



# **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  $-20^{\circ}\text{C}$ .

# Physical Examination

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## ■ 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

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- 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

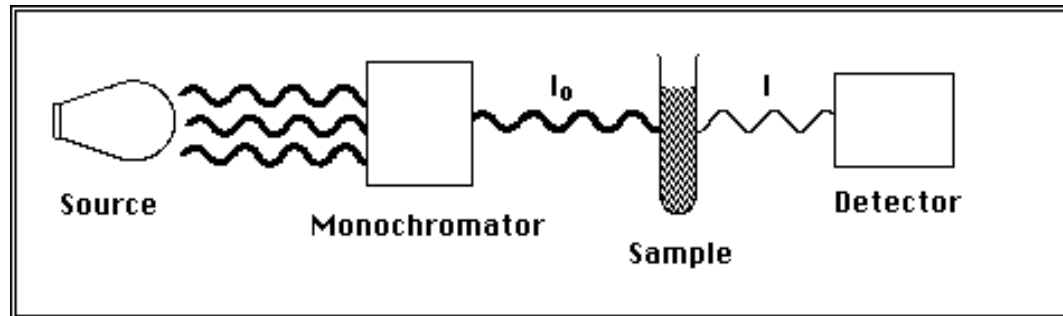


Figure 1

# Procedure

	Test	Standard	Blank
Reagent	2 ml	2 ml	2 ml
CSF sample	40 $\mu$ l	-	-
Standard (60mg/dL)	-	40 $\mu$ l	-
H <sub>2</sub> O	-	-	40 $\mu$ l

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

# Calculation

■ Protein conc (mg/dL) =

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

■ To convert from mg/dL to g/L, divide the concentration by 100

# Normal Range



Normal reference values for CSF  
protein:

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

# CSF Examination Report

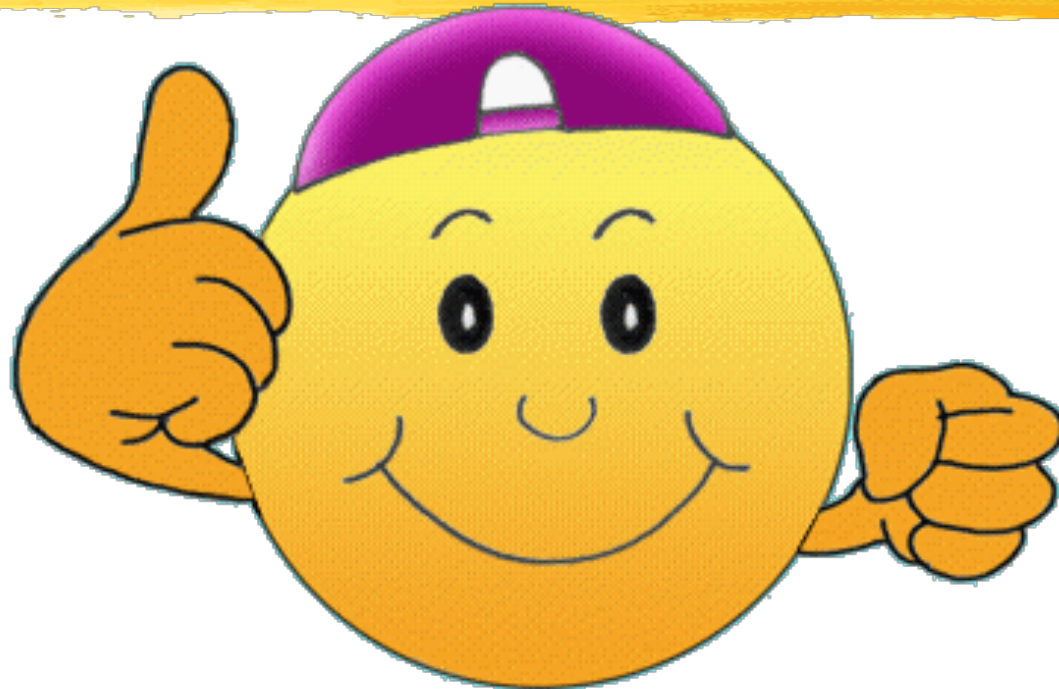


- **Physical examination**
  - Volume
  - Color
  - Appearance
  - Viscosity
- **Chemical examination**
  - CSF protein concentration (g/L)
- **Group number & Student names**

# 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 !***