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BILAMINAR -TRILAMINAR DISCS & THEIR DERIVATIVES



We are so thankful for anatomy team for helping us this lecture

BILAMINAR -TRILAMINAR DISCS & THEIR DERIVATIVES

At the end of the lecture, the student should be able to describe :

- Changes in the bilaminar germ disc (embryonic plate).
- Formation of the secondary embryonic mesoderm (intraembryonic mesoderm).
- Formation of trilaminar germ disc.
- Formation of the primitive streak, prechordal plate & notochord.
- Differentiation of intra-embryonic mesoderm, Ectoderm & Endoderm.

Good Luck

Overview mind map

BILAMINAR DISC

↓
composed of two layers :

↓
*epiblast
*hypoblast

NOTOCHORD

↓
as a temporary axial skeleton

EXTRA EMBRYONIC MESODERM

↓
arises from the yolk sac.

TRILAMINAR DISC

↓
Embryonic Ectoderm

↓
Intraembryonic Mesoderm

↓
Embryonic Endoderm

GASTRULATION

↓
characterized by:

- ↓
- 1-Appearance of primitive streak.
 - 2-Development of the prechordal plate.
 - 3-Differentiation of three germ layers.

*introduction :

First of all, you should know that the implantation of the blastocysts which we discussed it in the previous lecture is completed by **the 2nd week.**

As this process occurs, changes occur in the **embryoblast** that produce a **bilaminar embryonic disc.**

This **embryonic disc** gives rise to **the germ layers** that form **all tissues & organs of the embryo.**

Some Extraembryonic structures forming during the **2nd week** are : **amniotic cavity, amnion, yolk sac, and connecting stalk.**

*Bilaminar disc :

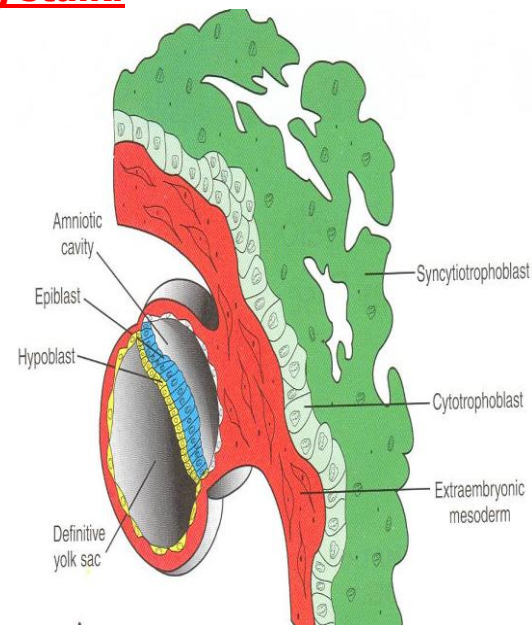
By the **8th** day the inner cell mass

Mass is differentiated into a bilaminar plate of cells composed of **Two layers :**

***epiblast** : high columnar cells. (attached to the **amniotic cavity**)

***hypoblast** : small cuboidal cells. (attached to

The blastocystic cavity*)



*هو الجزء الذي سيكون فيما بعد الـ **yolk sac**

#note:

Later, The **epiblast** cells will form the **ectoderm.**

And the **hypoblast** will form the **endoderm.**

*EXTRA EMBRYONIC MESODERM :

It is a loose connective tissue, arises from the **yolk sac**.

Where is it located ?

It fills all the space between the **trophoblast** externally and the **exocoelomic membrane & amnion** internally.

It surrounds the **amnion** and **yolk sac**.

notice the red star in the figure.

Inside this Extra embryonic mesoderm, multiple spaces will appear. Then they will fuse forming **the Extraembryonic Coelom**.

It surrounds the **amnion** and **yolk sac**.

*GASTRULATION:

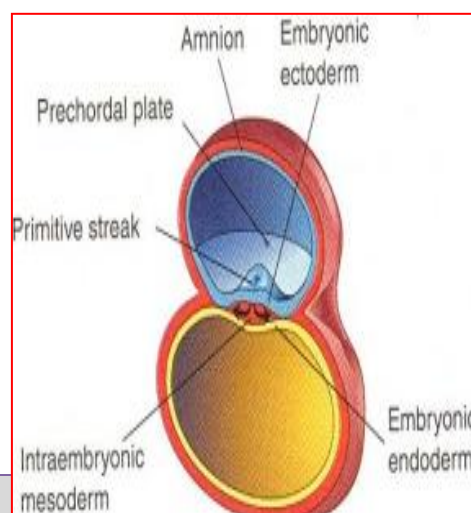
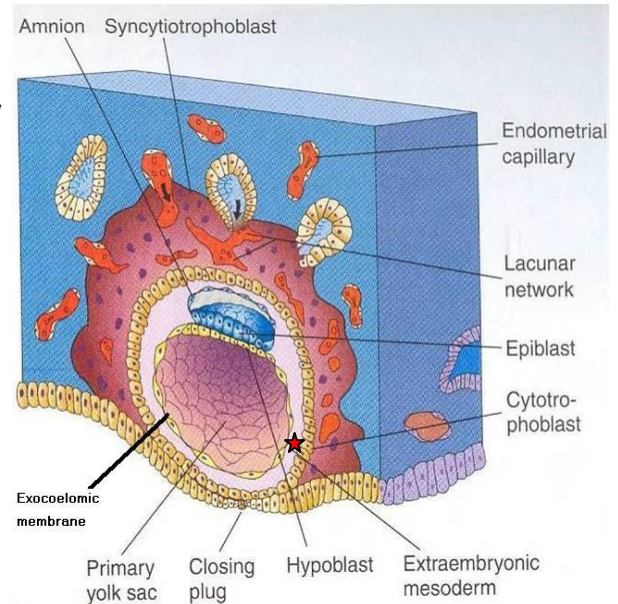
occurs during **3rd** week.

It is characterized by three things :

- Appearance of **primitive streak**
- Development of the **prechordal plate**
- Differentiation of **three germ layers**. (The bilaminar changes to trilaminar*)

* the third layer is formed as a new tissue

known as **2ry or intraembryonic Mesoderm**.



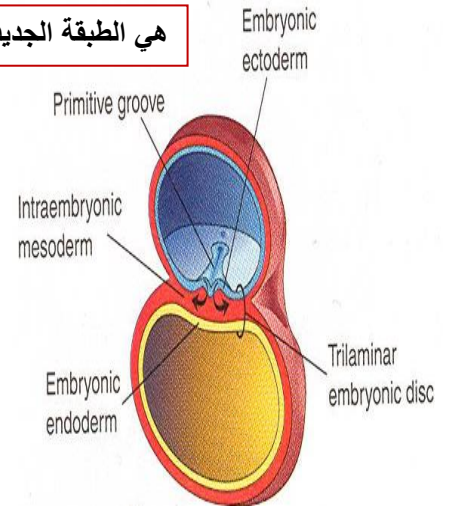
Now, this embryonic disc is formed of three layers :

*Embryonic Ectoderm. (upper layer)

*Intraembryonic Mesoderm. هي الطبقة الجديدة التي تكونت بين الطبقتين العلوية والسفلية

*Embryonic Endoderm. (bottom layer)

Cells in these layers will give rise to **all tissues and organs** of the embryo.



*Primitive Streak:

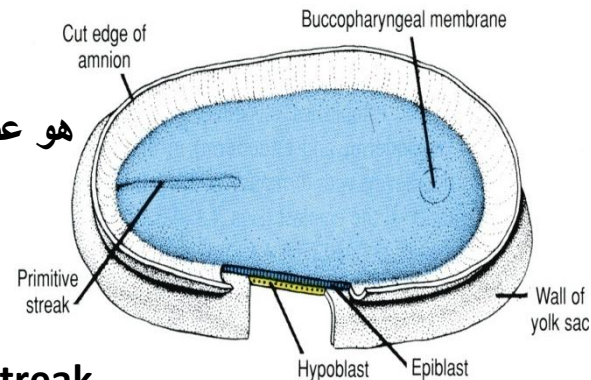
It is the first sign of Gastrulation. and it appears by the **15th-16th** day. It is a **thickened band** in the **caudal part** of the **dorsal aspect** of the epiblast.

هو عبارة عن سماكة أو تغلظ حصل للـ **epiblast** في الجانب الظهري وبالتحديد الجزء الذيلي.

FUNCTIONS OF PRIMITIVE STREAK:

By the end of the **3rd week** the cells of Primitive Streak gives rise to:

- * Mesenchymal cells* that migrate between Epiblast & Hypoblast.
- * The anterior end of the primitive streak. called (**primitive node**).



* هذه الخلايا هي التي ستكون لنا فيما بعد الطبقة الثالثة الجديدة. **Intraembryonic Mesoderm.**

What will happen to the primitive streak later ?

Primitive streak actively forms mesoderm until the **fourth week**. Then it diminishes in size and becomes an **insignificant** structure in the **Sacroccygeal** region of the embryo.

Normally the primitive streak undergoes degeneration and **disappears by the end of the fourth week**.

If the primitive streak didn't degenerate normally this will cause something called **(SACROCCYGEAL TERATOMA)**

SACROCCYGEAL TERATOMA

It is developed from **remnants of primitive streak**.

It is a benign tumor which contains elements of **incomplete differentiated (3) germ layers**. It is the most common tumor in newborn, infant mostly **female**.

How can we diagnose it ?

It is diagnosed by **ultrasonography**.

Also, It is removable by **surgery** and its prognosis is **good**.



*PRECHORDAL PLATE

It is a localised area of thickening of the **Hypoblast(endoderm)**.

It is the primordium of the oropharyngeal membrane*

It indicates two things :

**The future Cranial end of the embryo.*

**The future site of the mouth.*

It is an important organiser of the **Head**.

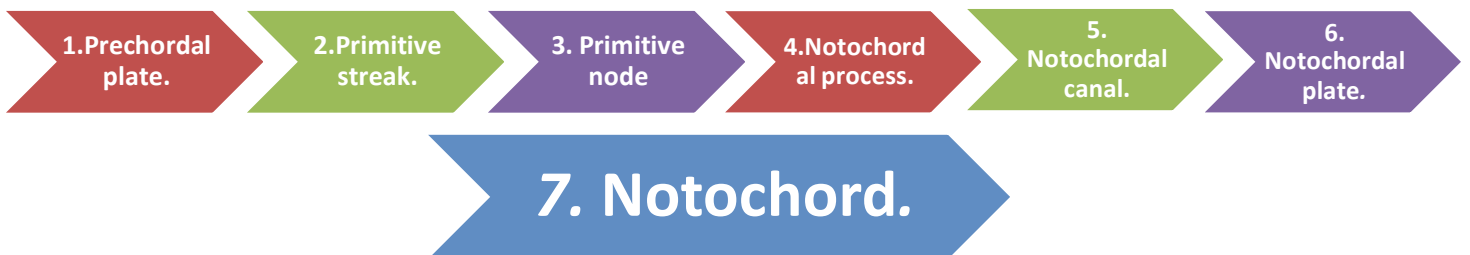
There is no mesoderm in this area.

*NOTOCHORD:

It is a **temporary axial skeleton** for the embryo.

Later, it will be replaced by the vertebral column.

The formation of the notochord starts by appearance of :



Notice that the Notochordal process It is an **extension of cells from the primitive node to the oral cavity**.

* (future site of oral cavity) include → (cranial end of the embryo + future site of mouth)

ملاحظة : الـ notochord ليس هو من سيكون العمود الفقري لكن العمود الفقري سيتكون حوله . لأن العمود الفقري سيتكون من الطبقة الوسطية mesoderm .

* The notochord degenerates and disappears as the bodies of the vertebrae form, but it persists as the nucleus pulposus of each intervertebral disc.

(هو عبارة عن axis يبقى إلى أن تبدأ ال **bodies of the vertebrae** بالتكون سيبدأ يختفي ما عدا في ال **intervertebral disc** سيبقى مثل jelly like substance يسمى **the nucleus pulposus** وموقعه سيكون بين ال **bodies of the vertebrae** . بمعنى أنها تبقى كآثار أو بقايا للـ **notochord**)

*The developing **notochord** induces the overlying ectoderm to thicken & form the neural plate & neural tube which will form the central nervous system (CNS...Brain & spinal cord).

Function of the notochord :

1. Define the Primitive axis of the embryo and gives it some rigidity.
2. Serves as the basis for the development of the axial skeleton.
3. Indicates the future site of the vertebral bodies.
4. Induction of development of the CNS. By formation of the neuroectoderm that differentiated later into **neural tube(forms the CNS)** and **neural crest cells**.

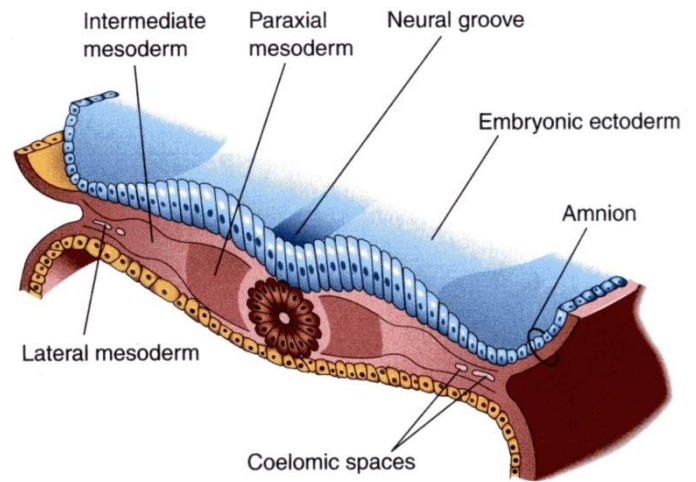
*DIFFERENTIATION OF THE INTRAEMBRYONIC MESODERM:

it is divided into:

1-Medial part (*Paraxial Mesoderm*).

2-Middle part : (*Intermediate mesoderm or nephrogenic mesoderm*).

3-lateral part (*Lateral mesoderm*).



*SOMITES:

What are they ?

They are **paired cuboidal masses** appear in the **paraxial mesoderm** by end of **3rd** week.

What will they do ?

Somites will give rise to the **Axial Skeleton , Striated muscle & dermis***.

Also, By the end of 3rd week, the first pair of somites appears in the **future occipital region** so, they develop **craniocaudally**. And Because the somites are **so prominent during the 4th & 5th weeks**, they are one of **criteria for determining an embryo's age**.

By the end of 5th week, there are about 42-44 pairs of somites.

***dermis NOT epidermis.**

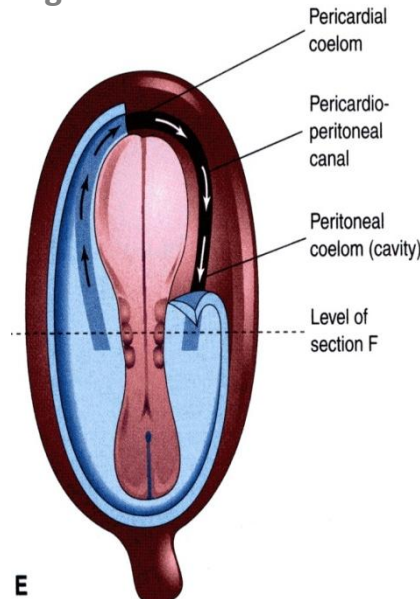
Because the origin of the dermis is mesoderm. While the origin of the epidermis is ectoderm.

*Development of Intraembryonic Coelom :

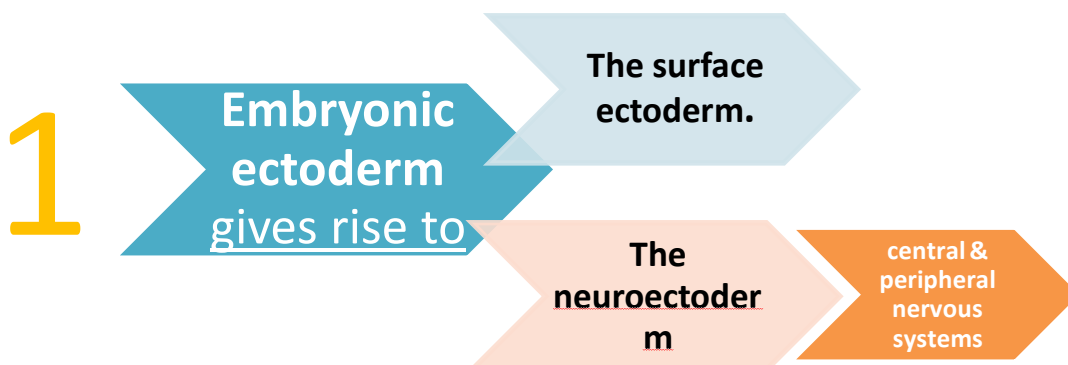
The primordium of the **intraembryonic coelom** appears as isolated *spaces* in the **lateral mesoderm**.

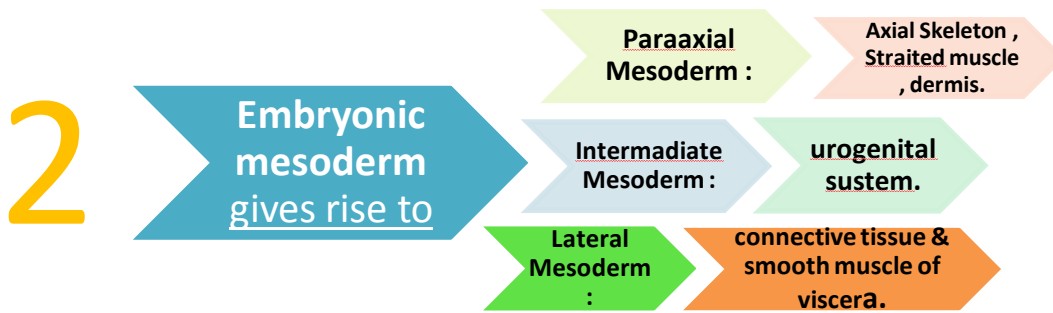
These spaces soon unite to form a **single horseshoe-shaped cavity**, the **intraembryonic coelom**. And during the second month this intraembryonic coelom will divide into three cavities :

- pericardial cavity.**
- pleural cavities.**
- peritoneal cavity.**



Each of the three germ layers (**ectoderm, mesoderm, and endoderm**) gives rise to specific tissues and organs :



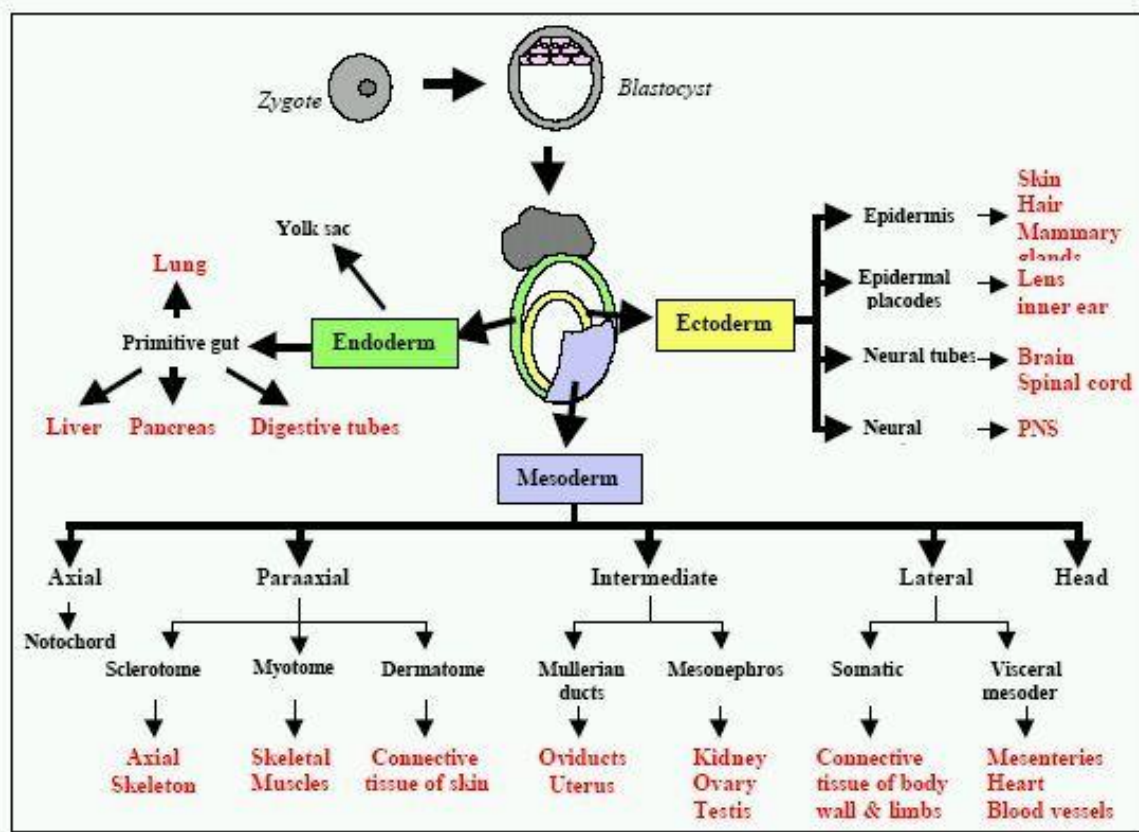


3

The embryonic endoderm

epithelial linings of the respiratory passages & gastrointestinal (GI) tract, including the **glands** opening into the GI tract & **glandular cells** of associated organs such as the **liver** and **pancreas**.

SUMMARY



If you read this you will have an about the whole lecture :

*BILAMINAR DISC = (composed of epiblast + hypoblast)

*EXTRA EMBRYONIC MESODERM (loose C.T arise from yolk sac)

*GASTRULATION = characterized by (Appearance of primitive streak, Development of the prechordal plate, Differentiation of three germ layers).

*TRILAMINAR DISC (changing from bilaminar to trilaminar)

***PRIMITIVE STREAK** = (15-16)days. anterior end of the primitive streak is called primitive node.

***PRECHORDAL PLATE** = It is a localised area of thickening of the Hypoblast(endoderm

***NOTOCHORD** = (temporary axial skeleton)It is an extension of cells from the primitive node to the oral cavity.

***DIFFERENTIATION OF THE INTRAEMBRYONIC MESODERM** (three parts)

***SOMITES** = (in the paraxial mesoderm) which give rise Axial Skeleton , Striated muscle & dermis.

***DEVELOPMENT OF INTRAEMBRYONIC COELOM** (single horseshoe-shaped cavity)

*simple MQs :

- the first sign of gastrulation is :

1-appearance of extraembryonic mesoderm

2- **primitive streak**

3- epiblast

4- 1 & 2

- what the function of mesenchymal cells ?

1- forming the third layer

2- give me the primitive node

3- building intraembryonic mesoderm

4- **1 & 3**



During fourth week primitive streak disappear :

1- True

2- False

(at the end of the fourth week)

Notochord disappear when :

1- The bodies of vertebra form

2- Gastrulation occur

3- The nucleus pulposus disappear too

4- 1 & 3

- the first pair of somites appears in the future occipital region at :

1- the end of fourth week

2-during 3rd week

3-the end of 3rd week

We can determine an embryo's age :

1-4th and 5th week

2-when the somites so prominent

3-when we have 42-44 pairs of somites

4-all answers

- neural plate + neural tube are forming CNS :

1- true

2-false

Which one don't have mesoderm:

1-hypoblast

2-epiblast

3-prechordal plate

4-1 & 2

- interembryonic coelom divided into 3 cavities in :

1- the end of 3rd week

2-during second month

3-4th and 5th week

4- during third month

-paraxial mesoderm give rise to :

1-dermis

2- epidermis

3-cranium

epidermis grow from: مهم***

1- paraxial mesoderm

2- ectoderm

3- endoderm



Links can help :

Human development :

<https://www.youtube.com/watch?v=UgT5rUQ9EmQ>

Gastrulation :

https://www.youtube.com/watch?v=x-p_ZkhqZ0M

Good Luck

