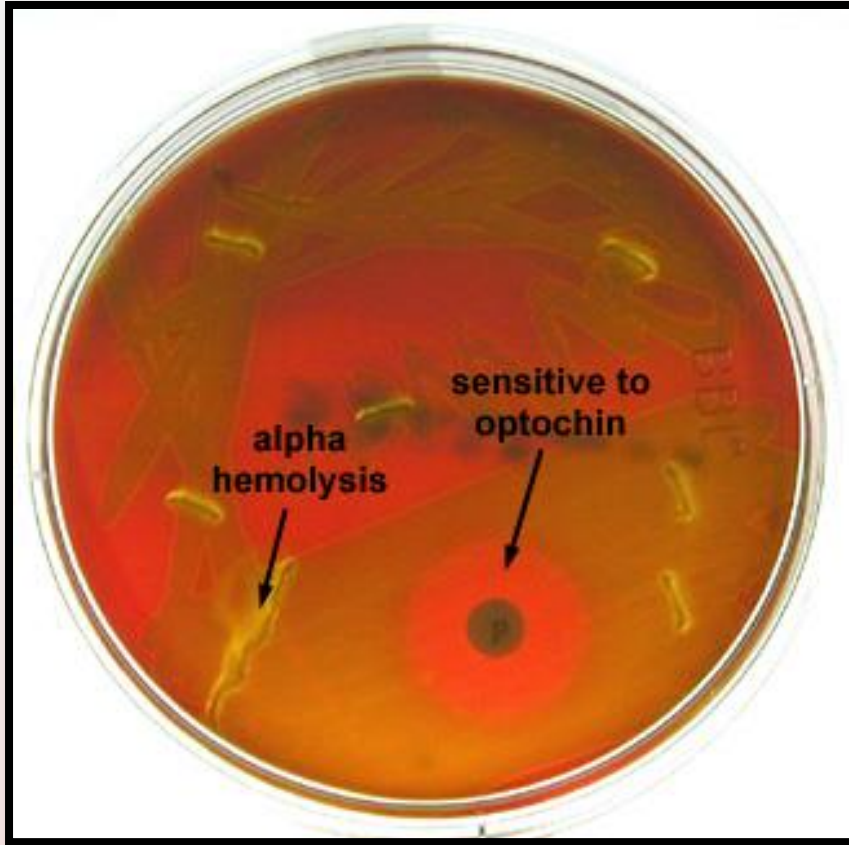
## 2- Pneumococcal Meningitis



**Culture on blood agar Shwing alpha-hemolytic colonies**

# Bacterial meningitis:

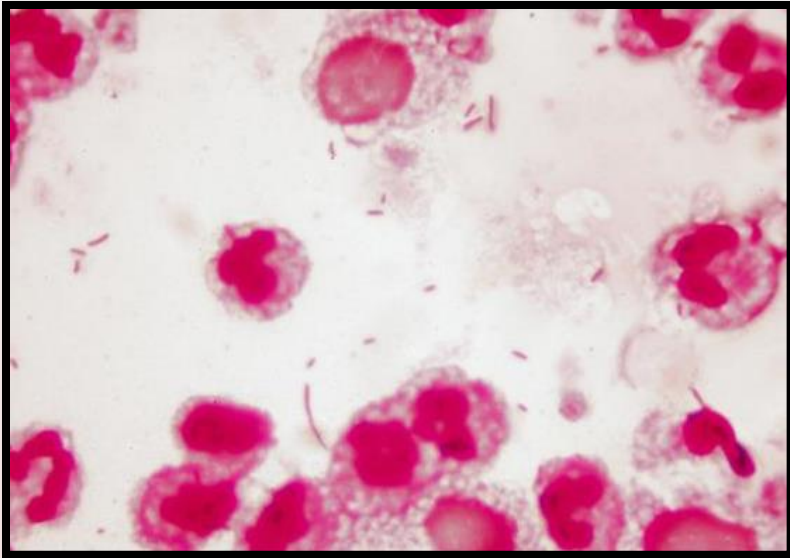
## 2- Pneumococcal Meningitis



**OPTOCHIN SENSITIVE ALPHA-HAEMOLYTIC STREPTOCOCCI**

# Bacterial meningitis:

## 3- H. influenzae



## Microscopic Appearance

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

# Bacterial meningitis:

3- H. influenzae

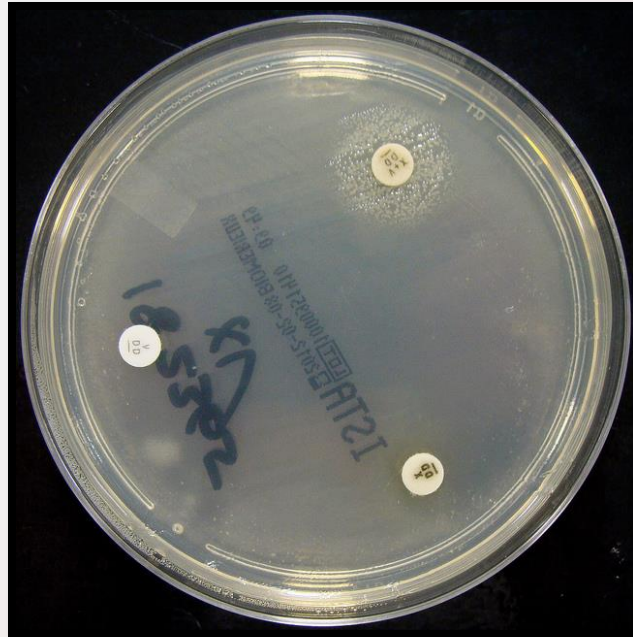


**Culture on chocolate agar**



# Bacterial meningitis:

## 3- 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:

## 3- H. influenzae



### Culture on Blood agar

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

# Bacterial meningitis:

## 4- *E. coli*

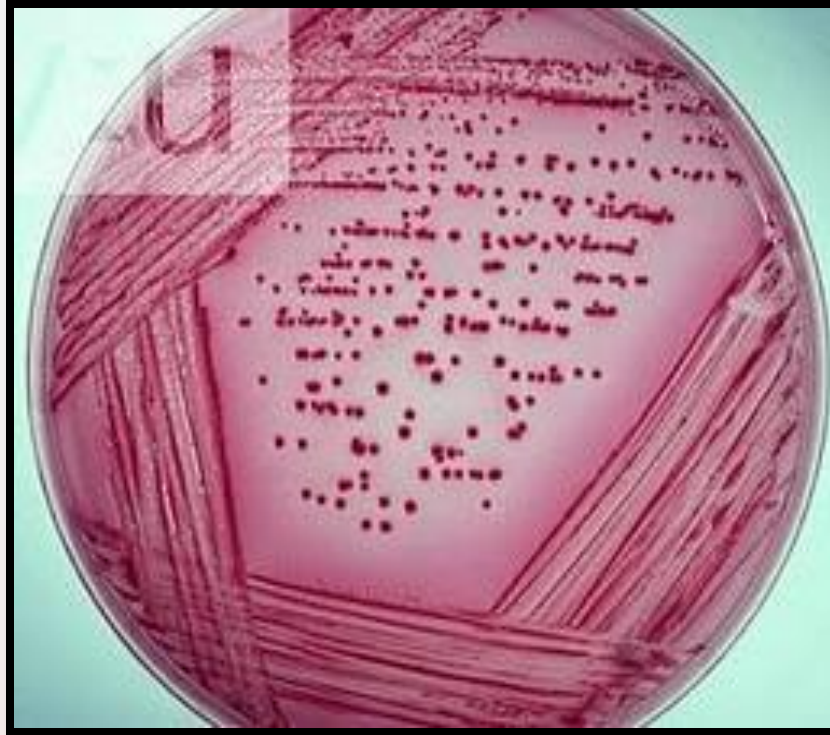


## Microscopic Appearance

Gram negative bacilli

# Bacterial meningitis:

## 4- E. coli



## Culture on MacConkey agar

E. coli appear pink as they ferment lactose

## **Question 5:**

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

.....

.....

.....

**What is the most probable Pathogen isolated?**

.....

.....

.....

**What is your most likely diagnosis?**

.....

.....

.....


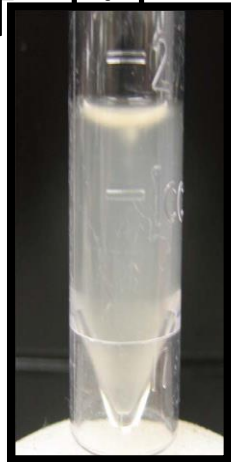
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# CASE 3

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		
WBCs and differential	Few (<5 cells/mm <sup>3</sup> )	300 per mm <sup>3</sup> Mainly lymphocytes
Protein	0.1-0.4 g/L	0.8
Glucose	3.0-4.5 mmol/L	2.0
Chloride	115-130 mmol/L	115



## **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? (State 3)

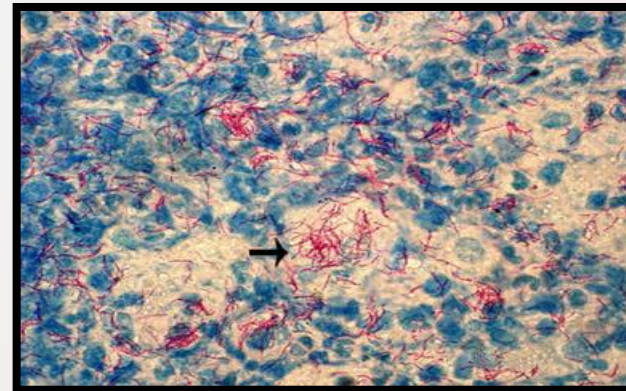
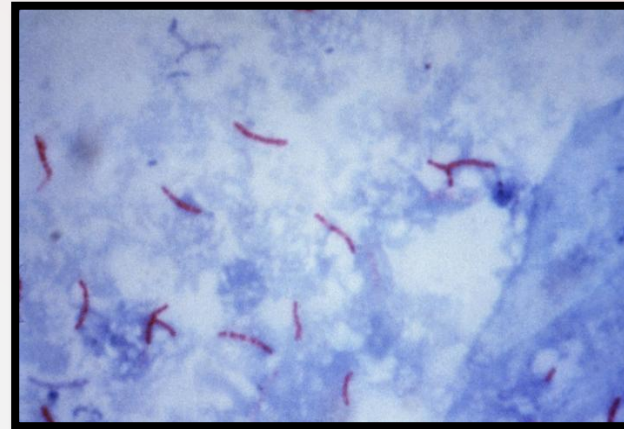
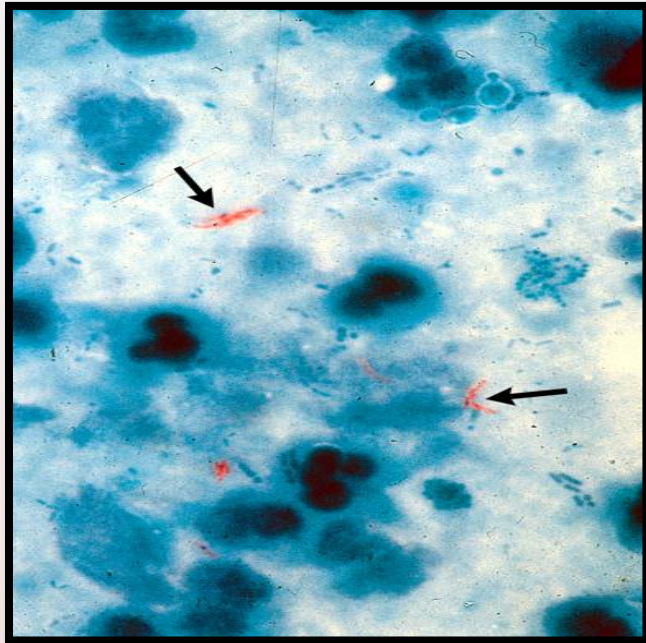
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# **Bacterial meningitis:**

## **5- *Mycobacterium tuberculosis***

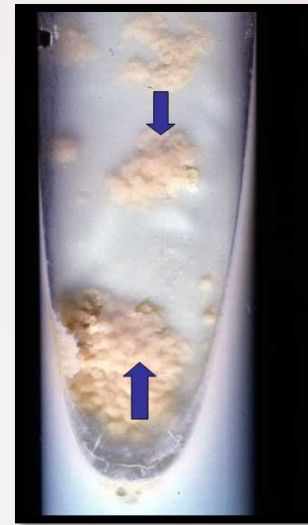
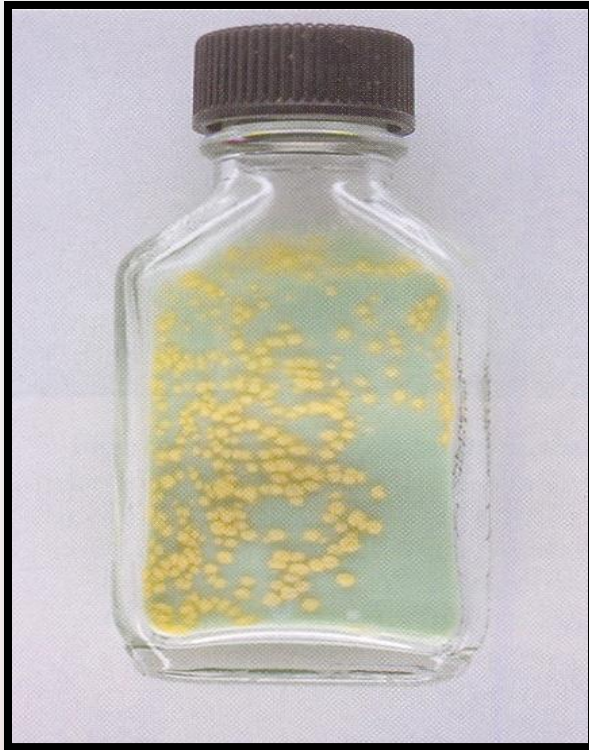


### **Microscopic Appearance**

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

# Bacterial meningitis:

## 5- *Mycobacterium tuberculosis*



### **Culture on Lowenstein – Jensen medium**

Colonies or growth is Rough, Tough and Buff