

**Program: M.Sc., Biomedical Science**

Course Title : Neurobiology

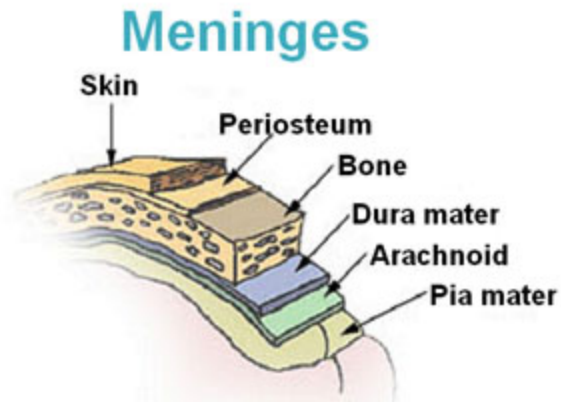
*Meninges*

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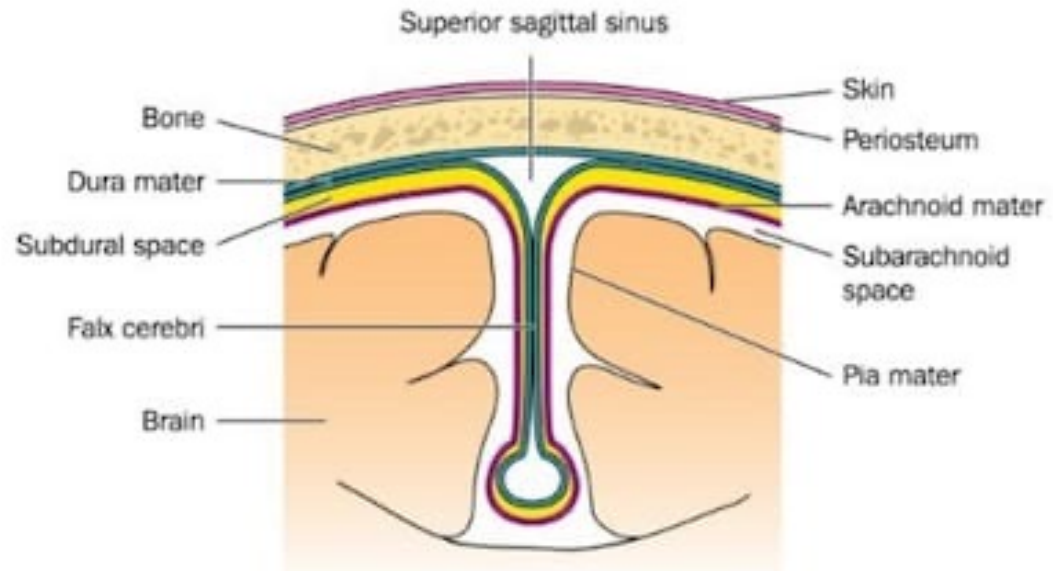
Dept. of Biomedical Science

# Meninges

- CNS is surrounded by three specialized membranes, termed **meninges**.
- **subarachnoid space**- where cerebrospinal fluid or CSF flows



Dura mater -- outer layer lining skull  
Arachnoid (mater) -- contains blood vessels  
Subarachnoid space -- filled with CSF  
Pia mater -- covers brain



# Meninges

The role of the first of these protective devices, the **bony covering**, latter **three meningeal membranes have protective mechanisms**

**The three meningeal membranes wrap protect and nourish the CNS**

From the outermost to innermost layer is Dura mater, then the arachnoid mater, and then the pia mater.

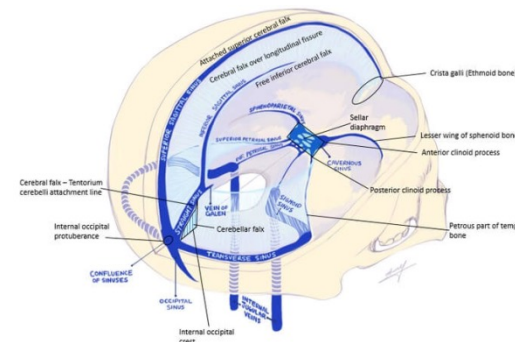
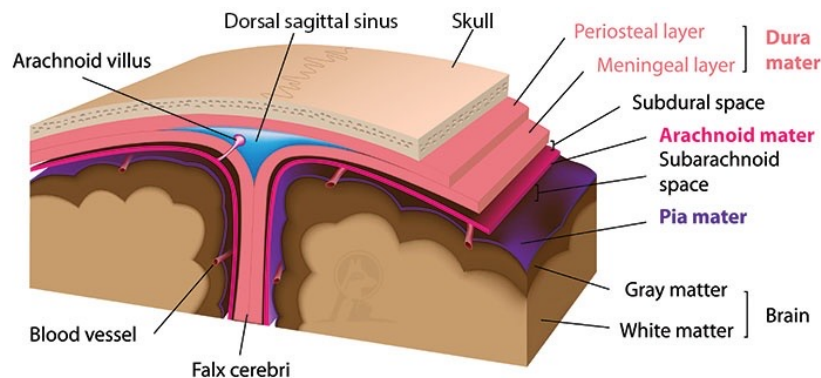
- 1.Dura mater-** tough, inelastic membrane that covers, protects the CNS from penetration & consists of two layers
- 2.Arachnoid mater-** forms a fluid-resistant sac around the CNS.
- 3.Pia mater-** a very thin and delicate membrane separated from the arachnoid by the **subarachnoid space**.

**Mater**-mother, pia mater means pia mother. **Dura**-tough, **arachnoid**-spider like **pia**-gentle or fragile

**The meninges surround the CNS but not the PNS.**

# Dura mater

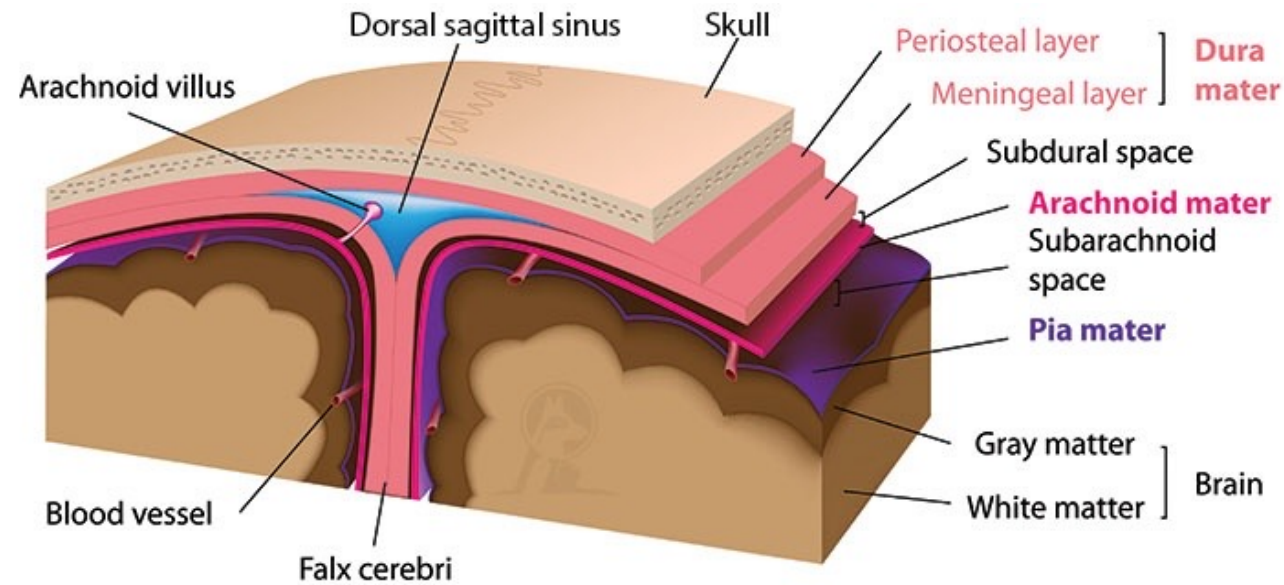
1. Tough, inelastic membrane that covers, protects the CNS from penetration & consists of two layers
2. Usually, 2 layers of dura mater adhere closed, but in some regions they are separated to form blood filled cavities, **dural sinuses**, or in the case of the large cavities, **venous sinuses**.
3. Venous blood draining from the brain empties into these sinuses to be returned to the heart
4. CSF also reenters the blood at one of these sinus sites.



# Arachnoid mater-

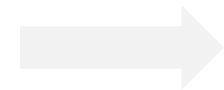
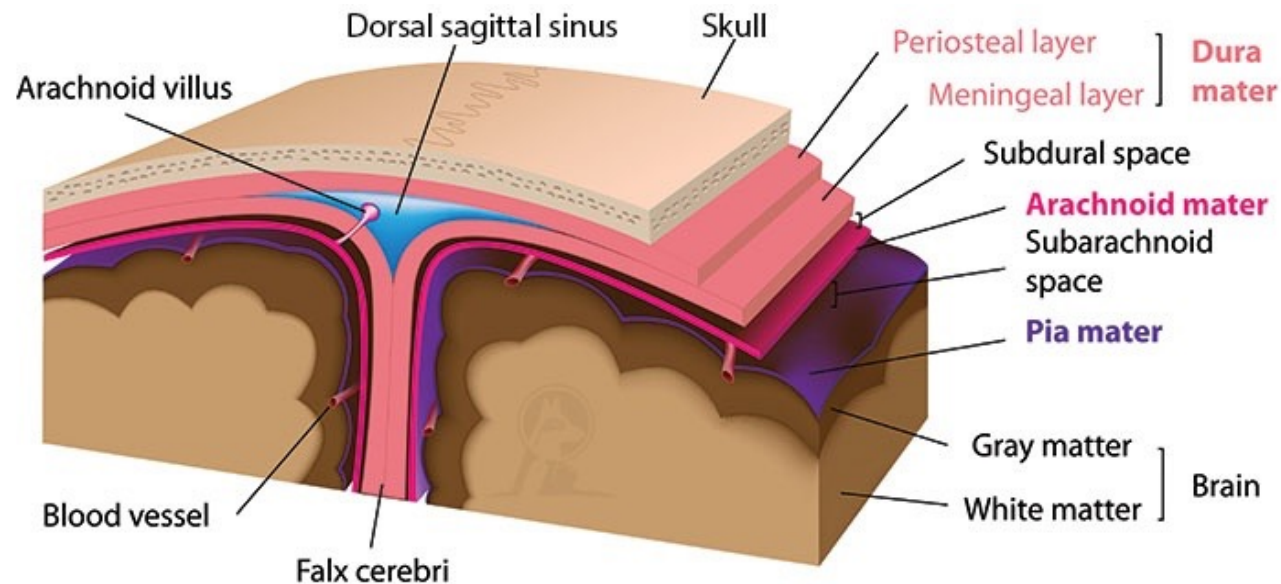
Forms a fluid-resistant sac around the CNS.

- The arachnoid mater is a delicate, richly vascular layer with a “cobwebby” appearance.
- The space between the arachnoid layer and the underlying pia mater, the subarachnoid space, is filled with CSF.
- Protrusions of arachnoid tissue, the arachnoid villi, penetrate through gaps in the overlying dura and project into the dural sinuses.
- CSF is reabsorbed across the surfaces of these villi into the blood circulating within the sinuses.



# *Pia mater*

- **Pia mater**- The inner most very thin & delicate meningeal layer
- separated from the arachnoid by the **subarachnoid space**.
- It is highly vascular and closely adheres to the surfaces of the brain and spinal cord, following every ridge and valley.
- In certain areas it dips deeply into the brain to bring a rich blood supply into close contact with the ependymal cells lining the ventricles.



# *Meninges (in PNS)*

- An **analogous** set of membranes to the meninges surrounds peripheral nerves.
  1. **Epineurium (outer layer)**
  2. **Perineurium (middle layer)**
  3. **Endoneurium (inner layer)**
- act together to protect nerves from **mechanical** and chemical damage,
- to ferry nutrients and waste between the nerves and blood.

