2nd year
CNS Block

PRACTICAL BIOCHEMISTERY

- There will be 1 or 2 stations in the exam .
- The question will be case-scenario based.
- The biochemistry question may be integrated within the Microbiology station question or may be separate (Explained later).
- We highly recommend that you go through the CSF lecture

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CSF SAMPLE

Obtained by LP (lumbar puncture) at L3-L4 interspace.
The specimen should be delivered to the lab immediately after collection
If delayed => Freeze the specimen.

REMEMBER

INDICATED IN :

- CNS infection
- Demyelinating diseases
- CNS Malignancy
- Hemorrhage in CNS

CONTRAINDICATID IN:

- Bleeding diathesis (tendency)
- Increased intracranial pressure
- Infection at site of needle insertion

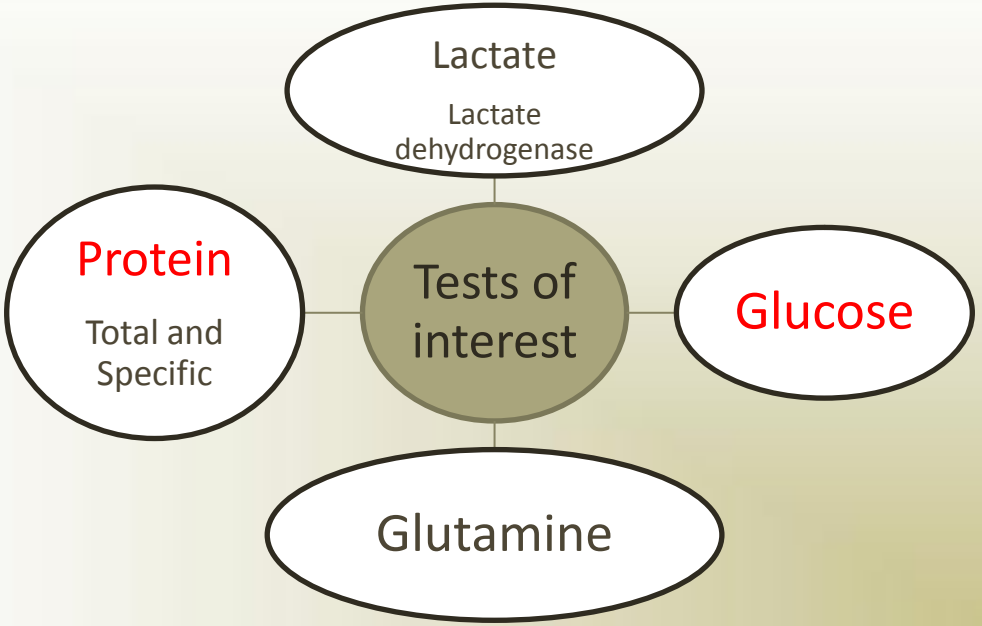
Physical examination of the CSF

	Normal	Abnormal
Appearance (turbidity)	Clear	Cloudy (turbid) may indicate : The presence of white, or red blood cells, microorganisms, or an increase in protein level
Color	Colorless	❑ Yellow => (Xanthochromia[1]) ❑ Orange-brown or red may indicate the presence blood[2].
Viscosity	Same consistency as water	Thicker CSF may be seen in patients with certain types of cancers or meningitis.

1: Hemoglobin pigment breakdown and RBCs lysis

2: If the blood color was bright red and RBCs decrease in number as fluid is sampled => Traumatic tap

BIOCHEMICAL ANALYSIS OF THE CSF



Normal reference values for CSF protein:	**0.15-0.45 g/L (15-45 mg/dL)**
Normal reference values for CSF Glucose:	2/3 that of PLASMA (50 - 80 mg/dL)

ABNORMAL FINDING OF CSF IN SOME PATHOLOGICAL CONDITIONS

Parameter	Conditions			
	Bacterial meningitis	Tuberculous meningitis	Viral meningitis	Brain tumor
Appearance	Turbid	Turbid (Fibrin web)	Clear	-
Predominant cell	Polymorphs	Lymphocyte	Lymphocyte	-
Protein	Very high	Very high	Normal	High
Glucose	Very low	Very low	Normal or slightly low	Low
Chloride	Very low	Very low	Normal or low	Normal or low

Case scenario 1 (Bio + Micro)

A 12-years old child was brought to the emergency department in KKUH by his mother. She said that her child has been suffering form fever and headache symptoms for the last two weeks, and developed a stiffness in the neck recently.
A CSF sample was drown from the patient and sent to the microbiology and biochemistry labs.

The microbiology lab results: The culture reveals the growth of ….. Etc.

Biochemistry lab results for analysis of CSF:

Parameter	Result	Normal state
Predominant cell	Neutrophils	Nill
Protein	100 mg/dl	15-45 mg/dL
Glucose	35 mg/dl	50 - 80 mg/dL

Q1) What is the most likely diagnosis?

Bacterial meningitis.

Q2) What other relevant finding is expected to be seen in such condition ?

Decreased Cl levels.

Case scenario 2

A 50-years old male presented to the ER with excruciating headache.
He said “It is the worst headache I have ever had in my life”.
The diagnosis of subarachnoid hemorrhage was suspected, the GP ordered a sample of the cerebrospinal fluid (CSF) to be drawn for examination.

The result of physical examination are shown below :

Parameter	Result	Normal
Appearance	Cloudy	Clear
Color	Yellow	Colorless
Viscosity	As water	As water

Q1) The yellowish CSF color is referred as ? What is the pathogenesis underlying it ?

Xanthochromia , due to hemoglobin pigment breakdown and RBCs lysis.

Q2) What is the level of spinal cord in which the CSF sample can be drawn ?

The interspace L3-L4.

Thank You!

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