



PRACTICAL



Microbiology

	Acute meningitis	Chronic meningitis	Encephalitis
Duration & symptoms	1-2 day Headache, fever, vomiting & nauseous	10 days to week. Headache, fever, vomiting & nauseous	Anytime Drowsiness, agitation, coma, Motor/sensory abnormality
Etiology	Neonates: Group B Streptococcus, E.coli & Listeria monocytogenes. Adults: S.Pneumoniae, N.meningitidis & H.influenzae Elderly people: Listeria monocytogenes, N.meningitidis & H.influenzae	TB Brucella Fungus	Herpes simplex virus Enterovirus
Diagnosis	- CBC, urea - LP: (Culture, smear, glucose, protein, cell count) - Blood culture	- AFB smear, LJ culture (for TB) - PCR - CBC, urea - LP: (Culture, smear, glucose, protein, cell count) - Blood culture	- PCR - Viral culture - MRI - CBC, urea - LP: (Culture, smear, glucose, protein, cell count) - Blood culture
NOTE	• <i>N.meningitidis</i> combined with rash		

Case 1

- It is about one week after the Hajj time, Mr. Mohammed Khan, a Pakistan citizen has completed the Hajj holy duty and is preparing to go home. A day before his travel he present to the emergency department (A & E) at Al Noor Hospital in Makkah because of headache, vomiting and high temperature. On clinical examination he has a rash on his body, (see the picture provided). Mr. Khan's relatives who has brought him to the Hospital mentions that Mr. Kahan received vaccination required for Hajj, a day before his travel for Hajj.
- The doctor in the emergency department takes a detailed history and conducts a clinical examination. Because of clinical findings, he decided to do lumber puncture. The result of the lumber puncture are shown in the table.

CSF	Patient's Result	Normal Range
Appearance	Turbid	Clear
WBC and differential	1400 per mm ³ Mainly polymorphnuclear leucocytes (80%)	Few (<5 cells/mm ³)
Protein	5.0	0.1-0.4 g/L
Glucose	1.3	3.0-4.5 mmol/L
chloride	110	115-130 mmol/L

▪ Q1: What is your diagnosis?

Acute pyogenic meningitis

▪ Q2: What is the most likely infection responsible? (Select only one)

- Mycobacterium Avium
- Fungal infection
- Parasitic infection
- Viral infection
- Bacterial infection
- Trepanoma pallidum (Neurosyphilis)
- Mycobacterium tuberculosis

▪ Q3. What is your justification for your answer to question two?

From the table Turbid CSF, increased WBC polymorphnuclear leucocytes, increased protein, decreased glucose & decreased chloride.

▪ Q4. What further investigation would you like to do at this stage?

CSF (Gram stain, culture and Latex agglutination)

Blood culture

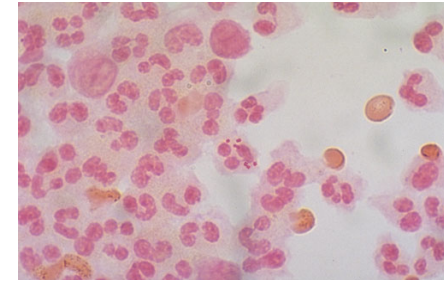
Complete Blood Count CBC

▪ Q5. Mr. Khan has received the required vaccination before his travel, how would you explain his infection despite vaccination?

Two theories:

1) He might take the vaccination for 2 serotypes (A & C) and he may be infected by W135.

2) He should take the vaccination before travelling by two weeks at least.



gram negative diplococci + pus cells



Chocolate agar



turbid CSF



characteristic of meningococcal septicemia, caused by 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 lumbar puncture.

▪ Q1: What is your most likely diagnosis?

Aseptic or viral meningitis

▪ Q2: What is the most likely infection responsible? (Select only one)

- Mycobacterium Avium
- Fungal infection
- Parasitic infection
- Viral infection
- Bacterial infection
- Trepanoma pallidum (Neurosyphilis)
- Mycobacterium tuberculosis

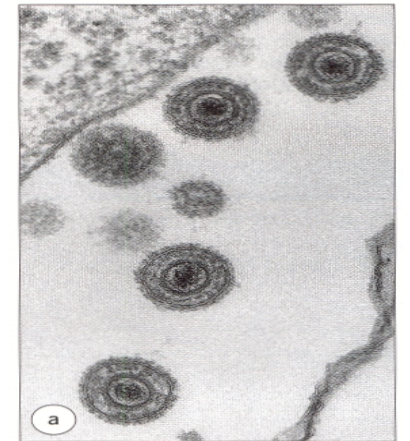
▪ Q3. What is your justification for your answer to question two?

From the table: Clear CSF, high WBC **lymphocytes**, slightly high protein, Normal glucose & low chloride.

▪ Q4. What further investigation would you like to do at this stage?

PCR, EM (in addition to these 2, mention the investigation of acute bacterial meningitis as well).

CSF	Patient's Result	Normal Range
Appearance	Clear	Clear
WBC and differential	100per 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	100	115-130 mmol/L



Treatment for Herpes: **Acyclovir**

CSF Molecular testing is positive for Herpes simplex type II

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 right table:

- Q1: What is your most likely diagnosis?

TB or chronic meningitis

- Q2: What is the most likely infection responsible? (Select only one)

✓ Mycobacterium tuberculosis

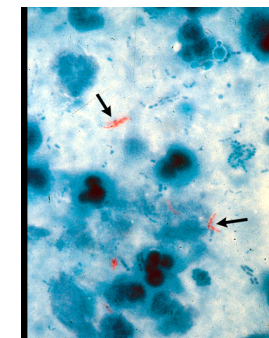
- Q3. What is your justification for your answer to question two?

From the table: Turbid CSF, high WBC lymphocytes, high protein, low glucose, normal chloride.

- Q4. What further investigation would you like to do at this stage?

-CSF sample: Gram stain, Bacterial culture, Blood culture, Latex agglutination, AFB stain, TB Culture, -Tuberculin skin test -Chest x-ray

CSF	Patient's Result	Normal Range
Appearance	Turbid	Clear
WBC 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



Acid fast smear



^A TB culture

Case 4

- A 59 y.o. male farmer with sudden onset of fever, headache, neck stiffness and confusion
- Peripheral Blood count: 12,800 wbc's/mm³ (73% neutrophils; 12% bands)
- Cerebrospinal Fluid:
 - 3520 wbc's/mm³ (100% neutrophils)
 - Glucose: <1 mg/deciliter
 - Protein: 368 mg/deciliter
- Q1: What is the most probable pathogen isolated? (right picture)

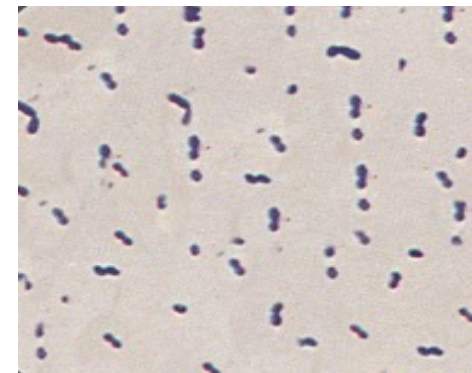
Streptococcus Pneumoniae

- Q2: What is probable treatment in this case?

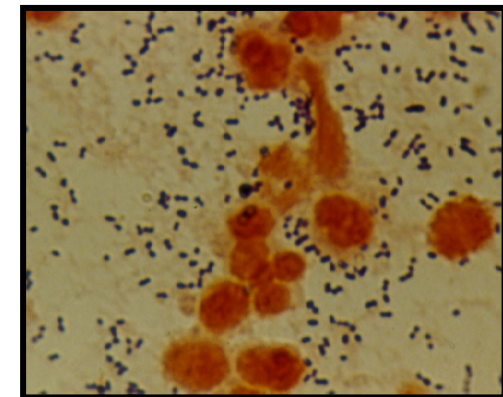
Ceftriaxone + Vancomycin



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



Pneumococci from culture: Gram-positive cocci in pairs; lancet-shaped

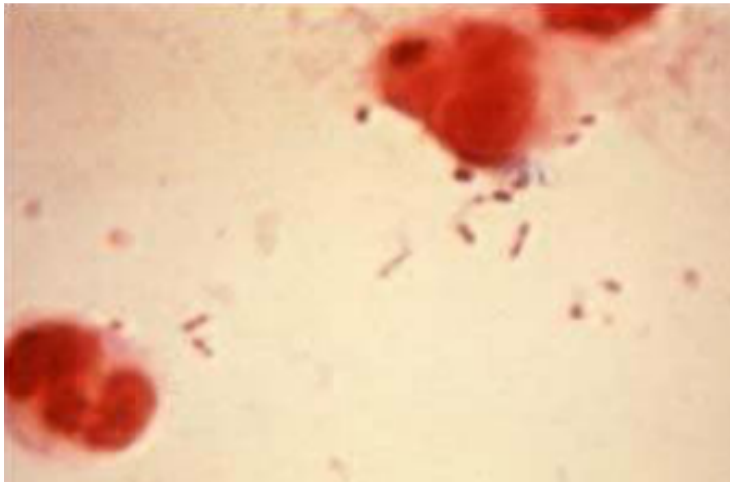


Direct gram stain of a CSF: deposit shows gram-positive diplococci with lanceolate shape and polymorphneoclear leucocytes

Bacterial meningitis: H.influenza Meningitis:

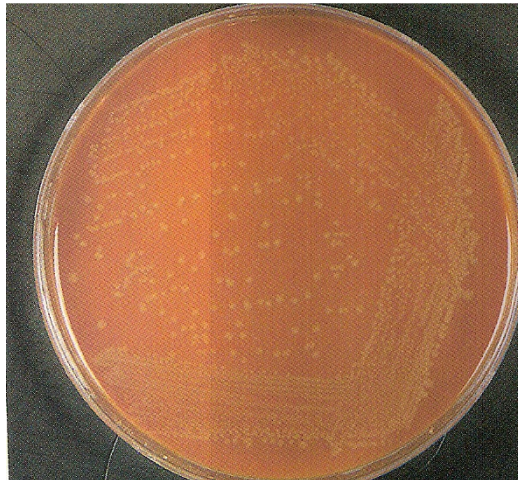
is caused mainly by hemophilus influenzae type b. Gram negative coccobacilli. Requires X & V growth factors for growth. The optimum growth temperature is 35°C - 37°C in 5% CO₂.

Gram stain :CSF Deposit



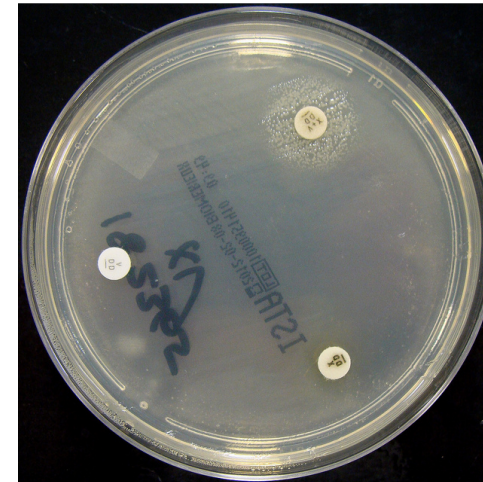
Gram-Negative coccobacilli with many polymorphonuclear leucocyte

Culture: H.influenzae on chocolate agar



Grow well on chocolate agar at 35°C - 37°C in 5% CO₂, colonies are convex, smooth, pale, grey or transparent

X , V, and X+V factors



H. influenzae :Growth around XV factors(requires both factors XV> no growth around X or V alone

Satellitism:



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