The Nervous System

Meninges
CSF
Protection of the Brain

- Bone (skull)
- Membranes (meninges)
- Watery cushion (cerebrospinal fluid)
- Blood-brain barrier
Meninges

- Series of membranes
- Cover and protect the CNS
- Anchor and cushion the brain
- Contain cerebrospinal fluid (CSF)
Meninges

- Three layers
  - Dura mater
  - Arachnoid mater
  - Pia mater
Figure 12.24
Skin of scalp
Periosteum
Bone of skull
Periosteal Dura mater
Meningeal
Arachnoid mater
Pia mater
Arachnoid villus
Blood vessel
Falx cerebri (in longitudinal fissure only)
Superior sagittal sinus
Subdural space
Subarachnoid space
Dura Mater

- Strongest meninx
- Fibrous connective tissue
- Limit excessive movement of the brain
Figure 12.25a

(a) Dural septa

- Superior sagittal sinus
- Falx cerebri
- Tentorium cerebelli
- Falx cerebelli
- Straight sinus
- Crista galli of the ethmoid bone
- Pituitary gland
Arachnoid Mater

- Middle layer with weblike extensions
- Separated from the dura mater by the subdural space
- Subarachnoid space contains CSF and blood vessels
Pia Mater

- Layer of delicate vascularized connective tissue that clings tightly to the brain
Meningitis

- Inflammation of meninges
- May be bacterial or viral
- Diagnosed by obtaining CSF sample via lumbar tap
Figure 12.30

- **Ligamentum flavum**
- **Supra-spinous ligament**
- **Lumbar puncture needle entering subarachnoid space**
- **Filum terminale**
- **Cauda equina in subarachnoid space**
- **Inter-vertebral disc**
- **Arachnoid matter**
- **Dura mater**
- **D12**
- **L5**
- **L4**
- **S1**
Cerebrospinal Fluid (CSF)

**Composition**
- Watery solution
- Modified plasma
- Constant volume (about 150 ml)
- About 500 ml formed daily
- Replaced every 8 hours or so
Cerebrospinal Fluid (CSF)

- Functions
  - Gives buoyancy to the CNS organs
  - Protects the CNS from blows and other trauma
  - Nourishes the brain and carries chemical signals
Choroid Plexuses

- Produce CSF at a constant rate
- Hang from the roof of each ventricle
- Clusters of capillaries enclosed by pia mater and a layer of ependymal cells

![Image of choroid plexuses]
Wastes and unnecessary solutes absorbed

CSF forms as a filtrate containing glucose, oxygen, vitamins, and ions (\(Na^+\), \(Cl^-\), \(Mg^{2+}\), etc.)

(b) CSF formation by choroid plexuses
(a) Anterior view

Lateral ventricle
Septum pellucidum
Anterior horn
Inferior horn
Lateral aperture
Interventricular foramen
Third ventricle
Inferior horn
Cerebral aqueduct
Fourth ventricle
Central canal

(b) Left lateral view

Posterior horn
Median aperture
Lateral aperture
CSF circulation

1. CSF is produced by the choroid plexus of each ventricle.
2. CSF flows through the ventricles and into the subarachnoid space via the median and lateral apertures. Some CSF flows through the central canal of the spinal cord.
3. CSF flows through the subarachnoid space.
4. CSF is absorbed into the dural venous sinuses via the arachnoid villi.
Hydrocephalus

- Due to blockage or overproduction of CSF
- Internal versus external hydrocephalus
- Infants versus adults
- Treatment
End of Quiz One Material

- Entire Introductory Nervous System section
- CNS section through bottom of pg 6
- CNS page 12, Meninges and CSF
- Labs week 1 and 2

*Remember we meet at 5:30pm next Tuesday*