Veterinary Anatomy
(Unit -8)

Topic

Formation of Notochord and Neural Tube

By

Dr. Nirbhay Kumar Singh

Assistant professor
Department of Veterinary Anatomy
Bihar veterinary college ,Patna
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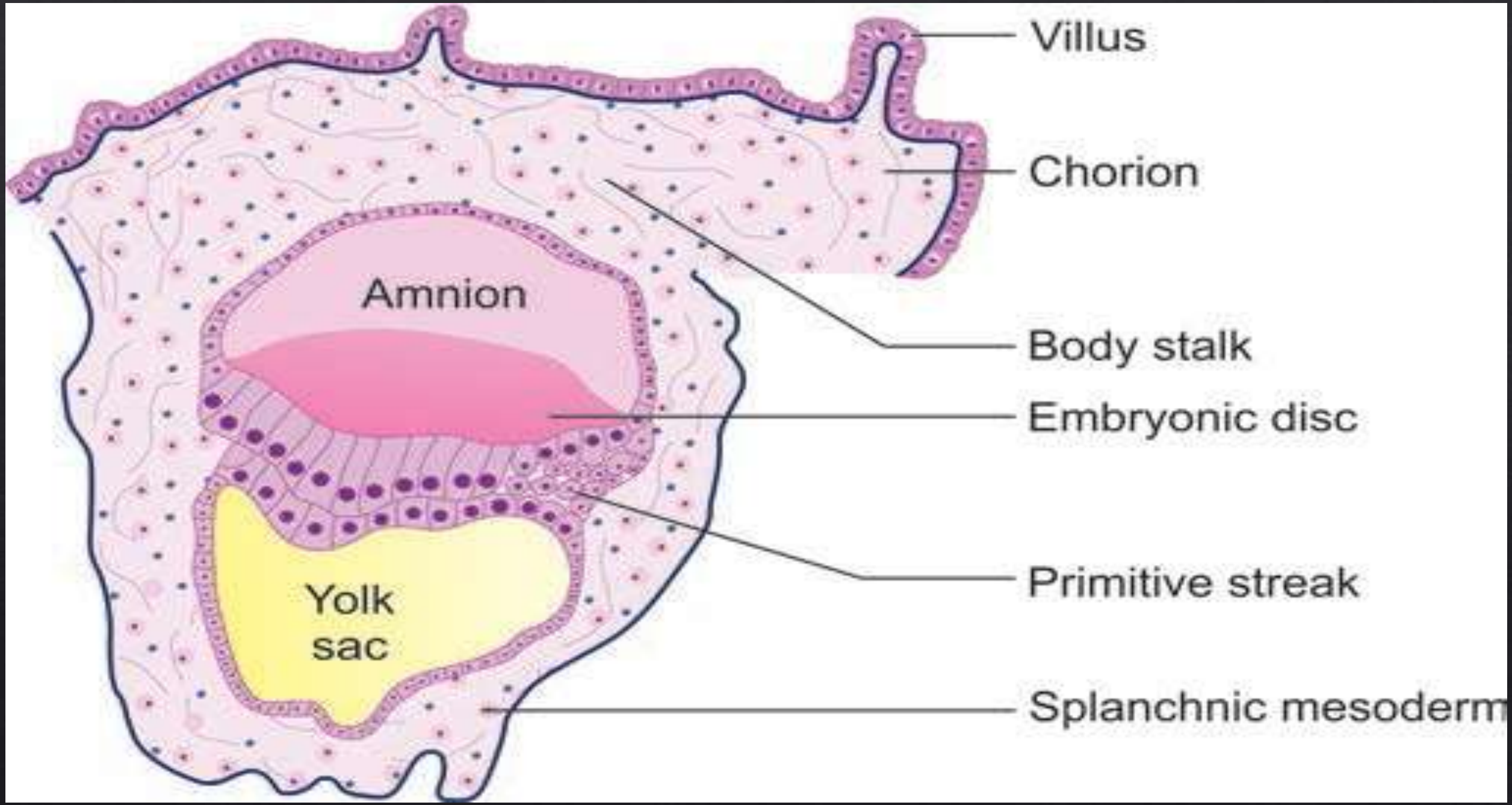
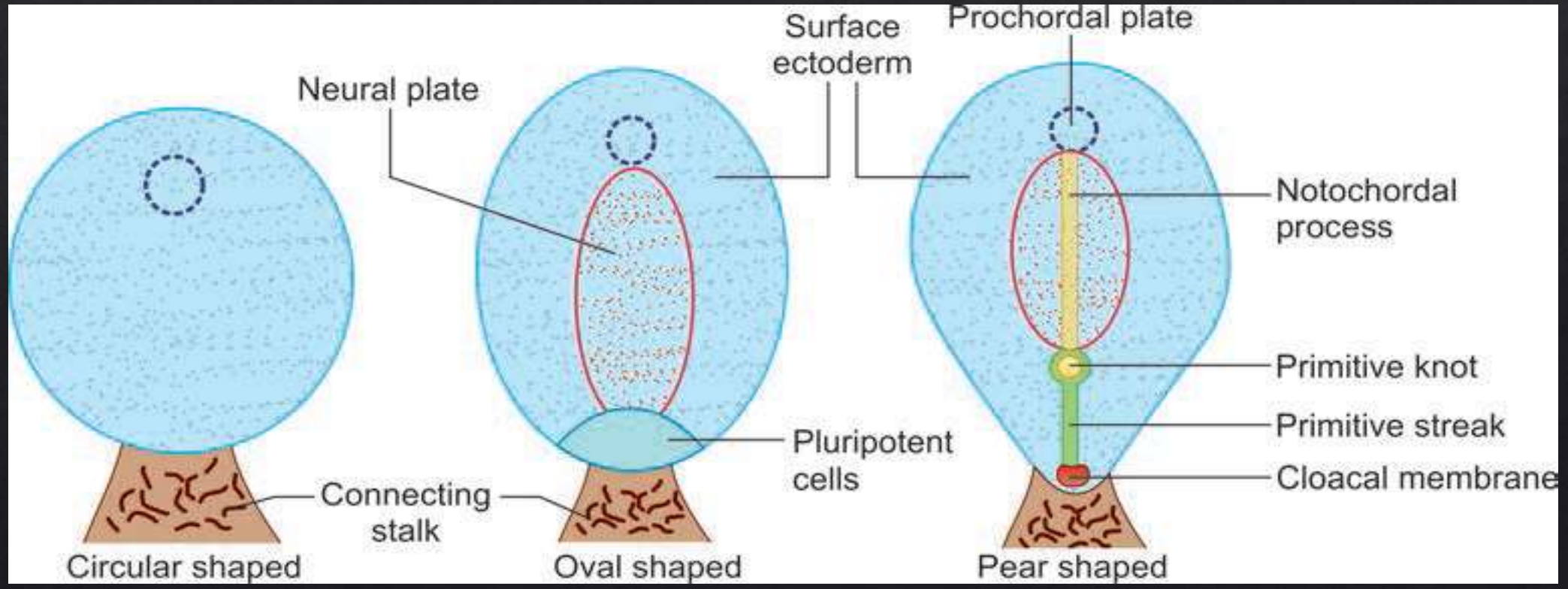

Villus
Chorion
Amnion
Body stalk
Embryonic disc
Primitive streak
Yolk sac
Splanchnic mesoderm

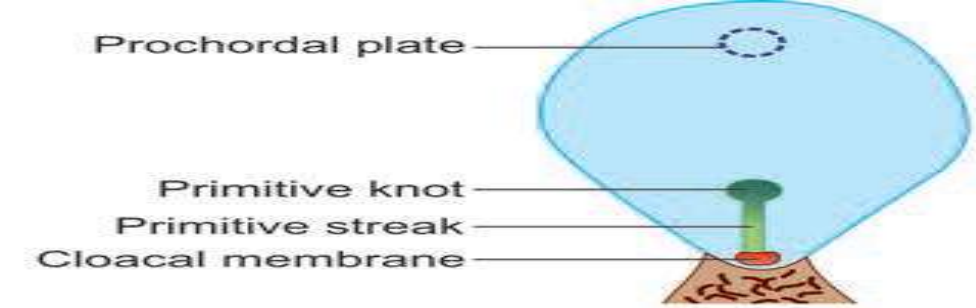
FORMATION OF NOTOCHORD

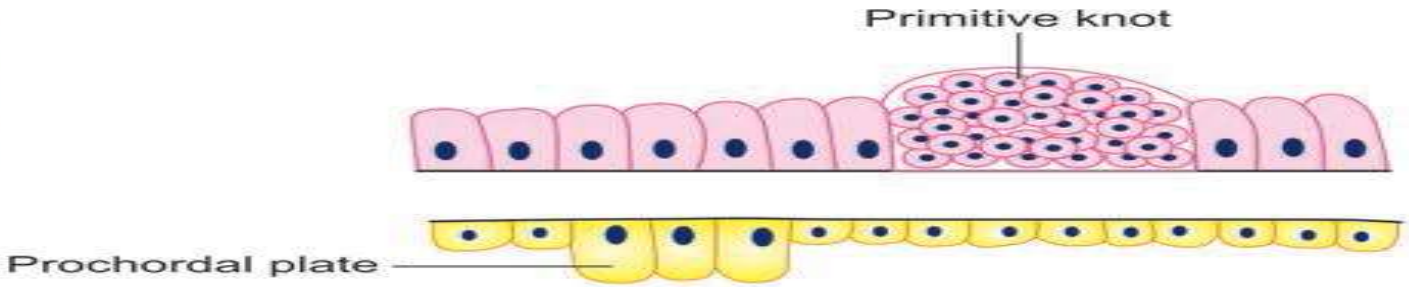
The cranial end of the primitive streak becomes thickened. This thickened part of the streak is called the primitive knot, primitive node or Henson's node



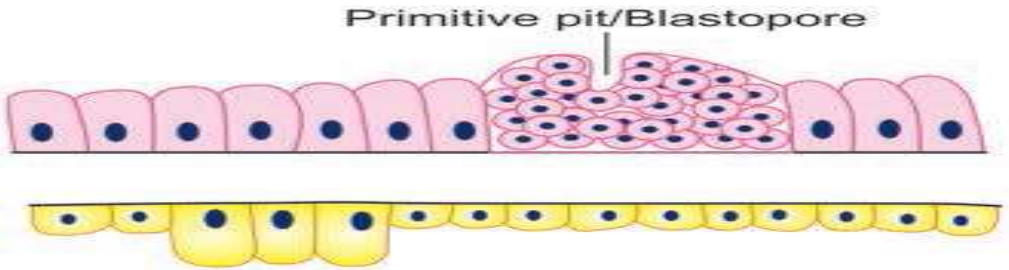
•• A depression appears in the center of the primitive knot.
This depression is called the blastopore/primitive pit

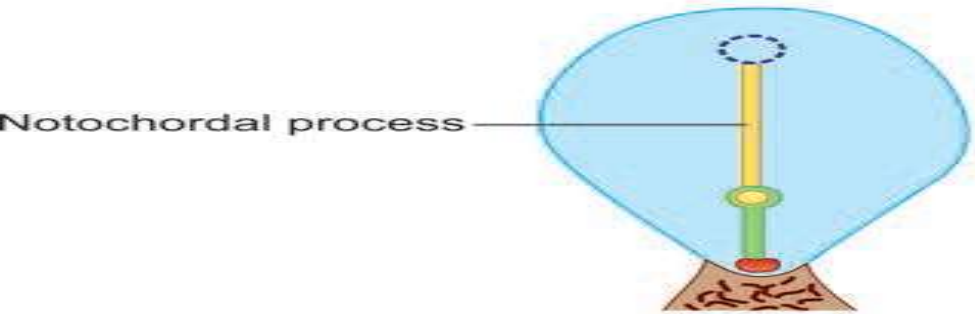
•• Cells in the primitive knot multiply and pass cranially in
the middle line, between the ectoderm and endoderm,
reaching up to the caudal margin of the prochordal plate.
These cells form a solid cord called the notochordal
process or head process . The cells
of this process undergo several stages of rearrangement ending in
the formation of a solid rod
called the “notochord”

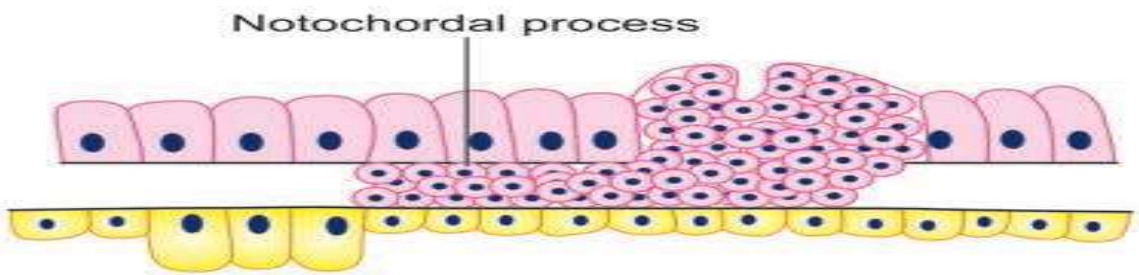

Prochordal plate
Primitive knot
Primitive streak
Cloacal membrane

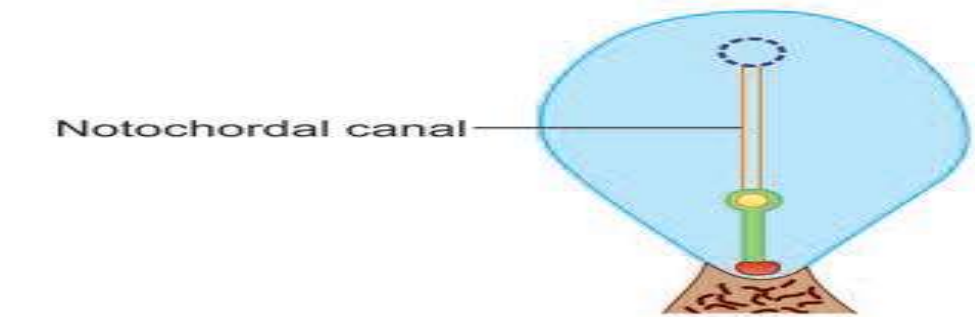

Primitive knot
Prochordal plate

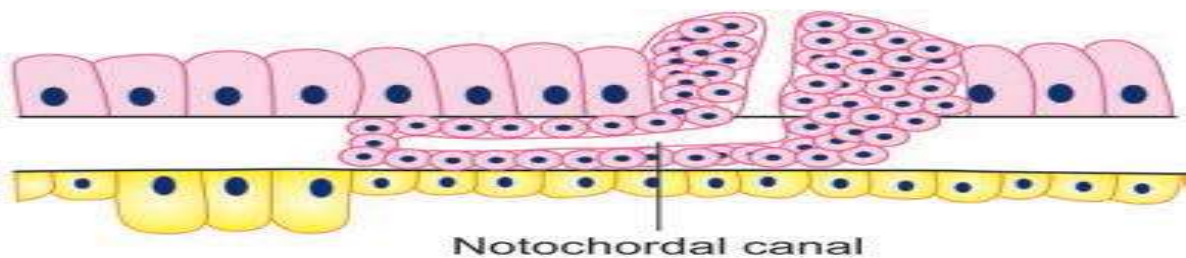

Blastopore


Primitive pit/Blastopore


Notochordal process


Notochordal process


Notochordal canal


Notochordal canal

•• The cavity of blastopore extends into the notochordal process and converts it into a tube called the notochordal canal

•• The cells forming the floor of notochordal canal become intercalated in (i.e. become mixed up with) the cells of the endoderm. The cells forming the floor of the notochordal canal now separate the canal from the cavity of the yolk sac.

— The floor of the notochordal canal begins to break down. At first, there are small openings formed in it, but gradually the whole canal comes to communicate with the yolk sac. The notochordal canal also communicates with the amniotic cavity through the blastopore. Thus, at this stage, the amniotic cavity and the yolk sac are in communication with each other.

Gradually the walls of the canal become flattened so that instead of a rounded canal we have a flat plate of cells called the notochordal plate.

— However, this process of flattening is soon reversed and the notochordal plate again becomes curved to assume the shape of a tube . Proliferation of cells of this tube converts it into a solid rod of cells. This rod is the definitive (i.e. finally formed) notochord. It gets completely separated from the endoderm.

— As the embryo enlarges, the notochord elongates considerably and lies in the midline, in the position to be later occupied by the vertebral column.

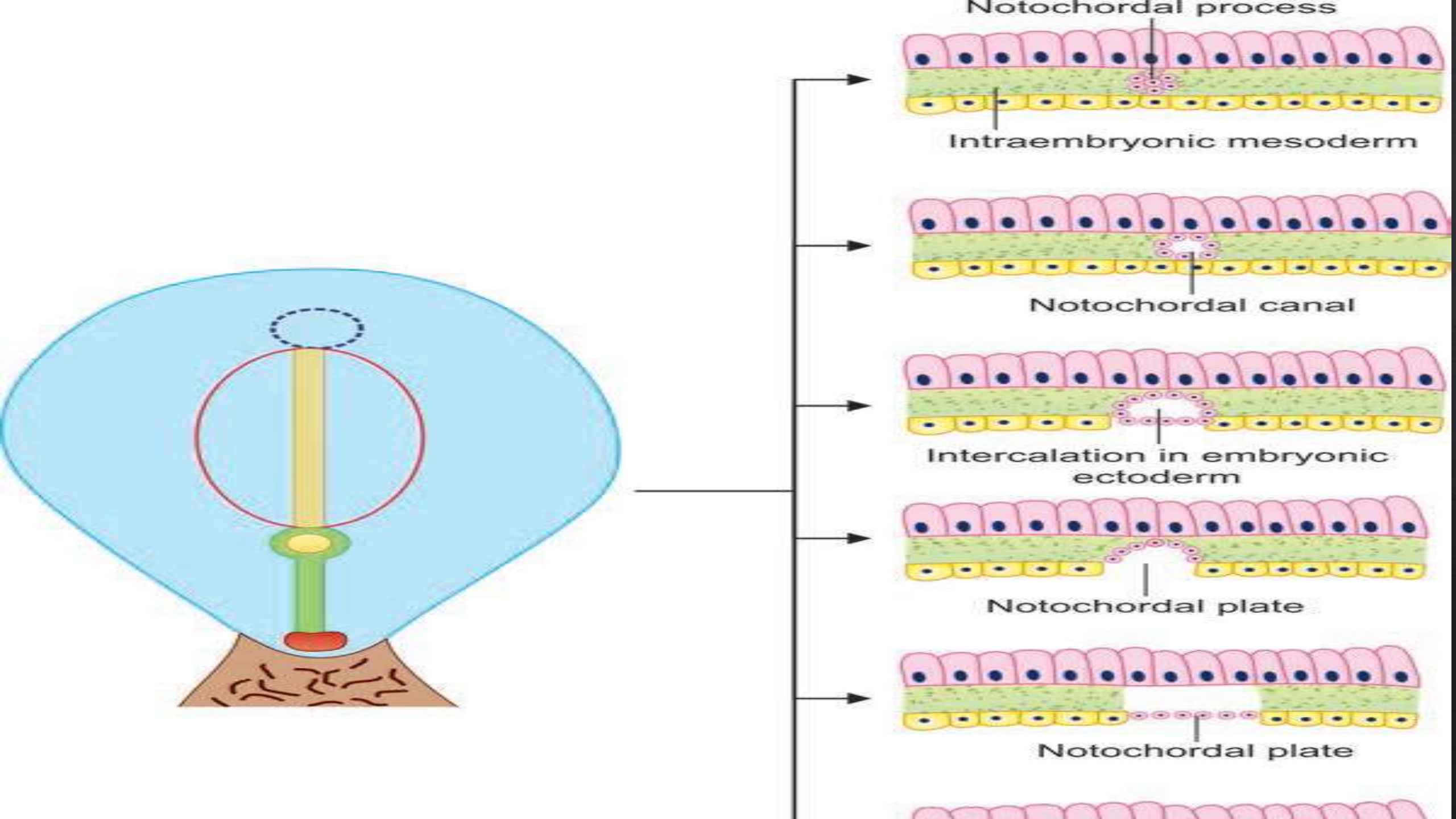
However, the notochord does not give rise to the vertebral column. Most of it disappears, but parts of it persist in the region of each intervertebral disc

as the nucleus pulposus and its cranial continuation the apical ligament of dens of axis vertebra.

— The notochord is present in all animals that belong to the phylum Chordata. In some of them, e.g. Amphioxus, it persists into adult life and forms the central axis of the body. In others, including man, it appears in the embryo but only small remnants of it remain in the adult.

•• Primitive streak is the primary organizer as it induces formation of notochord and intraembryonic mesoderm. Formation of notochord determines the cranio-caudal axis and right and left sides of embryo.

•• Fate of primitive streak: It regresses at the end of 3rd week of development and completely disappears by 26th day.


Notochordal process
Intraembryonic mesoderm
Notochordal canal
Intercalation in embryonic ectoderm
Notochordal plate
Notochordal plate

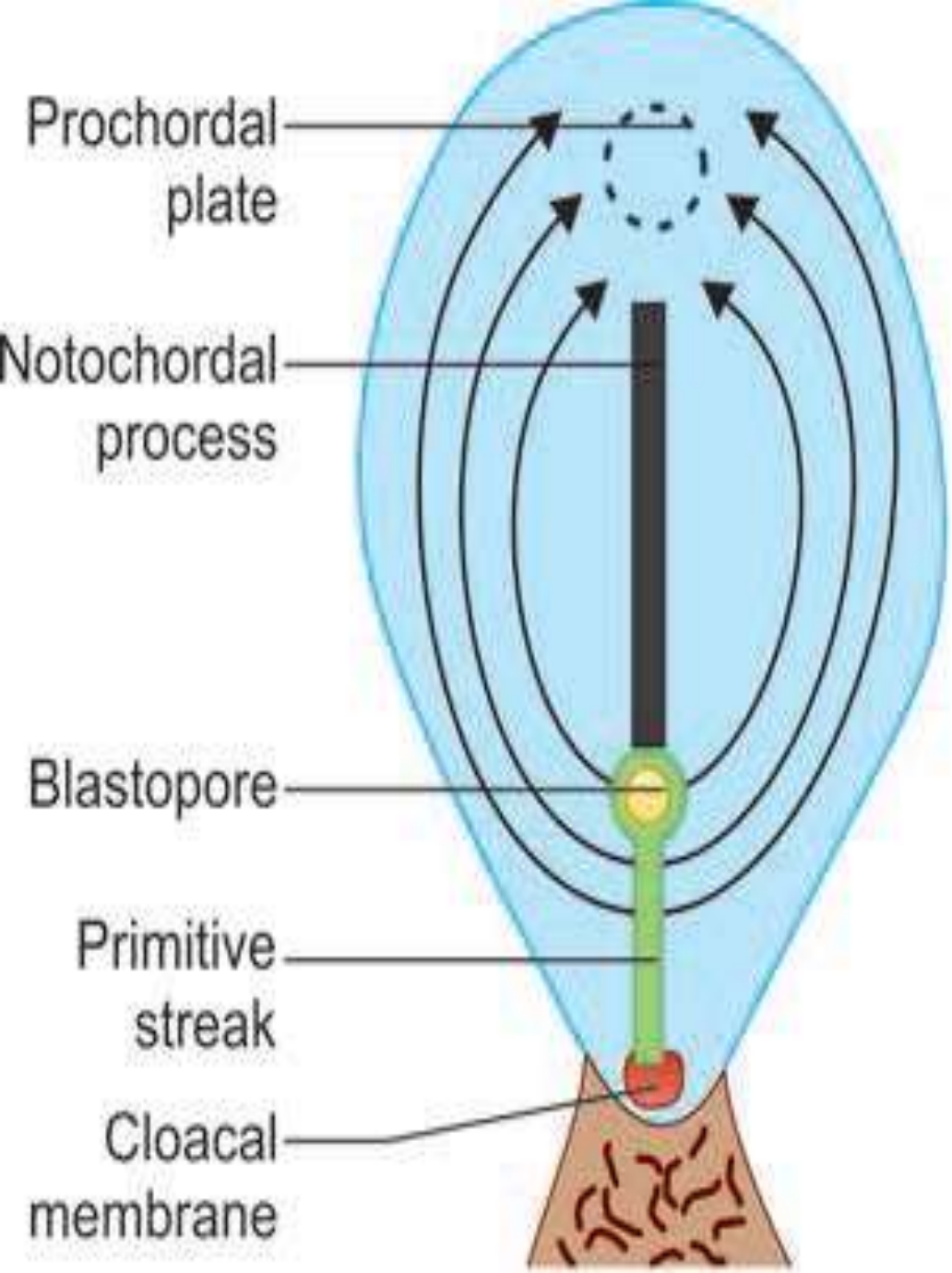
FORMATION OF THE NEURAL TUBE

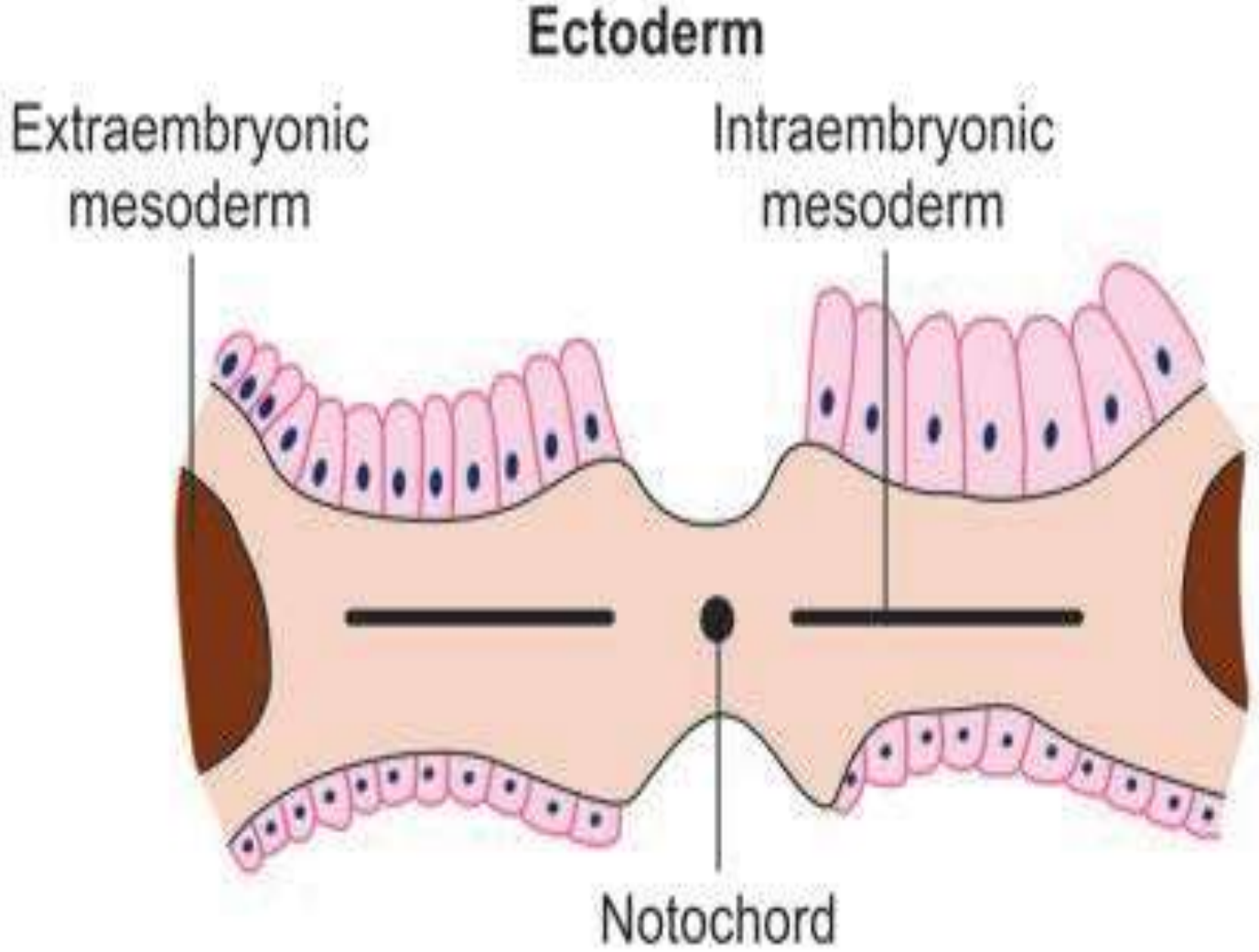
•• The neural tube gives rise to the brain and the spinal cord

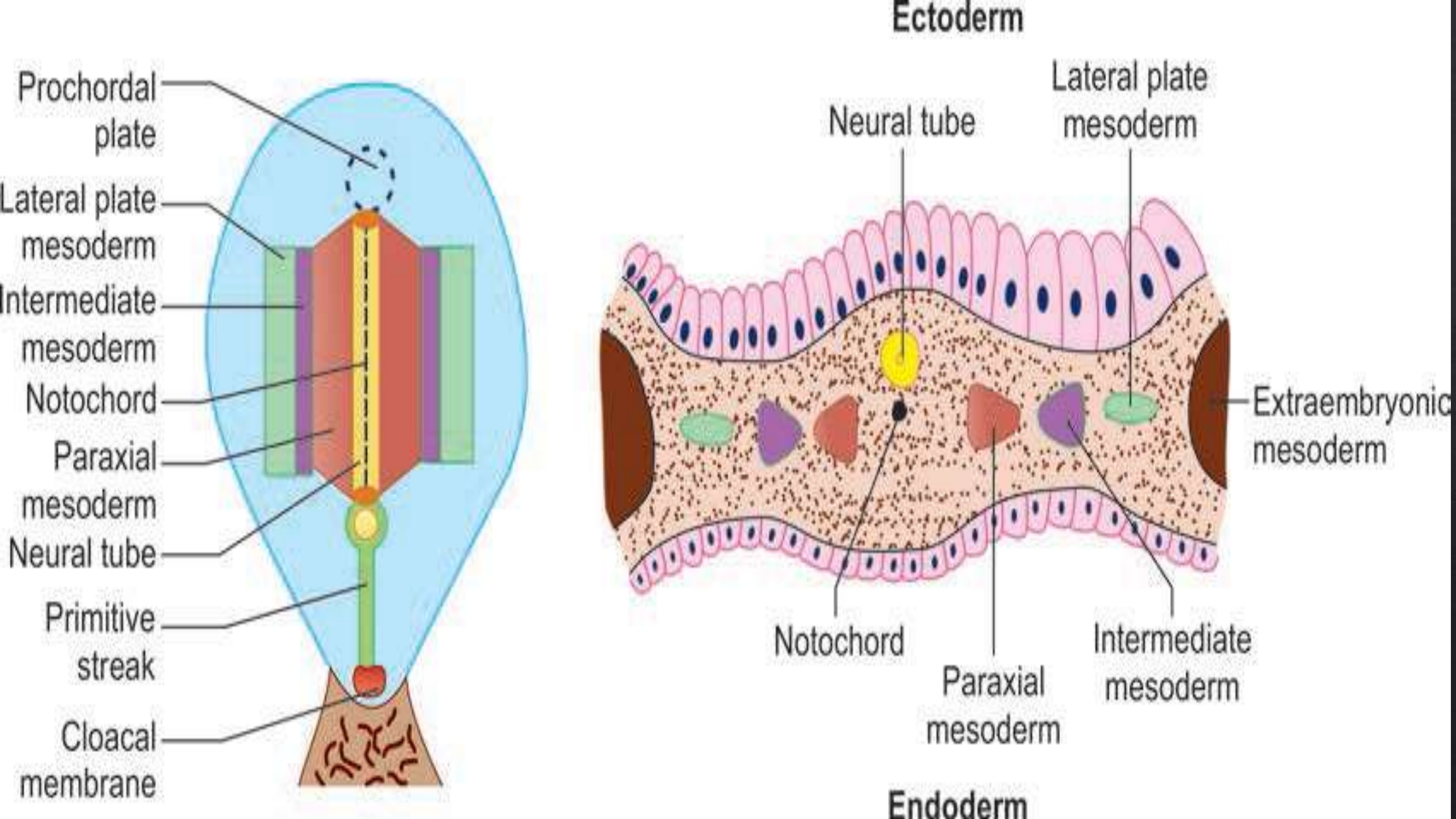
•• The neural tube is formed from the ectoderm overlying the notochord and, therefore, extends from the prochordal plate to the primitive knot .

•• The neural tube is soon divisible into: (a) a cranial enlarged part that forms the brain, and (b) a caudal tubular part that forms the spinal cord.

•• In early embryos, the developing brain forms a large conspicuous mass, on the dorsal aspect. The process of formation of the neural tube is referred to as neurulation.


Prochordal plate
Notochordal process
Blastopore
Primitive streak
Cloacal membrane


Ectoderm
Extraembryonic mesoderm
Intraembryonic mesoderm
Notochord
Endoderm


Prochordal plate
Lateral plate mesoderm
Intermediate mesoderm
Notochord
Paraxial mesoderm
Neural tube
Primitive streak
Cloacal membrane
Ectoderm
Neural tube
Lateral plate mesoderm
Extraembryonic mesoderm
Notochord
Paraxial mesoderm
Intermediate mesoderm
Endoderm

THANKS