

"Neurulation"

- 'Neurulation is the process whereby neural plate forms the neural tube'
- Occurs during third to eight week of development -> Most congenital abnormalities occur during these weeks because most organs start to form in this period

» Step 1: Thickening of Ectoderm

- Notochord -> Prechordal plate signal the overlying ectoderm and cause its thickening
- Thickened ectoderm -> Forms neural plate
 - Cells of the neural plate make up the neuroectoderm

» Step 2: Lengthening of Neural Plate and Body Axis

- Occurs by the phenomenon of convergent extension
- Lateral to medial movement of cells in the plane of ectoderm and mesoderm takes places

- Regulated by signaling through planar cell polarity pathways
- If VINGL gene is defected, normal planar cell polarity pathways are disrupted

» Step 3: Formation of Neural Folds and Neural Groove

- As neural plate lengthens → Its lateral edges elevate to form neural folds and;
- Depressed midregion forms neural groove

» Step 4: Formation of Neural Tube

- Neural folds approach each other in the midline where they fuse
- Fusion begins in cervical region at 5th somite level
 - Neural tube formed

Step 5: Formation of Neuropores

- Before fusion is completed, two pores called neuropores are present:

1) Anterior Neuropore: Connected with amniotic fluid -> Closes at Day 25
- If it does not close -> Anencephaly

2) Posterior Neuropore: Connected with secondary yolk sac -> Closes at Day 28
- If it does not close -> Spina bifida (at lumbo-sacral region)