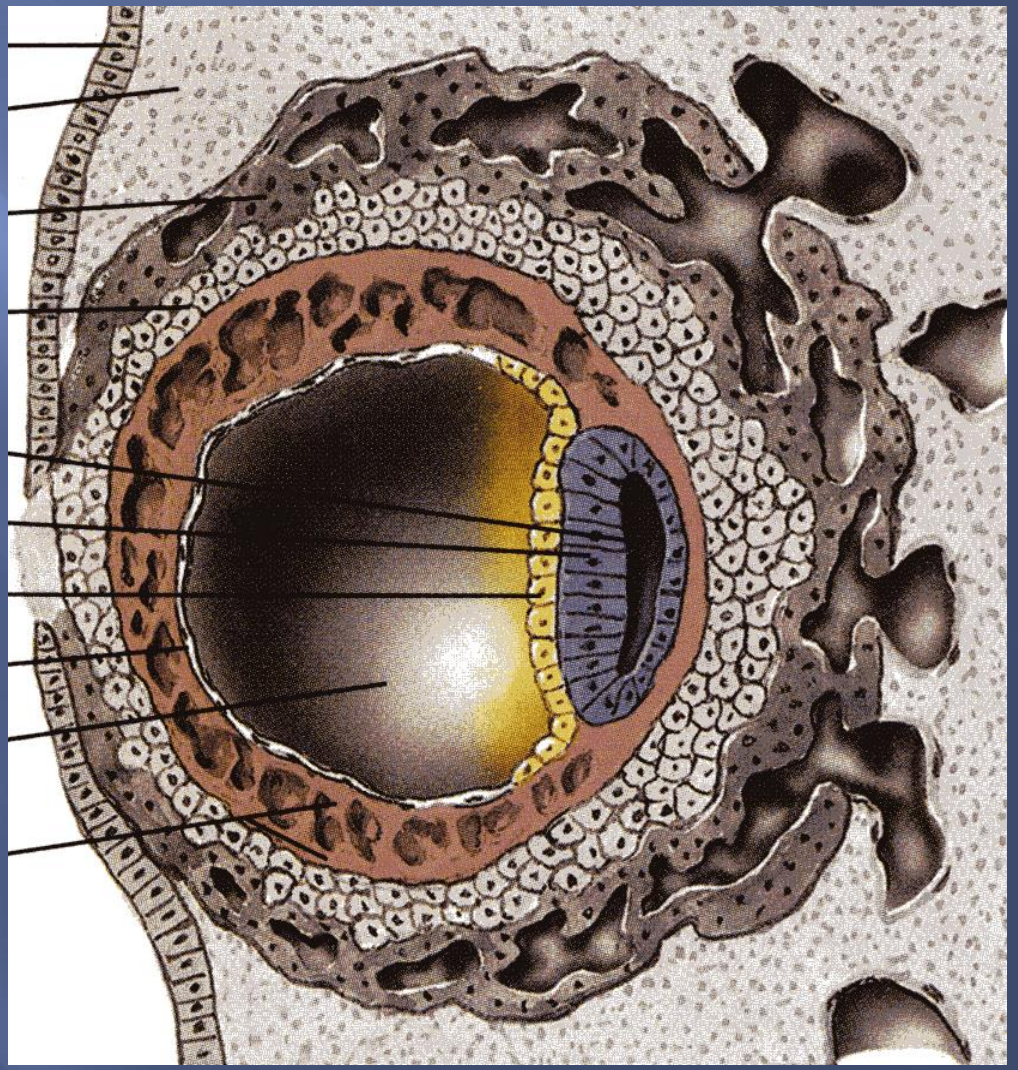
BILAMINAR –TRILAMINAR DISCS & THEIR DERIVATIVES

By

DR. SANAA ALSHAARAWY

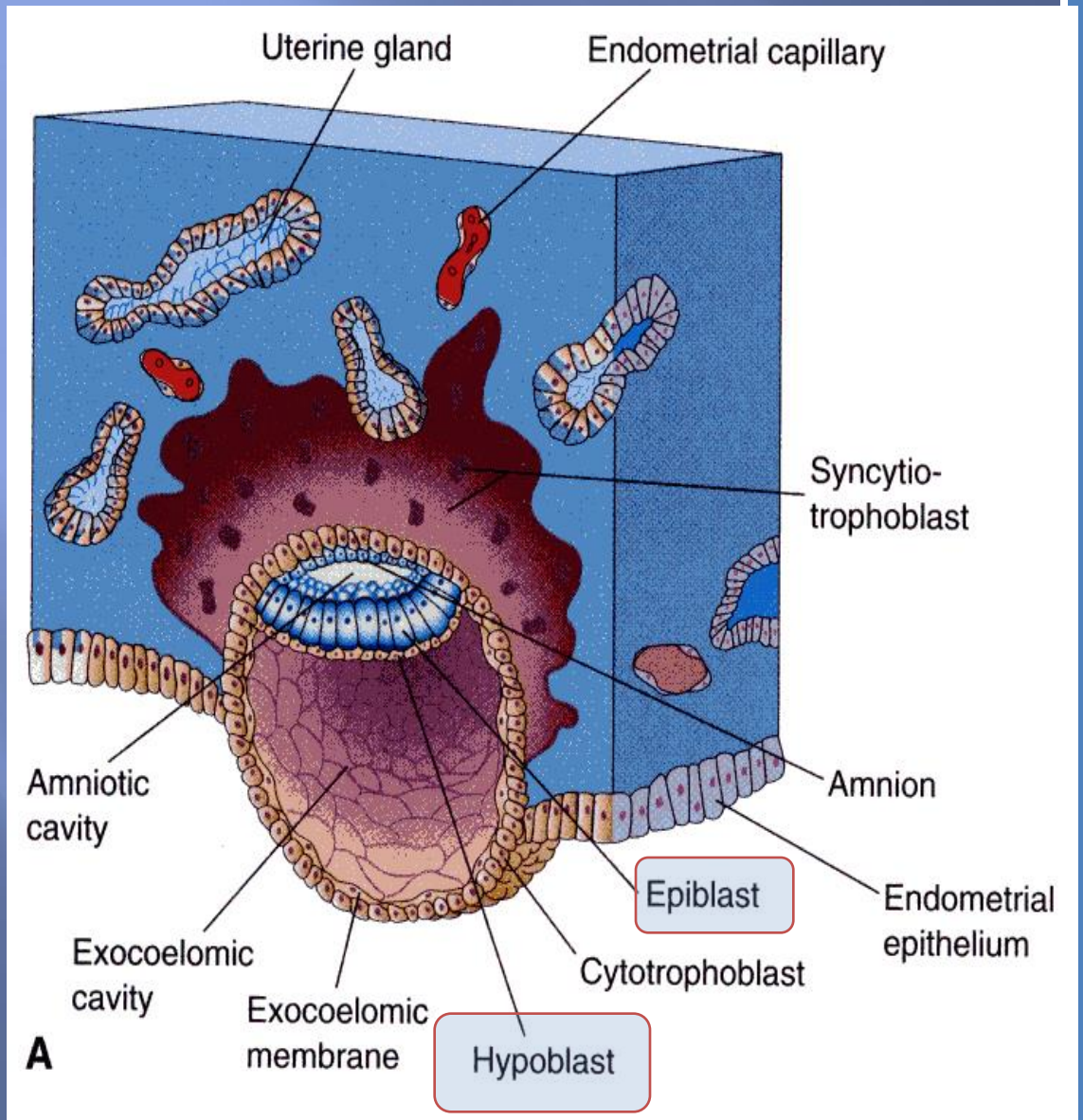
DR. ESSAM ELDIN SALAMA



BILAMINAR & TRILAMINAR DISCS

- **OBJECTIVES :**
- **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 streake & notochord.**
- **Differantiation of intra-embryonic mesoderm.**

INTRODUCTION



- **Implantation of the blastocyst** is completed by the end of the 2nd week .
- As this process occurs, changes occur in the **embryoblast** that produce a **bilaminar embryonic disc.**
- The **embryonic disc** gives rise to the germ layers that form all tissues & organs of the embryo.
- **Extraembryonic structures** forming during the 2nd week are : the amniotic cavity, amnion, yolk sac, and connecting stalk.

BILAMINAR DISC

By the (8th) day:

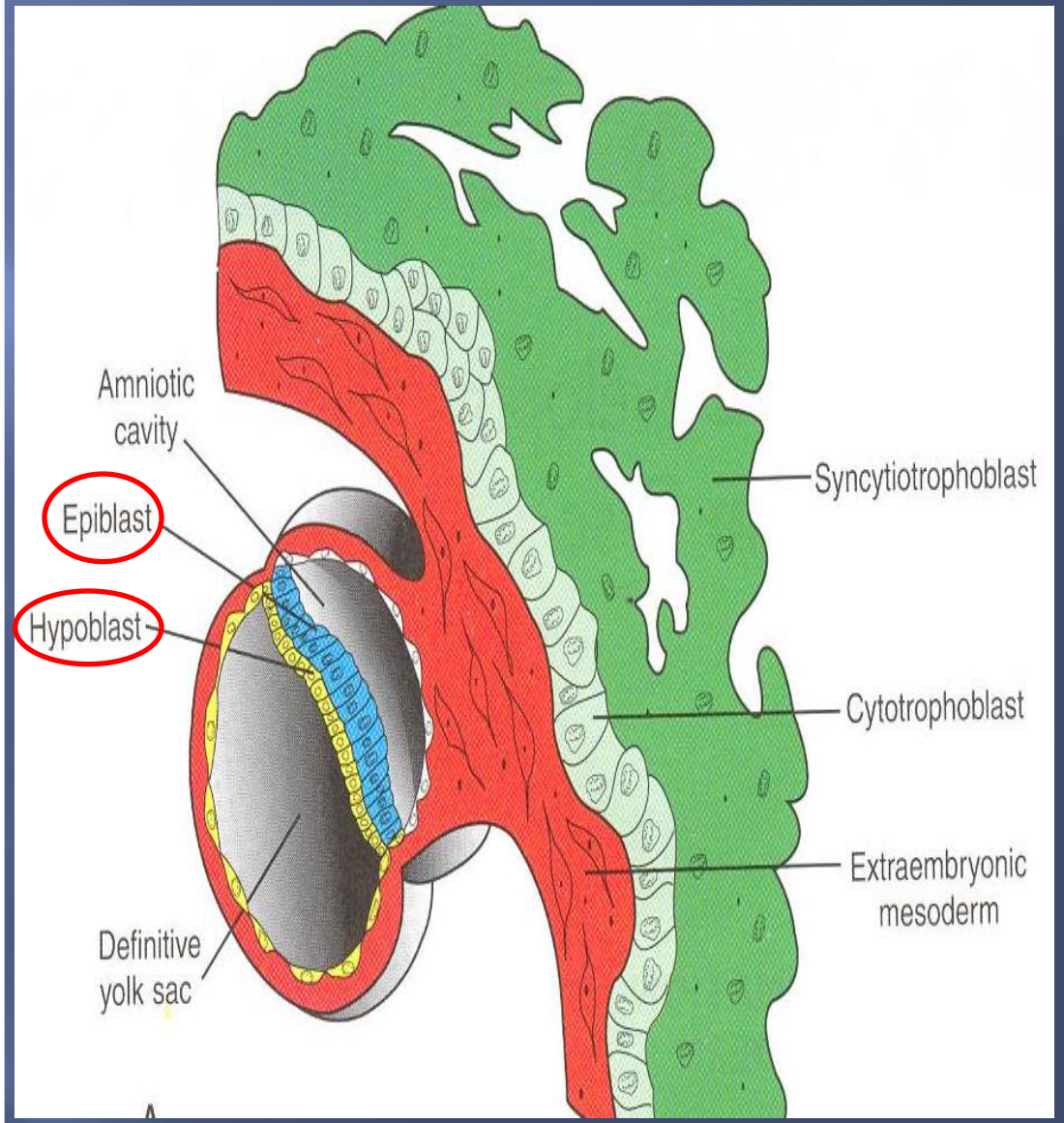
The Inner Cell Mass (Embryoblast) is differentiated into a bilaminar plate of cells composed of Two layers :

(A) ***Epiblast***

High columnar cells ***adjacent to the amniotic cavity.***

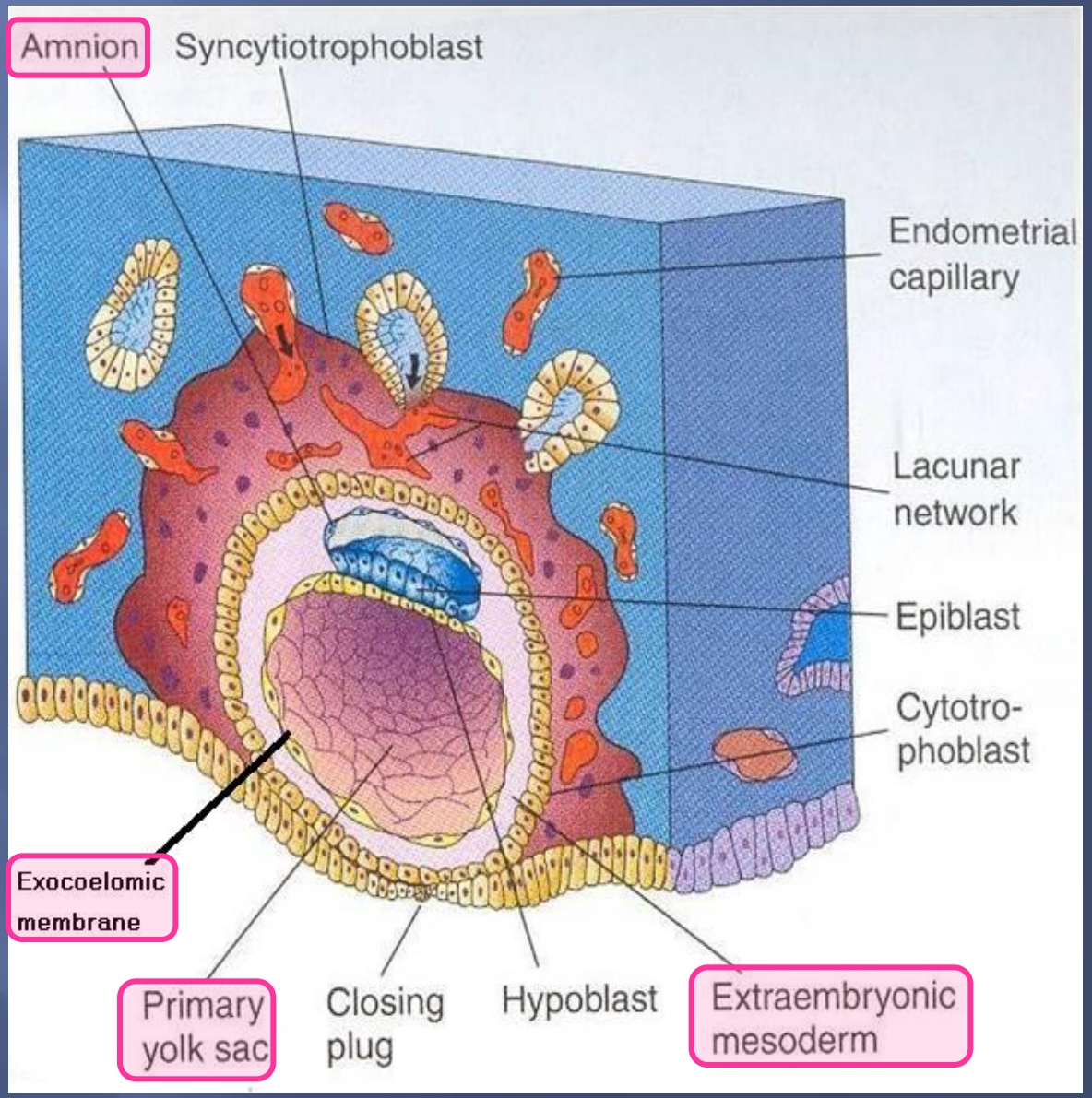
(B) ***Hypoblast***

Small cuboidal cells ***adjacent to the blastocyst cavity (Yolk Sac).***

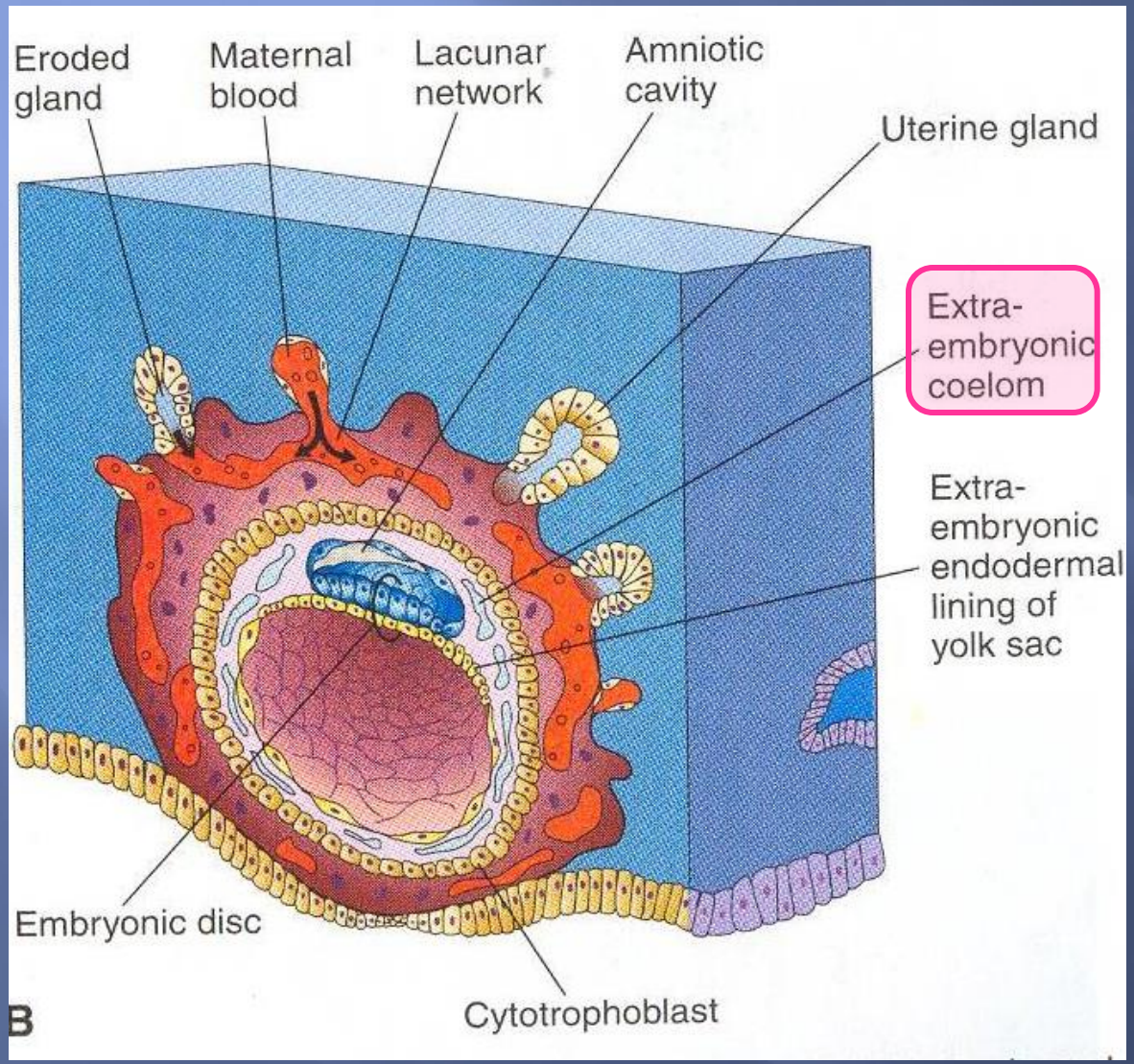


EXTRA EMBRYONIC MESODERM

- A loose connective tissue, arises from the yolk sac.
- It fills all the space between the **trophoblast** externally and the **exocoelomic membrane & amnion** internally.
- It surrounds the amnion and yolk sac.



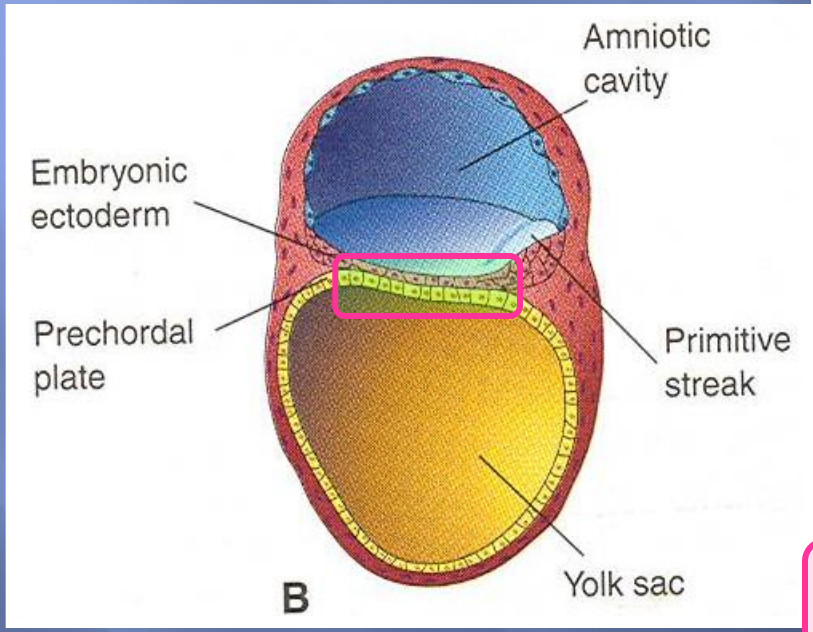
EXTRA EMBRYONIC COELOM

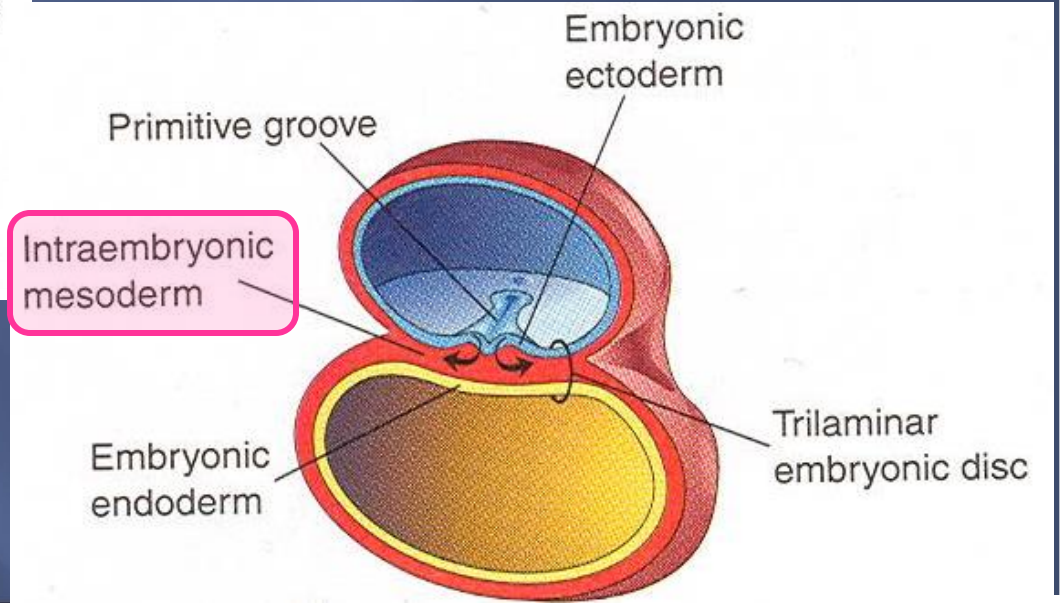


- *Multiple spaces appear within the Extraembryonic mesoderm.*
- *These spaces fuse and form the Extraembryonic Coelom.*
- *It surrounds the amnion and yolk sac.*

GASTRULATION

It is the process through which the Bilaminar embryonic disc is changed into a Trilaminar disc, as a new tissue (2ry or intraembryonic mesoderm) appears between the ectoderm and endoderm.





TRILAMINAR DISC

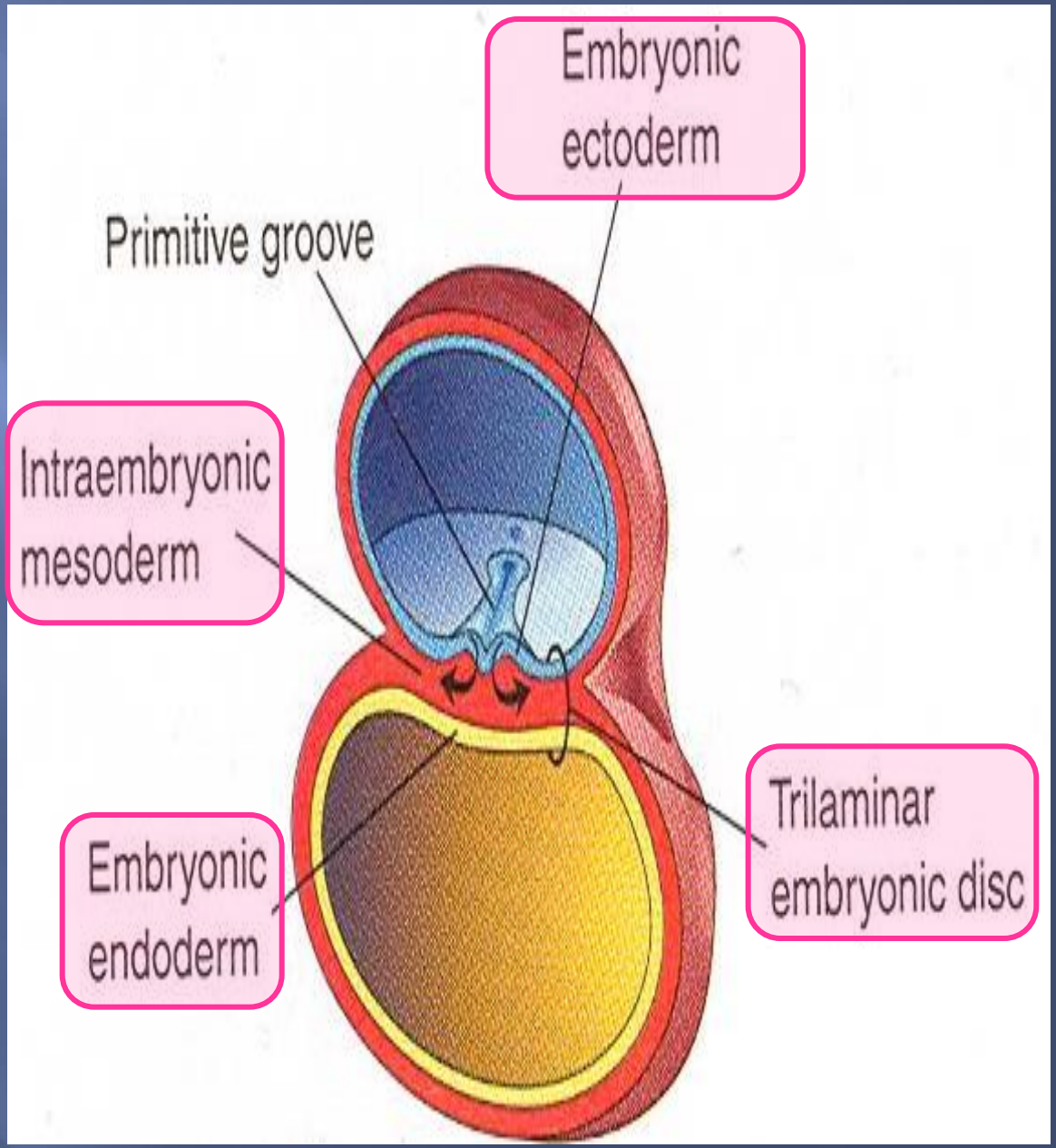
Now the embryonic disc is formed of 3 layers:

Embryonic Ectoderm

Intraembryonic Mesoderm.

Embryonic Endoderm.

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



GASTRULATION

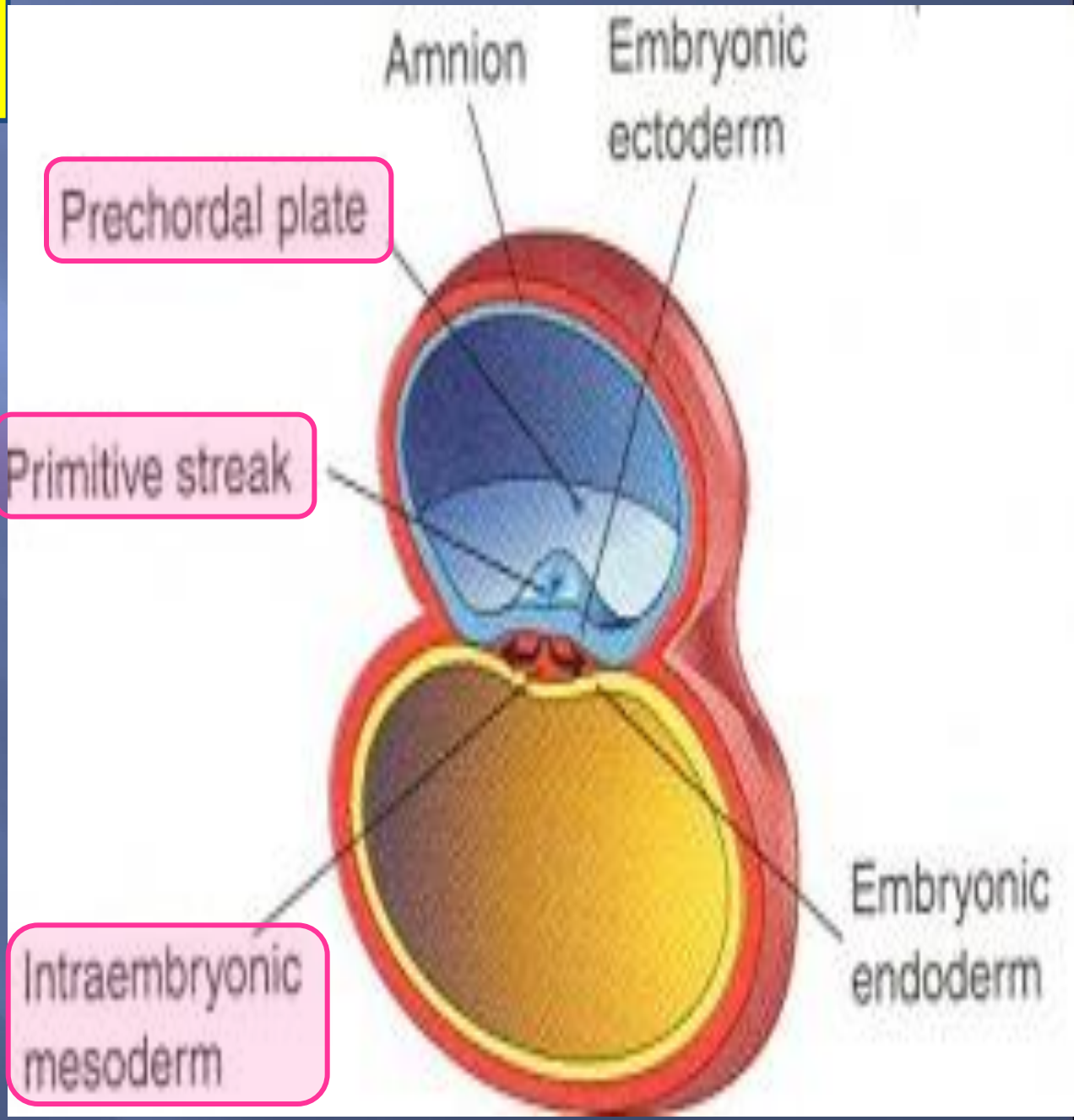
Rapid development of the embryonic disc occurs **during the 3rd week.**

It is characterized by:

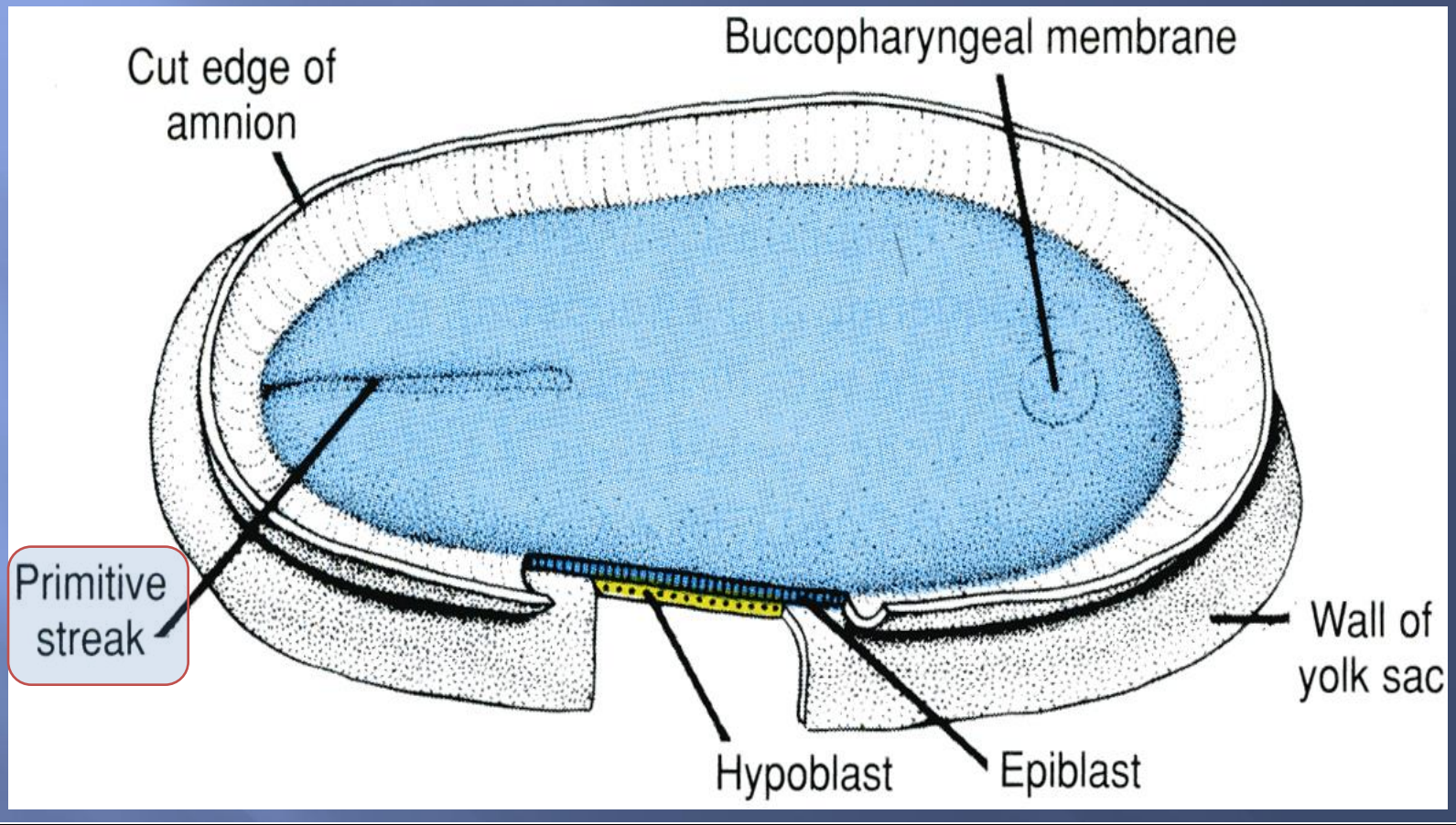
1-**Appearance** of **primitive streak.**

2-**Development** of **the prechordal plate.**

3-**Differentiation of three germ layers.**



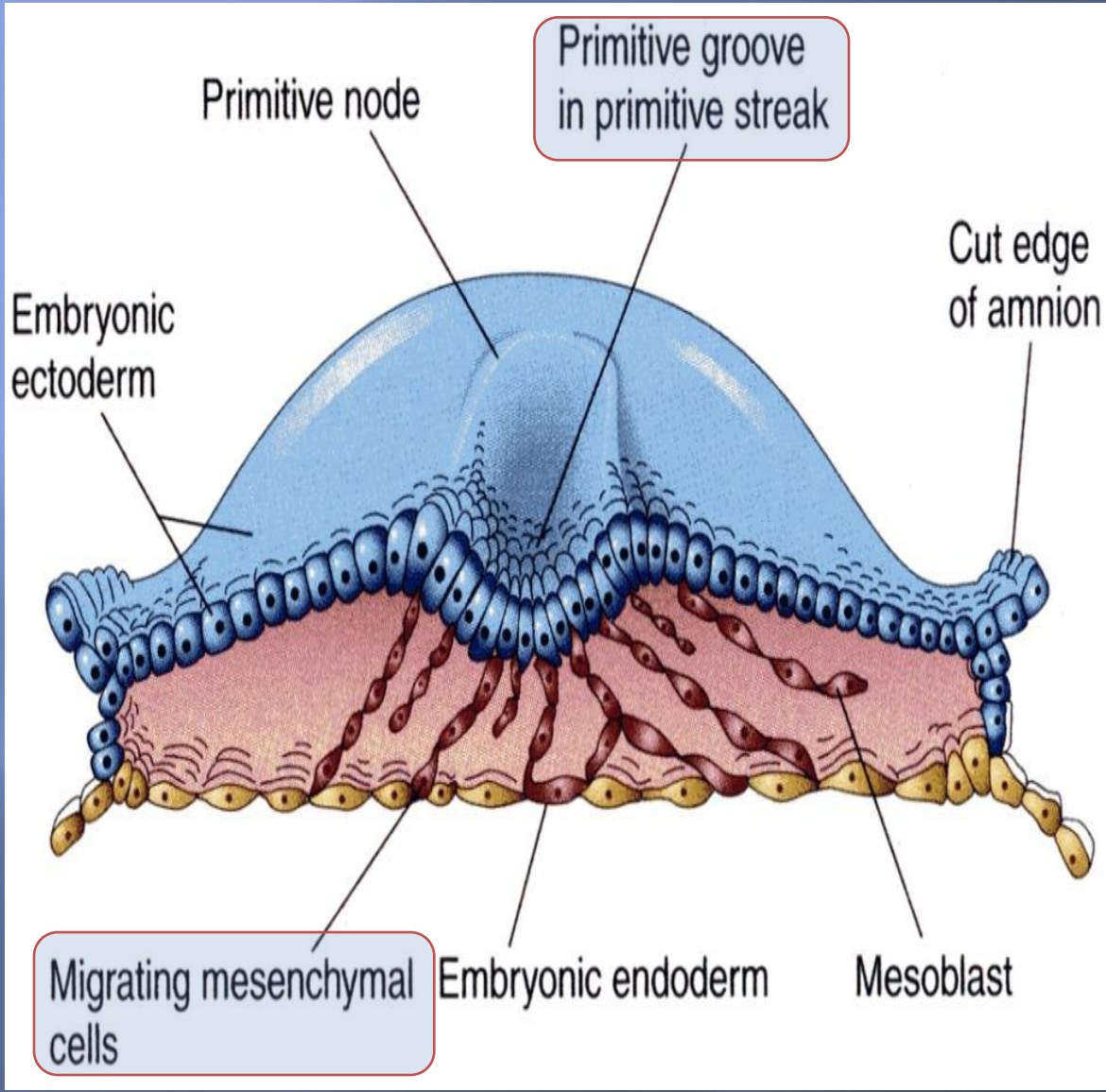
Primitive Streak



The first sign of <u>*Gastrulation*</u> *is the appearance of "**primitive streak**"*

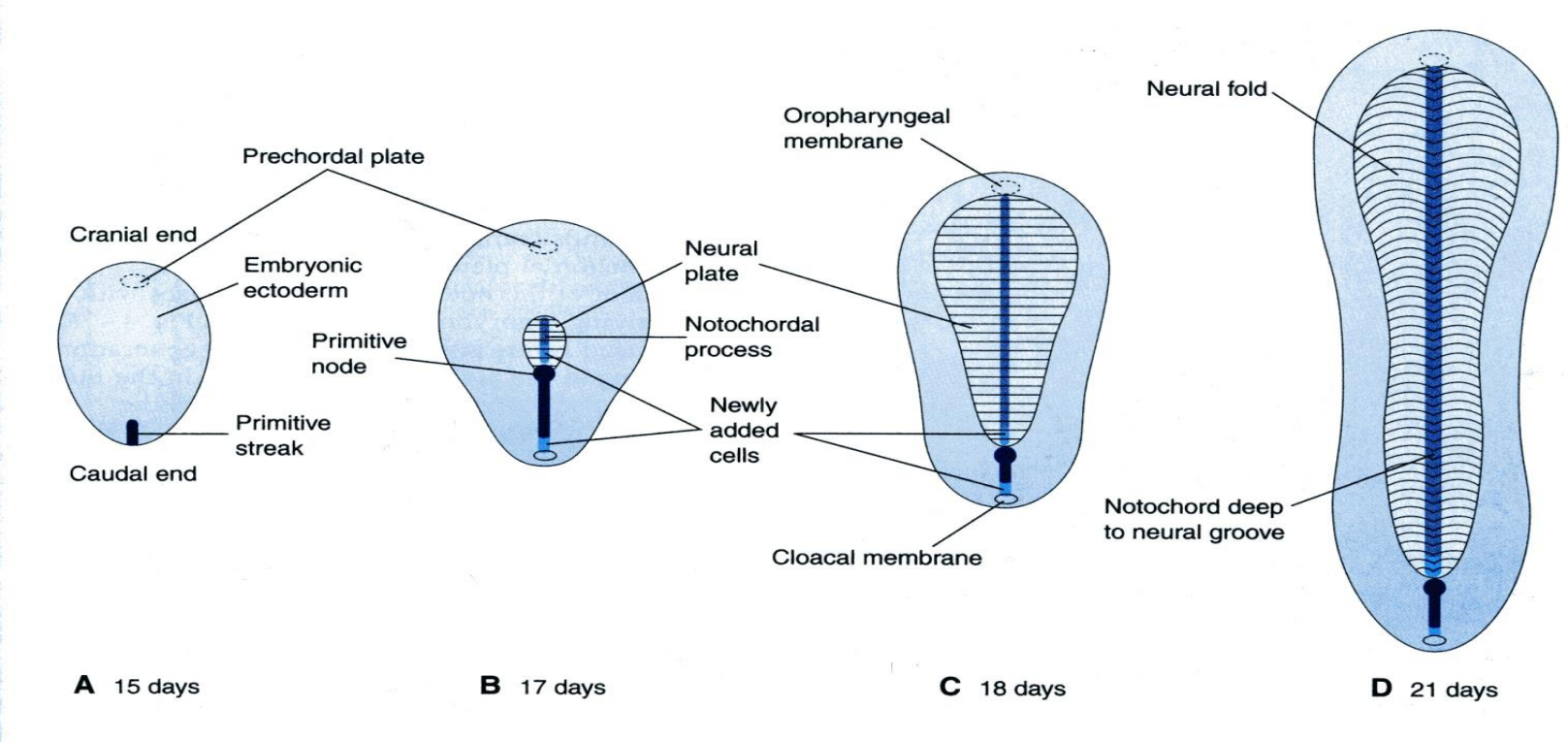
By (15-16 day). It is <u>a thickened band</u> in the caudal part of the <u>dorsal aspect</u> of the ***epiblast.***

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 to form a* ***third layer*** *-* ***Intraembryonic Mesoderm.***
- *The anterior end of the primitive streak is called primitive node.*

Fate of Primitive Streak



Primitive streak *actively forms mesoderm* <u>until the fourth week</u>, then it diminishes in size and becomes an **insignificant** structure in the **Sacrococcygeal** region of the embryo.

<u>Normally</u> the primitive streak undergoes degeneration and *disappears by the end of the fourth week.*

SACROCOCCYGEAL 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.*
- *It is usually diagnosed by ultrasonography.*
- *It is removable by surgery and its prognosis is good.*

PRECHORDAL PLATE

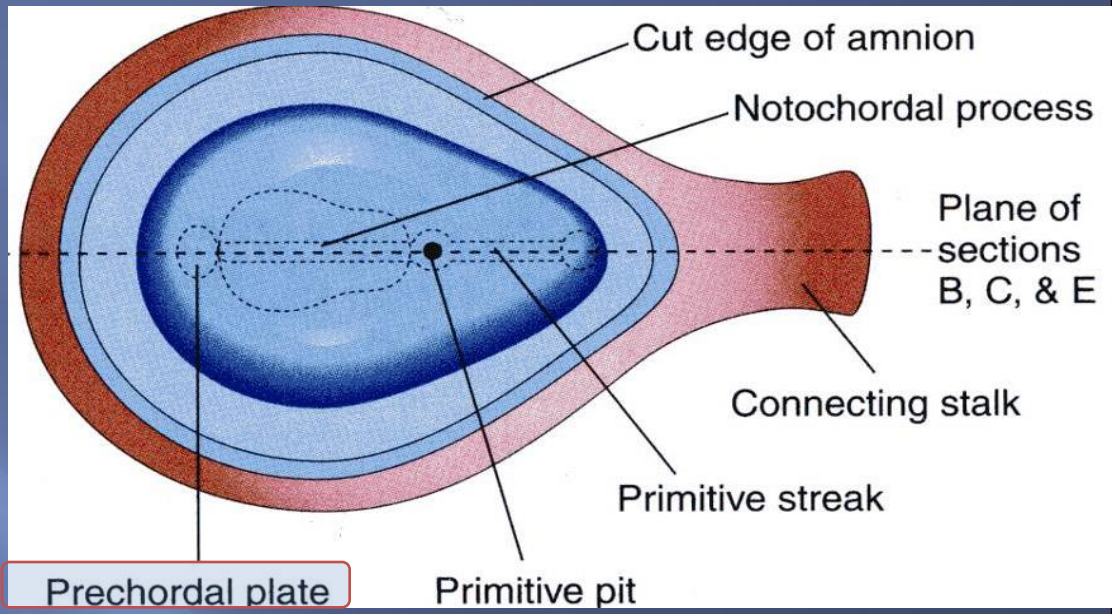
- *It is a localised area of thickening of the **Hypoblast**(endoderm).*
- It is the primordium of the oropharyngeal membrane, located at the future site of the oral cavity.
- ***It indicates:***

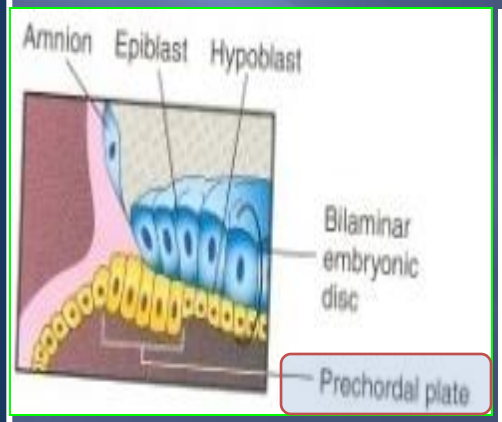
1. The future Cranial end of the embryo.

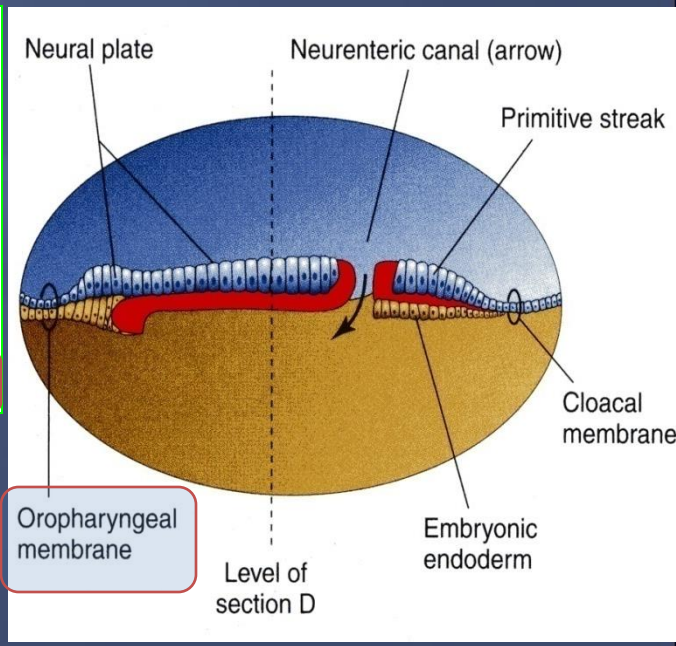
2. The future site of the mouth.

3. It is an important organiser of the Head.

There is no mesoderm in this area.







NOTOCHORD

The notochord acts as a temporary axial skeleton for the embryo.

It is replaced later on by vertebral column.

Its formation starts by appearance of:

1.Prechordal plate.

2.Primitive streak.

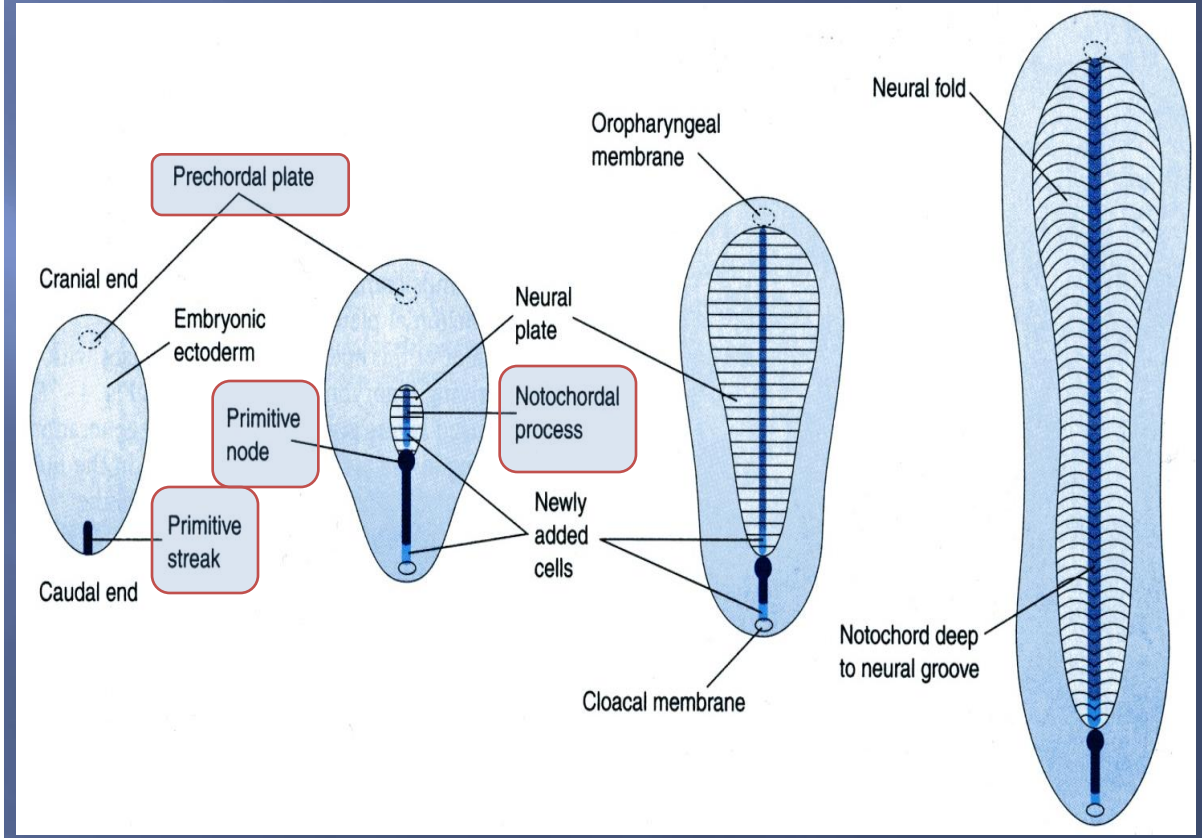
3. Primitive node

4.Notochordal process.

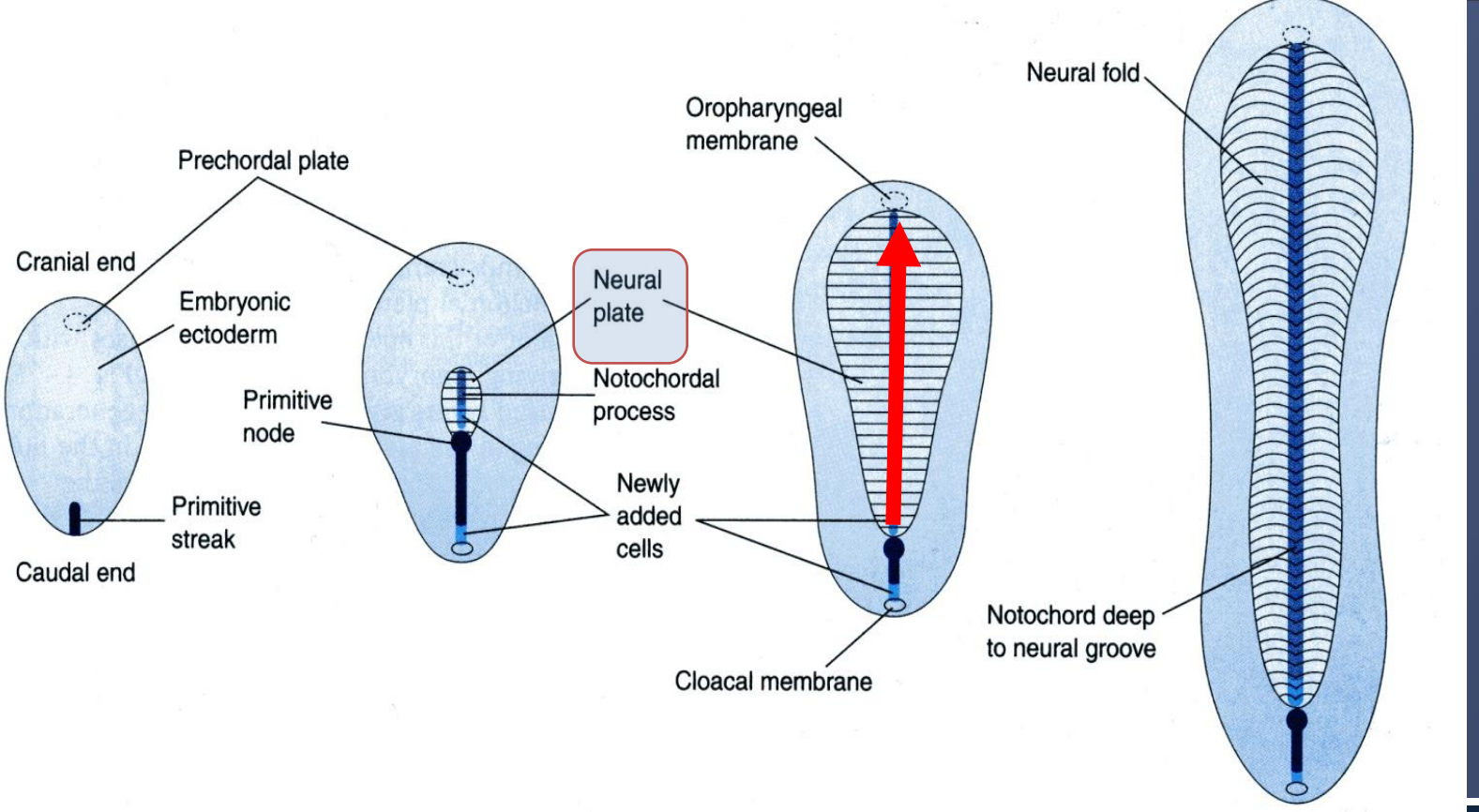
5. Notochordal canal.

6. Notochordal plate.

7. Notochord.

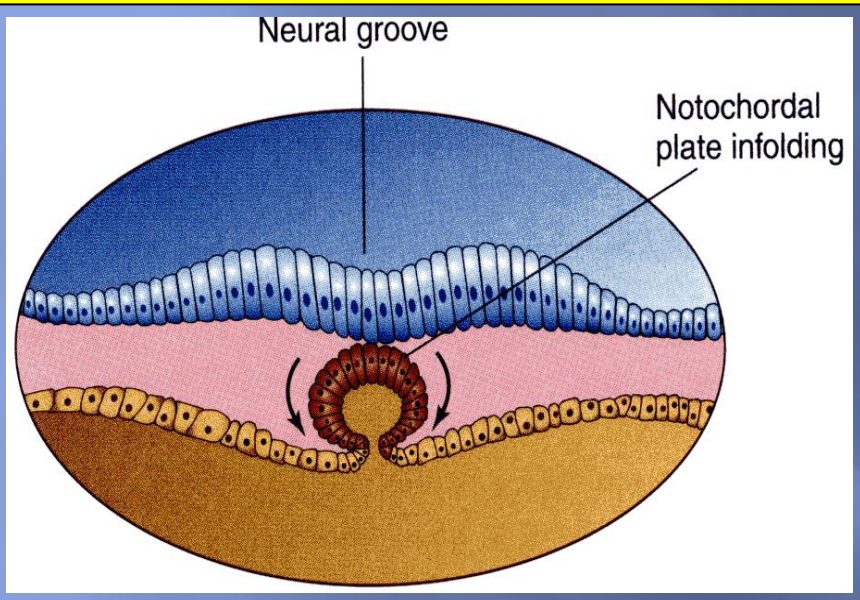


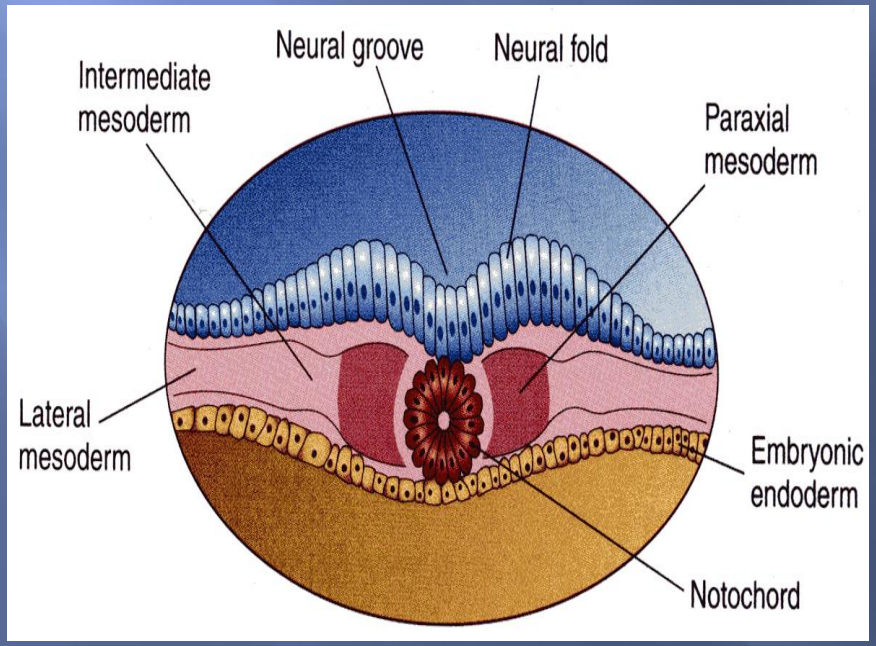
Notochordal process:
It is an extension of cells from the **primitive node** to the **oral cavity.**



- The notochord is a temporary structure *around which the vertebral column forms.*
- *It extends from the primitive node to the oropharyngeal membrane.*
- The notochord degenerates and disappears as the bodies of the vertebrae form, but *it persists as* *the nucleus pulposus* *of each intervertebral disc.*
- The developing notochord induces the overlying ectoderm to thicken & form the neural plate, which will forms the central nervous system (CNS).

FUNCTIONS 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 and neural crest cells

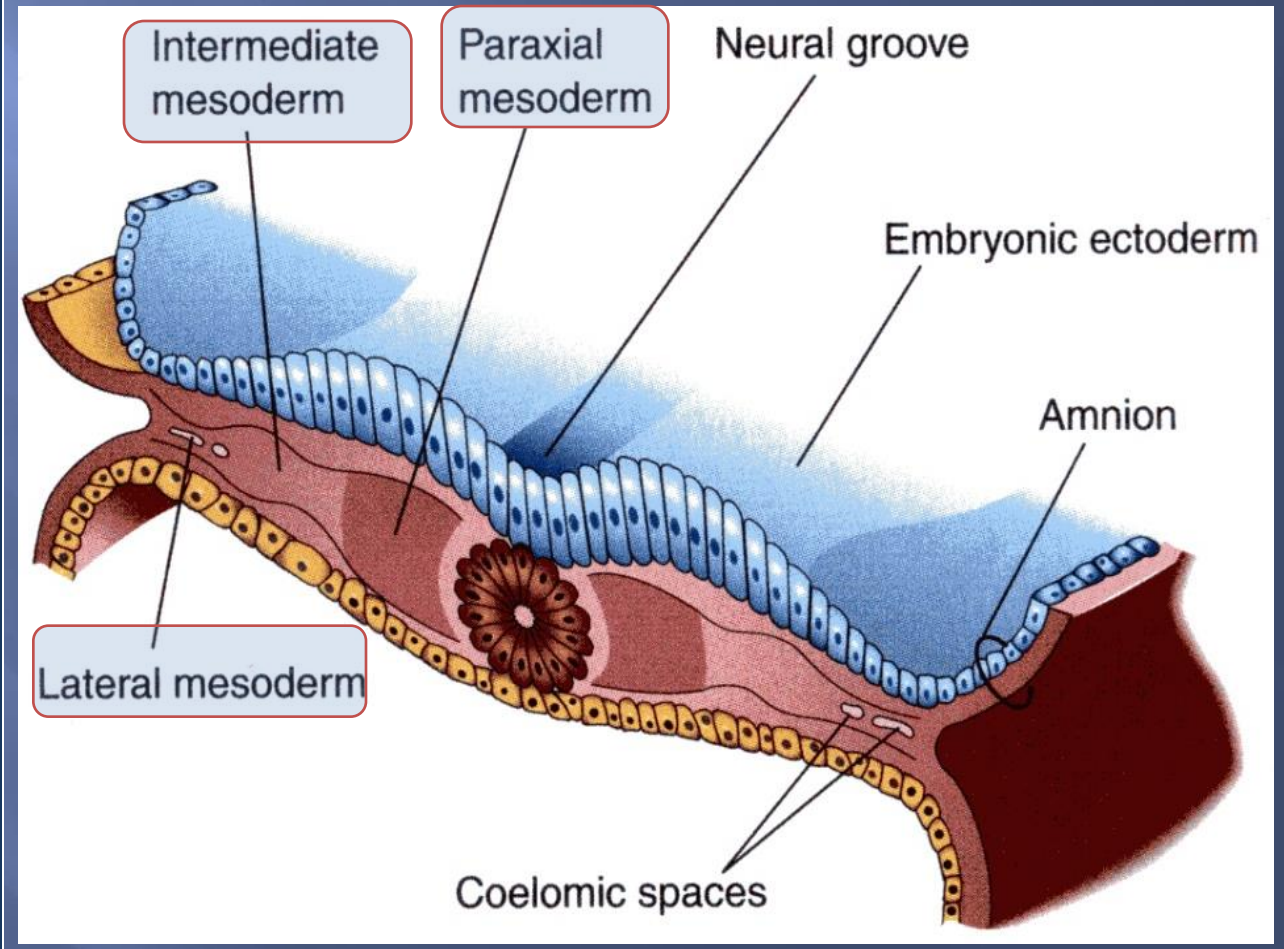
DIFFRANTION OF THE INTRAEMBRYONIC MESODERM

It is divided into:

1-Medial part (Paraxial Mesoderm).

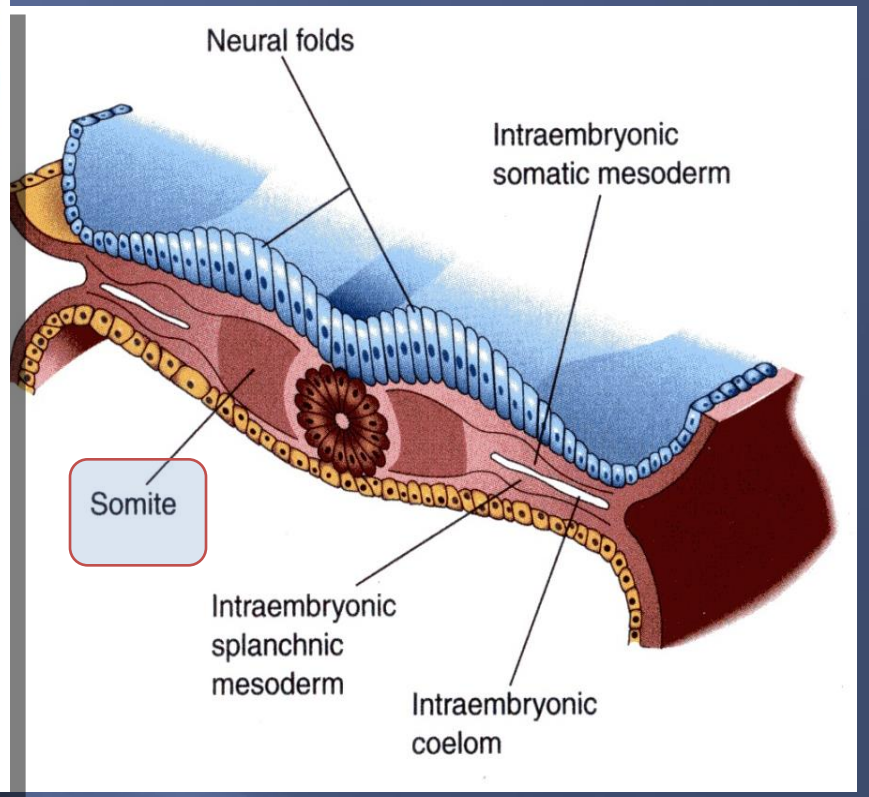
2-Middle part : (Intermediate mesoderm or nephrogenic mesoderm.

3-lateral part (Lateral mesoderm).



SOMITES

Approximate Age (days)	Number of Somites
20	1–4
21	4–7
22	7–10
23	10–13
24	13–17
25	17–20
26	20–23
27	23–26
28	26–29
30	34–35



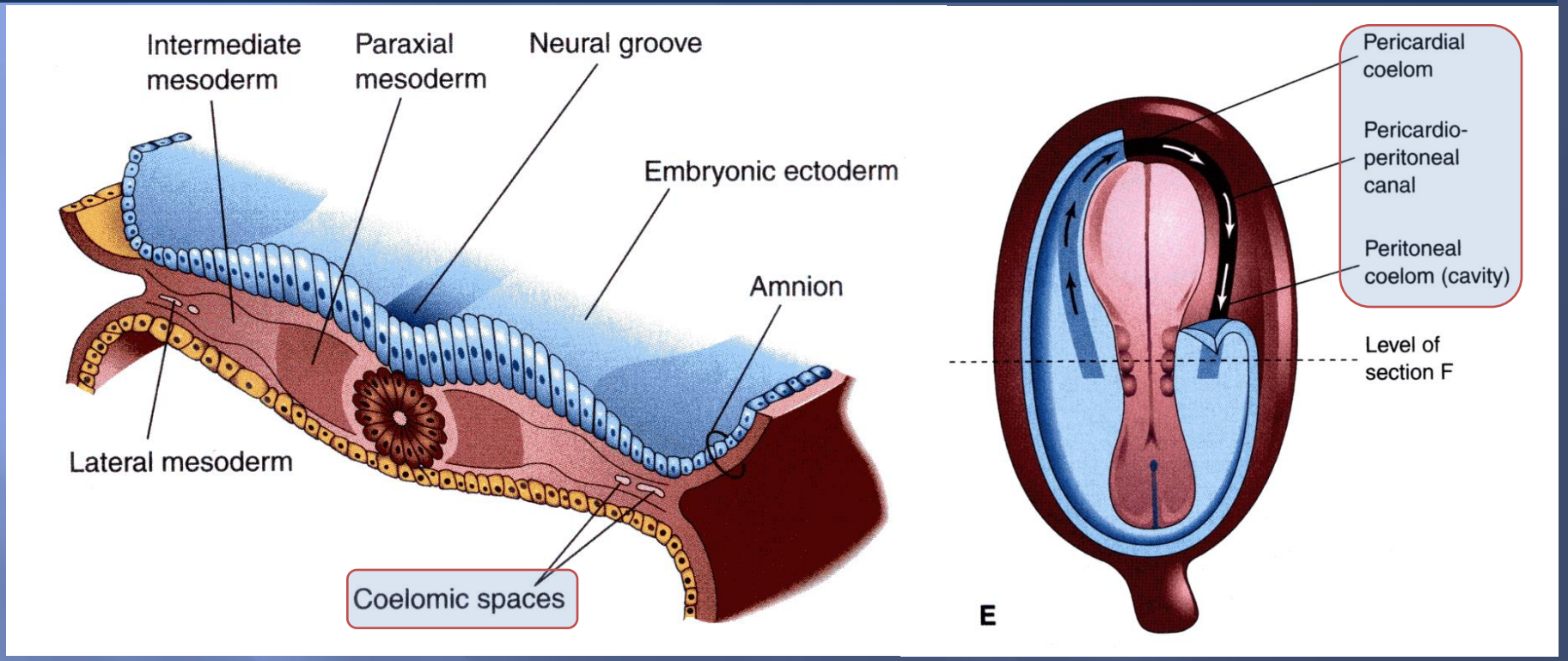
By the end of the third week, the **paraxial mesoderm** begins to divide into **paired cuboidal masses,** called **somites.**

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 3rd week, the first pair of somites appears in the future occipital region, so they develop craniocaudally.

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

Development of Intraembryonic Coelom

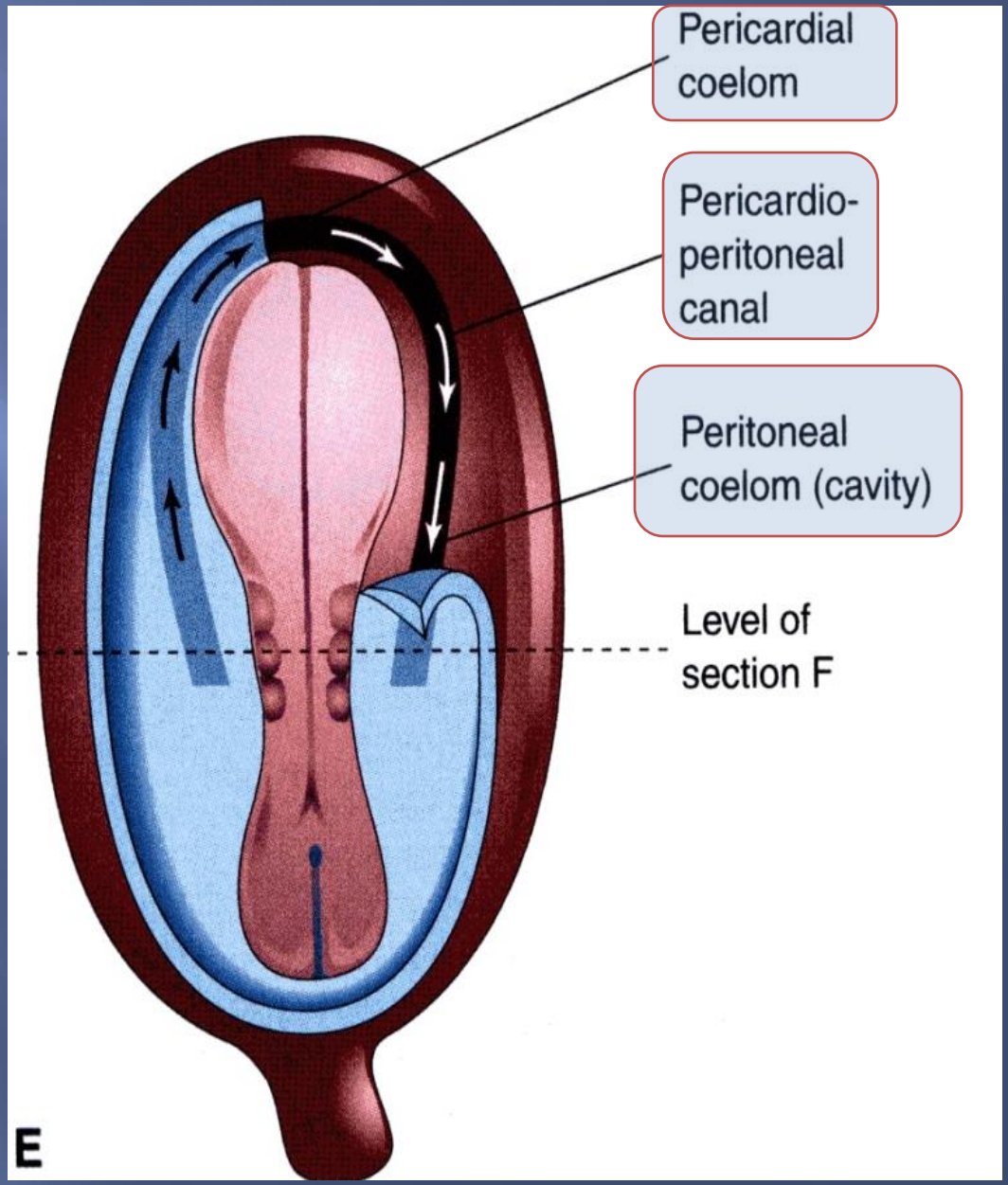


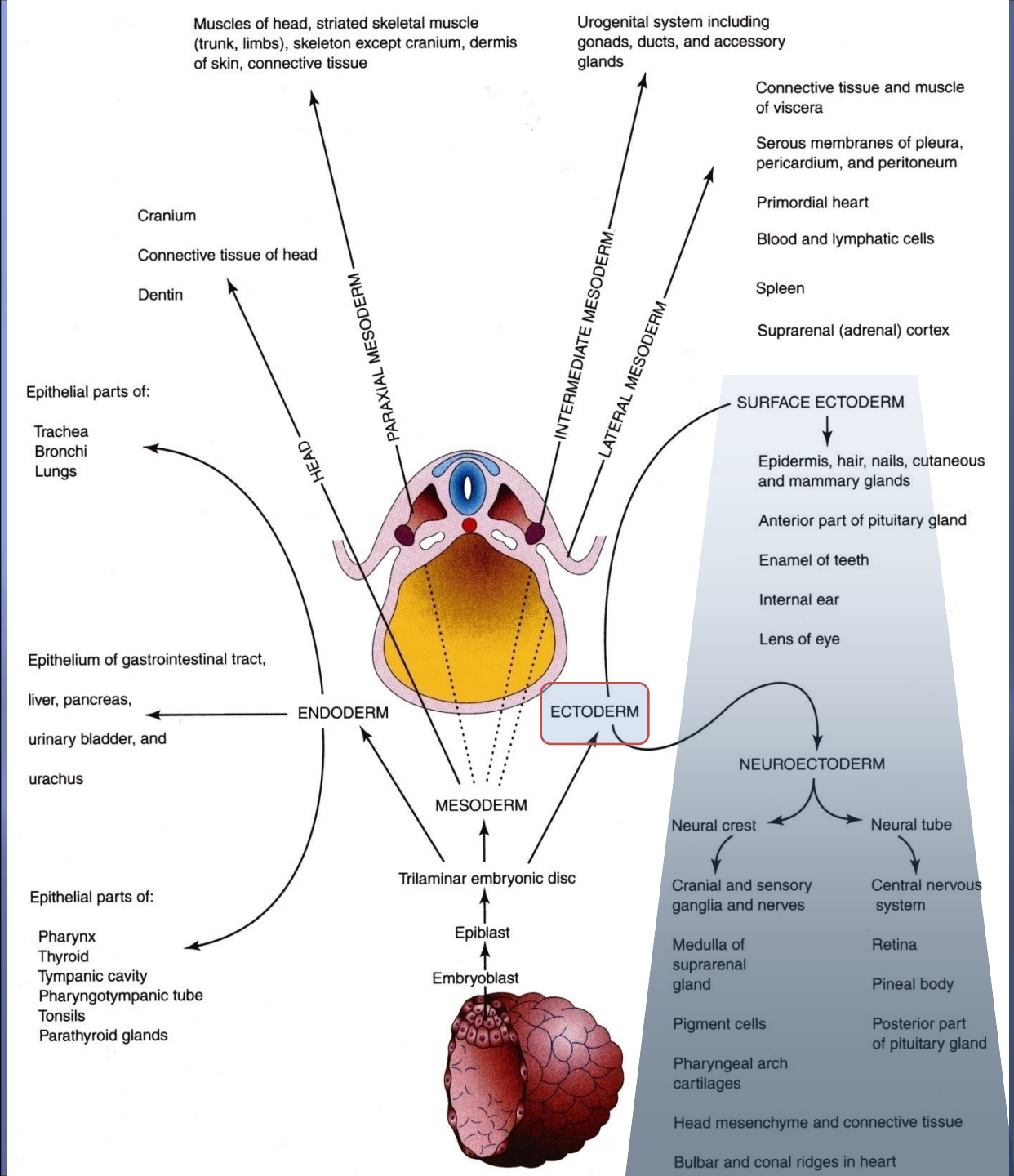
The primordium of the **intraembryonic coelom** appears as isolated *spaces* in the lateral mesoderm.

These spaces soon **unite** to form a **single horseshoe-shaped cavity,** the **intraembryonic coelom.**

During the second month, the intraembryonic coelom is divided into three body cavities:

1. *pericardial cavity*
2. *pleural cavities*
3. *peritoneal cavity*



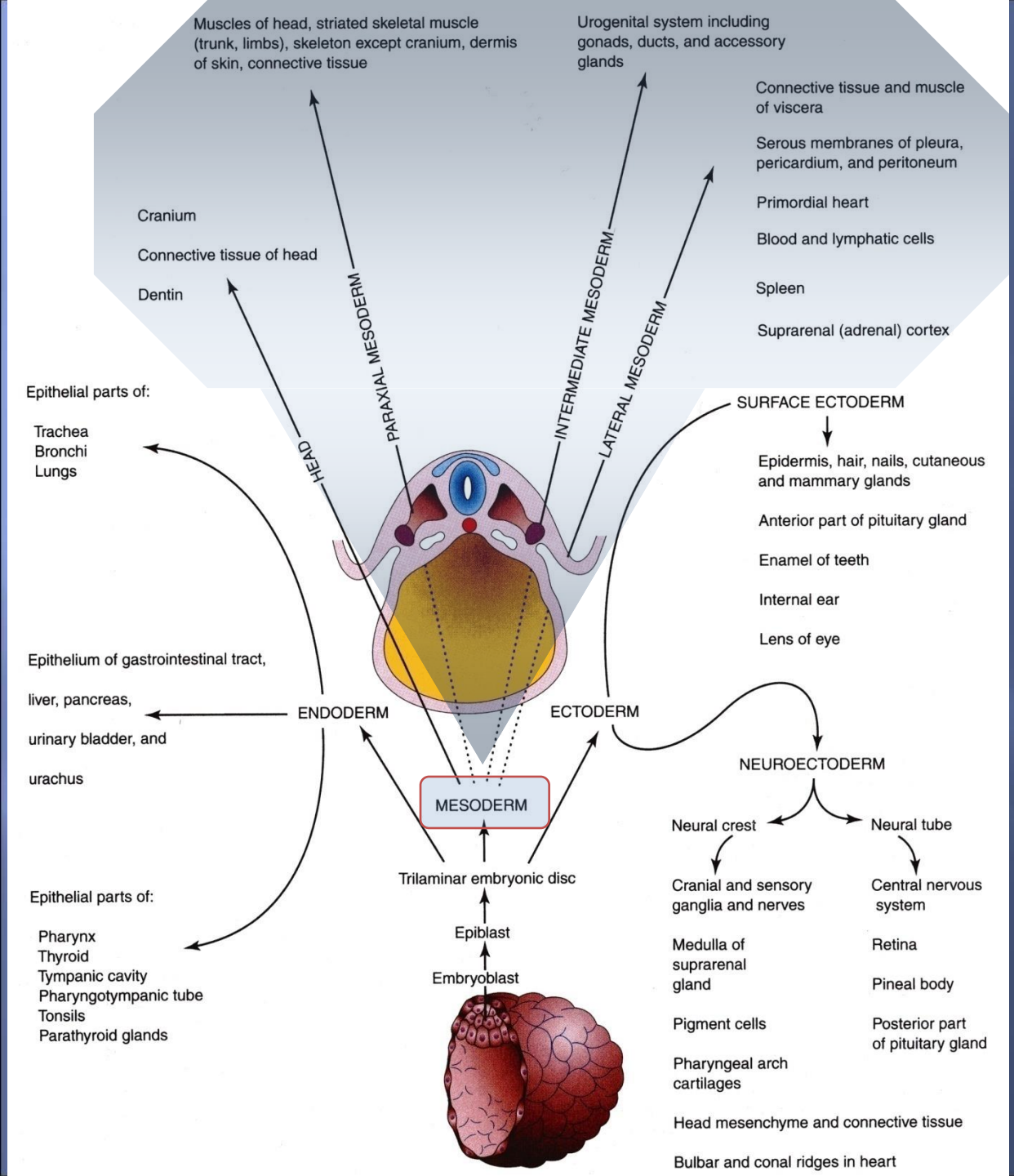


Each of the three germ layers (ectoderm, mesoderm, and endoderm) gives rise to specific tissues and organs.

Embryonic ectoderm gives rise to

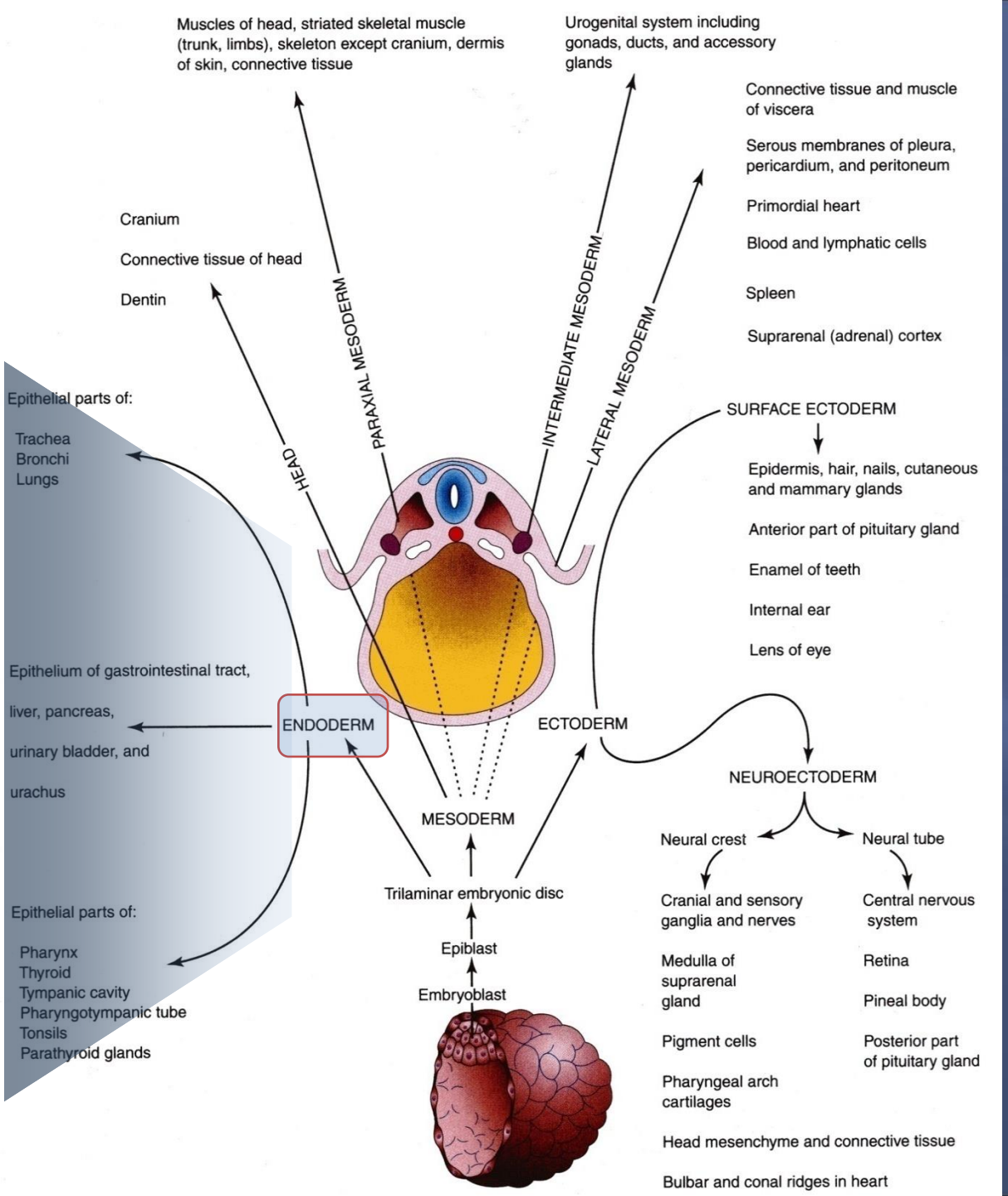
- The surface ectoderm
- The neuroectoderm

central & peripheral nervous systems,



The embryonic mesoderm gives rise to :

- **Paraxial :** Skeleton (vertebral column & limbs), Straited musles , dermis
- **Intermadiate :** urogenital system
- **Lateral plate :** connective tissue and smooth muscle of viscera.



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

Thank you