

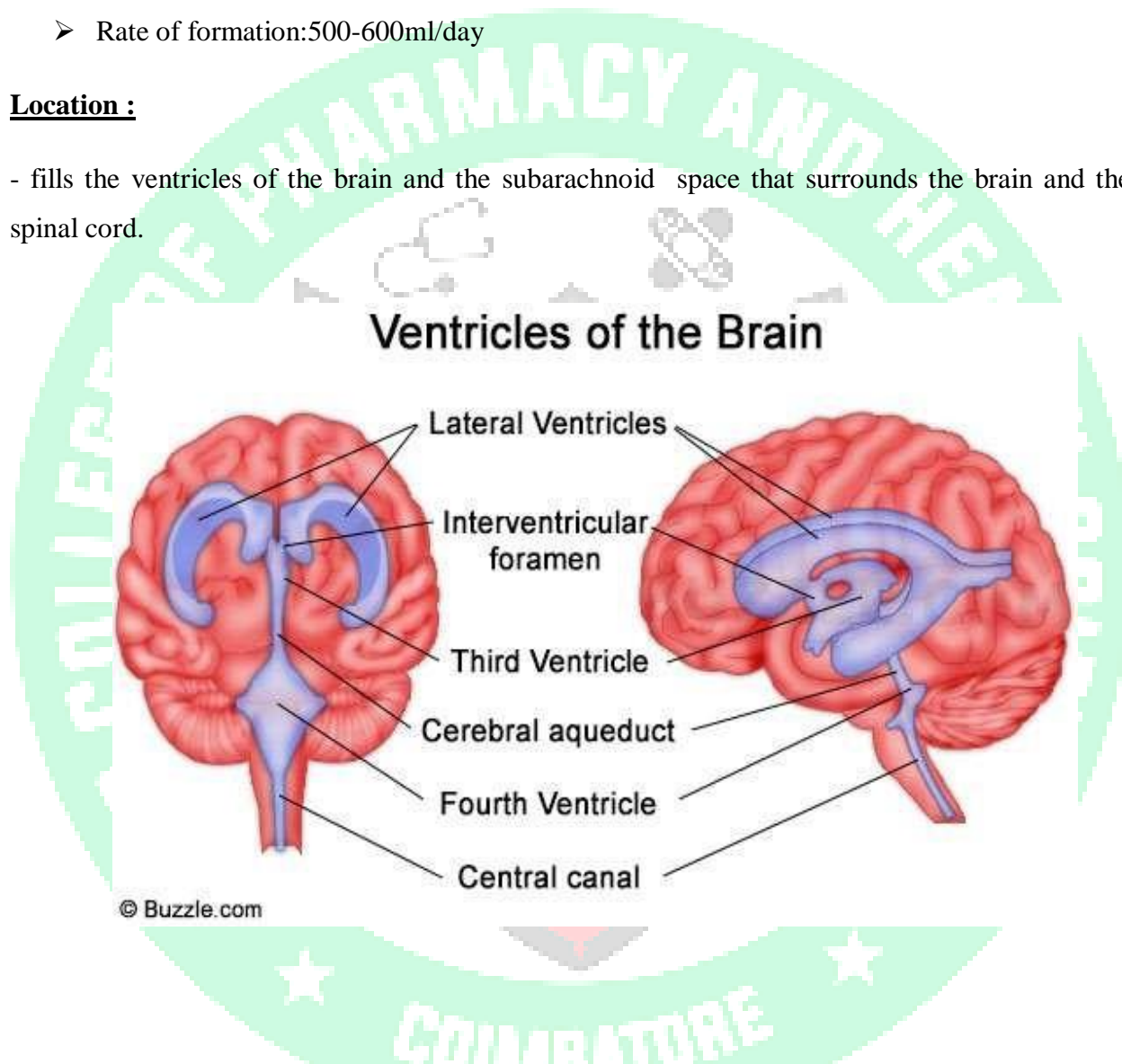
CEREBROSPINAL FLUID(CSF)

Cerebrospinal fluid is a clear, colorless fluid

- Total volume:150ml
- Rate of formation:500-600ml/day

Location :

- fills the ventricles of the brain and the subarachnoid space that surrounds the brain and the spinal cord.



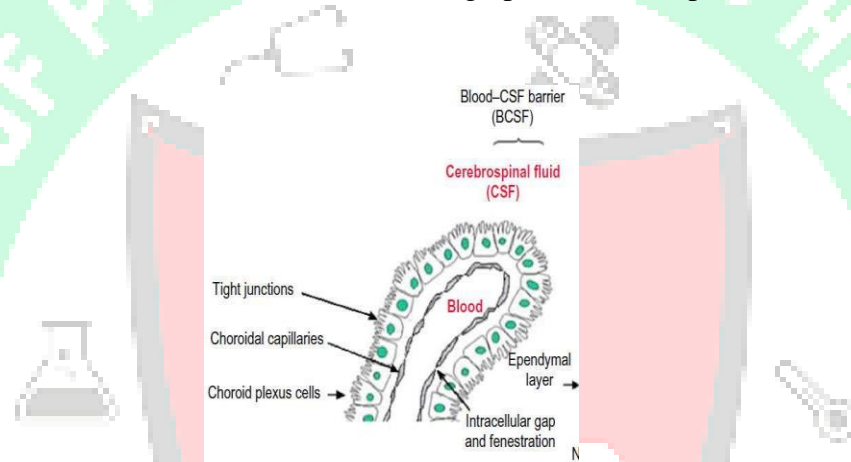
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ADAM.

FORMATION OF CSF

- 50-70% : choroid plexuses
 - 30-50%: blood vessels along the ventricular wall
1. Choroid plexus of the ventricle cavities, mostly is formed in the lateral ventricles
 2. some originate from the ependymal cells lining the ventricles
 3. some from the brain substances through perivascular spaces



MECHANISM OF FORMATION

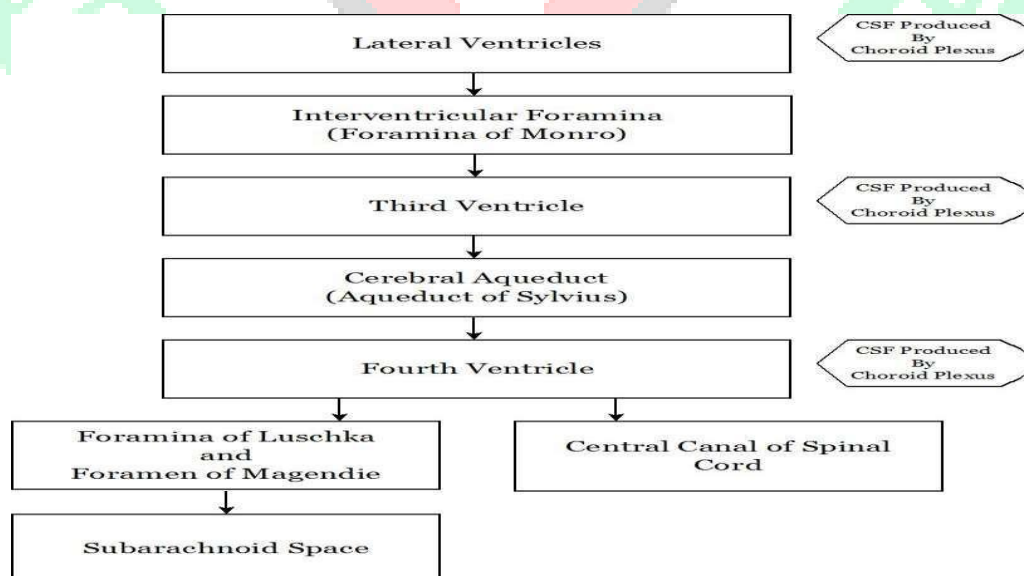
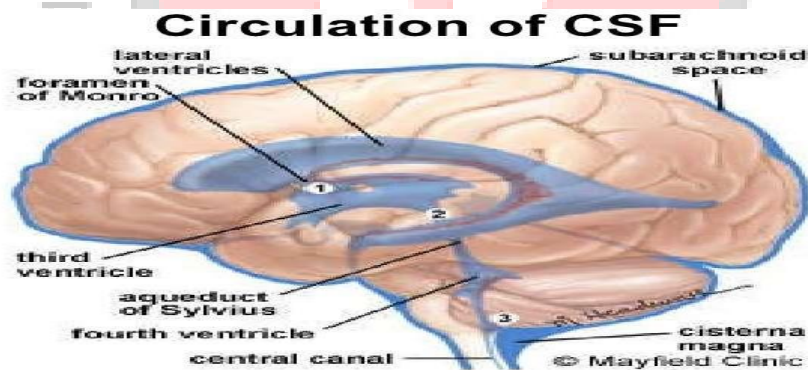
Formed continuously by the choroid plexus in two stages:

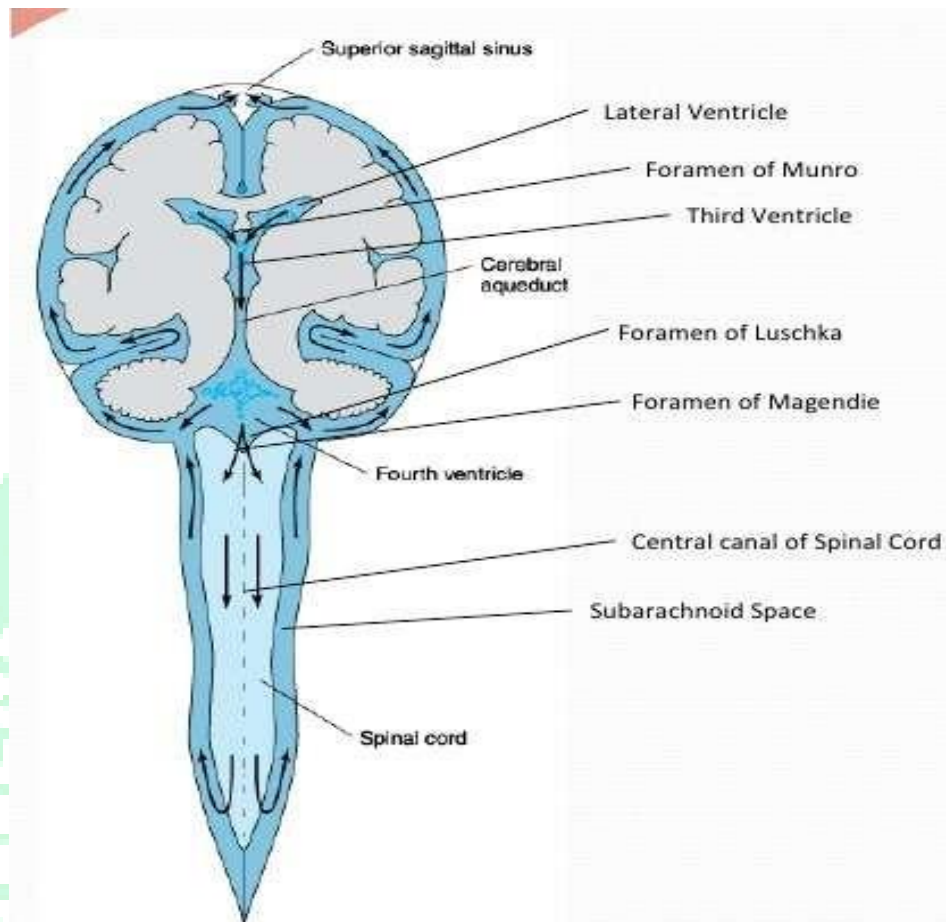
1. Plasma is passively filtered across the choroidal capillary endothelium
 2. Secretion of water and ions across the choroidal epithelium
- Bicarbonate, chloride, and potassium ions, enter the csf via channels in the epithelial cell apical membranes.
 - Aquaporins provide for water movement to balance osmotic gradients.

Composition

- Clear, colorless, alkaline fluid.

- Specific gravity 1.005 to 1.008.
- Ph (7.33) slightly less than that of plasma (7.4).
- Iso-osmolar with plasma 289 mosm / kg / water.
- Watery solution similar in composition to blood plasma
- Contains less protein and different ion concentrations than plasma. Almost *protein free*.(20 – 30 mg%).
- Almost *cell free* (lymphocytes 0-5 / mm³).
- Contains less glucose (50mg%) than plasma.
- Contains some urea & creatinine.
- also contains chloride, na⁺ , k⁺ , hco₃⁻





Absorption of csf:

- Mostly absorbed by the arachnoid villi into dural sinuses and spinal veins.
- Small amount is absorbed along the perineural spaces into cervical lymphatics and in to the perivascular spaces
- Normally, 500 ml of csf is formed everyday and equal amount is absorbed.

FUNCTIONS OF CSF:

- Mechanical: protective, nourishment, required for cerebral blood flow.

- Therapeutical: needed for administration of drug; lumbar puncture.
- **Protects brain from mechanical injury**
- **Effect of buoyancy** – brain has a higher specific gravity than csf. Therefore, the brain floats freely in the csf.
- Weighs about 1400 g in air; but only 50 g in csf.
- Protection from minor injuries during routine day-to-day activities.
- Impact of major injuries is greatly diminished
- **Cushion effect:**
 - Csf supports the brain; cushion like effect
 - Post lumbar puncture – severe headache after csf removal – brain hangs on the vessels & nerve roots, and traction on them stimulates pain fibers
- **Provides microenvironment for brain cells**
 - Serves as a fluid buffer – buffers changes in the blood & brain interstitial fluid –
 - Thereby, ensures constancy in the external environment of neurons.
- **Removal of proteins & waste products of metabolism**
 - Lymphatics absent in the brain & the spinal cord
 - Csf serves the function of lymphatics
- **Role in homeostasis**
 - Changes in blood gases in csf – chemoreceptors
 - sense & regulate respiration, bp
- **Blood-csf barrier**
- Abnormalities in composition – **diagnose diseases** like meningitis, encephalitis etc.,