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XAVIER INTERNATIONAL COLLEGE

+2 Science Management Humanities Law

Developmental Biology

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Organogenesis

- ✓ the series of organized integrated processes that transforms mass of cells into a complete organ in the developing embryo.
- ✓ the cells of an organ-forming region undergo differential development and movement to form an organ
- ✓ is the phase of embryonic development that starts at the end of gastrulation and continues until birth
- ✓ during organogenesis, the three germ layers formed from gastrulation form the internal organs of the organism.

Neurulation:

- in a frog is **a folding process** which essentially manages the transformation of the neural plate into the neural tube.
- at this particular stage the embryo is termed as a neurula.
- In the primary neurulation, the neural plate creases inward until the edges come in contact and fuse.
- it begins in the third week of development and continues into the fourth week.

During neurulation, the following embryonic tissues should be easily identifiable:

- Three germ layers (outer = ectoderm ; middle = mesoderm ; inner = endoderm)
- A hollow cavity called the archenteron (will develop into the digestive tract)
- Notochord (flexible rod that stimulates neurulation)
- Neural tube (developed from the enfolding of the neural plate)

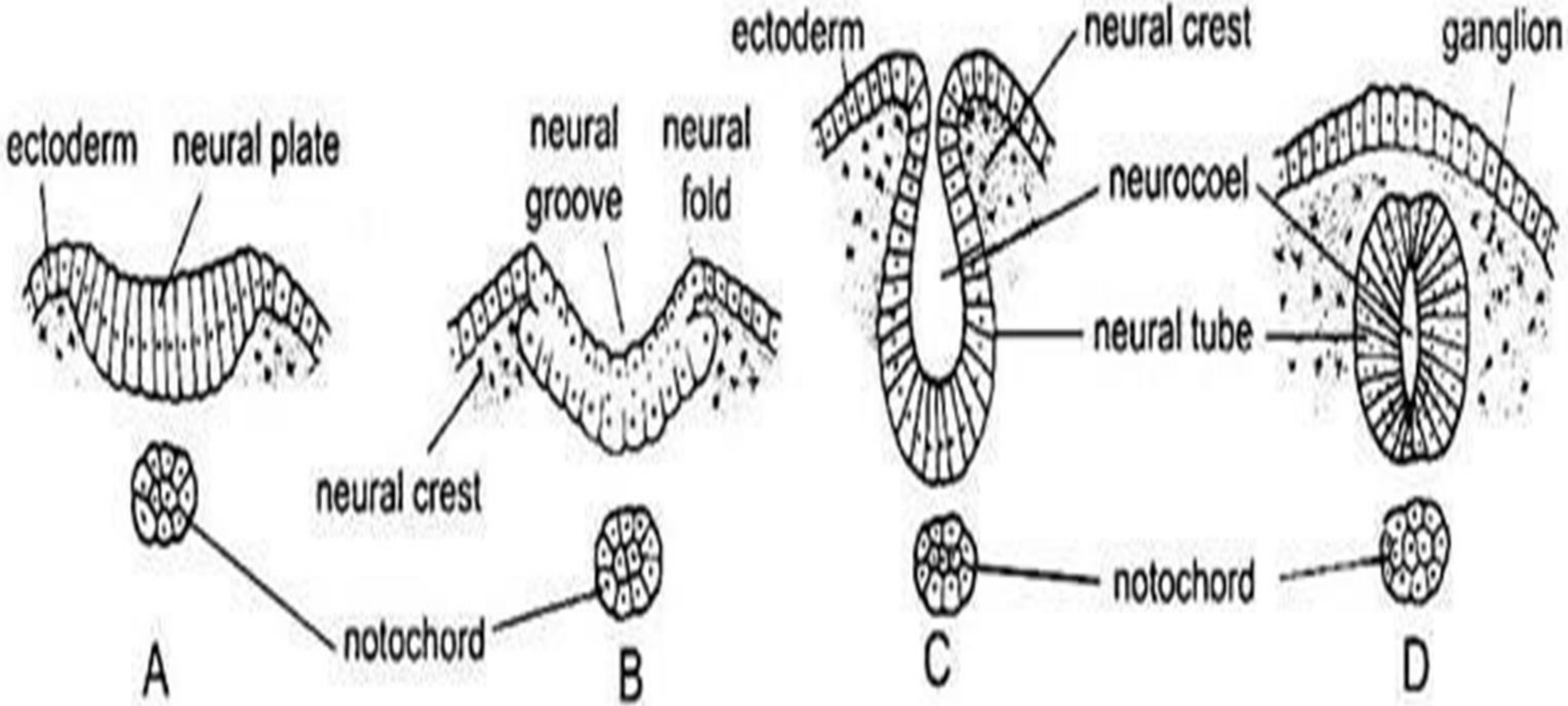
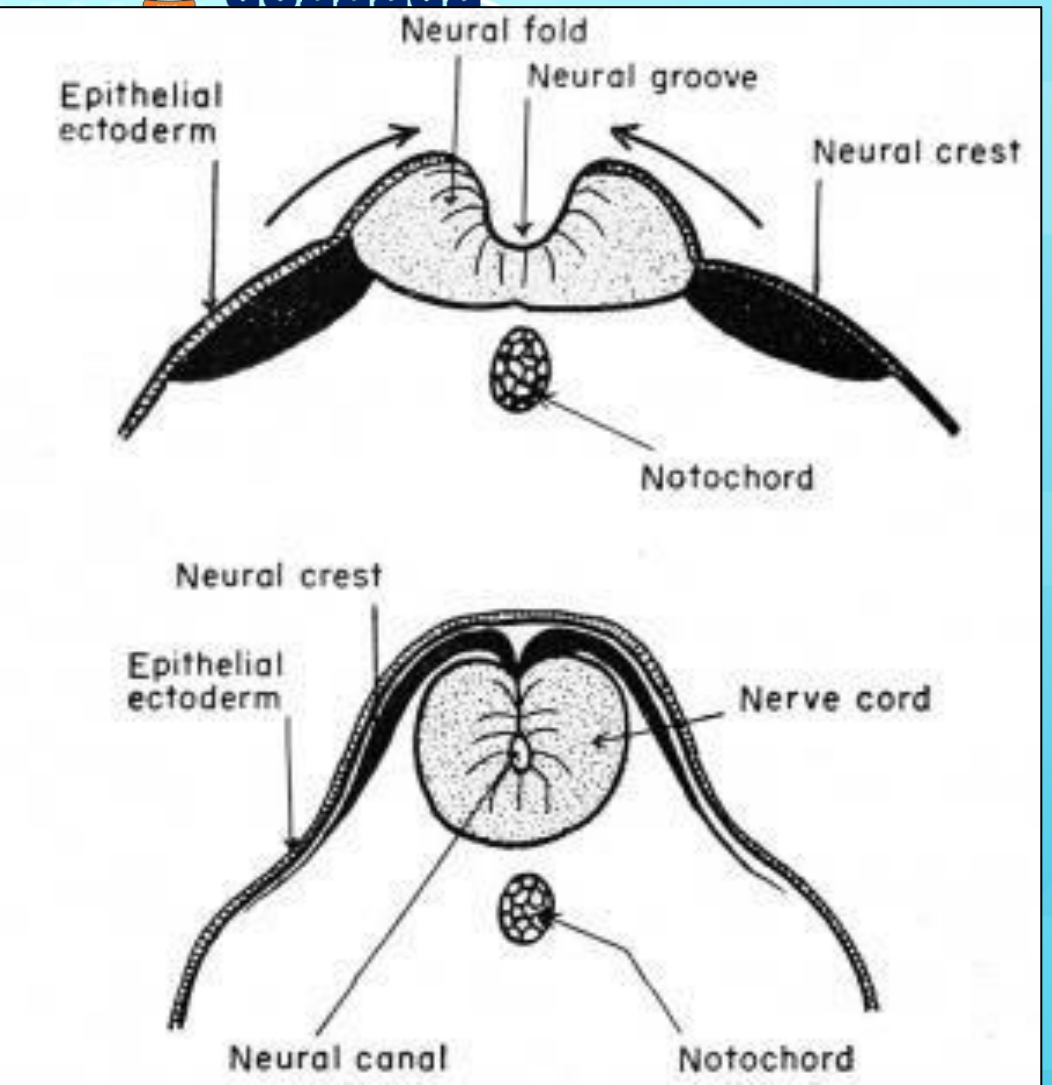
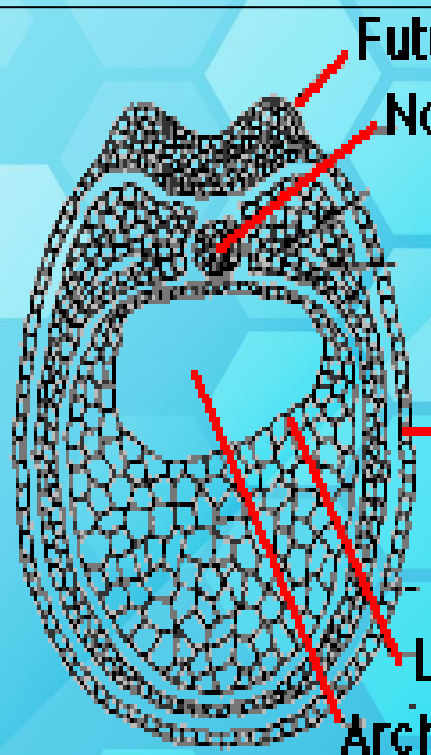


Fig. 37.7. Stages in the formation of neural tube in amphibians.





Future central nervous system (ectoderm)

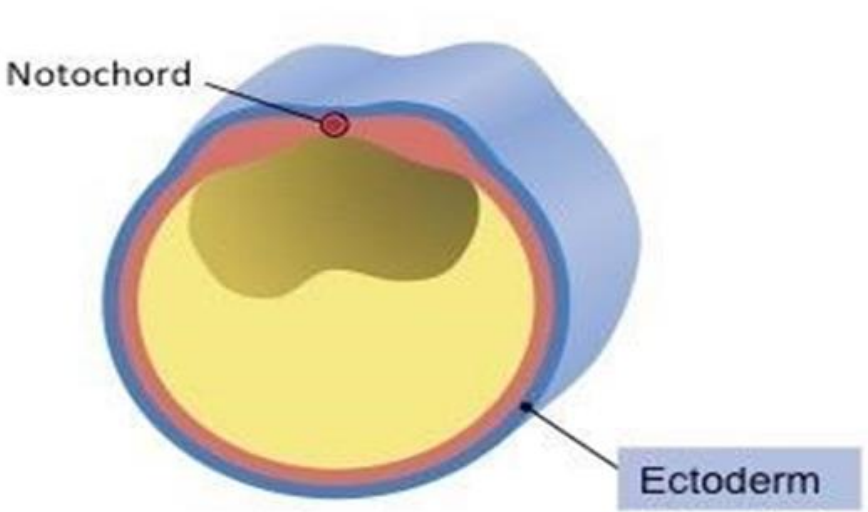
Notochord (future backbone)(mesoderm)

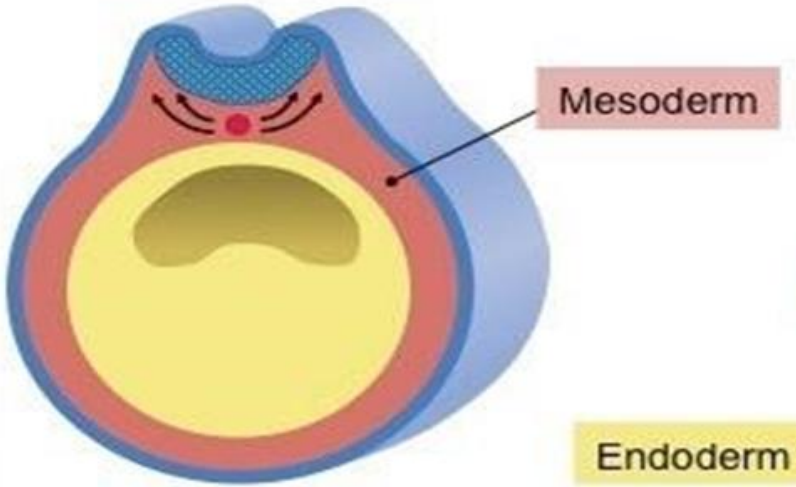
Epidermis (skin)(ectoderm)

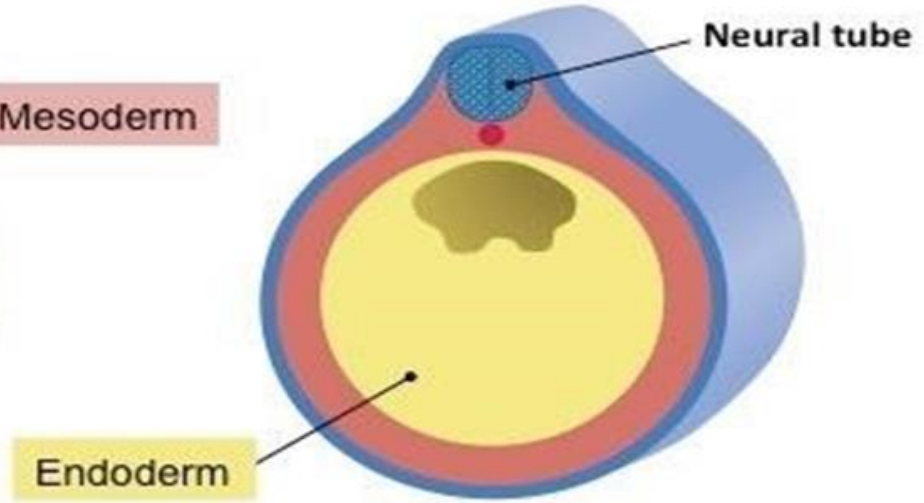
Lining of gut (endoderm)

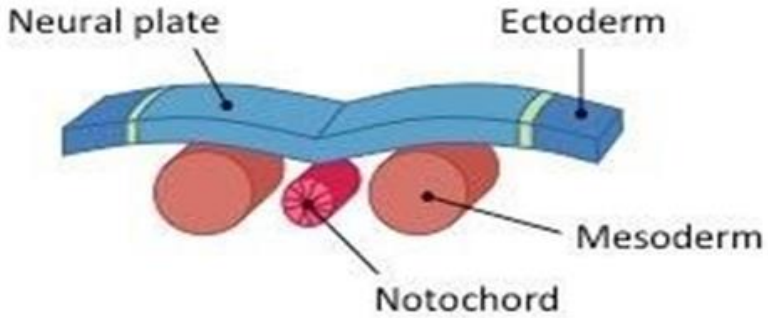
Archenteron (future gut)

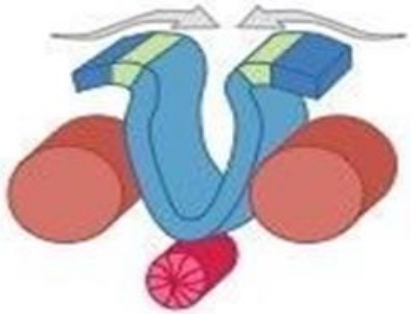
Neural folds stage

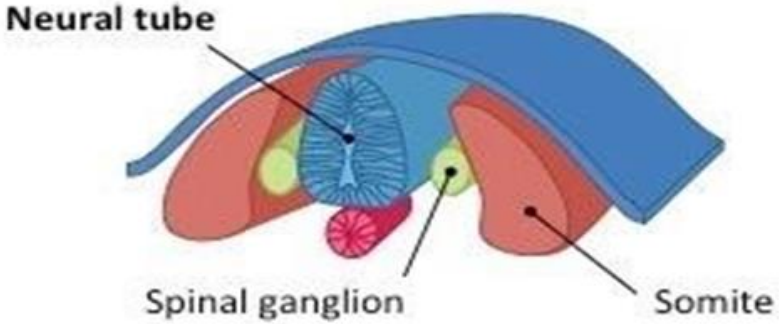








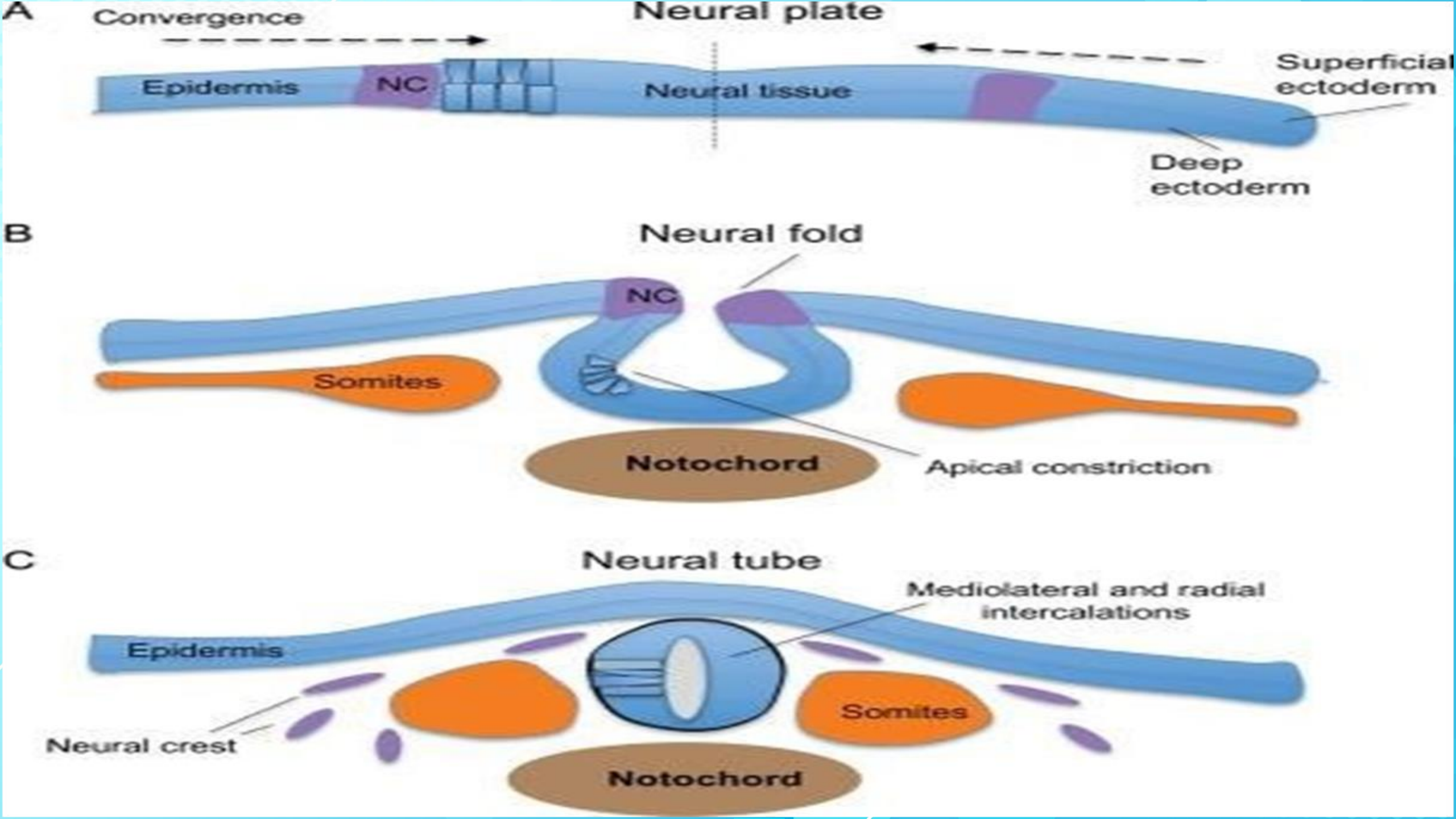




1. Notochord forms from mesoderm cells soon after gastrulation is complete

2. Signals from notochord cause inward folding of ectoderm at the neural plate

3. Ends of neural plate fuse and disconnect to form an autonomous neural tube


A
Convergence
Neural plate
Epidermis
NC
Neural tissue
Superficial ectoderm
Deep ectoderm
B
Neural fold
NC
Somites
Notochord
Apical constriction
C
Neural tube
Mediolateral and radial intercalations
Epidermis
Somites
Neural crest
Notochord

Neural Crest Cells:

•The cells from the neural folds that come to lie between the dorsal epidermis and the dorsal part of the neural tube are the neural crest cells.

•these lie along the dorso-lateral sides of the neural tube.

•the neural crests give rise to melanocytes, dorsal root ganglia of spinal nerves, parts of the autonomic nervous system and adrenal glands, and to some mesenchyme cells which form the visceral arches.

Notogenesis:

- notochord is developed from the mesoderm, so, it is mesodermal in origin.
- the notochord cells separates off from the prechordal plate of mesoderm as a narrow rod of cells.
- notochord lies parallel to and just below the neural tube. It is replaced by vertebral column later on.
- soon fluid-containing vacuoles appear in the notochordal cells .Thus, the notochord becomes round, turgid and elongated in antero-posterior axis.

Mesoderm Differentiation and Coelom:

1. Coelom is formed by mesoderm.

2. A split occurs in the mesoderm and outer in the mesoderm and outer parietal or somatic mesoderm and an inner visceral endoderm is formed around the wall of archenteron.

3. The cavity thus formed between the layers is called splanchnocoel (future coelom)

4. Splanchnocoel extended downward below the gust to appear U-shaped in section.

5.Visceral layer (which cover viscera or different organs) united with endoderm to form the gut wall or splanchnopleure. C. wall of oesophagus intestine rectum etc.

6. each somite or epimere (dorsal part of mesoderm) on either side of notochord splits into three layers:

✓ Inner is the sclerotome or skeleton-forming tissue around the notochord

✓ middle is the myotome whose cells differentiate to form the striated muscle fibres of the somatic muscles

✓ outermost narrow strip is the dermatome which forms the dermis of skin.

7. Mesodermal layer separates into an outer somatic or parietal layer, and an inner splanchnic or visceral layer

8. the space between these two layers is a splanchnocoel or perivisceral coelom.

9.The inner visceral layer gives rise to smooth muscles of the intestine and to the blood and blood vessels

10. Outer somatic layer with the ectoderm forms the somatopleure.

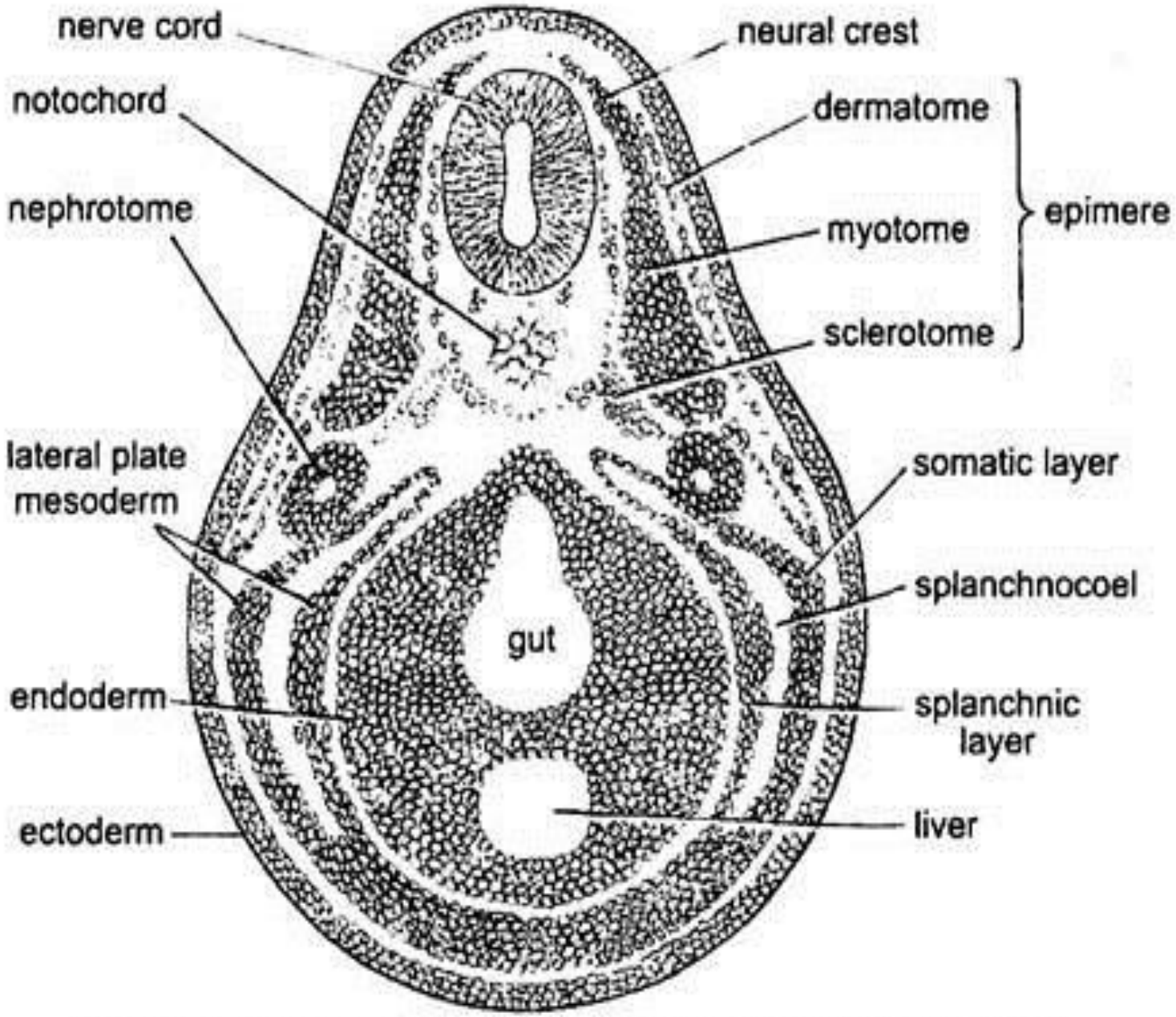


Fig. 37.9. Frog. T.S. of embryo through trunk showing mesoderm differentiation.

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Thank you!