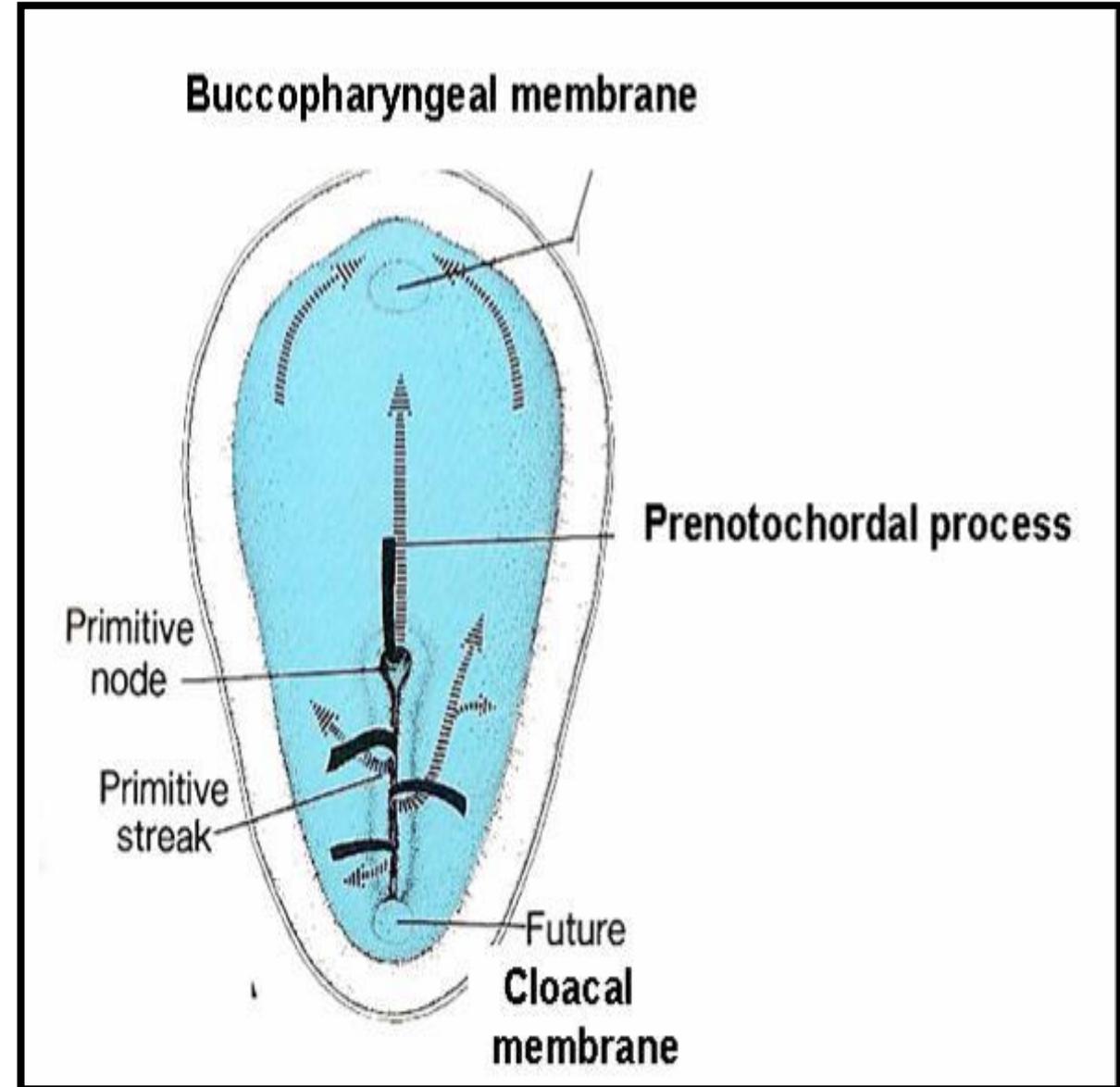


THIRD WEEK II

DR. DALIA BIRAM

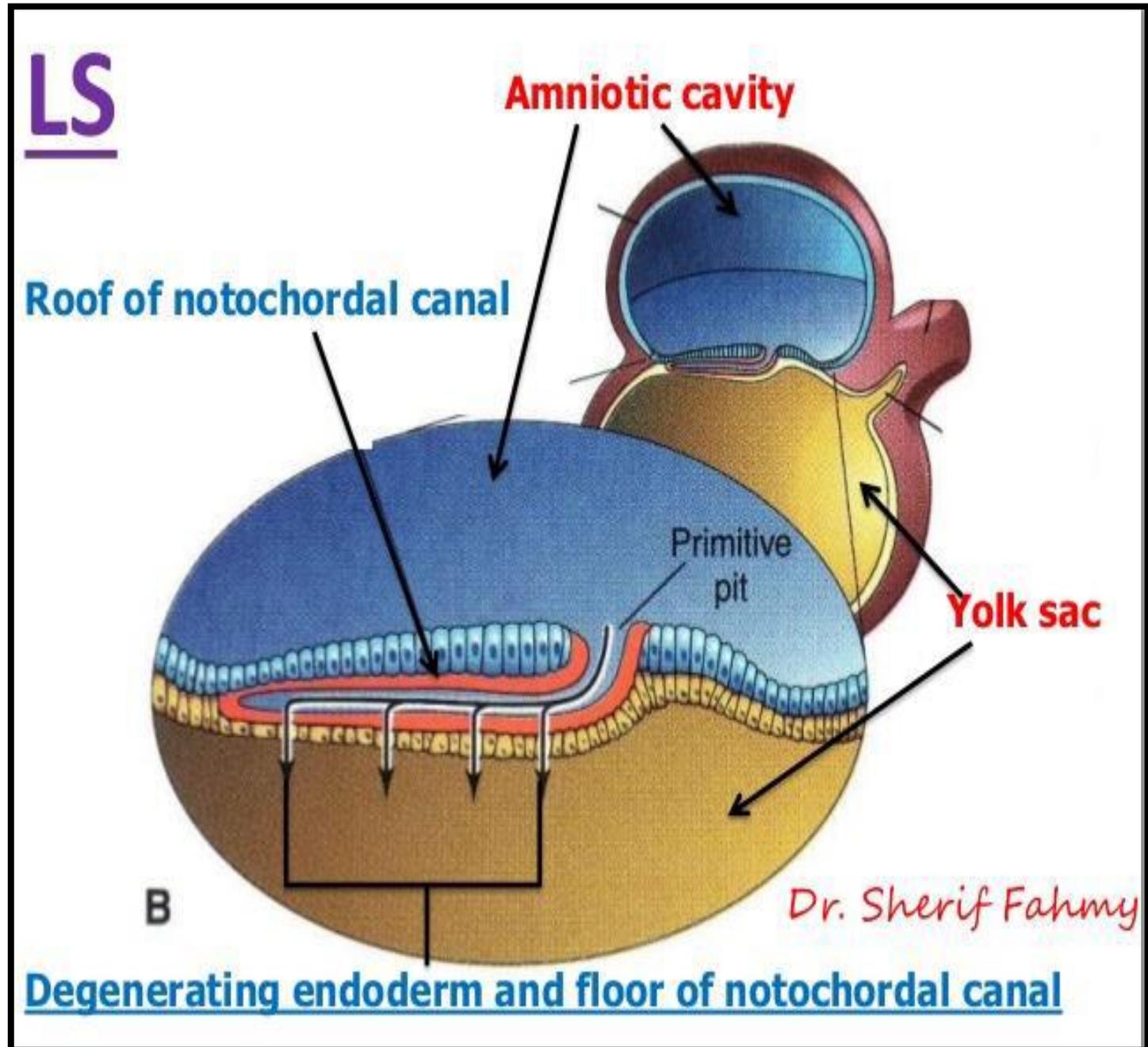
FORMATION OF THE NOTOCHORD

- It begins at day 17 .
- Formation of the **prenotochordal process** by invagination of cells in the **primitive node** . These cells grow cranially in the median plane between endoderm & ectoderm until they reach the **buccopharyngeal membrane**.
- A fine canal develops , starts from the **primitive pit** then extends cranially into the prenotochordal process , transforming it to **prenotochordal canal** .

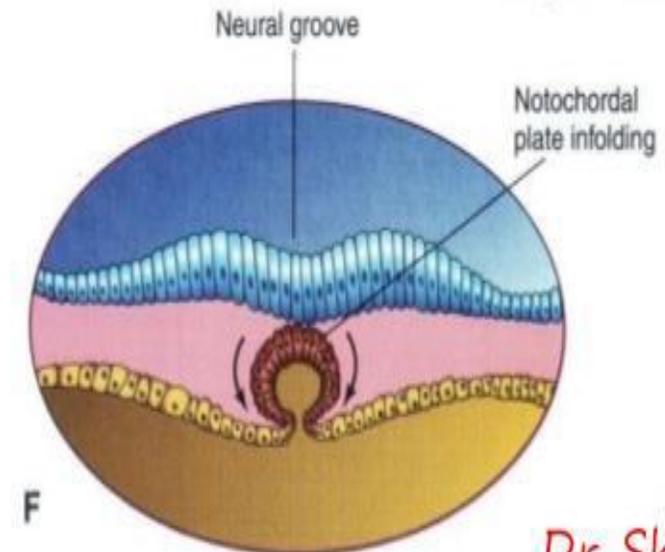
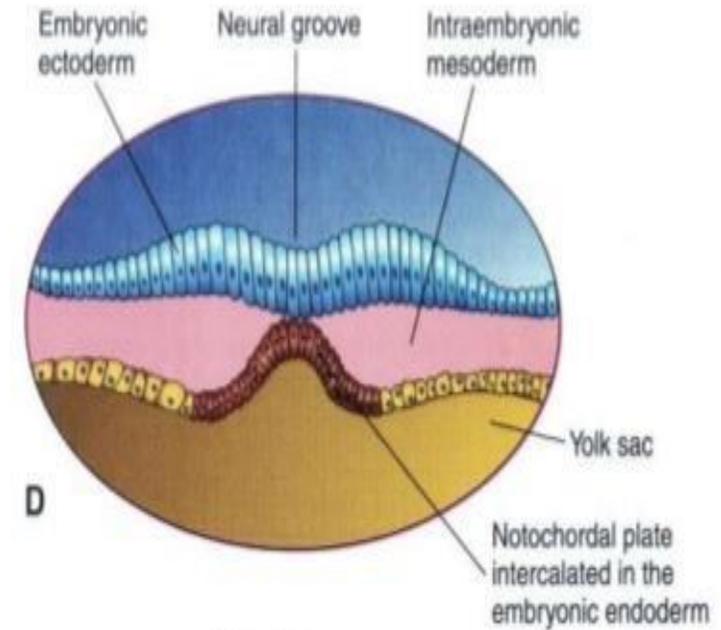


- **Notochordal-endodermal fusion:**

- The **floor** of prenotochordal canal is adherent to the underlying endoderm .
- The floor of the prenotochordal tube **degenerates** together with the underlying endoderm , forming a **Neurenteric canal** that temporarily **connects** the yolk sac with the amniotic cavity.
- **The Notochordal plate** is formed by fusion of the **roof** of the prenotochordal canal with the surrounding endoderm.



- **Definitive notochord is** formed by **folding** of the notochordal plate along its longitudinal axis to form a solid cord of cells **extending** from the primitive pit to the buccopharyngeal membrane.
- The **endoderm** on each side of the notochordal plate fuse together to **resume its continuity**.

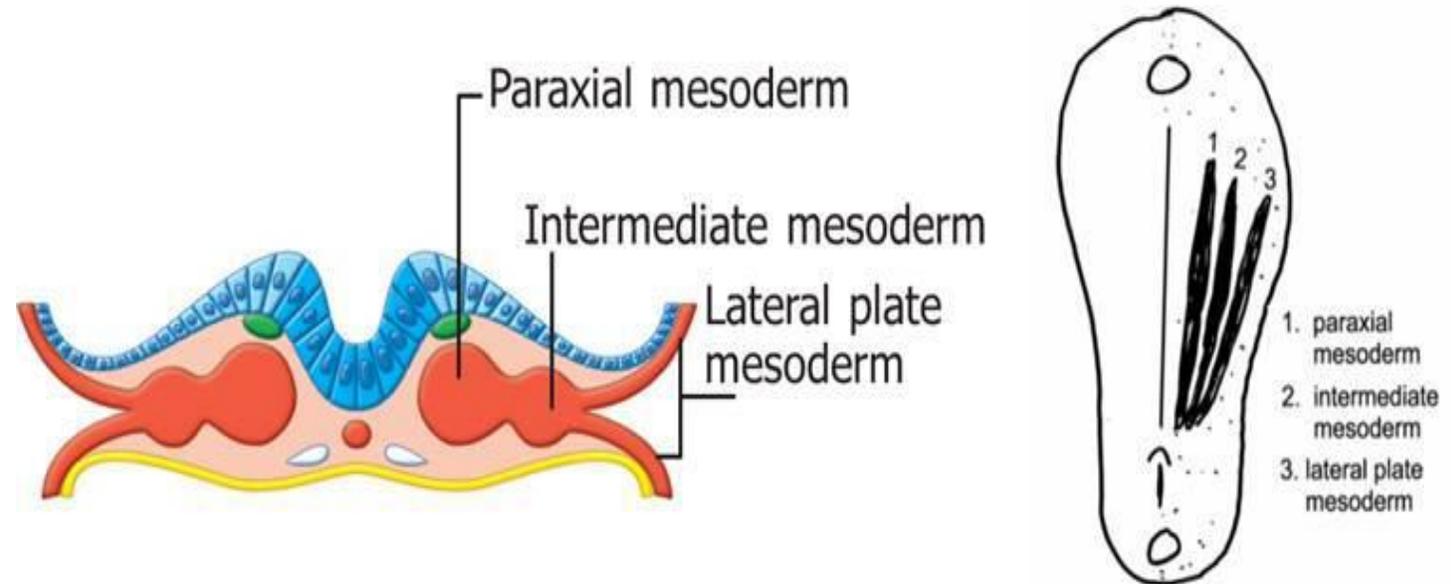
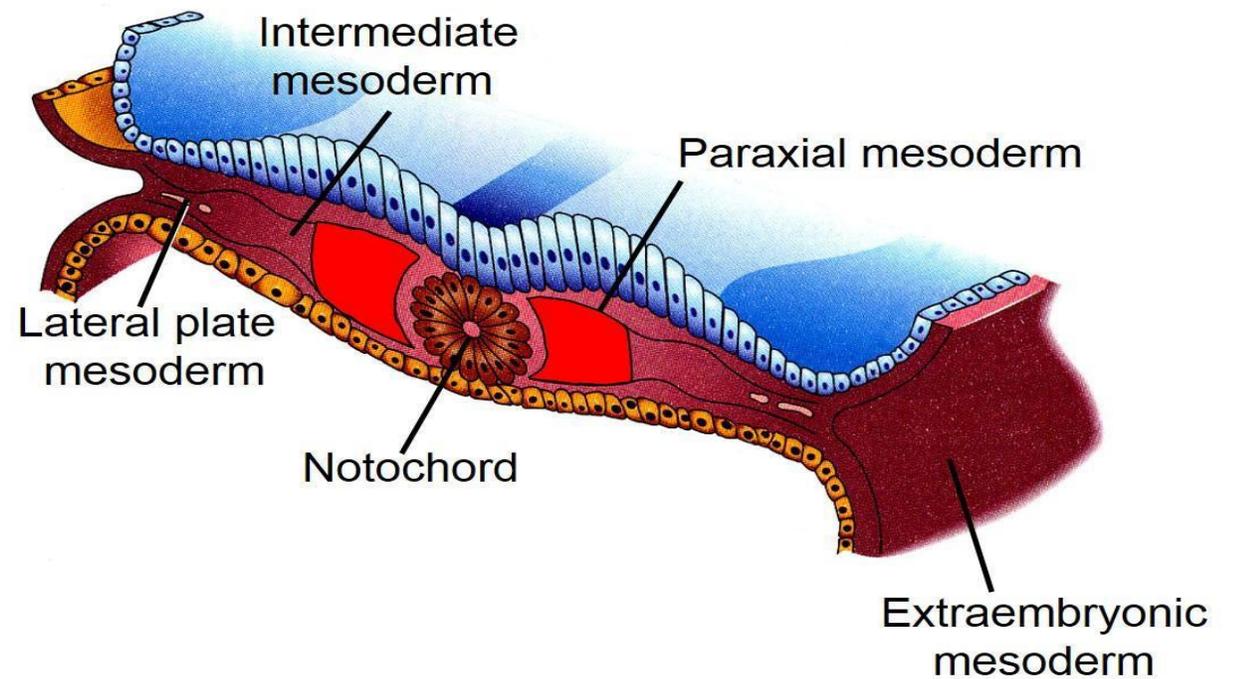


TS

Dr. Sherif Fahmy

FUNCTIONS OF THE NOTOCHORD

1. It forms the axis around which the axial skeleton develops (bones of the head and vertebral column).
2. It **Induces** the overlying ectoderm to differentiate to neurectoderm to form the neural plate.
3. The notochord degenerates and disappears as the bodies of the vertebrae form. Its remnant is the **nucleus pulposus of the intervertebral discs**.



2-DEVELOPMENT OF NEURAL TUBE

Begins during the 3rd week (18-20 days)

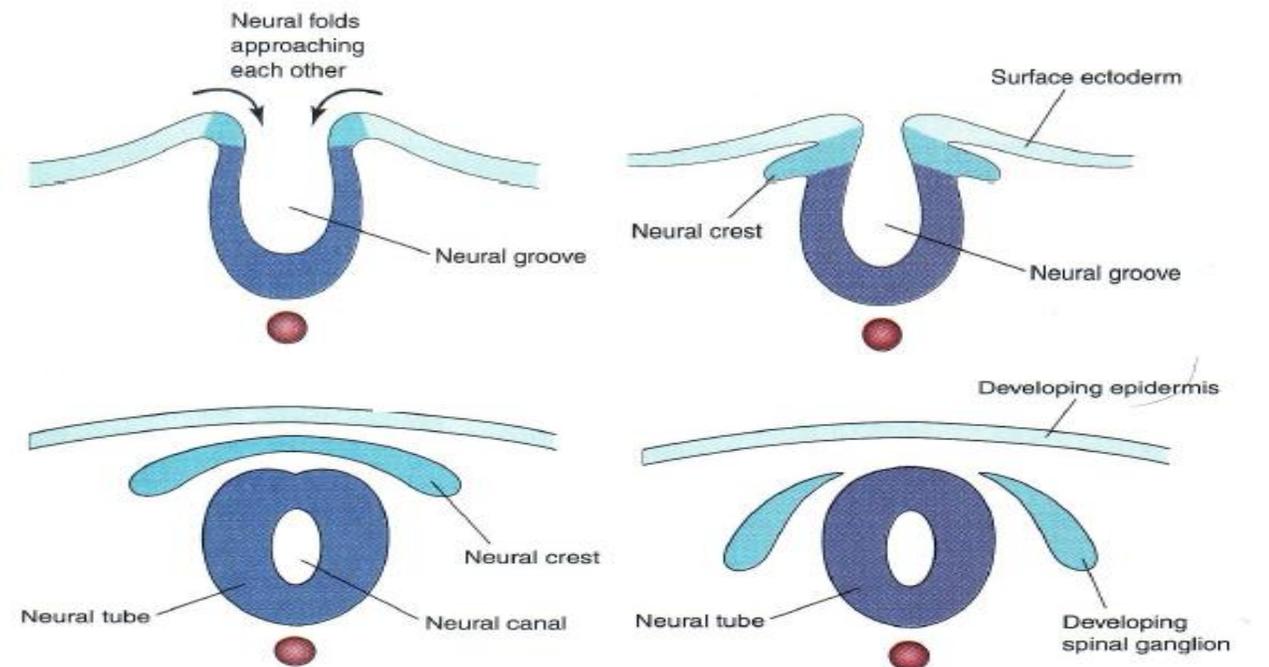
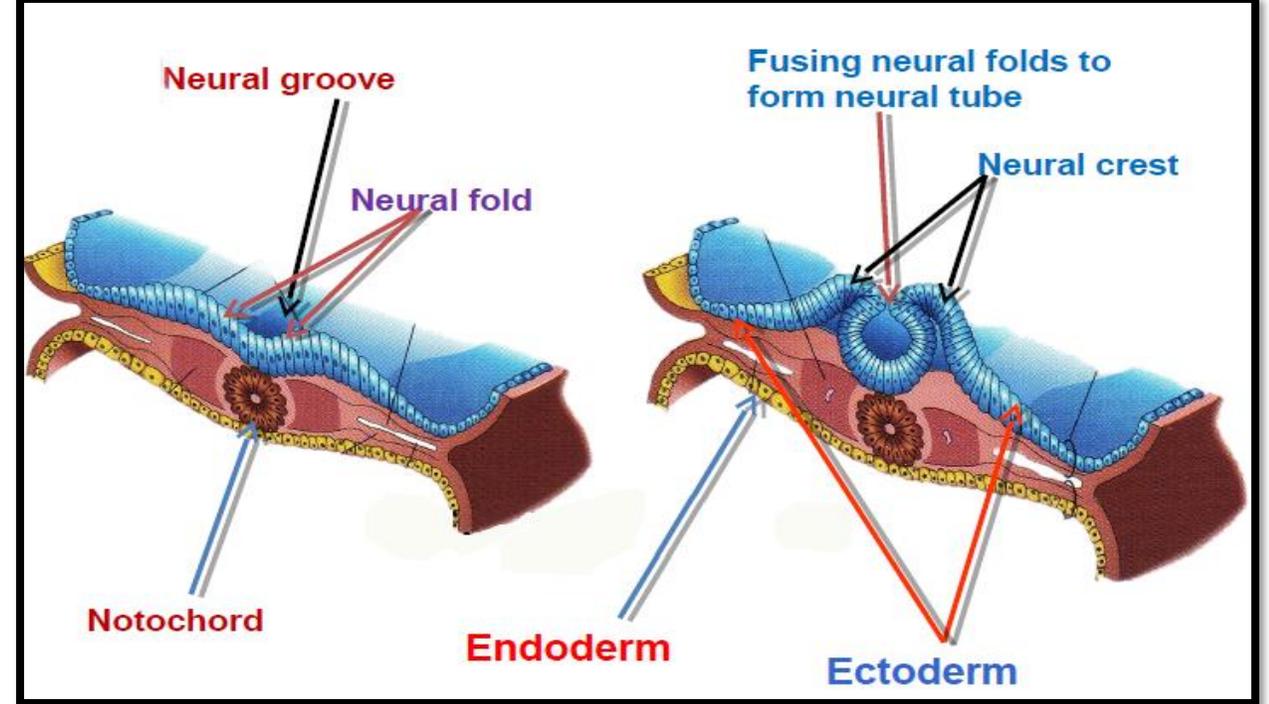
Ends by the end of 4th week (27 days)

Is induced by the notochord

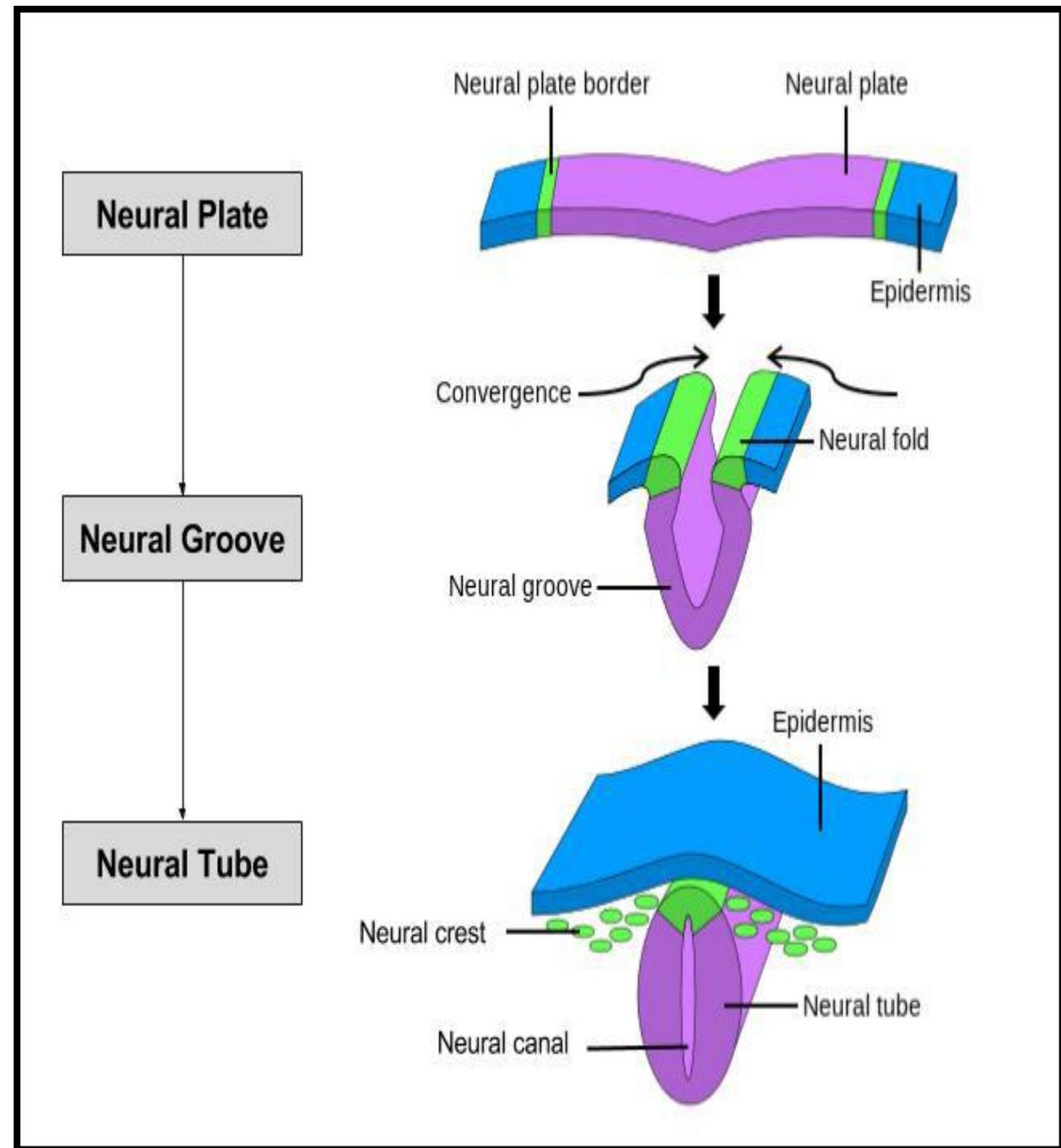
- Neural plate is median thickened area between primitive node and prechordal membrane. Two strips separate neural plate from the rest of ectoderm which are called neural crest.

- Neural folds are raised margins of neural plate while depressed median region is called neural groove.

- Neural tube is formed by fusion between two neural folds in the middle of the tube and extends craniocaudally.
-The fusion of the folds is absent at the anterior & posterior ends of the tube leaving 2 openings on the surface ectoderm called the anterior & posterior neuropores.

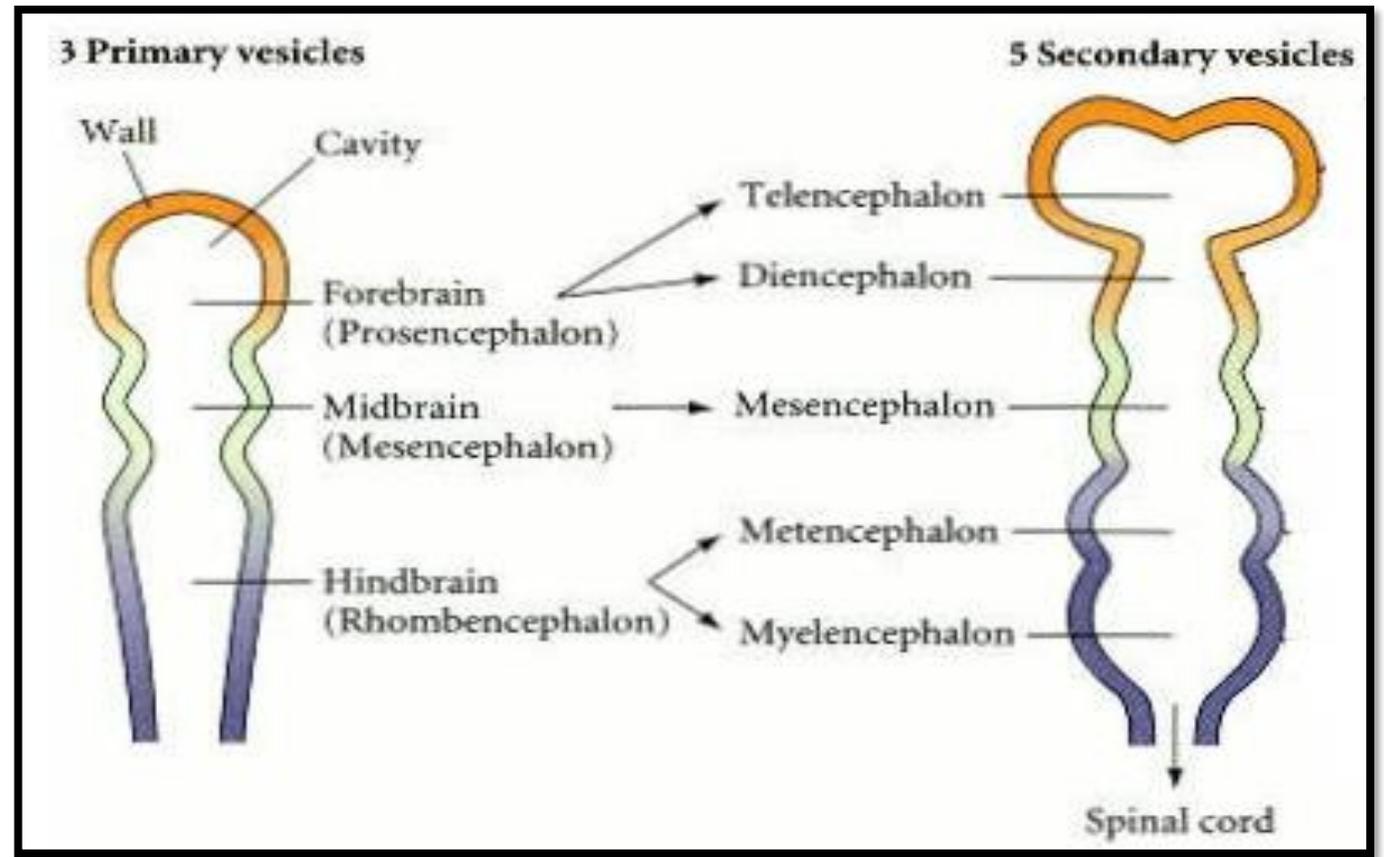


- **Cranial and caudal openings (neuropores) are the last To be closed**
- **-Anterior neuropore closes at 23rd day while posterior neuropore closed at 25th day.**
- **The surface ectoderm regains its continuity again.**
- **The closed neural tube develops into the brain and spinal cord.**



Fate of the neural tube

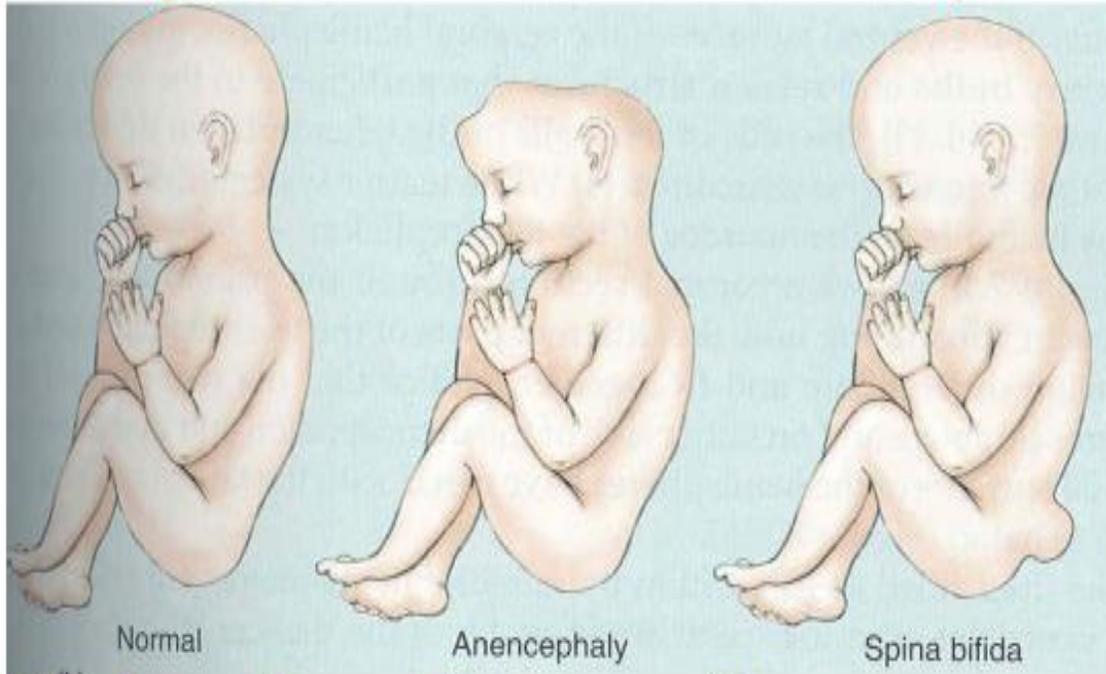
- The tube grows in the median region leading to elongation of the embryonic disc in cranio-caudal direction.
- The cranial part of the tube dilates to form the **brain vesicle** while the caudal part forms the **spinal cord**.
- **The brain vesicle divides by 2 constrictions into:**
 - **Forebrain:** forms cerebral hemispheres and diencephalon.
 - **Midbrain:** forms the midbrain (upper part of brain stem).
 - **Hindbrain:** forms medulla, pons and cerebellum.



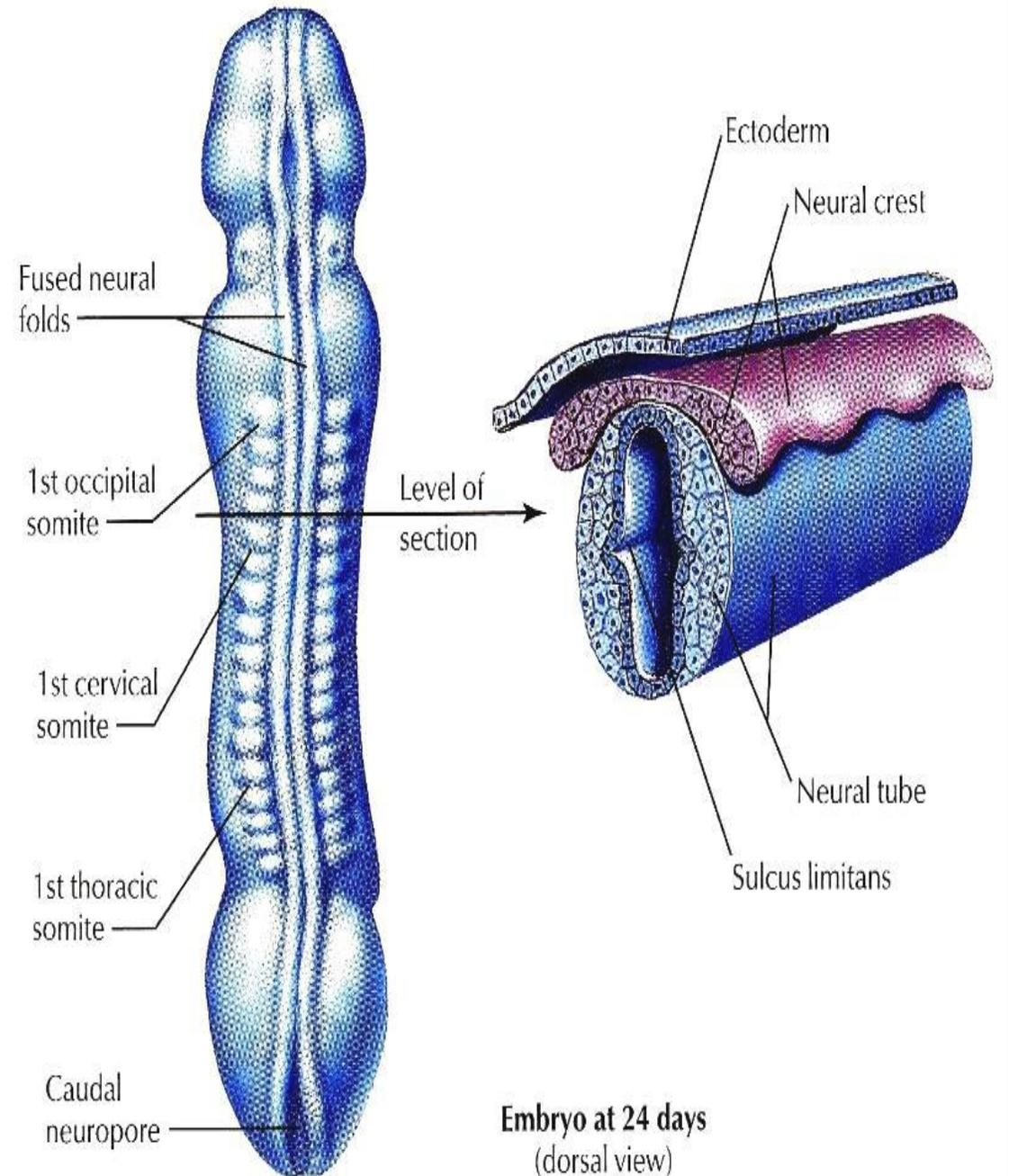
Neural Tube Derivatives

- Central nervous system
- Peripheral nervous system
- Retina
- Sensory epithelia of nose & ear
- Pineal gland
- Posterior lobe of the pituitary gland

Congenital Anomalies of the Nervous System

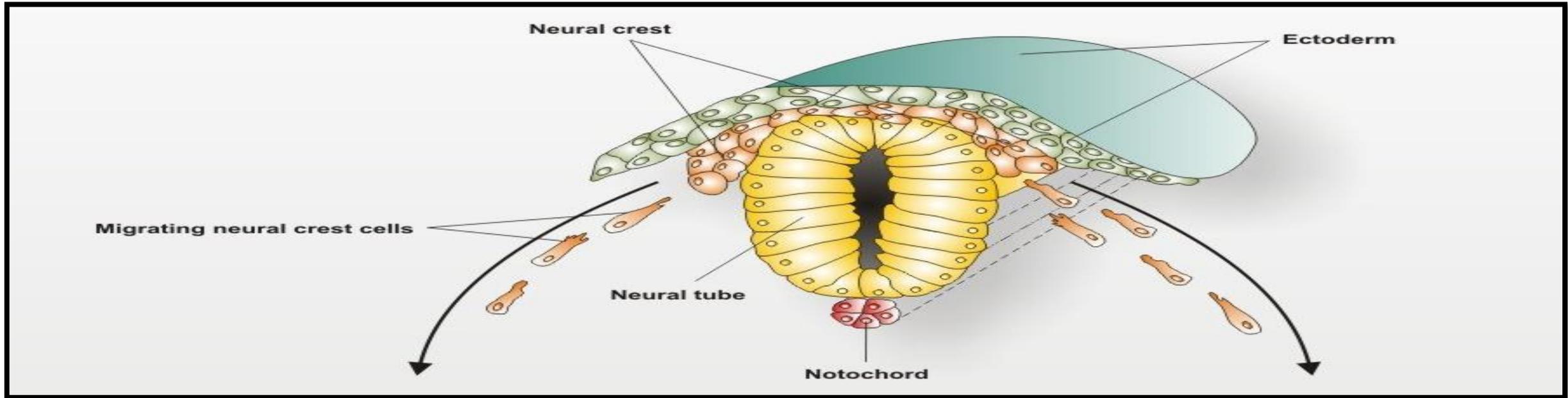


- Disturbance of neurulation may result in severe abnormalities of the brain and the spinal cord
- Most defects are the result of non-closure or defective closure of the neural tube:
 - In the brain region (e.g. anencephaly)
 - In the spinal cord regions (e.g. spina bifida)
- High level of alpha-fetoprotein (AFP) in the amniotic fluid is a strong sign of neural tube defects



The neural crests

These are the ectodermal cells which are found on the lateral margins of the neural folds. They are separated from the fused edges of the neural tube. They form an intermediate zone between the ectoderm and the formed neural tube. Later they become segmented, and their cells migrate in different directions to give many derivatives.



Fate of neural crest(derivatives)

- **Ganglia:** Sensory (of cranial and spinal nerves), sympathetic and parasympathetic.
- **Cells:** Chromaffin cells of supra-renal medulla, Schwann cells and melanocytes.
- **Others:** Pia mater, arachnoid mater, enamel of teeth, septa of the heart and some bones of the skull.