



Cerebrospinal Fluid (CSF) Analysis for total protein

CSF sample

- The specimen should be delivered to the laboratory immediately after collection
- Glucose and protein estimations should be performed as soon as possible after drawing the CSF specimen
- If testing is to be delayed, the specimen should be frozen at -20°C .

Physical Examination

- **Turbidity**
 - Clear- normal
 - Cloudy/ turbid- may indicate the presence of white, or red blood cells, microorganisms, or an increase in protein level

Physical Examination

- **Color**
 - Colorless- normal
 - Yellow, orange-brown, or red- may indicate the presence blood

Physical Examination

- **Viscosity**
 - Normal CSF should have the same consistency as water
 - Thicker CSF may be seen in patients with certain types of cancers or meningitis.

Chemical Analysis

- Routinely performed biochemical tests in CSF are:
 - glucose
 - protein (total and specific)
 - lactate
 - lactate dehydrogenase
 - glutamine and acid-base parameters

Remember !!

- Before any analysis, the fluid should be centrifuged to avoid contamination by cellular elements
- CSF is the most precious biological material. Often, only small volumes of CSF are available for analysis due to difficulty in collection; hence handle this with care
- The specimen may contain virulent organisms, so strict safety precautions should be followed.

CSF Protein Assay

- Protein present in the CSF is detected by a kit based on Biuret method.
- Biuret reagent when interacts with the peptide bonds in the protein give a blue coloured product
- The intensity of the colour is proportional the amount of protein in CSF

CSF Protein Assay

- Color intensity is determined by measuring the absorbance by the colored solution at a wavelength of 546nm
- Absorbance is measured by an instrument, **spectrophotometer**

Spectrophotometer



Most of visible spectrophotometers are composed of.

- Light source which works with visible wavelengths (400-700 nm)
- Monochromator filter for choosing desired wavelength
- Sample holder (cuvette)
- Detector
- Meter or recorder

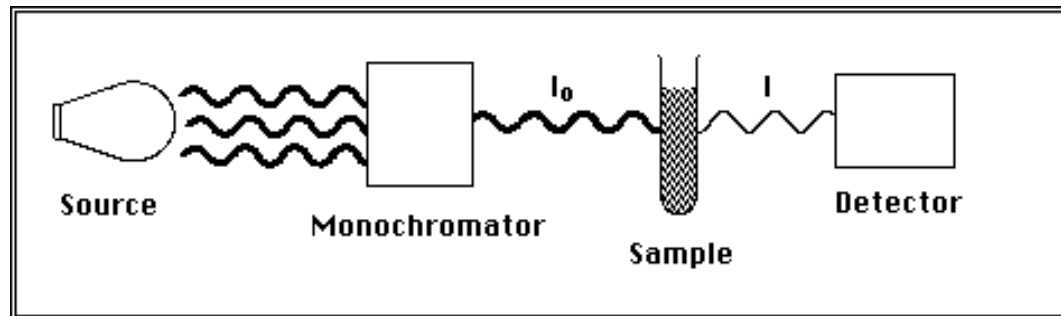


Figure 1

Procedure

	Test	Standard	Blank
Reagent	2 ml	2 ml	2 ml
CSF sample	40 μ l	-	-
Standard	-	40 μ l	-
H ₂ O	-	-	40 μ l

Mix and incubate for 15 minutes at room temperature
Measure absorbance at 546 nm

Calculation

- Protein conc (g/L) =

$$\frac{\text{Abs of sample}}{\text{Abs of standard}} \times \text{Conc of standard (60g/L)}$$

Normal Range

Normal reference values for CSF
protein:

15-45 mg/dL (0.1 -0.4 g/L)

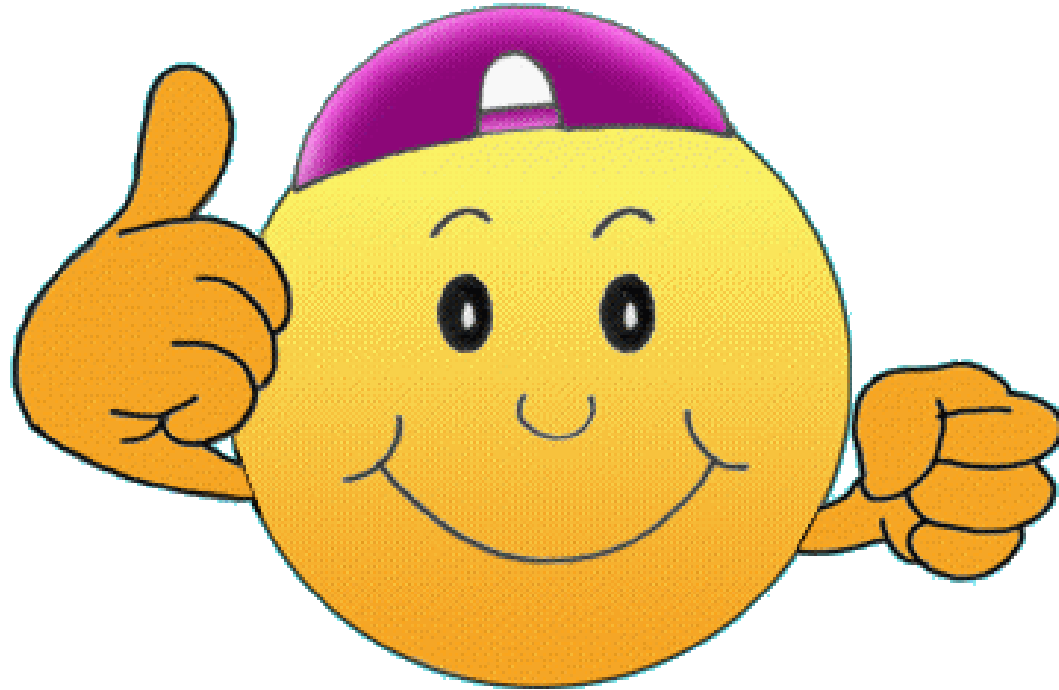
CSF Examination Report

- **Physical examination**
 - Volume
 - Color
 - Appearance
 - Viscosity
- **Chemical examination**
 - CSF protein concentration (g/L)
- **Group number & Student names**

Abnormal findings of CSF in some pathological conditions

Parameter	Condition			
	Bacterial Meningitis	Tuberculous Meningitis	Viral Meningitis	Brain Tumor
Protein	↑ ↑	↑ ↑	Normal	↑
Glucose	↓ ↓	↓ ↓	Normal or slightly ↓	↓
Chlorides	↓ ↓	↓ ↓	Normal or ↓	Normal or ↓

GO FOR IT !



GOOD LUCK !