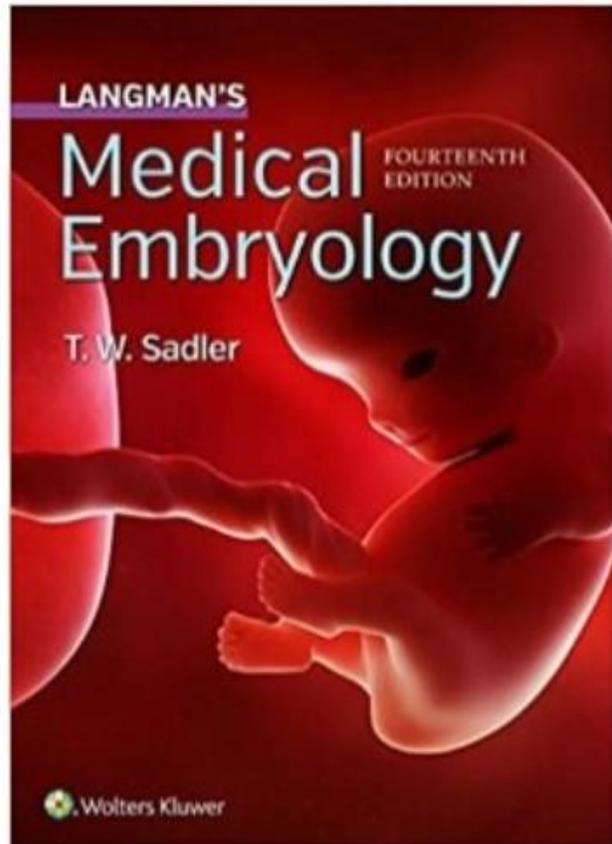




Human Embryonic Development



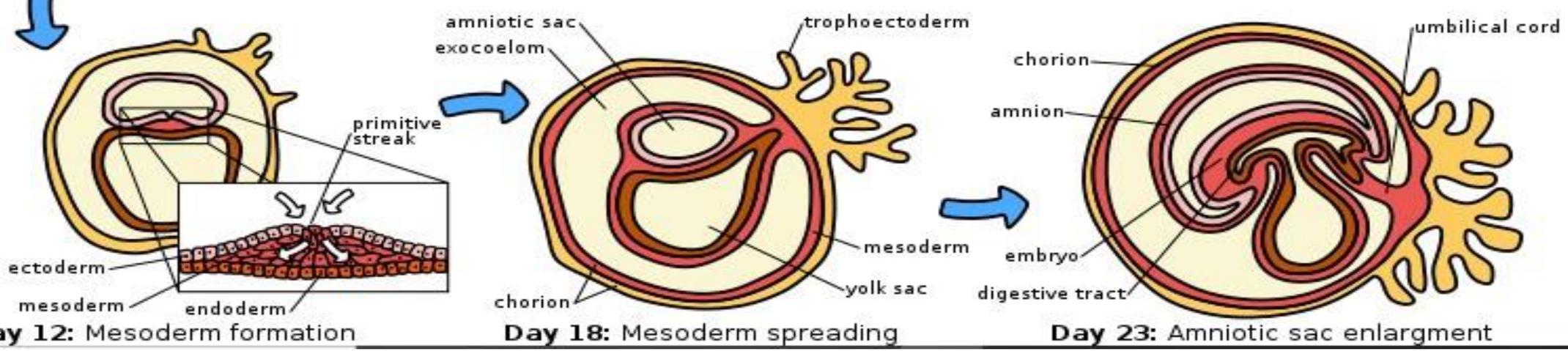
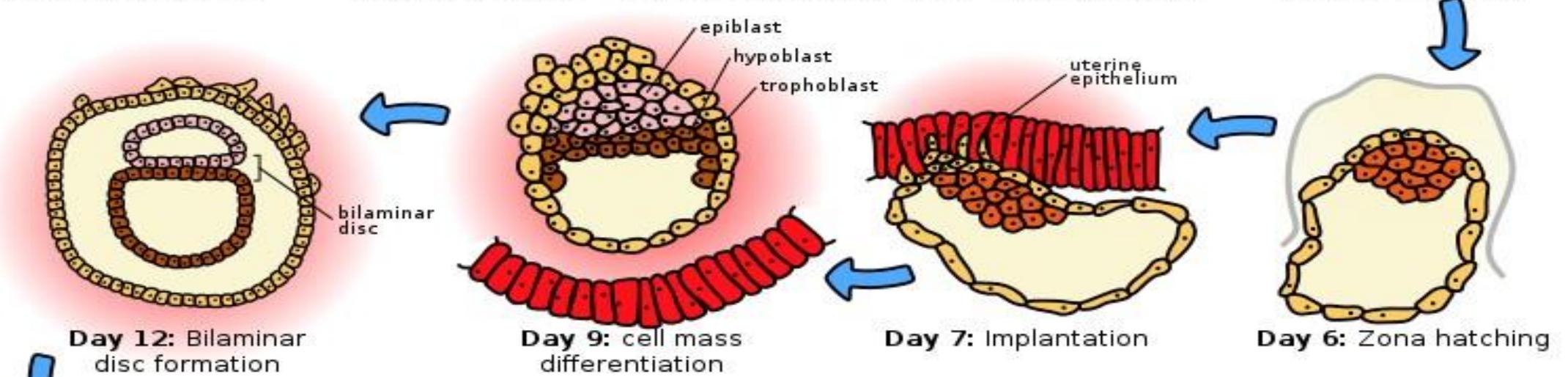
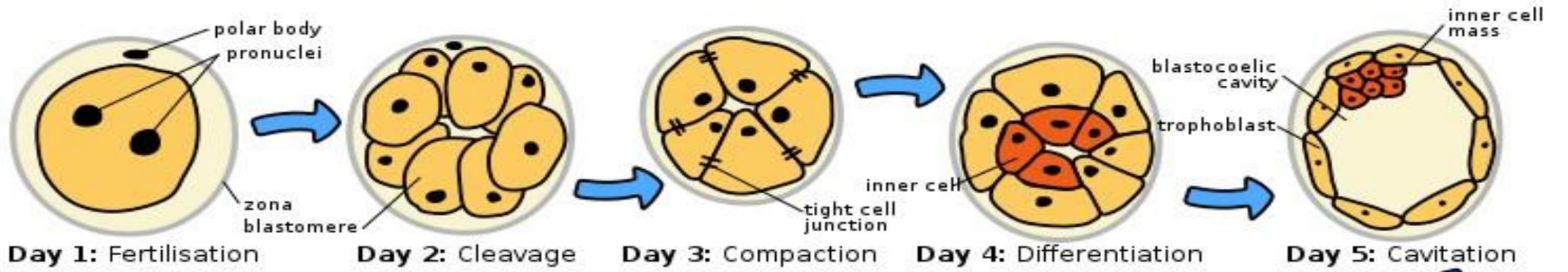
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Week 3-4:

- ❖ Formation of mesoderm
- ❖ Differentiation of mesoderm
- ❖ Formation and Differentiation of somites
- ❖ Blood and blood vessels formation

-Once the zygote reaches the the 2cell stage, it undergoes mitotic divisions resulting blastomeres, after 3-4 division is known as morula (**during the third day after fertilization**).

At 12-16 cell stage, the morula consist of centrally located cells (**inner cell mass**) and a surrounding layer (**outer cell mass**).

The inner cell mass **form the tissue of embryo** proper while the **outer cell mass form placenta** .

After the morula enter the uterine cavity fluid penetrate through zona pellucida in to intra cellular spaces forming cavity named(blastocele),the embryo is named as .embryoblast.

- At the 8 day **the cell of inner cell mass differentiate to two layer**

- 1- layer of small ,**cuboidal cell (hypoblast)**).

- 2- layer of high **columnar cell (epiblast)** .

- These two layer together named the **bilaminar germ disc** .

At this time a small cavity appears in the epiblast called **amniotic cavity** .

GERM LAYER

 Ectoderm

 Endoderm

 Mesoderm

BECOMES

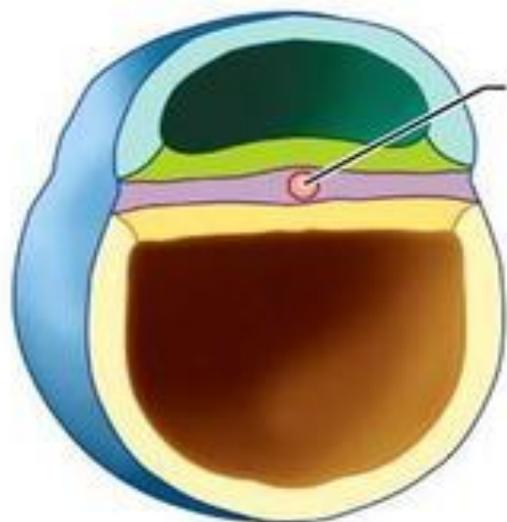
Outer layer of skin, hair, lining of the nose and mouth, and the nervous system

Digestive tract, respiratory tract, liver, and pancreas

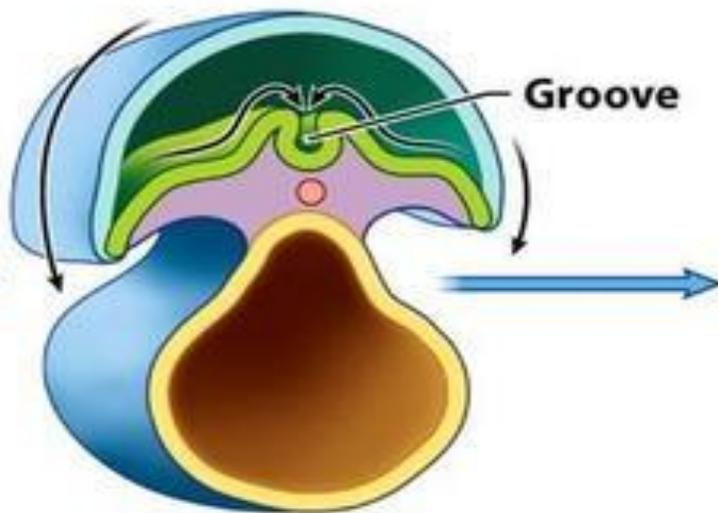
Muscles and skeleton

NEURULATION

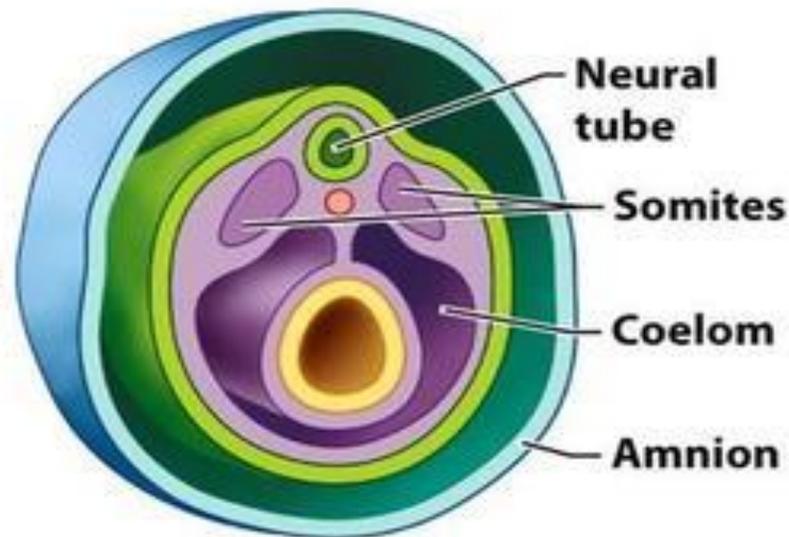
During the third week of development, the three types of tissues formed during gastrulation begin to develop into the various organs and tissues of the organism.



Cells within the mesoderm form the notochord, which runs the length of the embryo.



The ectoderm folds inward, forming a groove that runs the entire length of the embryo.



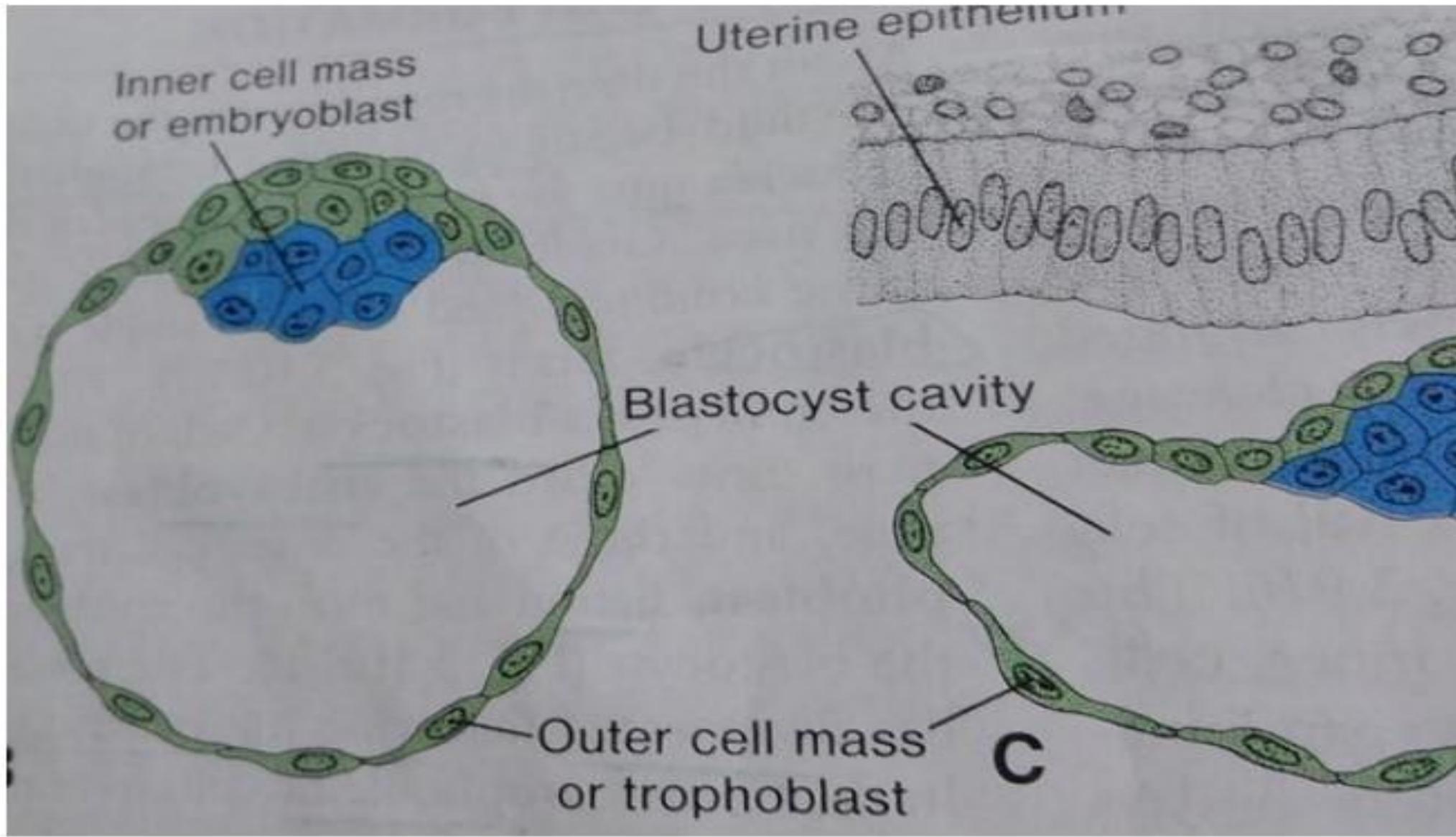
Neurulation is completed with the formation of the neural tube. Somites and the coelom develop from the mesoderm.

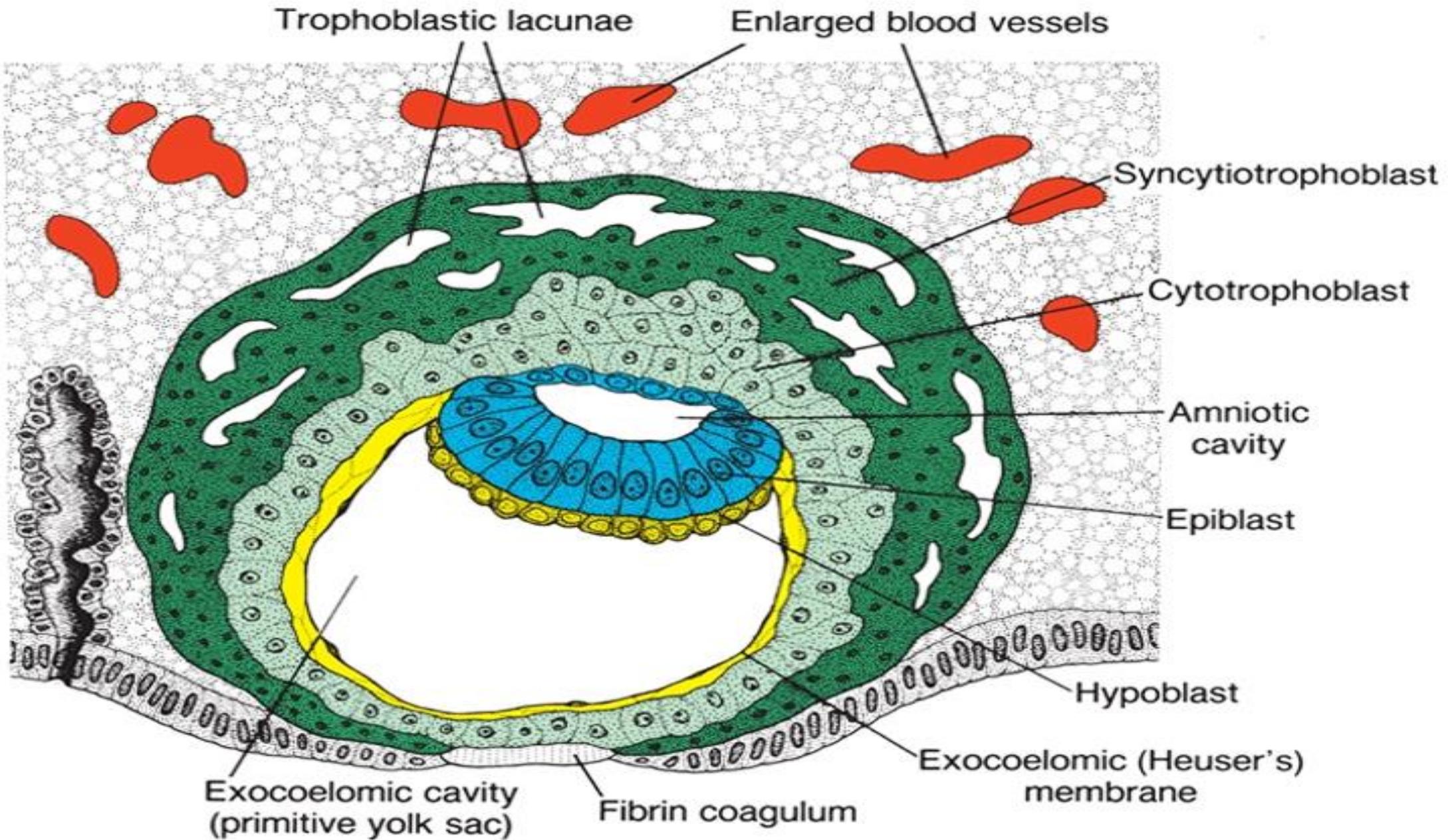
Mesoderm

At third week ,the most characteristic event is formation **of primitive streak** on the surface of epiblast.

•Some cells migrate toward the primitive streak from epiblast and located between epiblast and hypoblast forming **mesoderm layer**, this mechanism of migration named **invagination** and this process called **gastrula**.

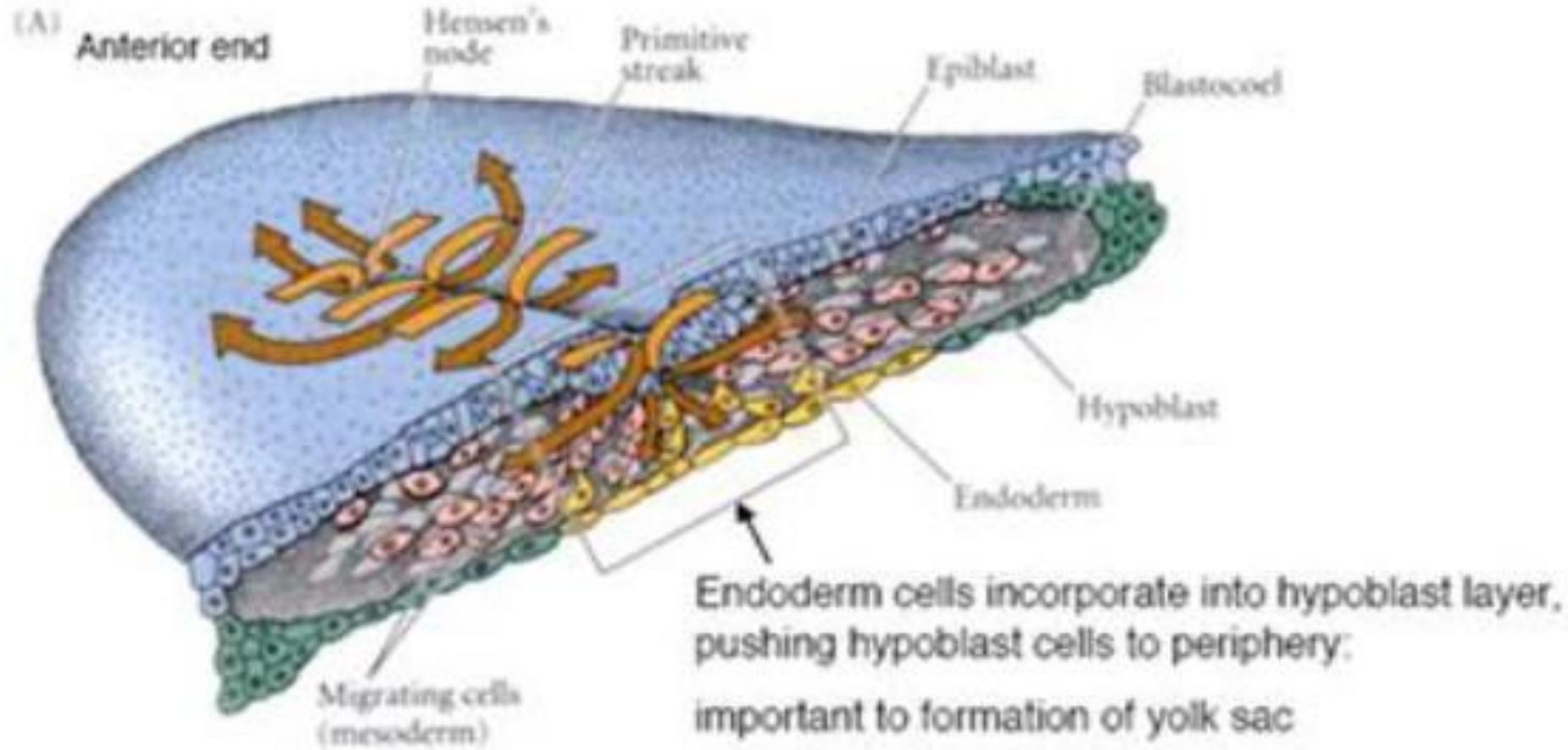
Formation of mesoderm





Mesoderm and endoderm are both form by ingression from epiblast

Ingression involves epithelial --> mesenchymal transformation

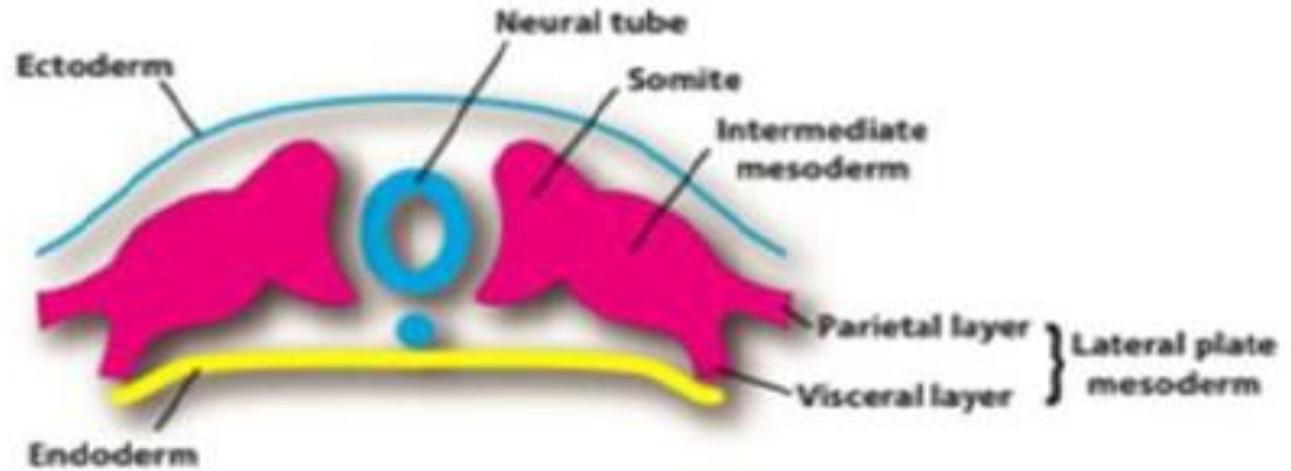
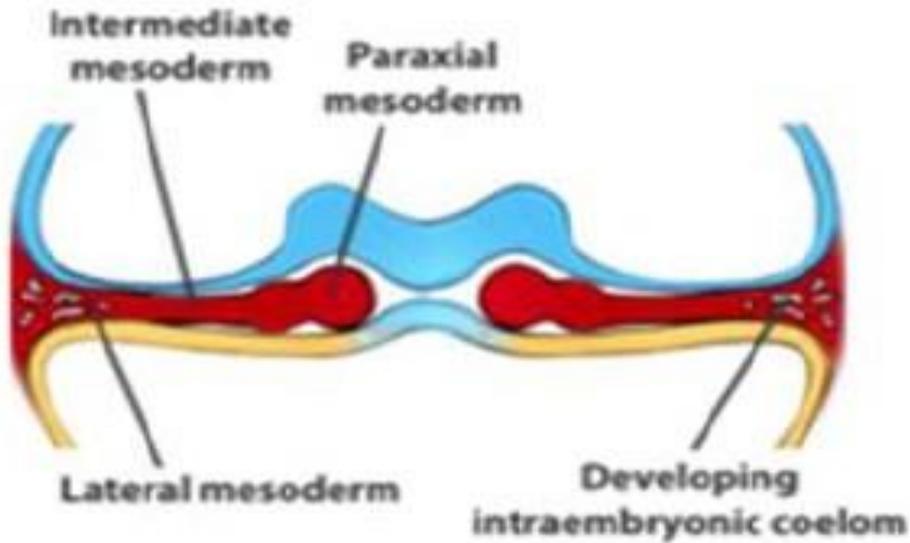
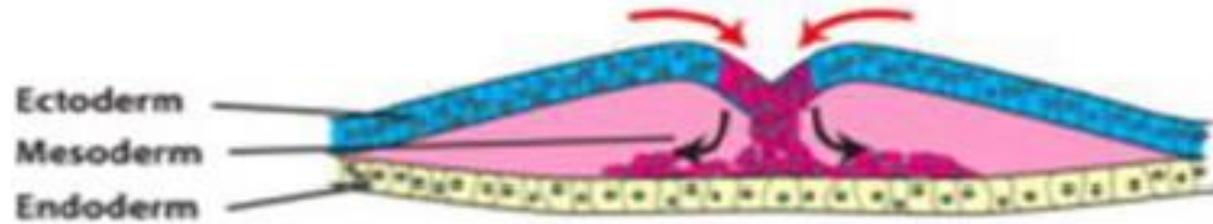


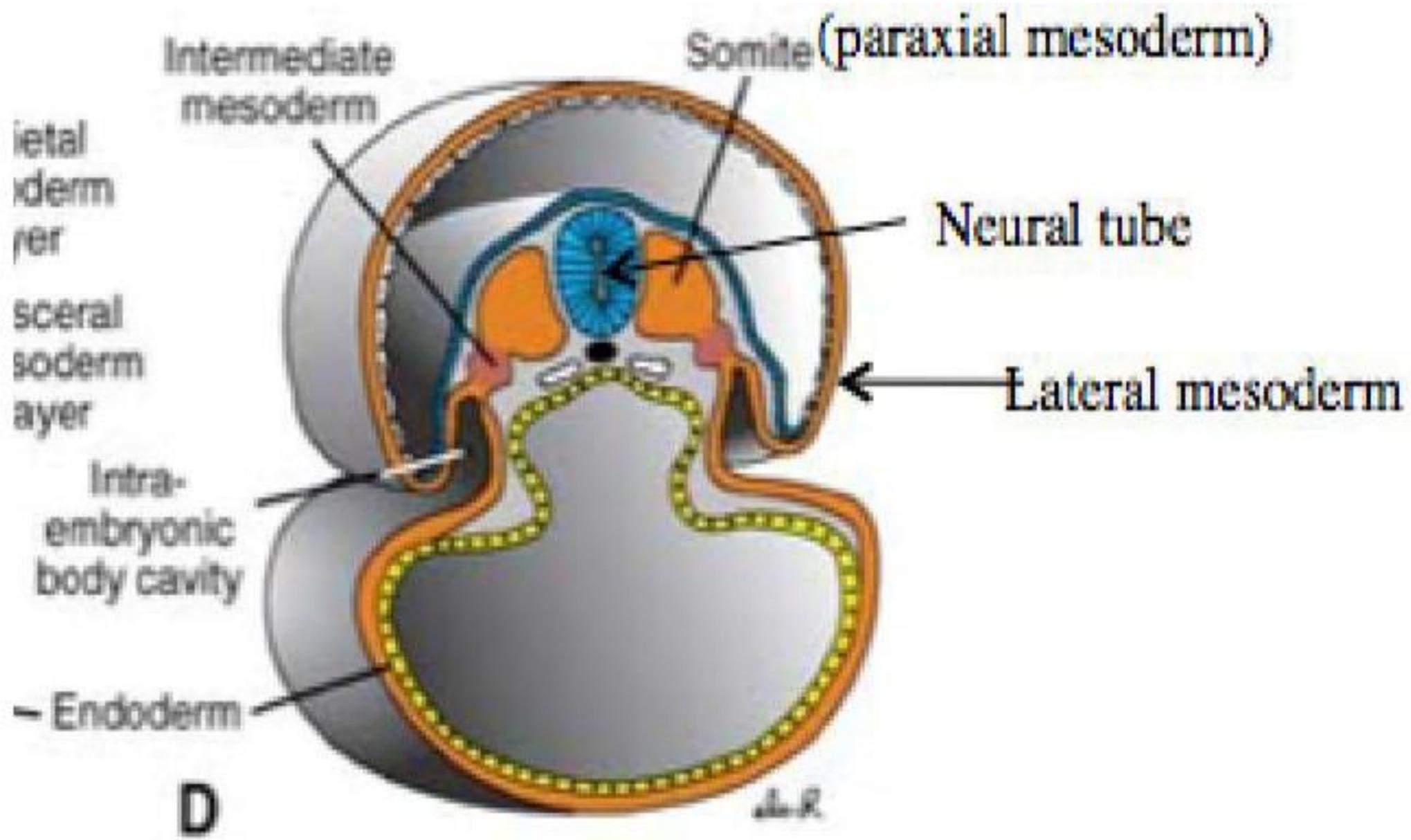
Ectoderm remains on surface, expanding by epiboly

Differentiation of mesoderm

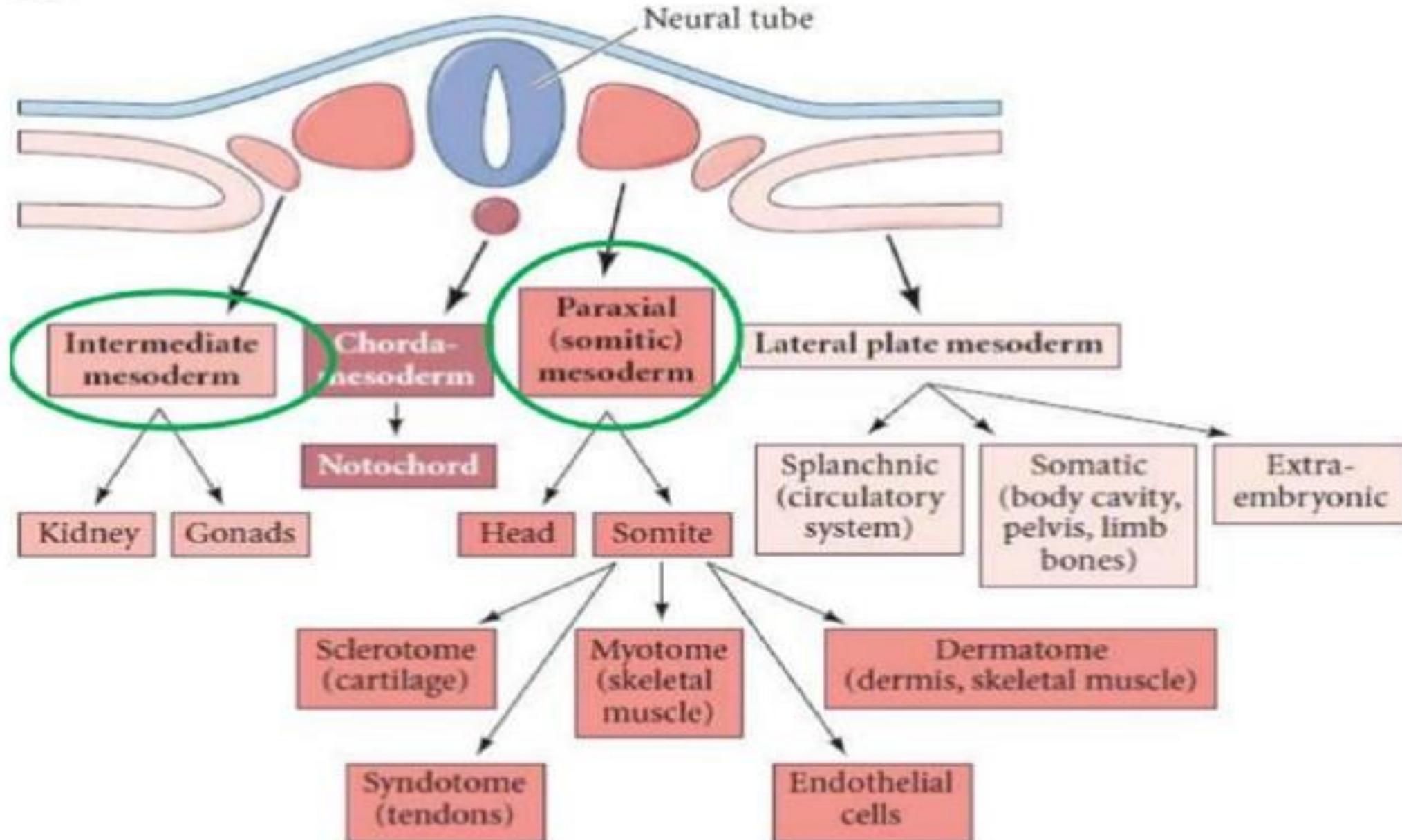
- Series of mesodermal tissue blocks found on each side of neural tube.
- The mesoderm closed to the midline named the **paraxial mesoderm**.
- More laterally, the mesoderm remains thin and named **lateral plate mesoderm** that divided into somatic that surround the amnionic cavity and visceral mesoderm that cover the yolk sac. **the cavity between these called Coelom**
- The mesoderm which connected paraxial and lateral plate mesoderm is named **intermediate mesoderm**

Differentiation of mesoderm





Differentiation of mesoderm



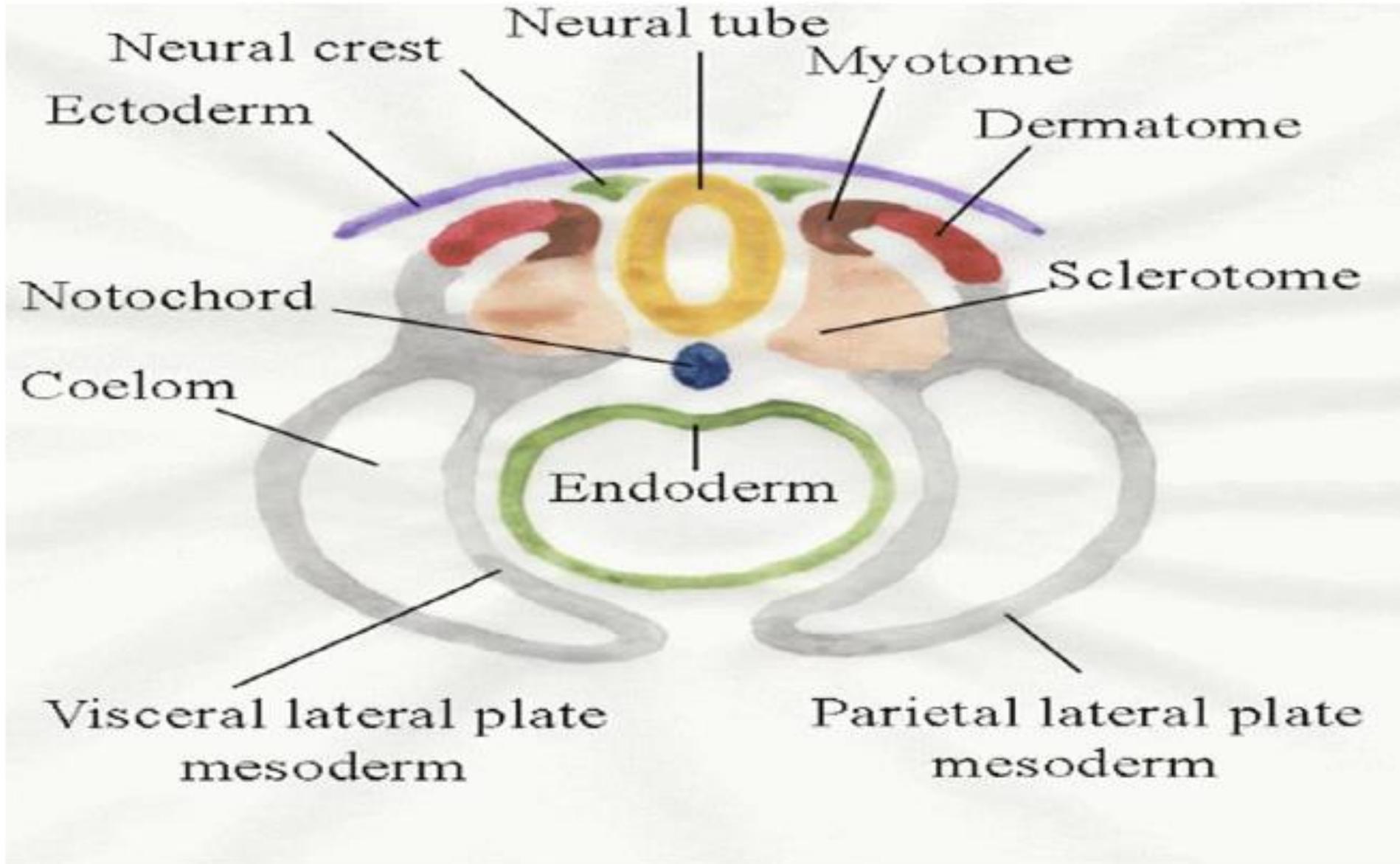
Formation of somites

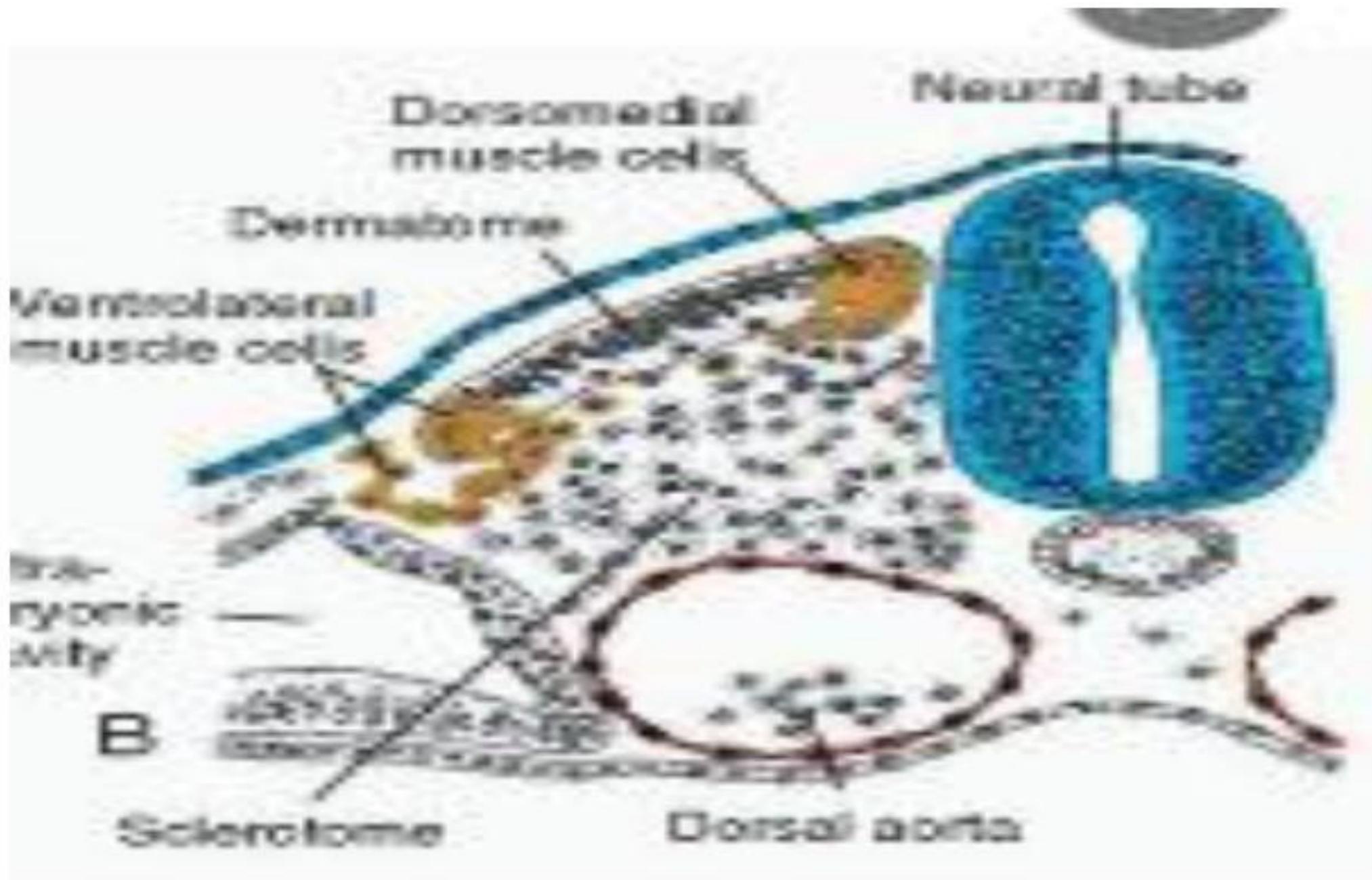
- At end of the third week the **paraxial mesoderm** breaks into segmented blocks of epithelioid cells (**somites**).
- The first pairs arise in cervical region and new somites appear in craniocaudal sequence, then until end of 5th week 42-44 pairs are present .

Differentiation of somites

- The **ventromedial portion** of somites loses epithelial characteristic forming **sclerotome** that will form cartilage and bone.
- The **dorsal portion** forming **dermamyotome** (arranged as epithelial sheets) that organize into:
 - dermatome(form connective tissue of dermis) and
 - myotome which form myoblast(muscle precursor)

Differentiation of somites





Blood and blood vessels formation

- At the end of 2nd week ,embryonic nutrition is obtained from maternal blood by diffusion.
- At 3th week ,blood vessels formation begins in the extra embryonic mesoderm.
- **chorionic villi** begin to branched and some **mesenchymal cells** in the villi soon differentiate into capillaries and blood cell .
- At the **end of 3th** week ,the embryonic blood begin to flow through capillaries

The formation of vascular system involves two processes

1-**Vasculogenesis** (formation of new channels by cell precursors (angioblasts)) in the mesoderm.

2-**Angiogenesis** (formation of new vessels by branching from preexisting vessels.)

Angioblasts aggregate to form blood island.

Blood island consist of 2 cell lines:-

•**1-Central cells** –hematogoniae or hemoblasts-they give rise to primitive blood cells)

•**2-Peripheral cells**-angioblasts-they become flattened and give rise to endothelial cells ,angioblasts then join up and form primitive blood vessels. . the mesenchymal cells around the endothelium blood vessels differentiate to muscular and connective tissue elements of the vessels

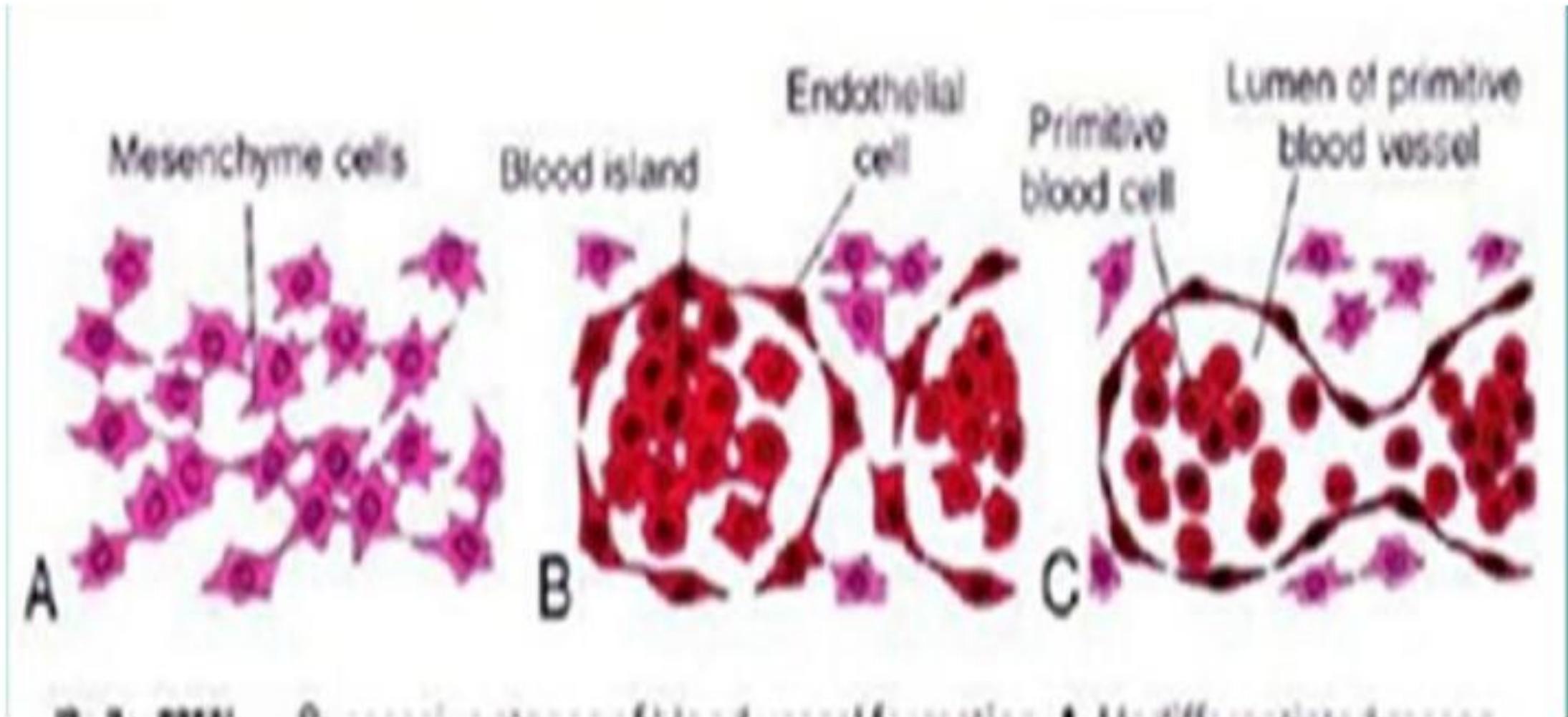
Blood islands appear as red spot and develop at three sites:-

- 1-in the extraembryonic mesoderm of yolk sac at **day 17(vitelline vasa)** .

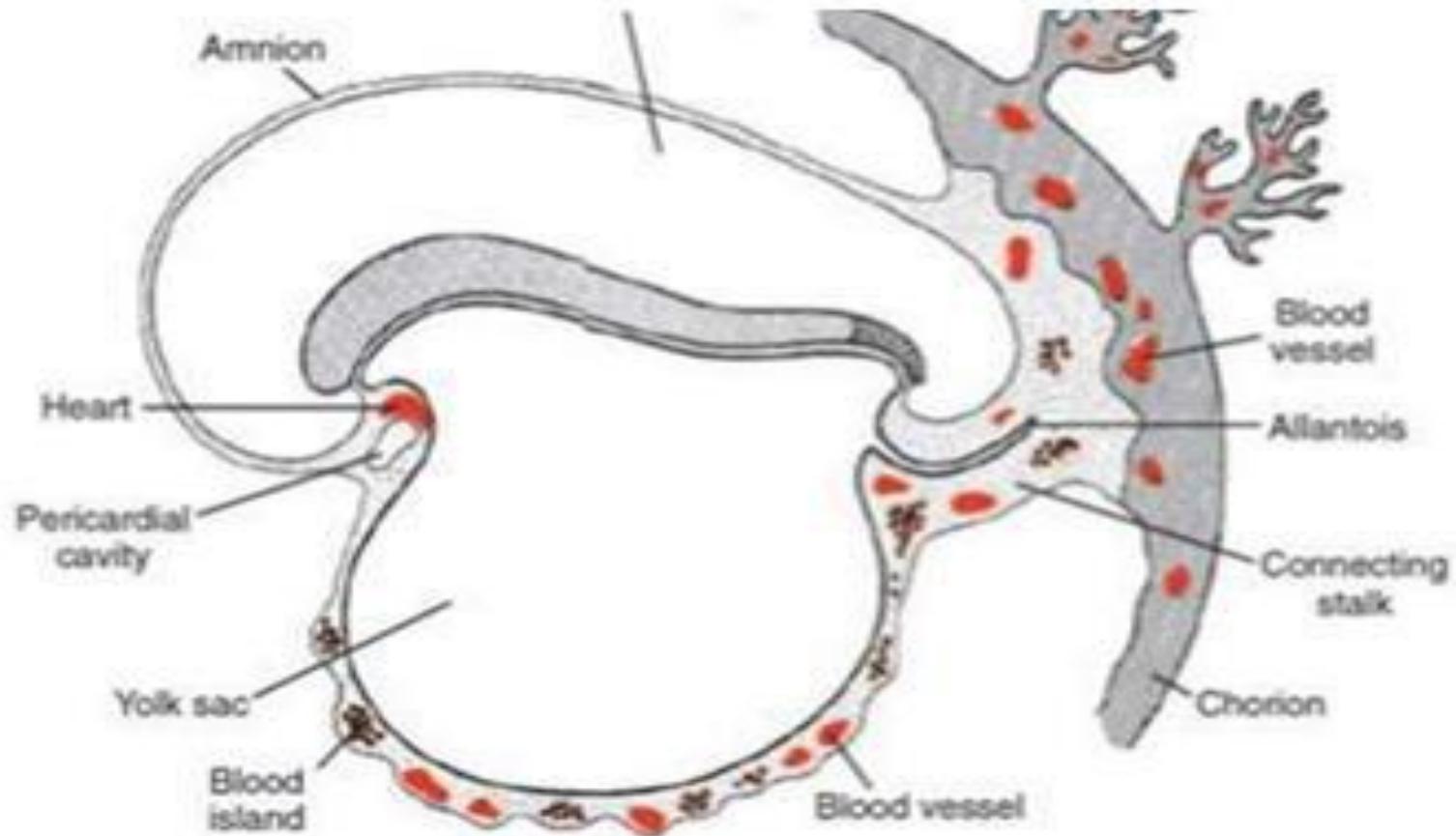
- 2-in the extra embryonic mesoderm of connecting stalk at **day18(umbilical vasa)** .

- 3-in the mesenchyme of embryo at **day 19-20** (**embryonic blood vessels**).

Blood and blood vessels



Blood and blood vessels



Blood and blood vessels



Thank You



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