Development of Nervous System

The notochord induces overlaying ectoderm to become neuroectoderm and form a neural tube.

Process of neural tube formation: The following stages of neural tube formation are evident:

- Neural plate-ectodermal cells overlaying the notochord become tall columnar, producing a thickened neural plate.
- Neural groove-the neural plate is transformed into a neural groove.
- Neural tube-the dorsal margins of the neural groove merge medially, forming a neural tube composed of columnar neuroepithelial cells surrounding a neural cavity.

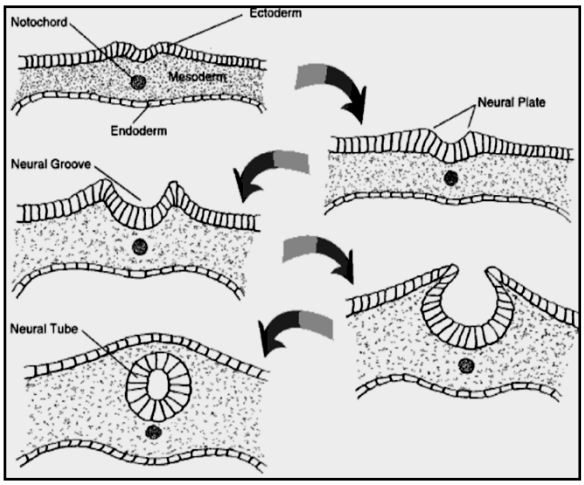

Fig. 1 Neural tube formation

In the process of separating from overlaying ectoderm, some neural plate cells become detached from the tube and form neural crest from which ganglia arises.

Formation of the Central Nervous System

Brain

- The cranial end of the neural tube forms three vesicles (enlargements)
- Then that further divide into the five primary divisions of the brain.
- Caudal to the brain the neural tube develops into spinal cord.

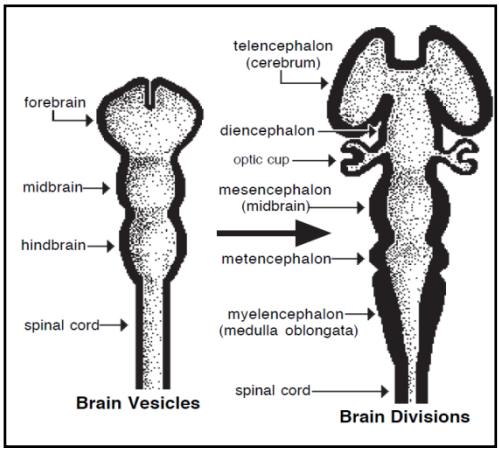

Fig. 2 Formation of brain

Spinal cord

Caudal to the brain the neural tube develops into spinal cord. Three concentric layers make up the neural tube:

1. Inner ventricular/germinal/ ependymal layer
2. A middle mantle/Intermediate layer
3. Marginal layer

- Inner ventricular layer: forms the central canal of spinal cord lined epedymal cells.
- Mantle layer/Intermediate layer develops into gray matter
- Marginal layer becomes white matter.

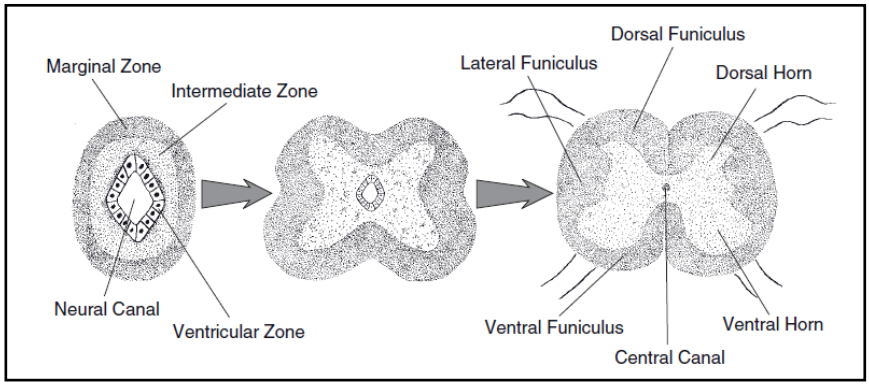

Fig. 3 Spinal cord formation

Adult CNS Structures Derived From Embyonic Brain Divisions

Embryonic Brain Division	Derived Brain Structures	Definitive Brain Cavities	Associated Cranial Nerves
FOREBRAIN			
Telencephalon	Cerebrum	Lateral ventricles	Olfactory (I)
Diencephalon	Thalamus; hypothalamus; etc.	Third Ventricle	Optic (II)
MIDBRAIN			
Mesencephalon	Midbrain	Mesencephalic aqueduct	III & IV
HINDBRAIN			
Metencephalon	Pons and Cerebellum	Fourth ventricle	V
Myelencephalon	Medulla Oblongata		VI—XII