

Embryology

Foundation block



Brought to you by:
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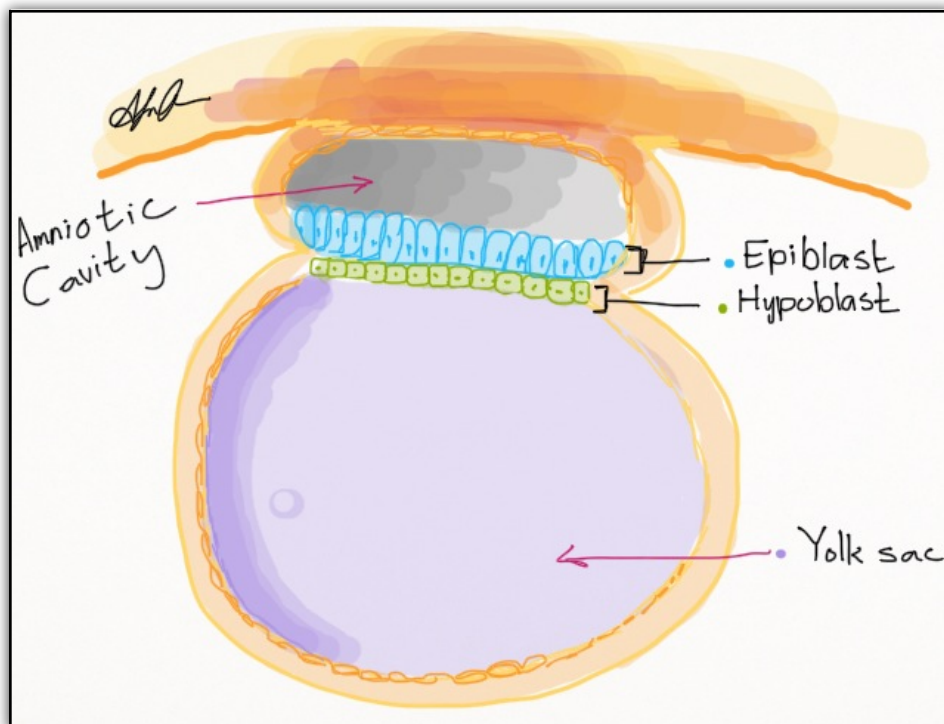
Third lecture

Development of bilaminar and trilaminar discs

Bilaminar disc:

- Implantation is completed by the second week.
- During the second week, the extra embryonic structures forming are: amniotic cavity, amnion, yolk sac, and connecting stalk.
- The embryoblast changes to produce a bilaminar embryonic disc.
- Changes to the **embryoblast (inner layer mass) (embryonic pole)** happen *during* implantation; **bilaminar disc production**.
- The embryonic disc gives rise to the germ layers to form **all tissues and organs of the embryo**.

- the inner cell mass is differentiated into two layers[A+B=bilaminar disc]:
 - A)**Epiblast**: high columnar cells. Adjacent to amniotic cavity.
 - B)**hypoblast**: small cuboidal cells. Adjacent to the **yolk sac**.



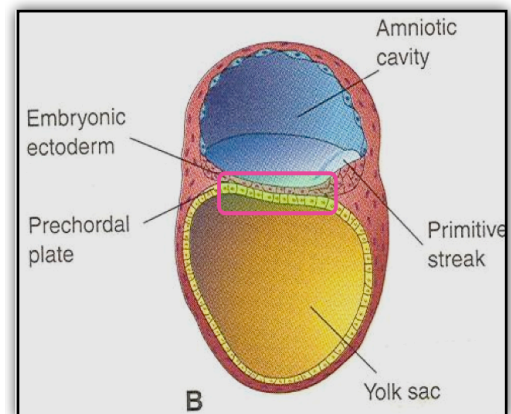
Extraembryonic mesoderm: A loose connective tissue that arises from yolk sac. It surrounds the amnion and yolk sac.

Extraembryonic coelom: Multiple vacant spaces appear within the mesoderm that fuse to form the coelom. It surrounds the amnion & yolk sac.

Gastrulation:

Checkpoint! Changes in bilaminar germ cells?

- The process through which the bilaminar is changed into trilaminar, as new tissue (secondary or intraembryonic mesoderm) appears *between* the **ectoderm** and the **endoderm**.
- Characterized by:
- Appearance of **primitive streak** [first sign].
 - Development of **prechordal plate**.
 - Differentiation of *three* germ layers.



Trilaminar disc:

Trilaminar disc is formed of *three* layers:

- 1) Embryonic ectoderm.
- 2) Intraembryonic mesoderm
- 3) Embryonic endoderm.

Checkpoint: Formation of secondary embryonic mesoderm?

- **Primitive streak** (Day 15-16): Thickened band in the caudal part of the dorsal aspect of the epiblast. A proliferation of cells.
- **Functions of primitive streak:** The primitive streak gives rise to **migrating mesenchymal cells** that migrate between epiblast and hypoblast to form a third layer (**Intraembryonic mesoderm**)
- The anterior end of the primitive streak is called **primitive node**.
- Primitive streak forms mesoderm. Then it normally degenerates and disappears by the end of the 4th week.
- *Sacrocoxygeal termatoma* is a developed remnants of primitive streak.
- It is most common in newborn infants, mostly females.

Checkpoint! Formation of trilaminar disc?

- **Prechordal plate:** A localized area of thickening of the endoderm(hypoblast).
 - It indicates the future cranial end of the embryo.
 - The future site of the mouth.
 - An important organizer of the head.
 - No mesoderm in this area!
- **Notochord:** acts as a temporary axial skeleton for the embryo. It is later replaced by vertebral column.
 - Extends from primitive node to the oropharyngeal membrane.
 - Vertebral column forms *around* it.
 - Induces overlying ectoderm to thicken and form **neural plate** (Which gives rise to the **CNS**)
 - Degrades and disappears as the vertebrae form, but it persists in between as the **nucleus pulposus!**
 - Divides into paraxial mesoderm, intermediate mesoderm and lateral mesoderm.
- Paraxial mesoderm divides into somites which are one of the criteria for determining an embryo's age.

Checkpoint! Formation of primitive streak and notochord?

Development of intraembryonic coelom:

- Appears in isolated places in lateral mesoderm.
- They unite to form a single horse-shoe cavity (Intraembryonic coelom).
- During the second month, it is divided to the three (Pericardial, pleural, peritoneal) cavities.
- Each of the three germ layers give rise to specific tissue and organs.

Checkpoint! Differentiation of intra-embryonic mesoderm?

By end of the 2 nd week.	<p>a) Implantation of blastocyst is completed.</p> <p>b) Extraembryonic structures including the amniotic cavity, amnion, yolk sac, and connecting stalk.</p>
By (15-16 day).	The first sign of Gastrulation with the appearance of <u>“primitive streak”</u>
During the 3 rd week.	Rapid development of the <u>embryonic disc</u>
By the end of the 3 rd week.	<p>The cells of Primitive Streak gives rise to:</p> <p>a) Mesenchymal cells</p> <p>b) The anterior end of the primitive streak is called <u>primitive node</u>.</p>
By the end of the 3 rd week.	<p>a) The paraxial mesoderm begins to divide into paired cuboidal masses, called somites.</p> <p>b) The first pair of somites appears in the <u>future occipital region</u>.</p>
By the end of the 4 th week.	<p>a) Primitive streak <i>actively forms mesoderm</i>.</p> <p>b) It diminishes in size and becomes an insignificant structure in the Sacrococcygeal region of the embryo.</p> <p>c) The primitive streak undergoes degeneration.</p>
By the end of 5 th week.	There are about 42-44 pairs of somites.
During the second month.	<p><u>Intraembryonic coelom is divided into three body cavities:</u></p> <p>a) <u>Pericardial cavity</u></p> <p>b) <u>Pleural cavities</u></p> <p>c) <u>Peritoneal cavity</u></p>

Section	GIVES RISE TO
A) Embryonic Ectoderm	Central and peripheral nervous system
B) Embryonic mesoderm:	
1) Paraxial	Skeleton except cranium, striated muscles, dermis of skin
2) Intermediate	Urogenital system
3) Lateral plate	Connective tissue and muscle of viscera. Serous membranes: Pericardium (heart), Pleura (lungs), Peritoneum (GIT)
c) Embryonic Endoderm	Epithelial parts of: GIT Respiratory Some glands



Final checkpoint! can you identify..

- Changes in bilaminar germ discs?
- Formation of secondary embryonic mesoderm?
- Formation of trilaminar germ discs?
- Formation of primitive streak and notochord?
- Differentiation of intra-embryonic mesoderm?

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