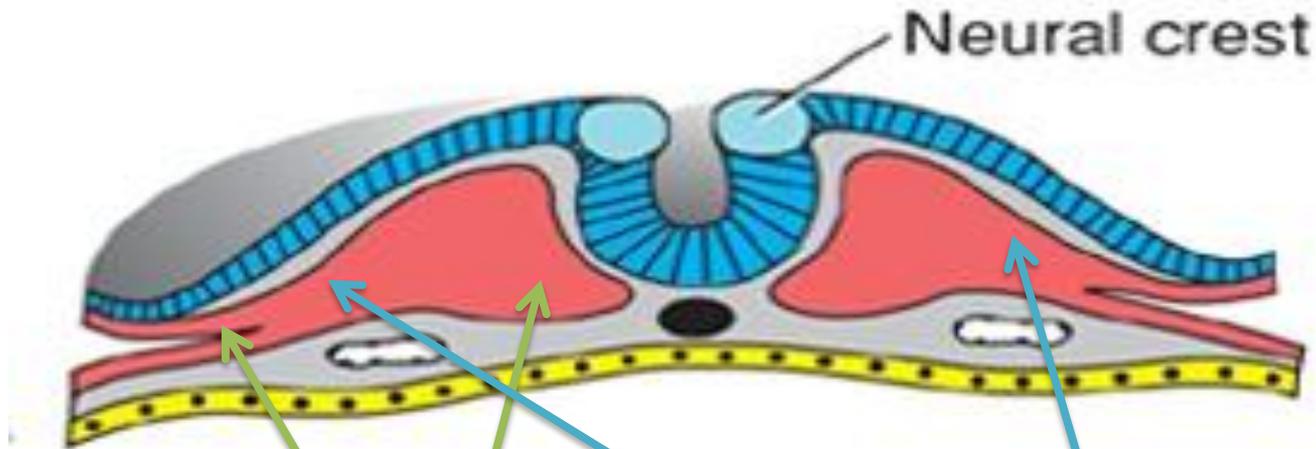


# DERIVATIVES OF THE MESODERMAL GERM LAYER

# Paraxial mesoderm



It develops into  
**TWO PERIPHERAL MASSES**  
and a **constriction in the middle**

Called:

**1-Medial mesoderm**



Intermediate mesoderm

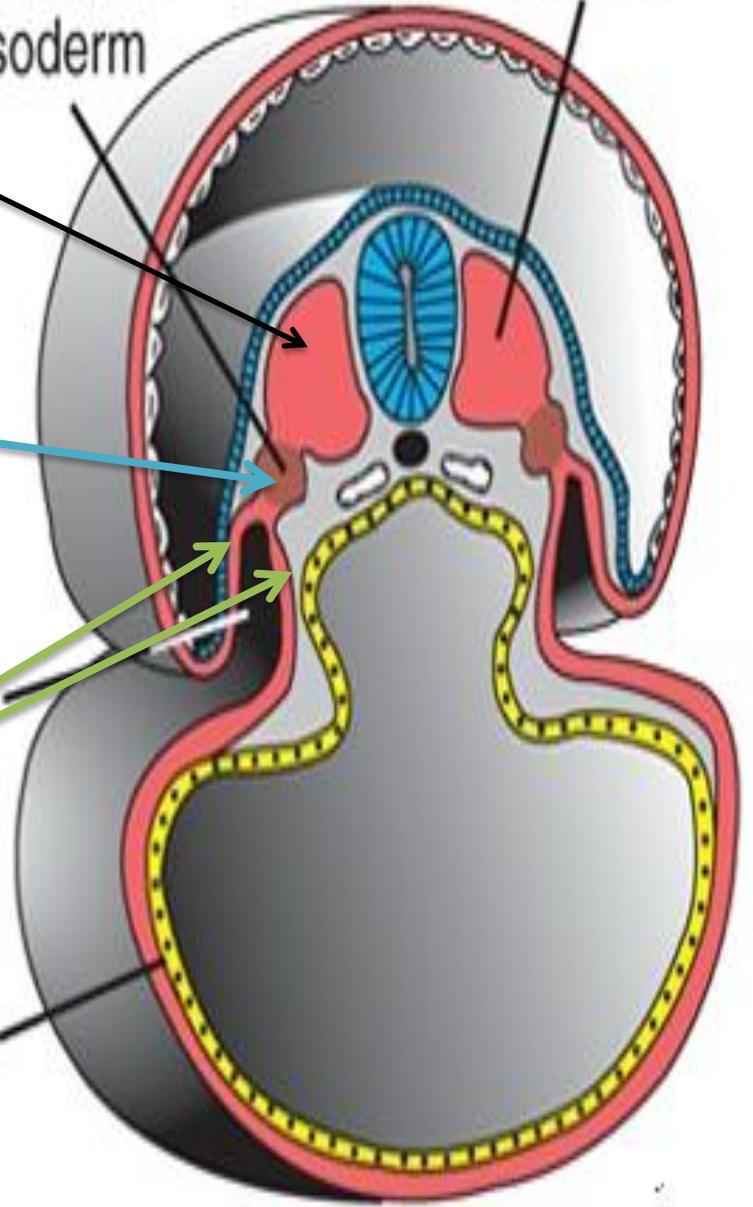
Somite

**2-Intermediate mesoderm**

**3-lateral mesoderm**

Intra-embryonic body cavity

Endoderm

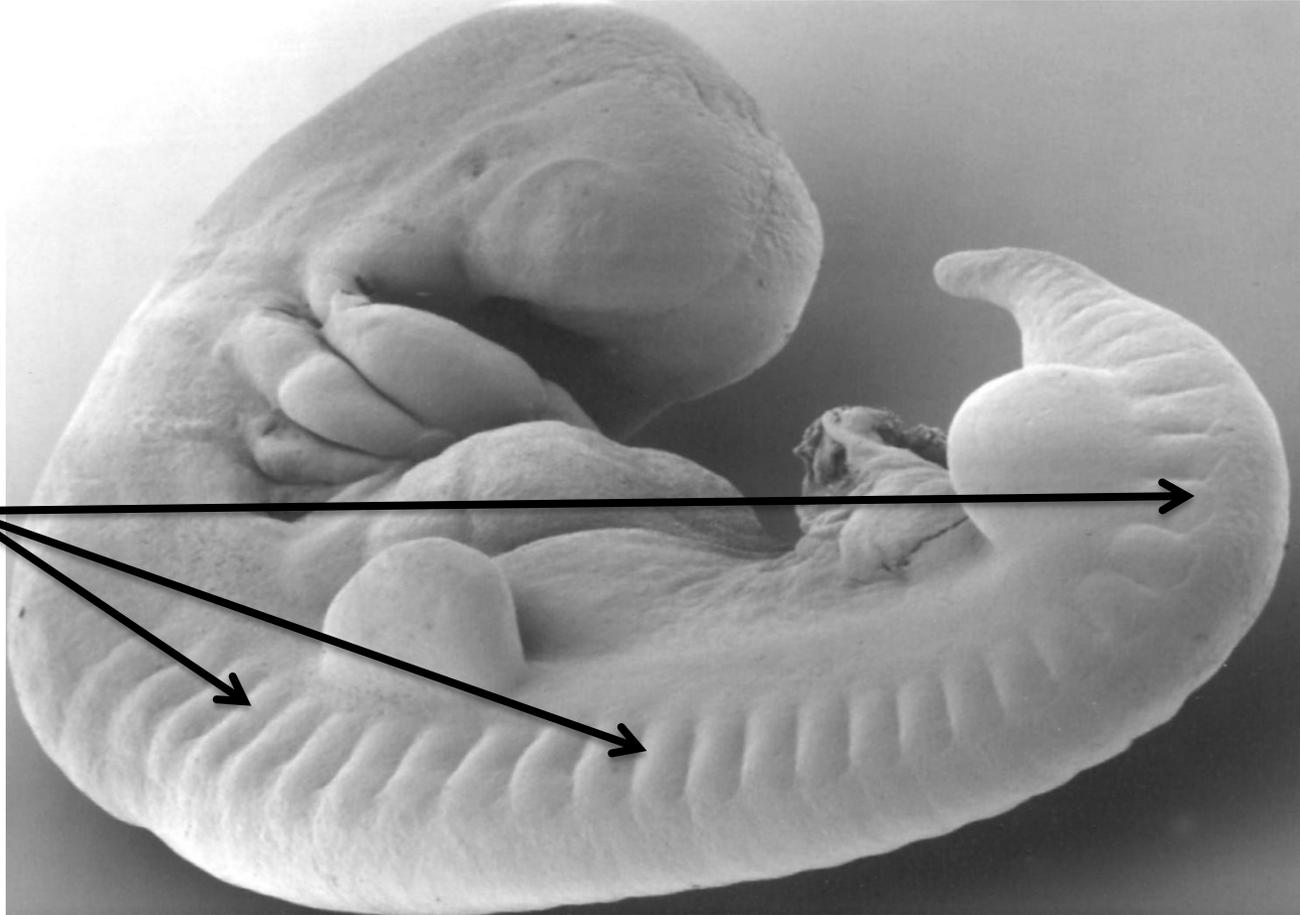


# Medial mesoderm

- The medial mesoderm enlarges pushing the ectoderm upwards to give the **somites**

- As the embryo develops the number of the somites increases from one to reach about **44-45 somites**
- when the embryo is completely developed

About 10 somites vanish when the tail of the embryo is lost



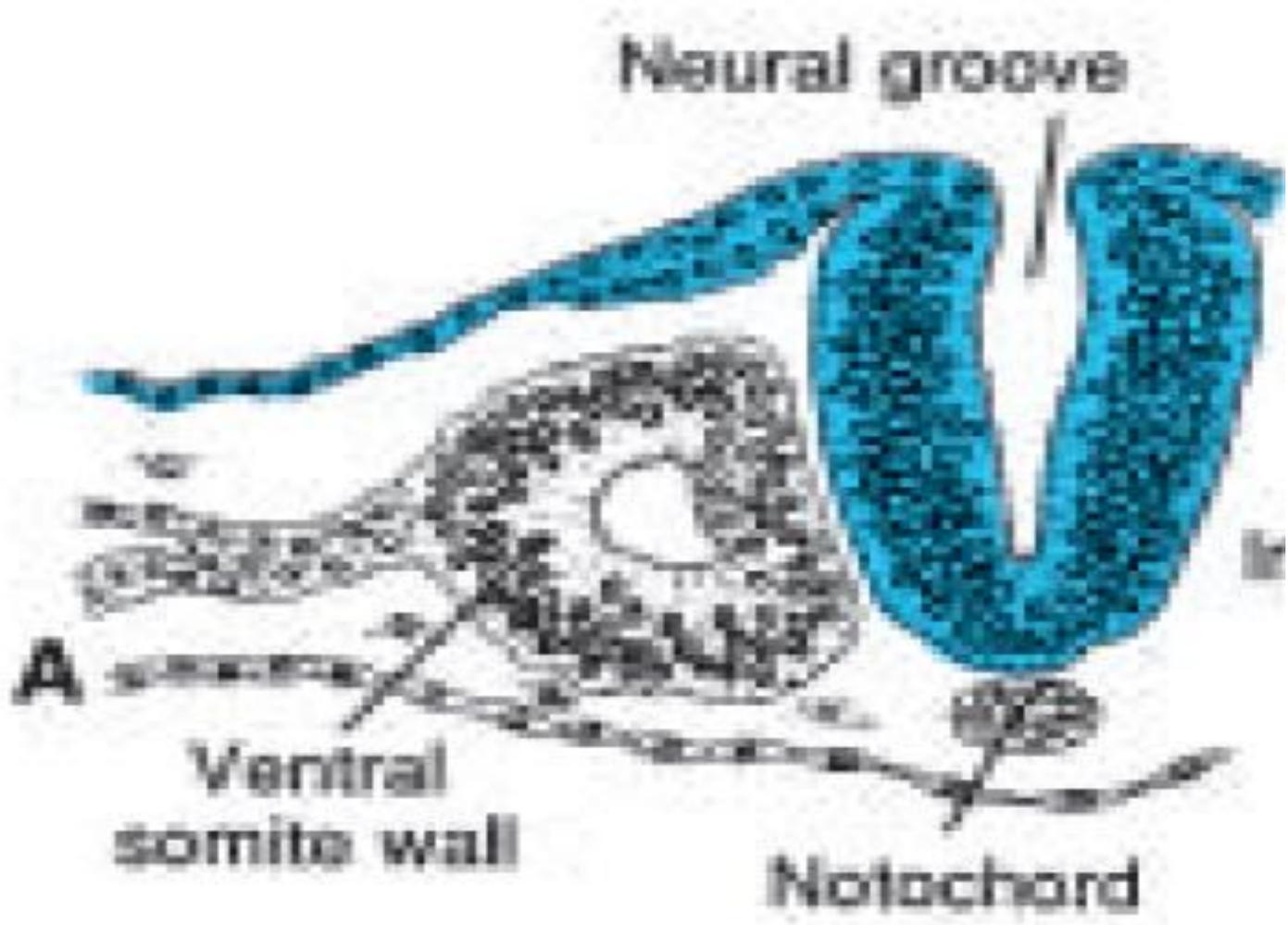
- ❖ **The first pair** of somites arises in the **occipital region** of the embryo **at** approximately the **20th day** of development
- ❖ From here, new somites appear in craniocaudal sequence at a rate of approximately three pairs per day until the end ***of the fifth week***,



**There are:**  
**four occipital**  
**eight cervical**  
**12 thoracic**  
**five lumbar**  
**five sacral,**  
**and eight to 10 coccygeal pairs.**

The  
first occipital and the last five to seven coccygeal somites later disappear

WHAT IS THE destiny OF EACH SOMITE?

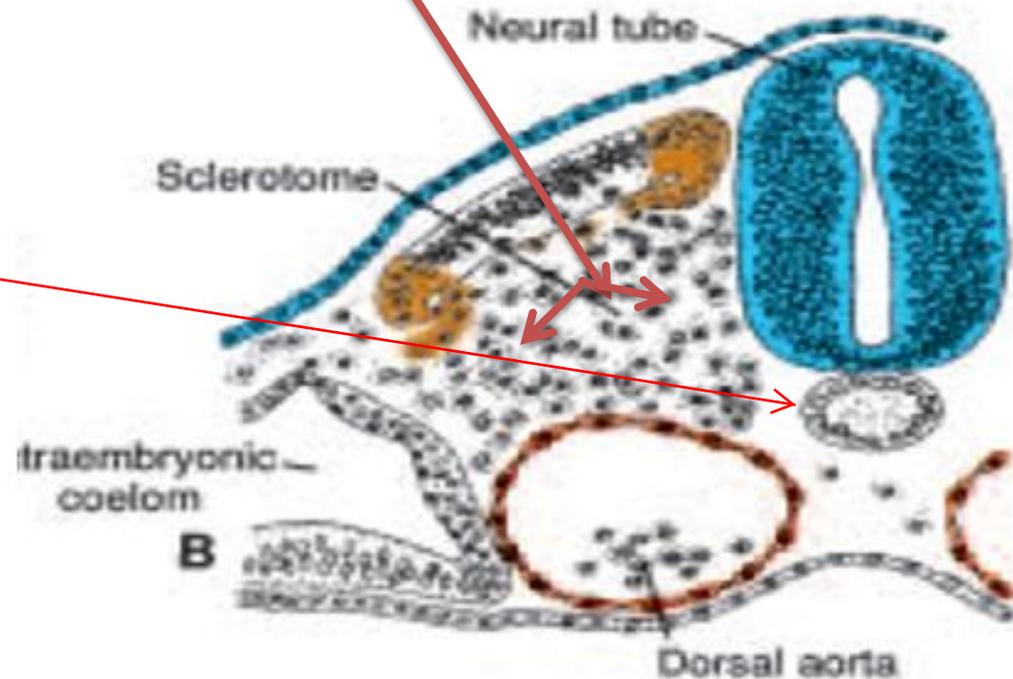


By the beginning of the fourth week  
cells forming the ***ventral and medial walls of the somite***  
lose their compact organization,  
and shift their position to surround the notochord  
These cells, collectively known as

## **THE SCLEROTOME**

They will  
surround the  
spinal cord and  
notochord to form

**the**  
**vertebral**  
**column**



Cells at the dorsolateral portion of the somite also migrate as precursors of the

**limb and body wall**

**musculature**

(hypomeric) musculature

*After migration of these muscle cells and cells of the sclerotome,*

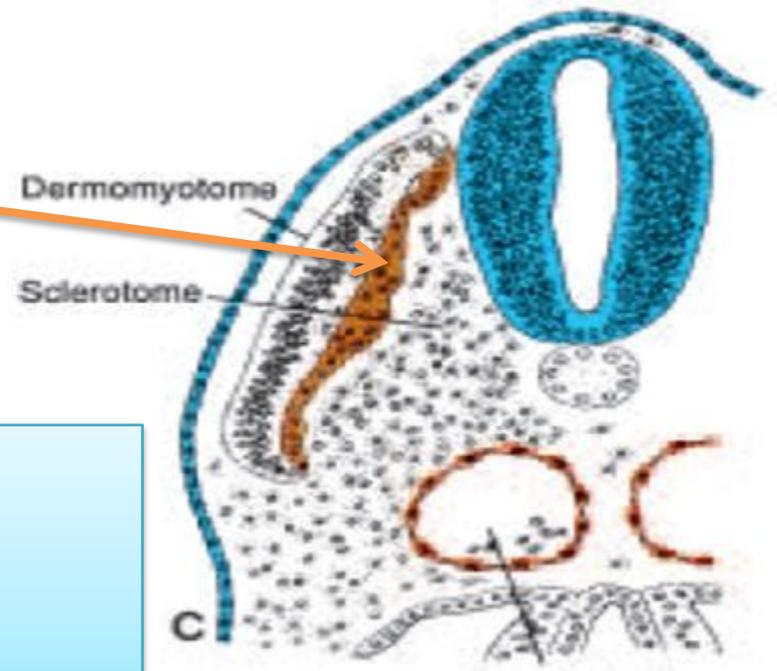
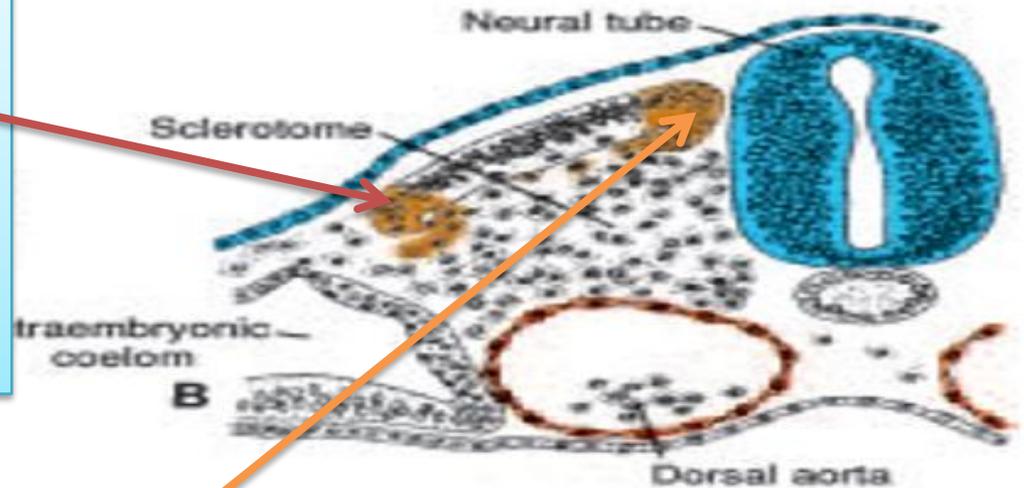
*Cells at the dorsomedial portion of the somite proliferate and migrate to form a new layer*

**THE MYOTOME**

myotome contributes to muscles of the back (epaxial musculature)

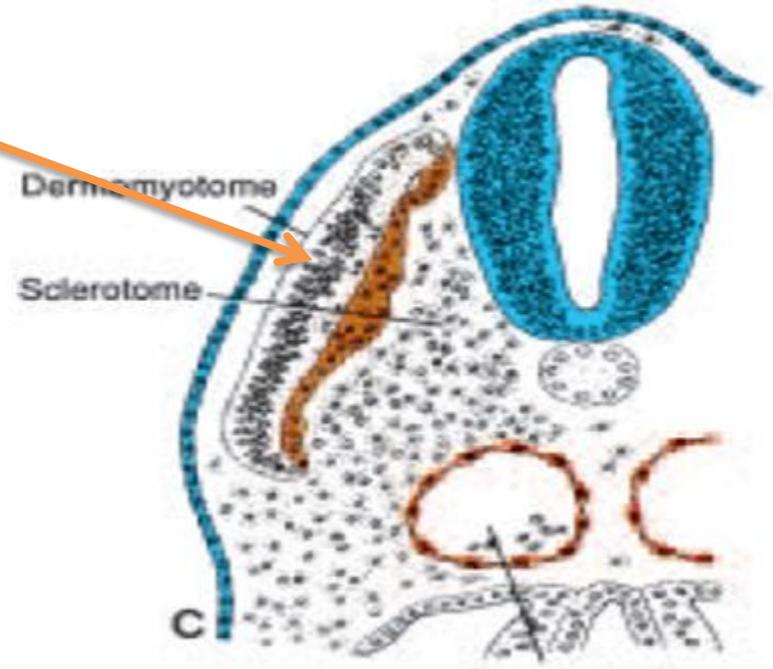
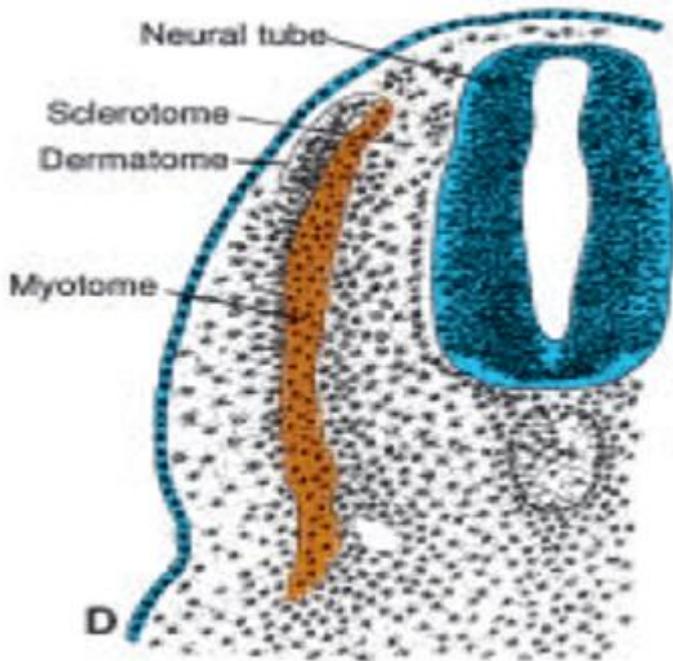
*or epimeric musculature*

the extensor muscles of the vertebral column



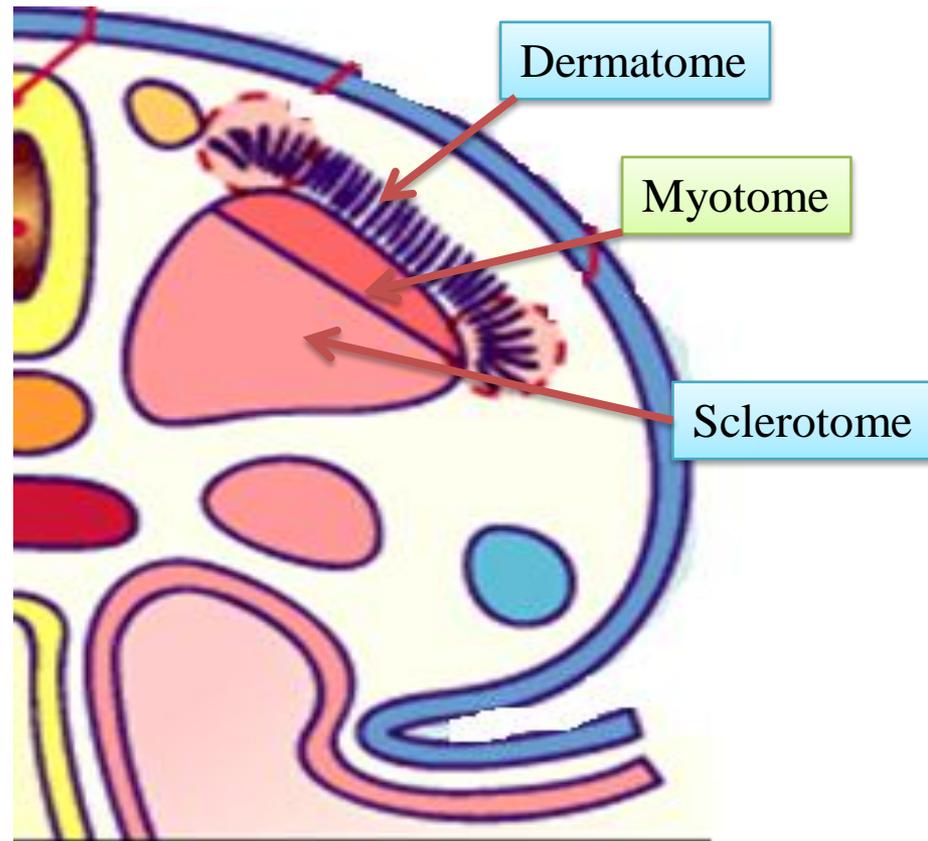
*The remaining dorsal  
epithelium  
forms the dermatome*

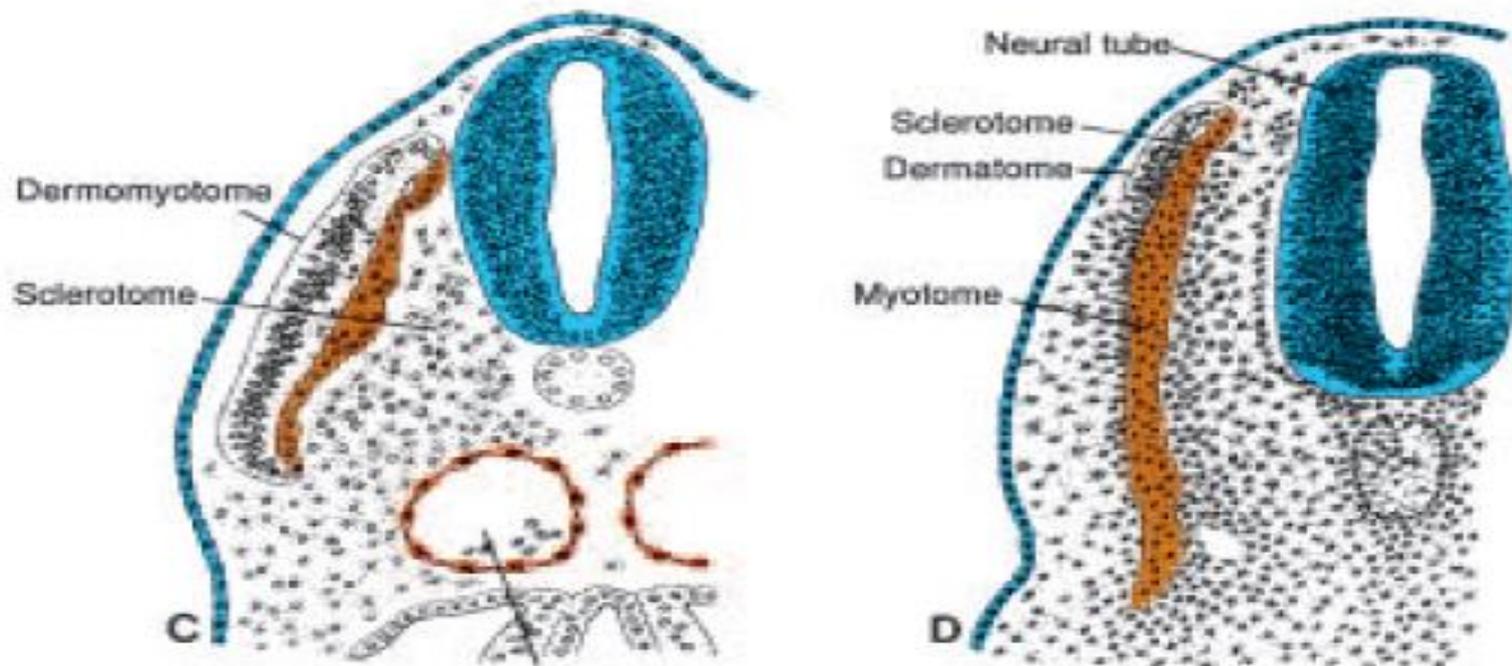
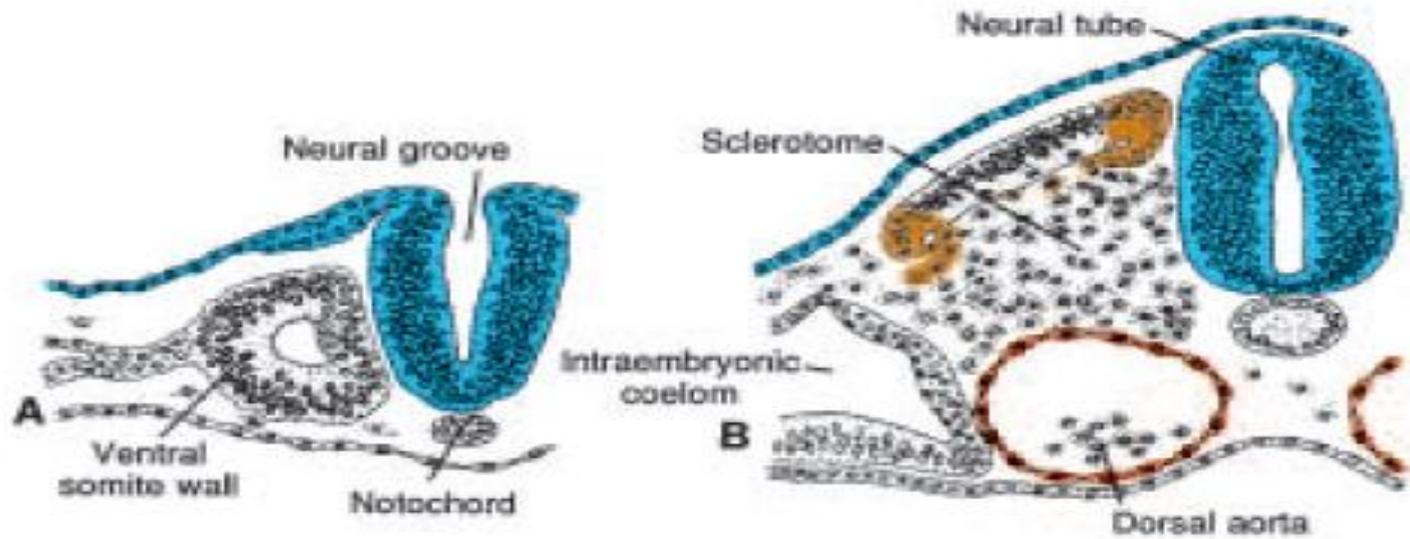
dermatomes form  
the dermis and subcutaneous tissue of the skin





a transversal section through the embryo at level A is displayed. The somites have released themselves and form *dermatomes*, *myotomes* and *sclerotomes*.



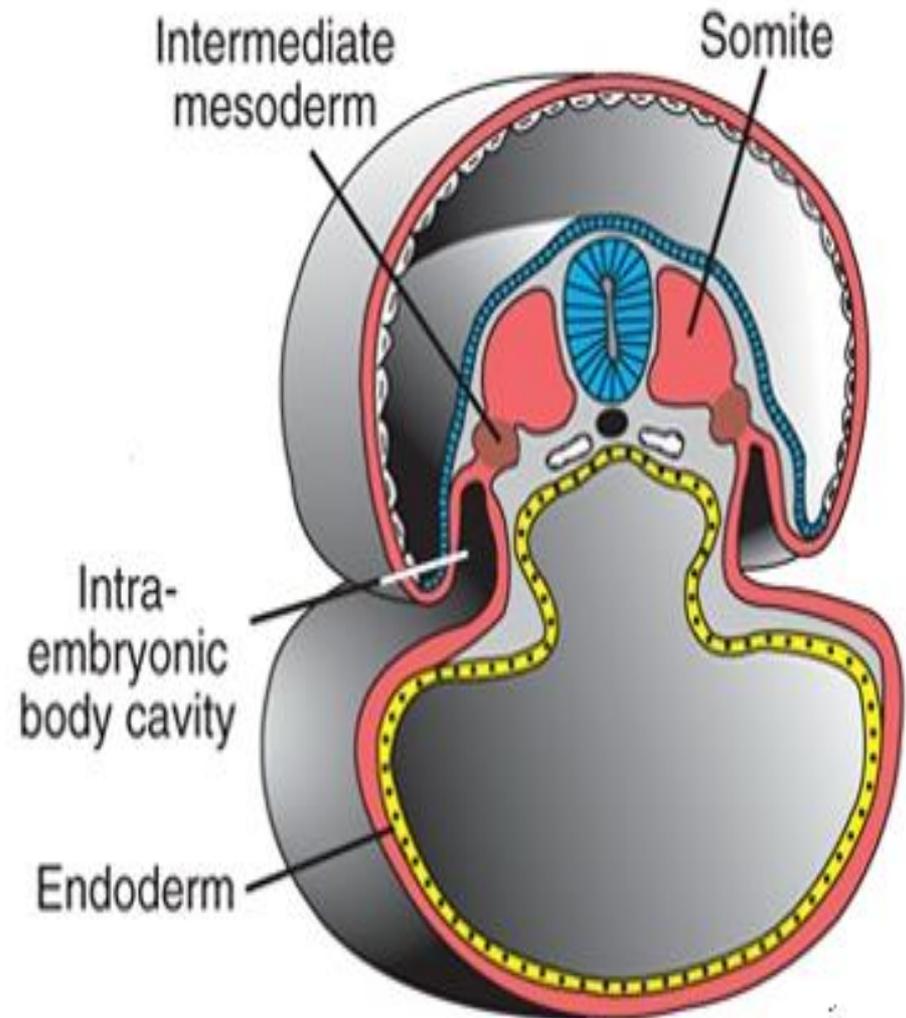


# DERIVATIVES OF THE INTERMEDIATE MESODERM

**It gives off:**

**1- Urine performing tubule (Kidney  
and ureter)**

**2-internal genitalia in males and femals  
(part of it not all)**



**Embryonic folds**

# WHY the embryo folds?

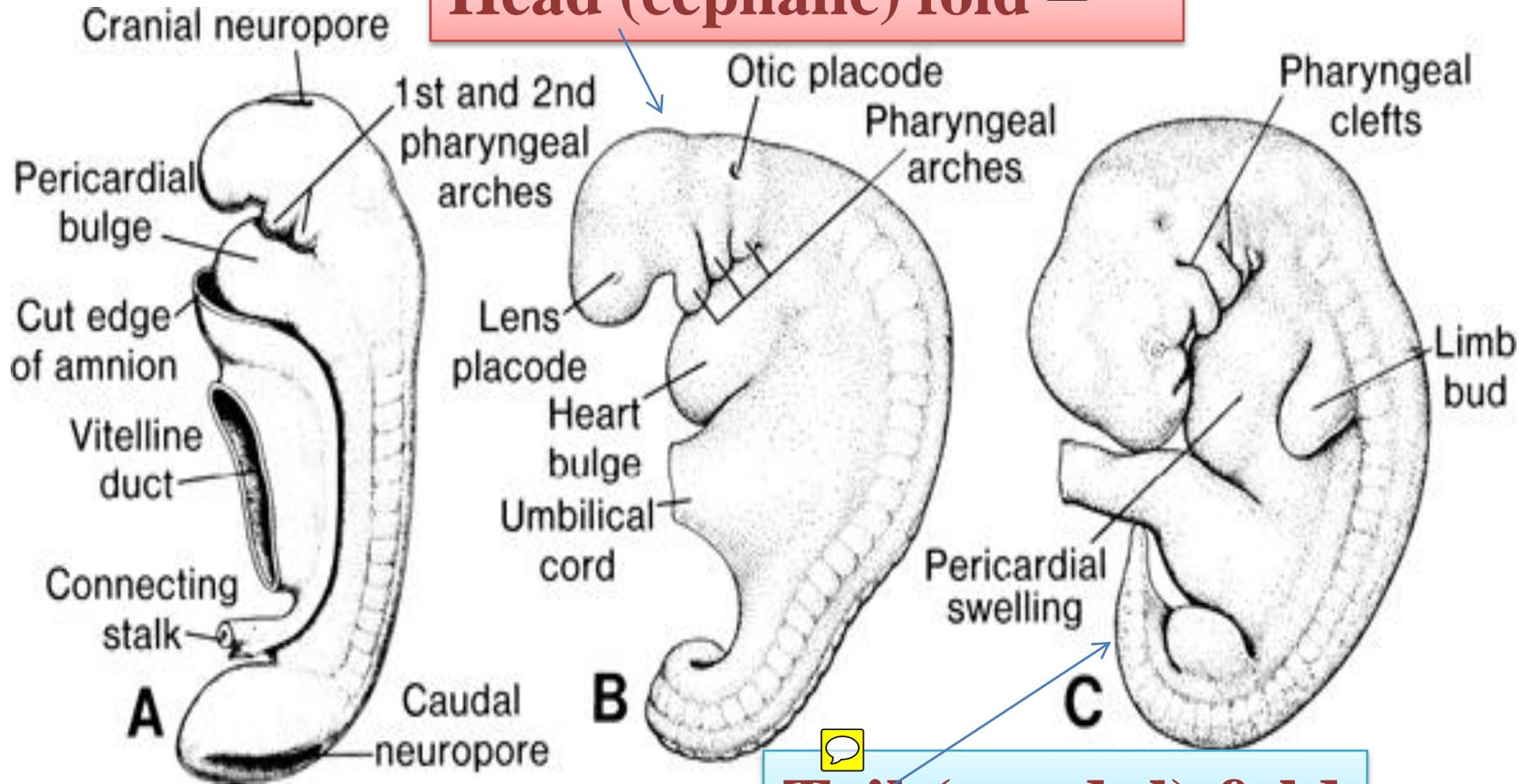
1- Extensive and rapid growth of the cranial end of the neural tube

2- The faster growth of the axial part of the embryonic disc than its periphery

3- Enlargement of the **amnion**

# Folding of the embryo Cephalocaudally and Laterally

## Head (cephalic) fold

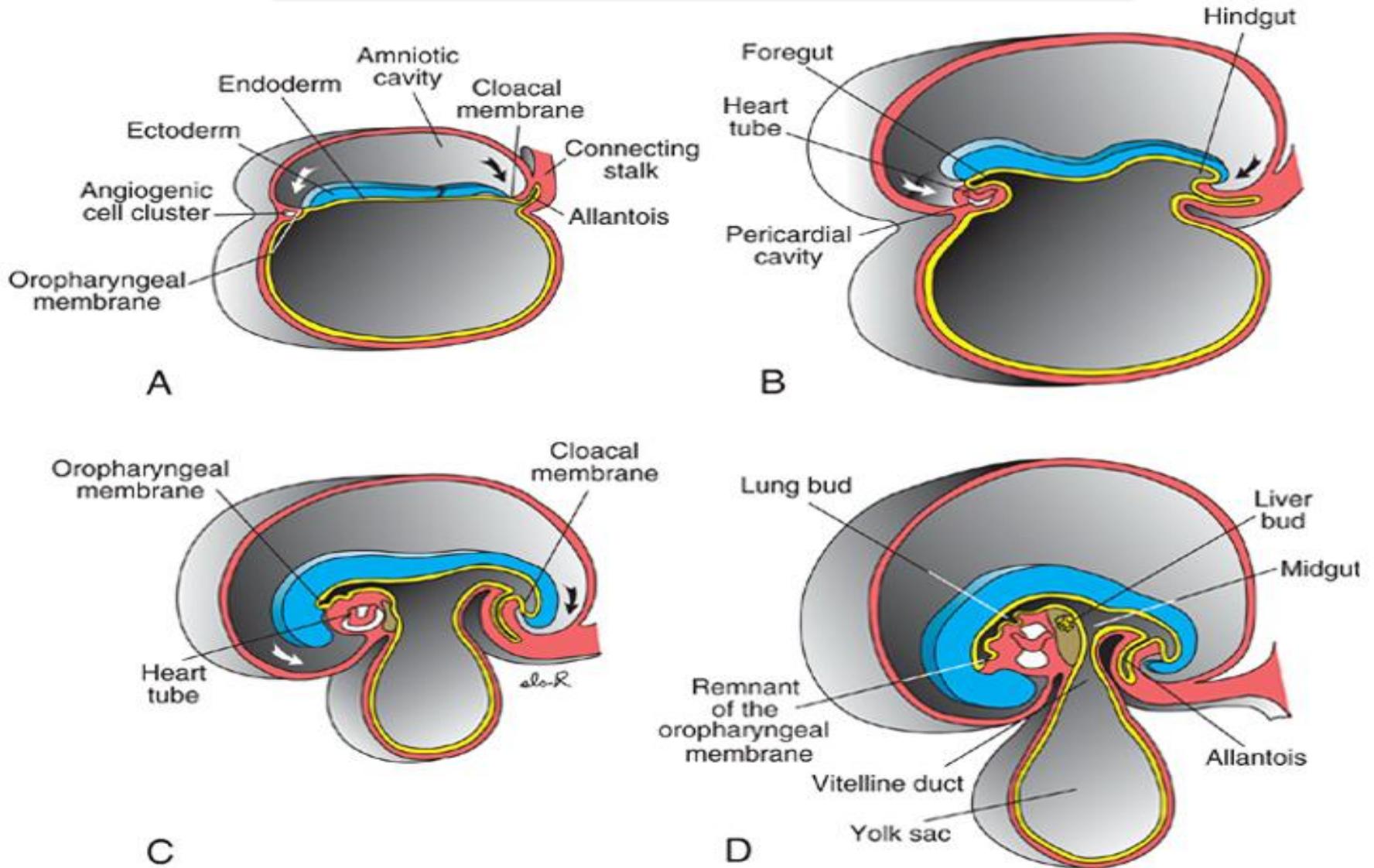


## Tail (caudal) fold

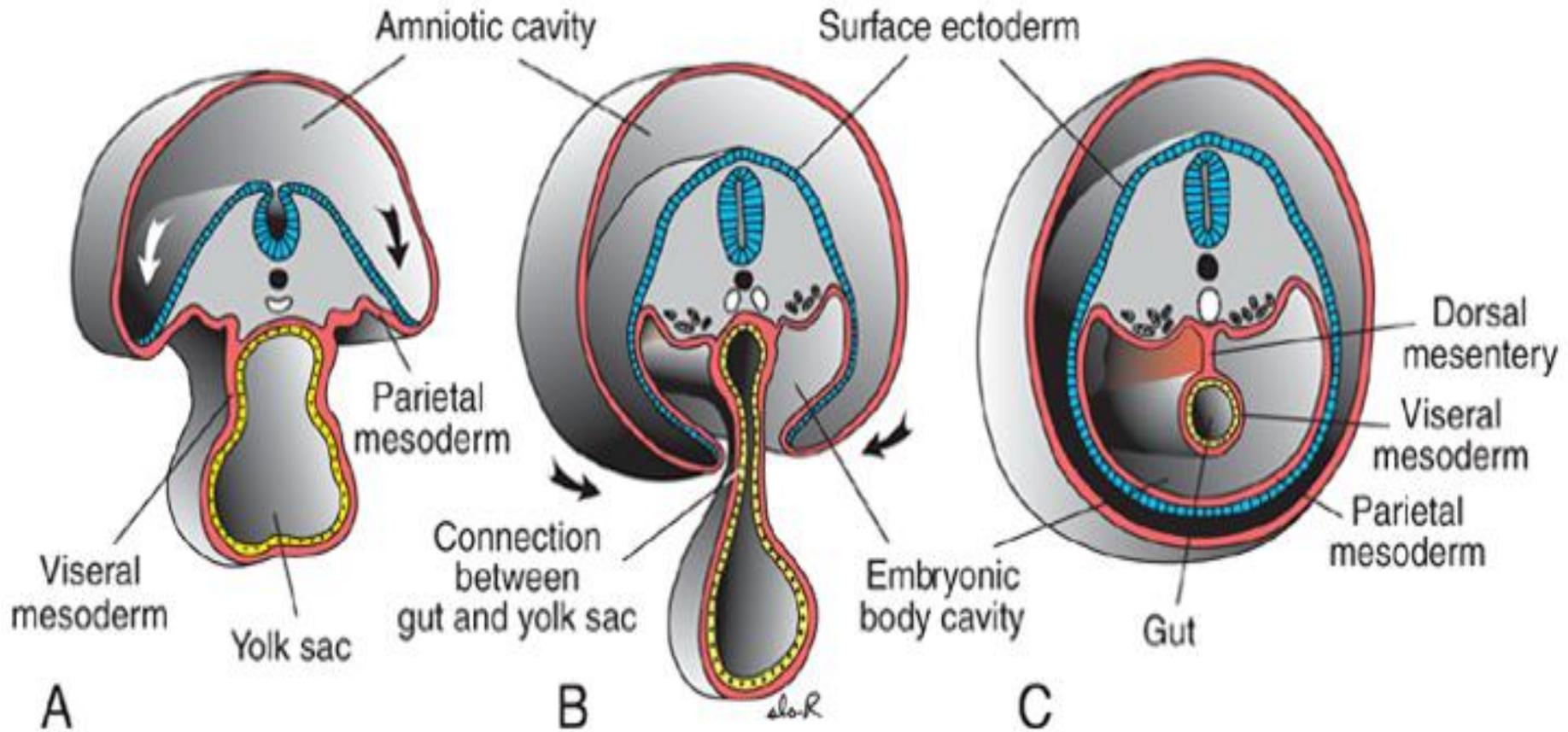
The embryonic disc begins to bulge into the amniotic cavity and to fold

# Cephalocaudally

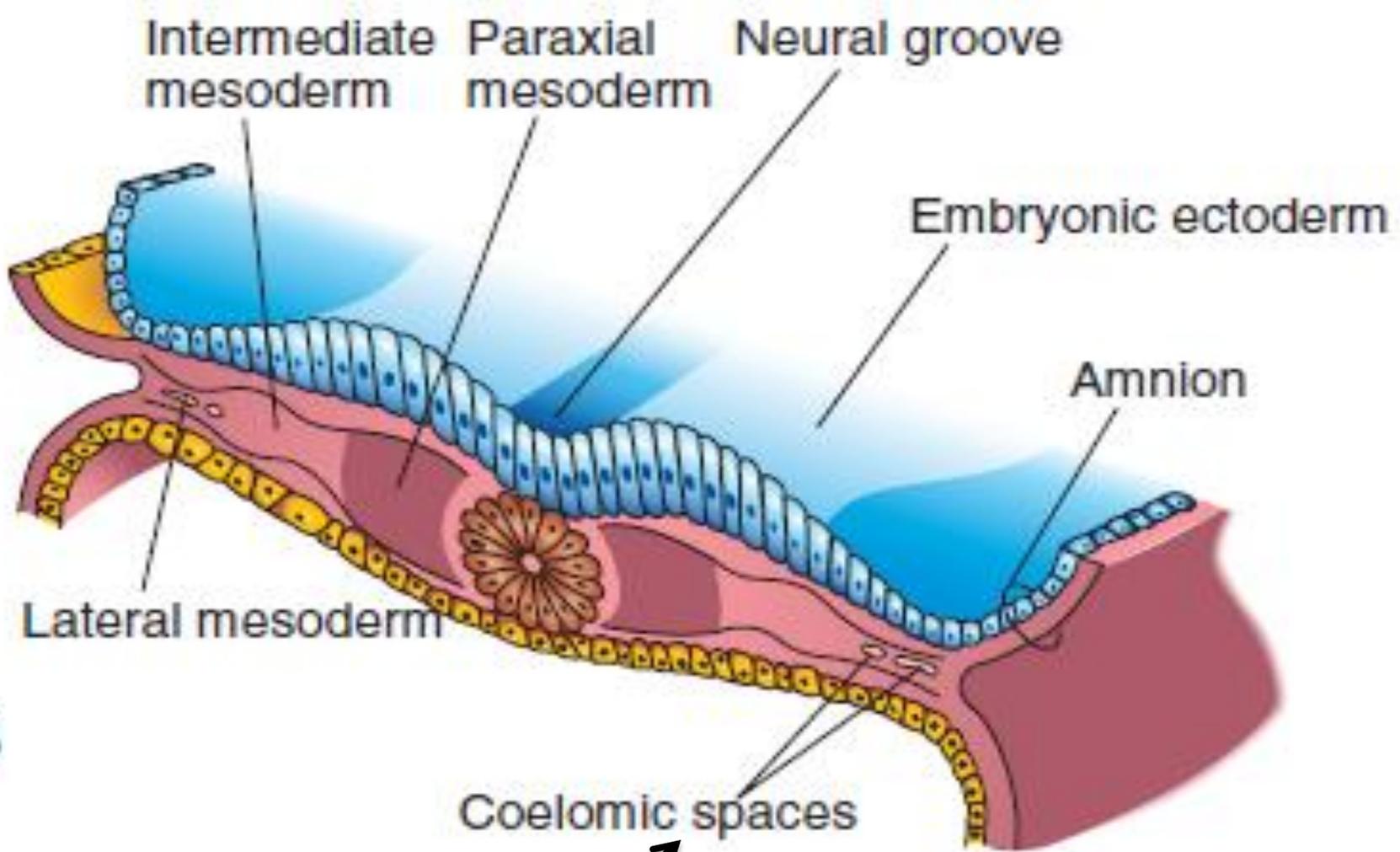
# Folding of the embryo Cephalocaudally



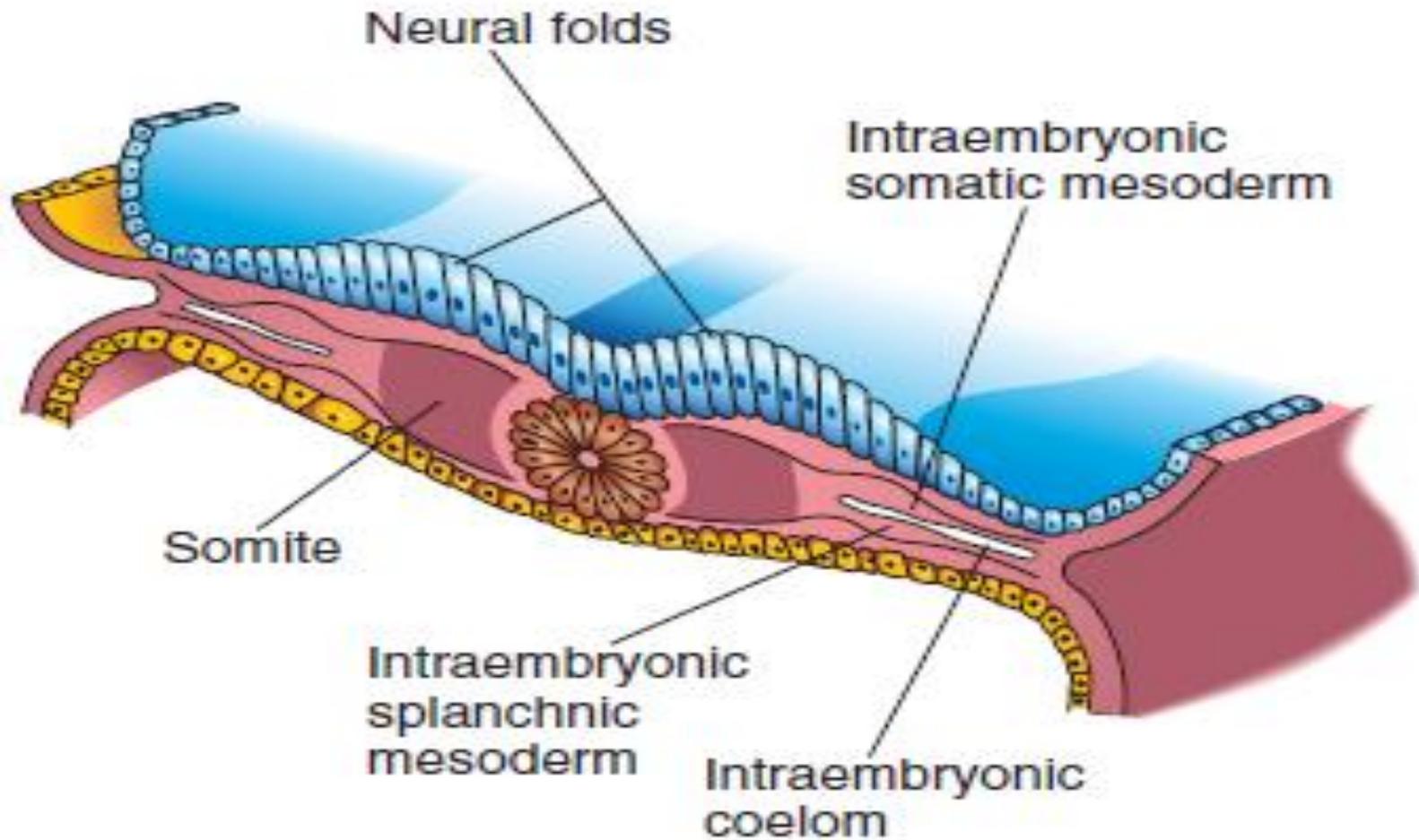
# Folding of the embryo Laterally



DERIVATIVES OF  
THE LATERAL  
MESODERM

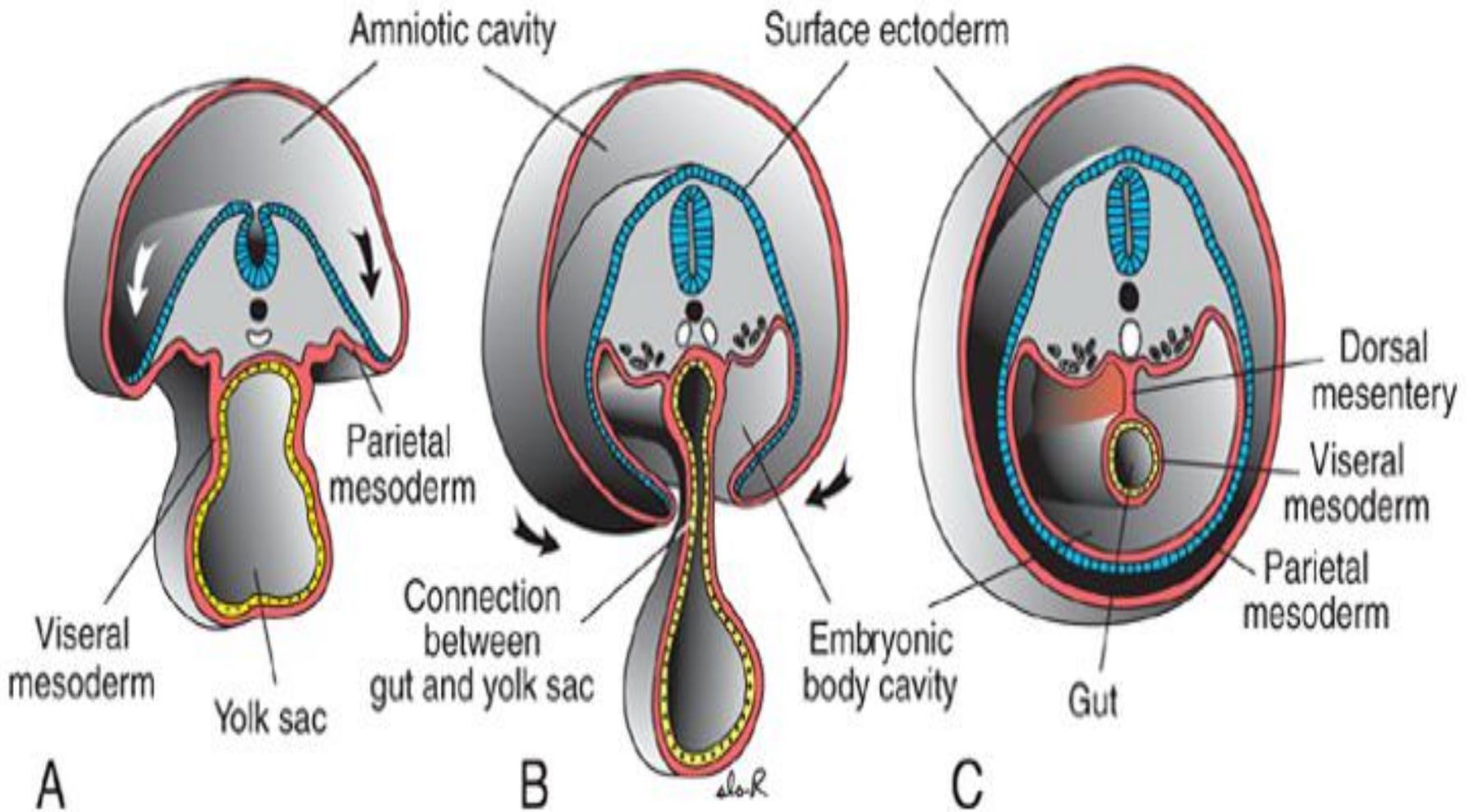


The intraembryonic coelom (body cavity) first appears as small, isolated, **coelomic spaces in the lateral intraembryonic mesoderm**



These spaces **coalesce** to form a single, horseshoe-shaped cavity—the **intraembryonic coelom**

*The coelom divides the lateral mesoderm into two layers:*



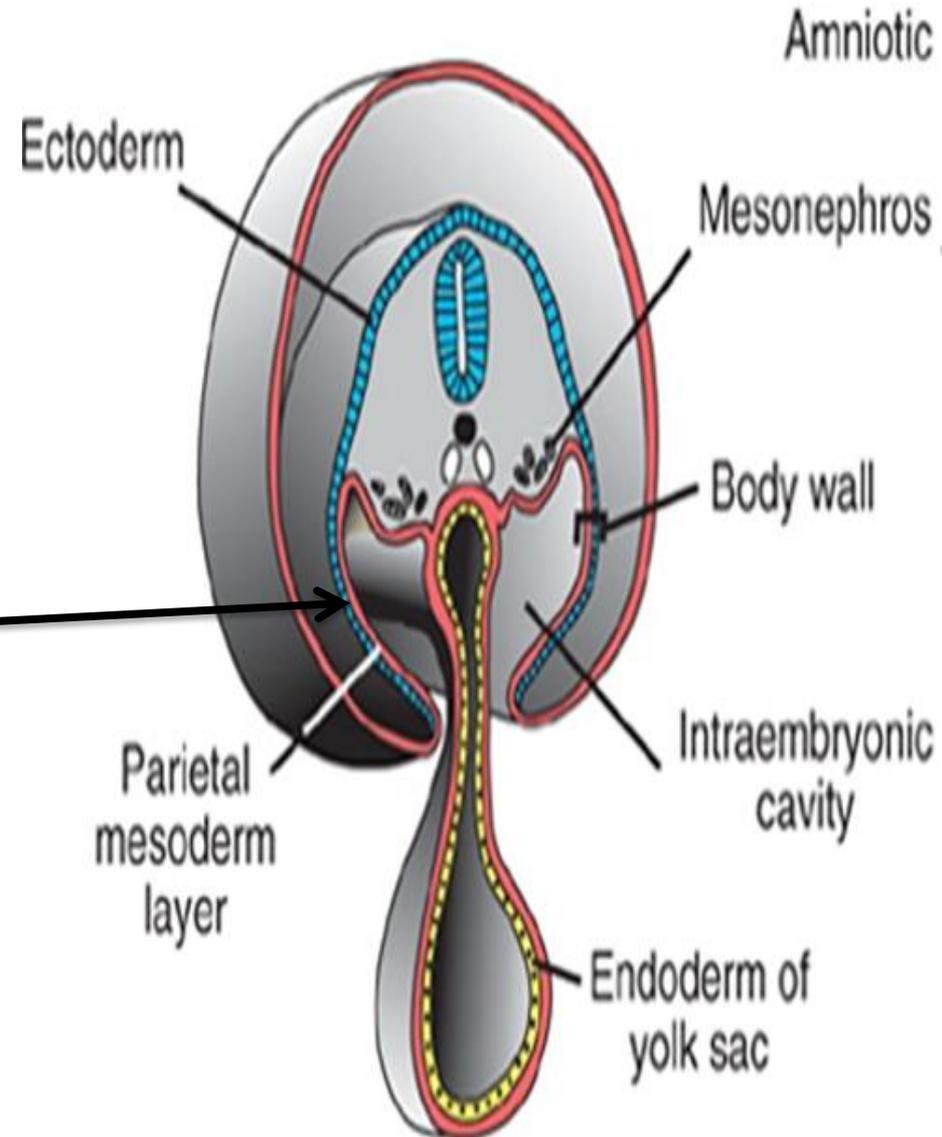
☞ Lateral mesoderm splits into two layers:

1- Parietal (somatic)

2- Visceral (splanchnic)

➤ Mesoderm from **the parietal layer**, together with **overlying ectoderm**, forms **the lateral body wall folds**

➤ These folds, together with the head (cephalic) and tail (caudal) folds, **close the ventral body wall**



# 1-The parietal layer of lateral mesoderm forms:

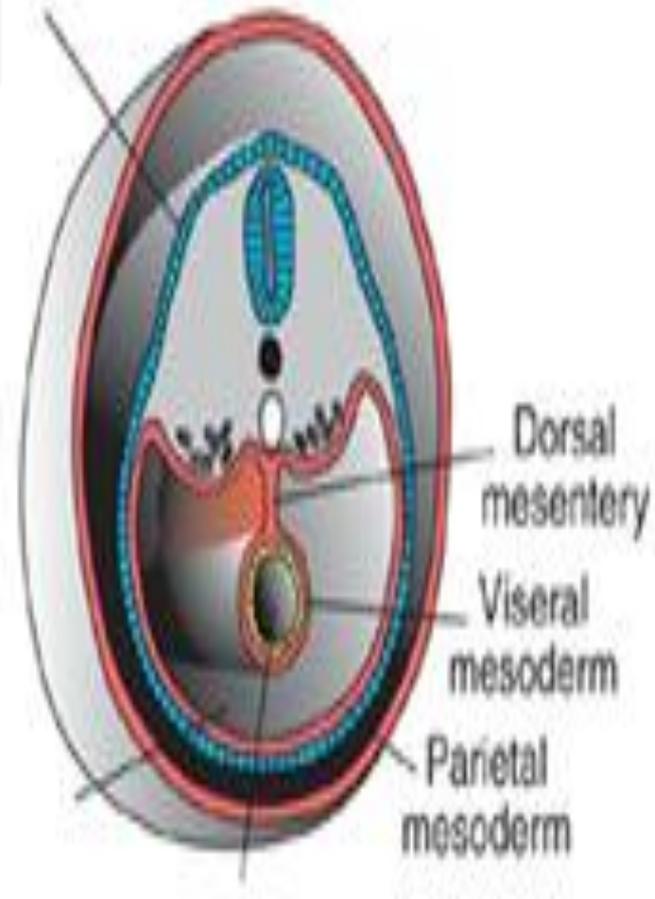
A) The dermis of the skin in the body wall and limbs

B) The bones and connective tissue of the  
limbs

C) The sternum

D) Mesoderm cells of the parietal layer surrounding the intraembryonic cavity form thin membranes, the mesothelial membranes, or serous membranes, which will line the  
1-peritoneal  
2- pleural 3- pericardial cavities

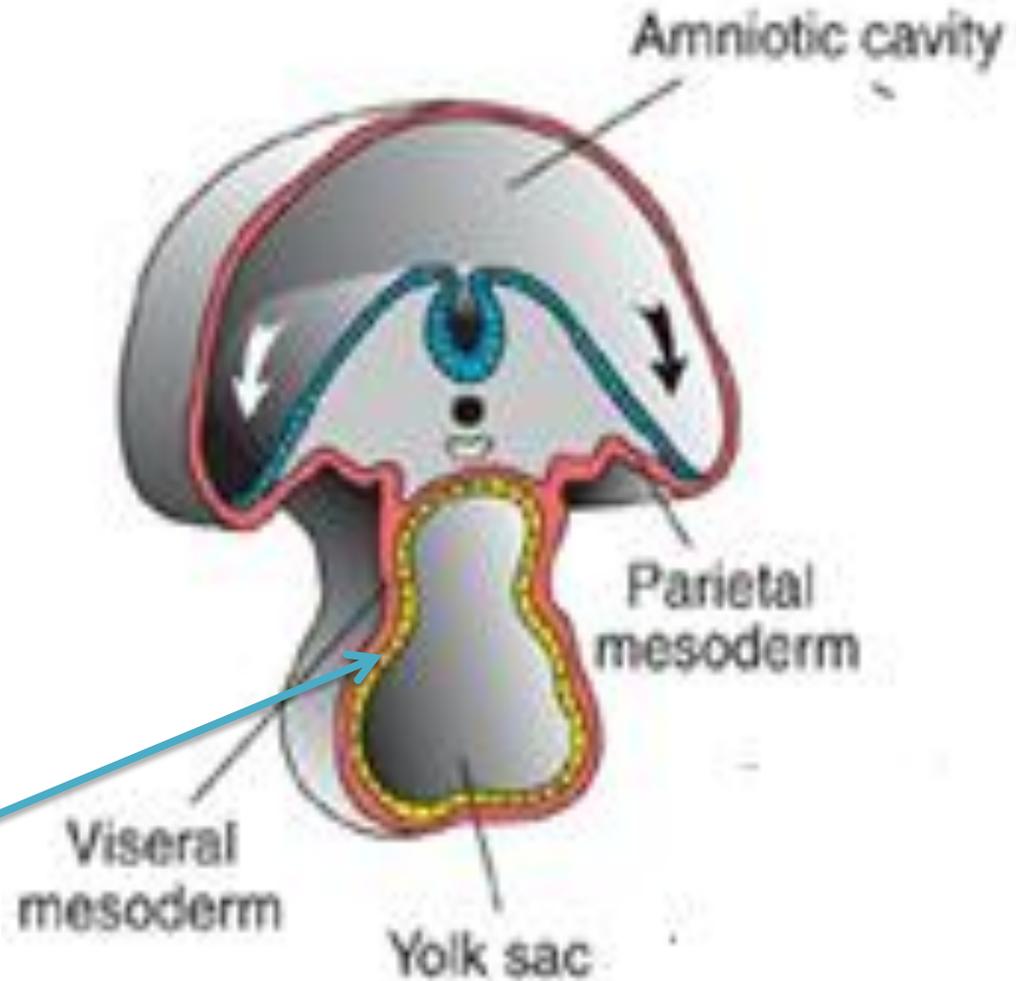
E) In addition, sclerotome and muscle precursor cells that migrate into the parietal layer of lateral plate mesoderm form  
the costal cartilages,  
limb muscles,  
and most of the body wall muscles



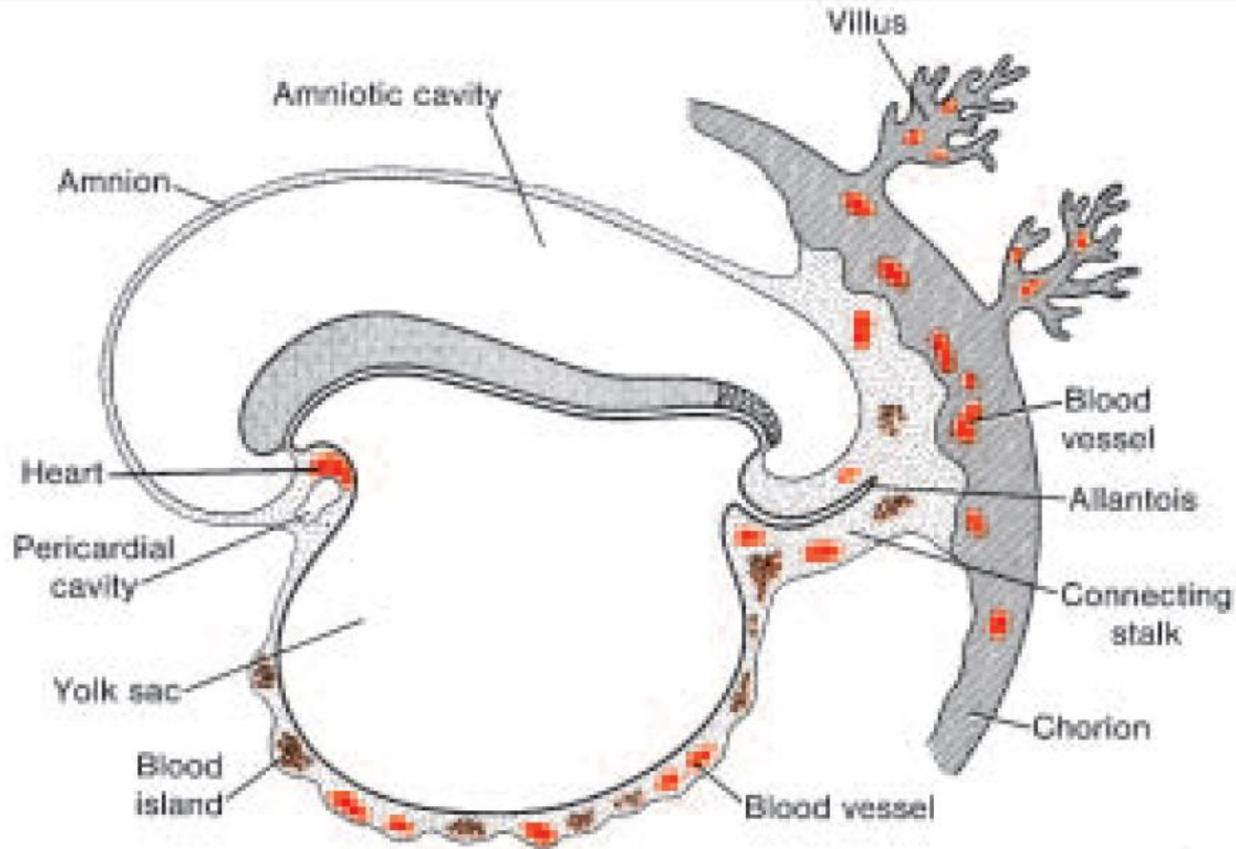
## 2-The visceral layer of lateral mesoderm

Surrounds the primitive gut and together with embryonic endoderm, forms

THE WALL  
OF THE  
GUT TUBE



Mesoderm also gives rise to the **vascular system, that is, the heart, arteries, veins, lymph vessels, and all blood and lymph cells**

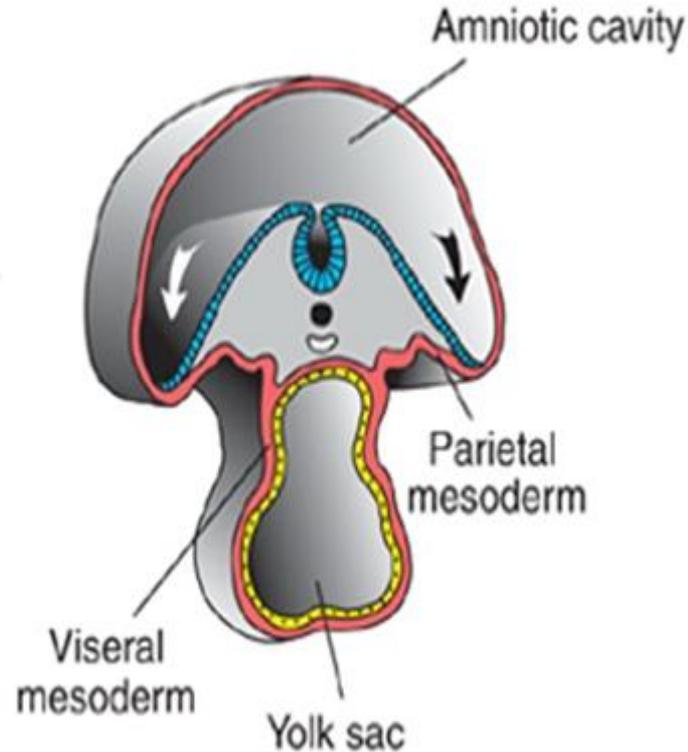


**Figure 5.15** Extraembryonic blood vessel formation in the villi, chorion, connecting stalk, and wall of the yolk sac in a presomite embryo of approximately 19 days.

**DERIVATIVES OF  
THE ENDODERMAL GERM  
LAYER**

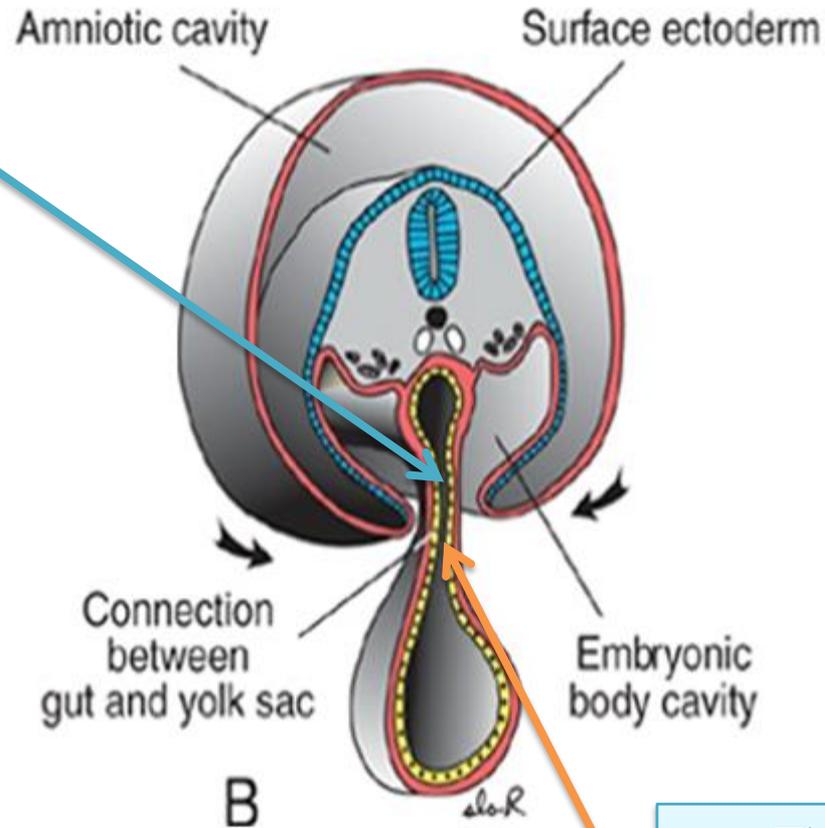
➤ The gastrointestinal tract **is the main** organ system derived from the endodermal germ layer

➤ *With development the embryonic disc begins to bulge into the amniotic cavity and to fold cephalocaudally and Lateral folds also form and move ventrally to **assist in body wall closure***



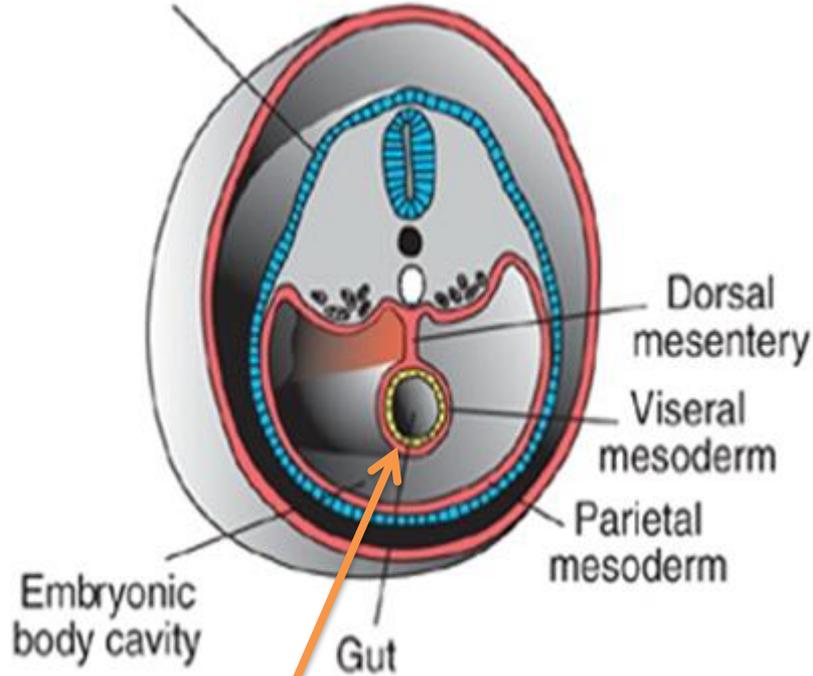
A

As a result of cephalocaudal folding, a continuously larger portion of the endodermal germ layer is incorporated into the body of the embryo to form the gut tube.



The midgut communicates with the yolk sac **by way of a broad stalk the VITELLINE DUCT**

Surface ectoderm



Dorsal mesentery

Viseral mesoderm

Parietal mesoderm

Embryonic body cavity

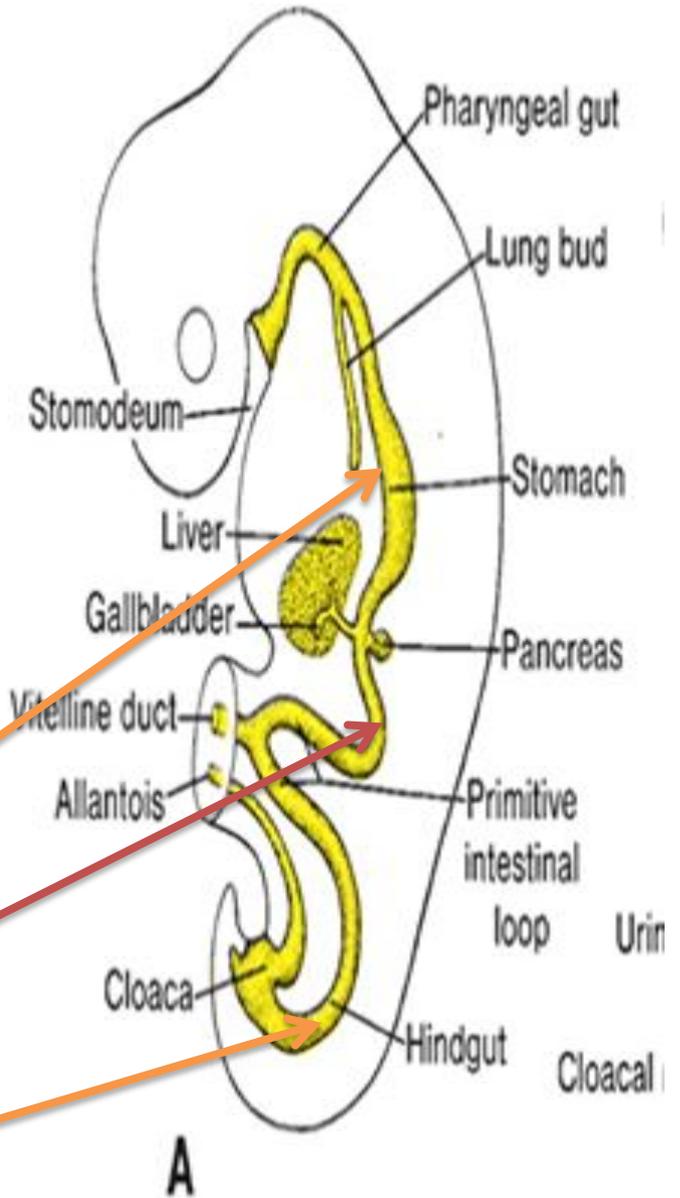
Gut

The tube is divided into three regions:

**FOREGUT**

**MIDGUT**

**HINDGUT**



Pharyngeal gut

Lung bud

Stomodeum

Stomach

Liver

Gallbladder

Pancreas

Vitelline duct

Allantois

Primitive intestinal loop

Urin

Cloaca

Hindgut

Cloacal

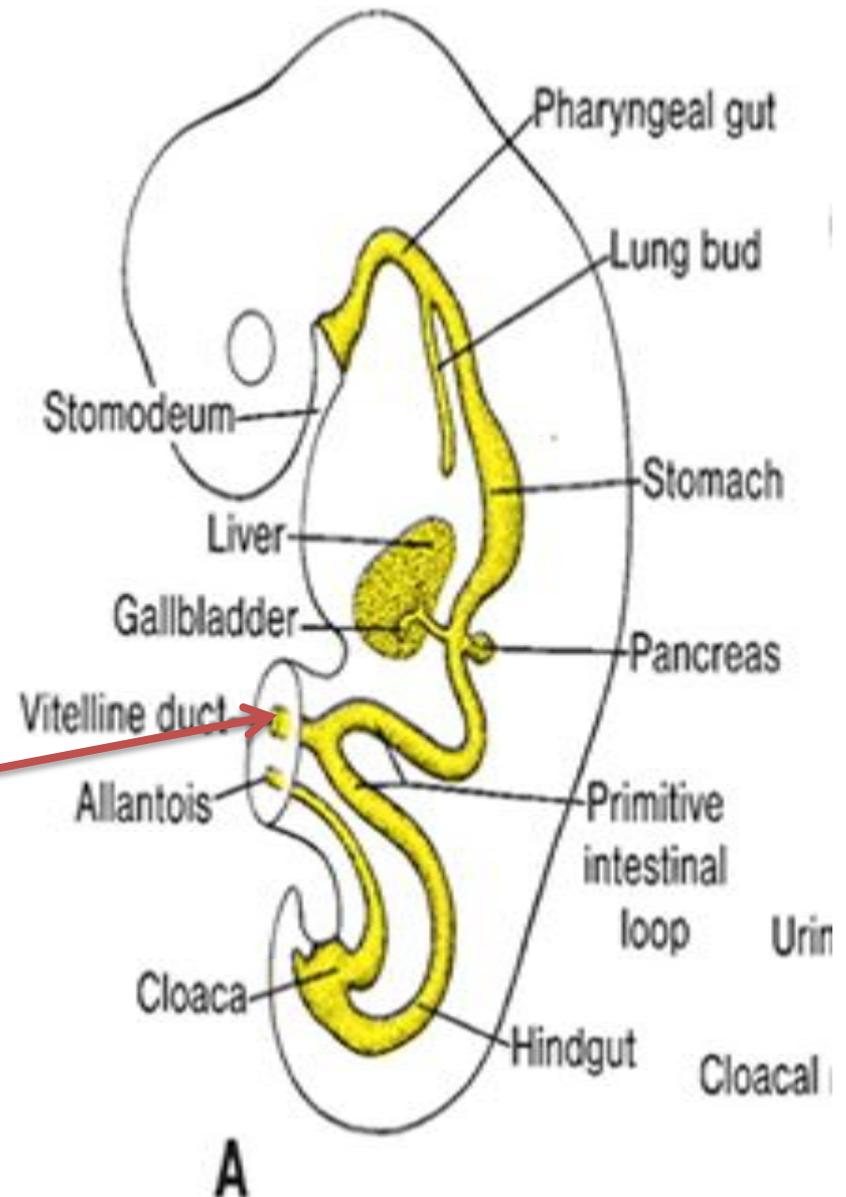
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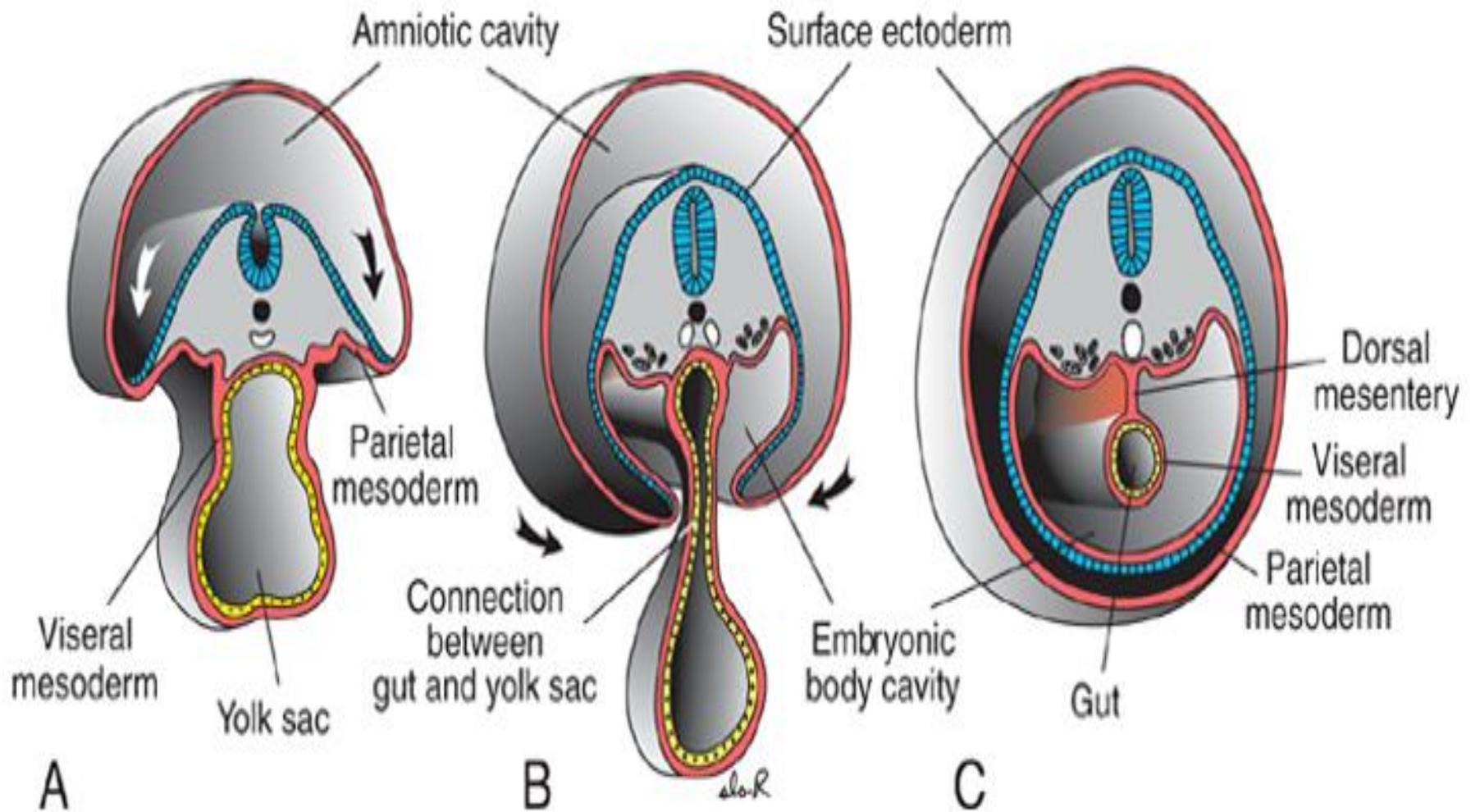
**The midgut remains in communication with the yolk sac.**

Initially, this connection is wide but as a result of body folding, it gradually becomes long and narrow to form

***the vitelline duct***

*Only much later, when the vitelline duct is **obliterated**, does the midgut lose its connection with the original endoderm-lined cavity and obtain its free position in the abdominal cavity*





At its cephalic end, **the foregut** is temporarily bounded by

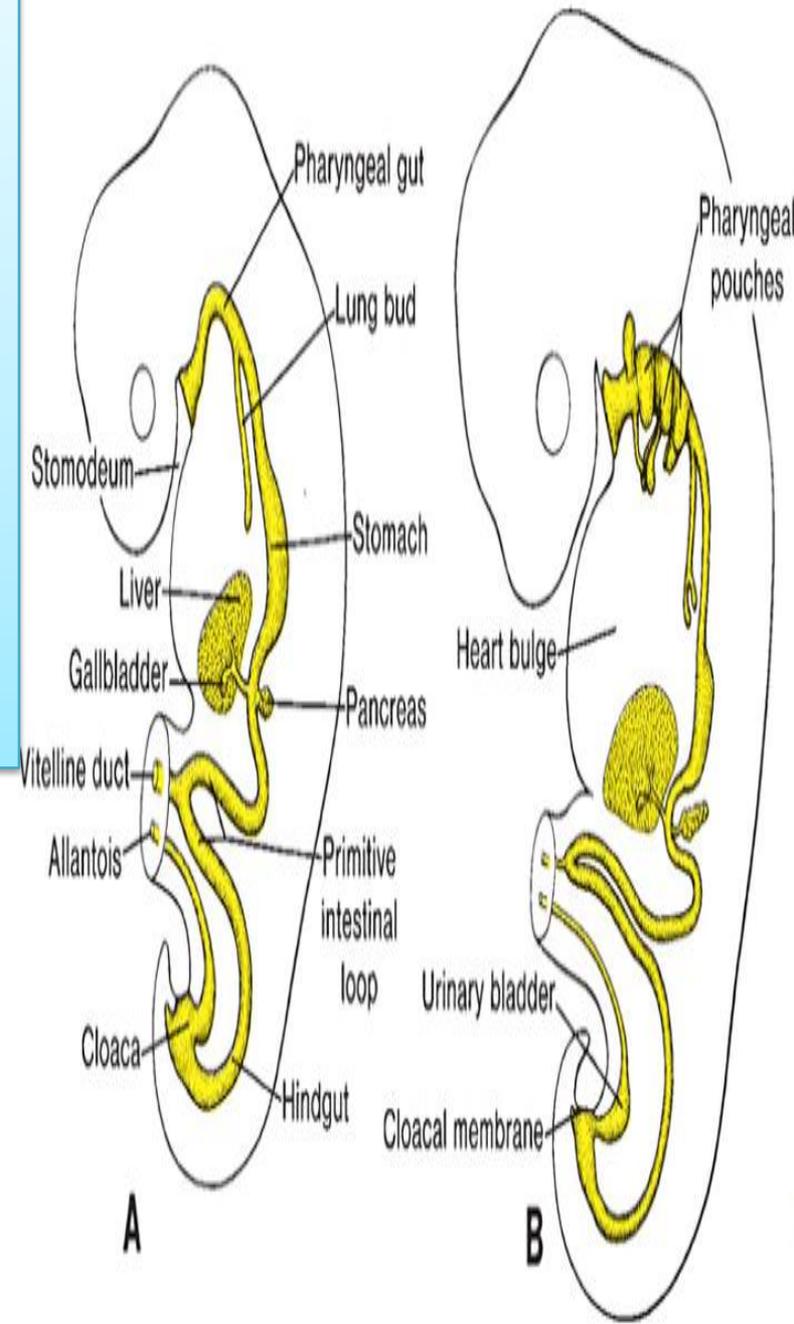
**an ectodermal-endodermal**  
**(no mesoderm)**

membrane called the

**OROPHARYNGEAL membrane**

This membrane separates the stomodeum, (the primitive oral cavity derived from ectoderm), from the pharynx, (a part of the foregut derived from endoderm).

**In the fourth week**, the oropharyngeal membrane ruptures, establishing an open connection between **the oral cavity** and the primitive gut



The hindgut also terminates temporarily at an ectodermal-endodermal membrane,

**THE CLOACAL membrane**

This membrane separates the upper part of the anal canal (derived from endoderm), from the lower part called (the proctoderm) that is formed by an invaginating pit lined by ectoderm.

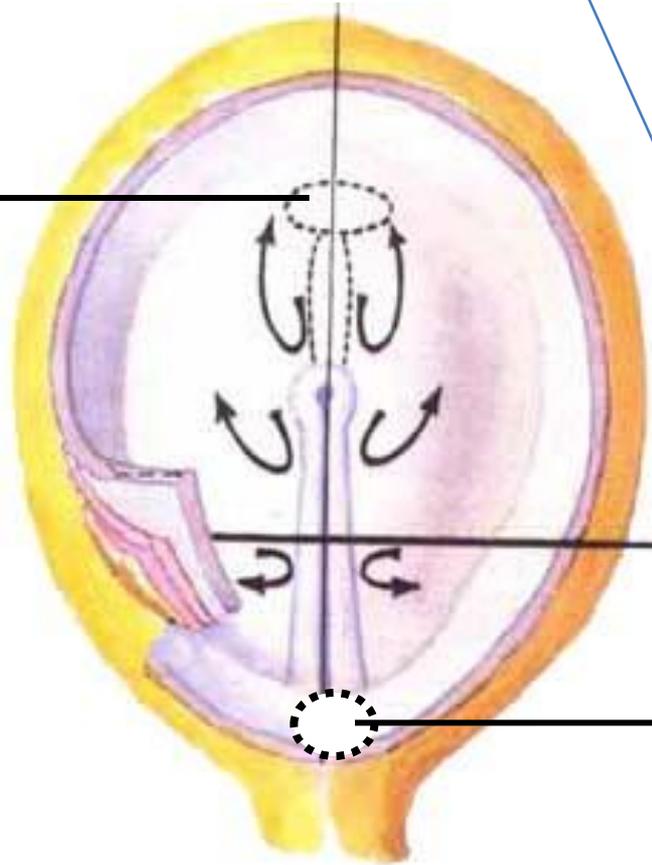
The membrane breaks down in the **seventh week** to create the opening for the **anus**

# No mesoderm

**Buccopharyngeal  
membrane**

**Cloacal  
membrane**

**WHY?**



**As a result of folding from the head, tail, and  
two lateral body wall folds**

**The ventral body wall of the embryo is closed  
except for a small part in the umbilical region  
where the yolk sac duct and connecting stalk  
are attached.**

# ENDODERM GIVES RISE TO:

- The epithelial lining of the respiratory tract
- The parenchyma of the thyroid, parathyroids, liver, and pancreas
- The reticular stroma of the tonsils and thymus
- The epithelial lining of the urinary bladder and urethra
- The epithelial lining of the tympanic cavity and auditory tube