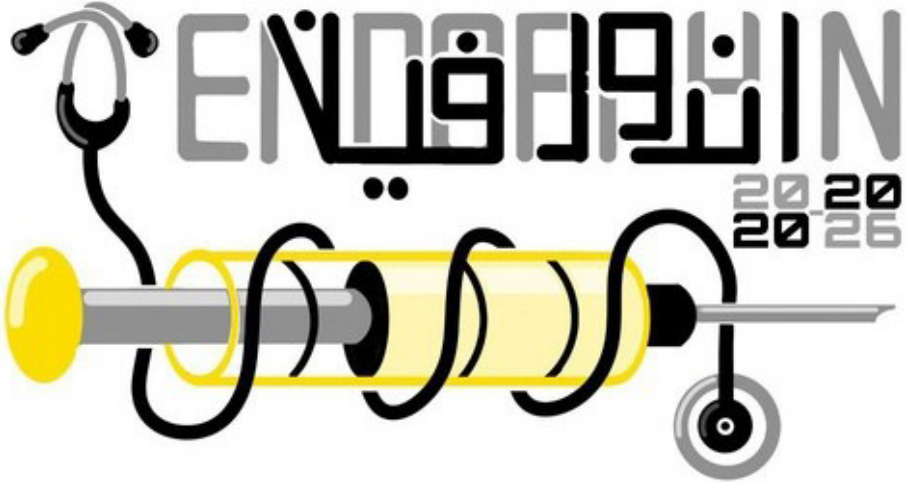
Anatomy



Sheet: 2

Lecture title: Body cavities,mesenteries & diaphragm

Date:

Done by: Huda Shehadeh

Edited by: Huda Shehadeh

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Body Cavities, Mesenteries & Diaphragm

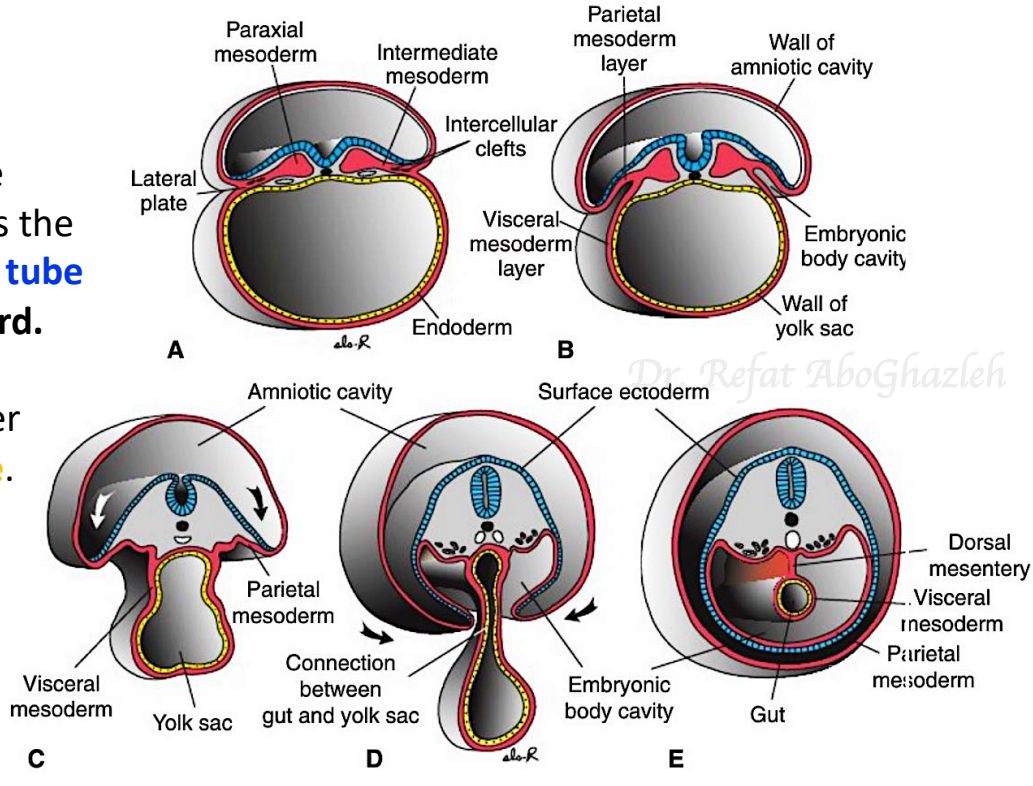
Dr. Refat AboGhazleh

A tube on top of a tube !!

During 3rd - 4th wks:

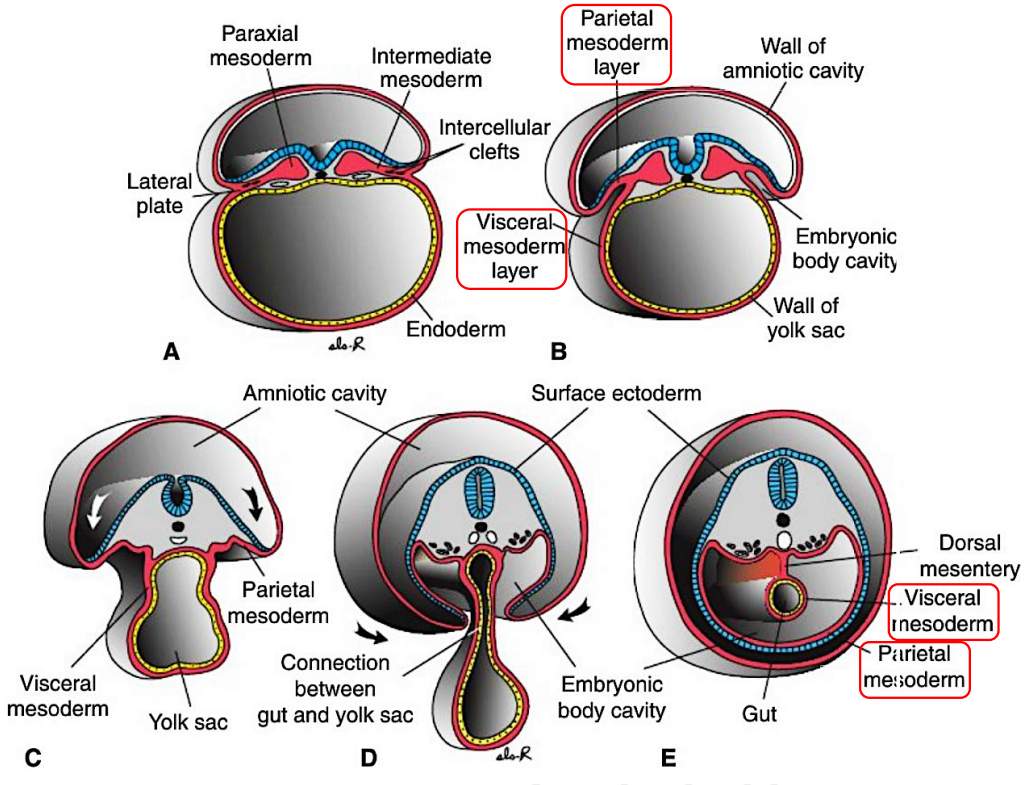
- The top layer (ectoderm) of the trilaminar embryonic disc forms the **neural plate** that rolls up into a **tube** to form the **brain and spinal cord.**
- Simultaneously, the ventral layer (endoderm) forms the **gut tube**.

"Thus, the neural tube dorsally and the gut tube ventrally".



A tube on top of a tube !!

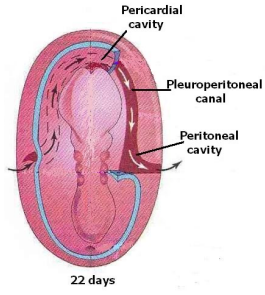
The middle layer (**mesoderm**) holds the two tubes together and the lateral plate component of this mesoderm layer also splits into visceral (splanchnic) and parietal (somatic) layers.

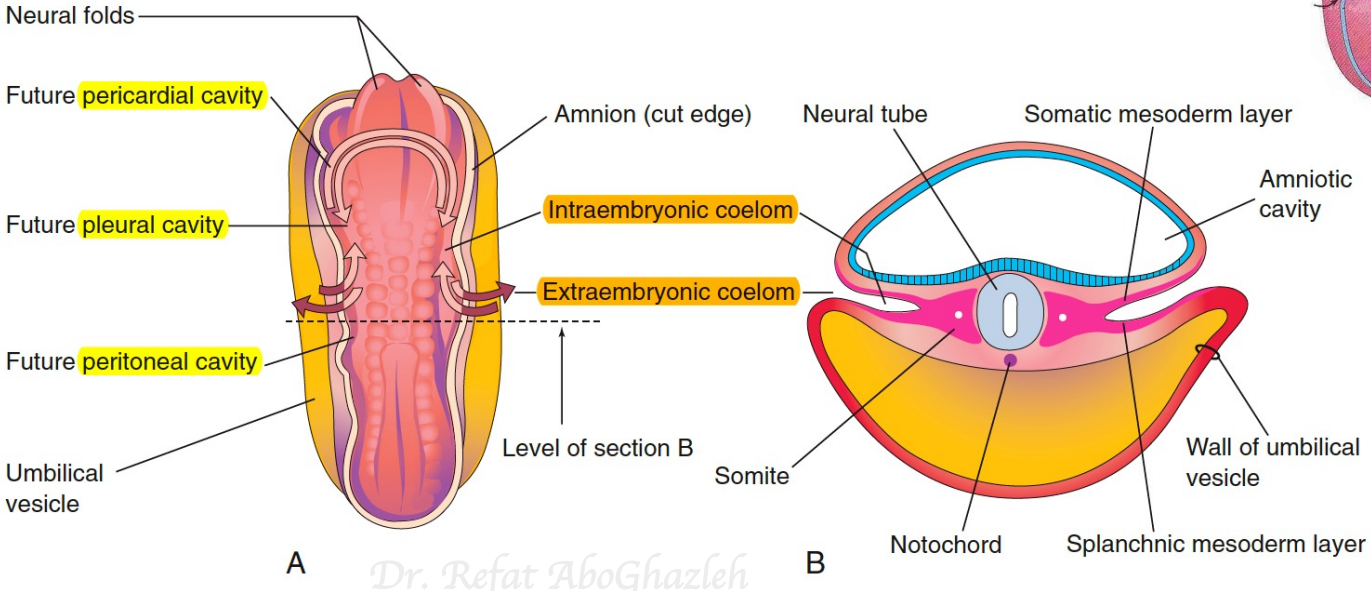


- The visceral layer rolls ventrally and connected to the **gut tube.**
- The parietal layer, together with the overlying ectoderm, **forms the lateral body wall folds**, which *meet ventrally* in the midline *to close the ventral body wall*.

- The space between visceral and parietal layers of lateral plate mesoderm is the **primitive body cavity**, which at this early stage is a continuous cavity, because it has not yet been subdivided into the pericardial, pleural, and abdominopelvic regions.

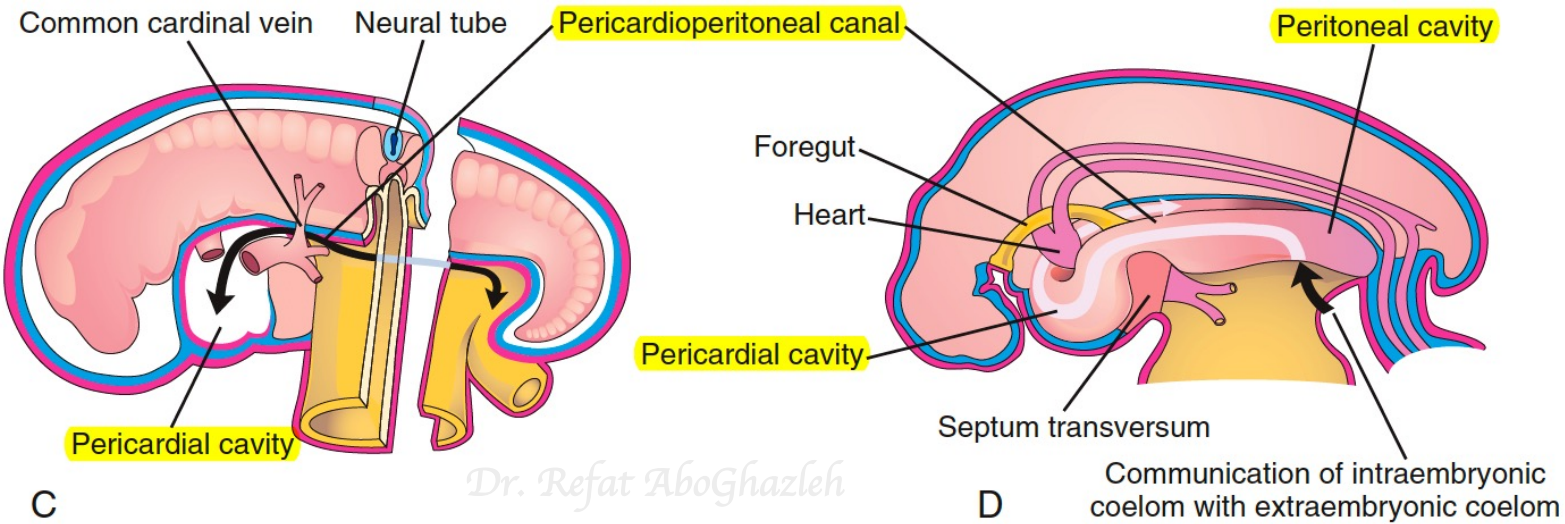
Intraembryonic Coelom



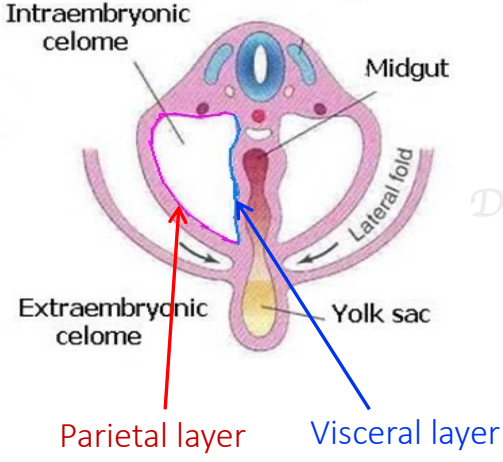


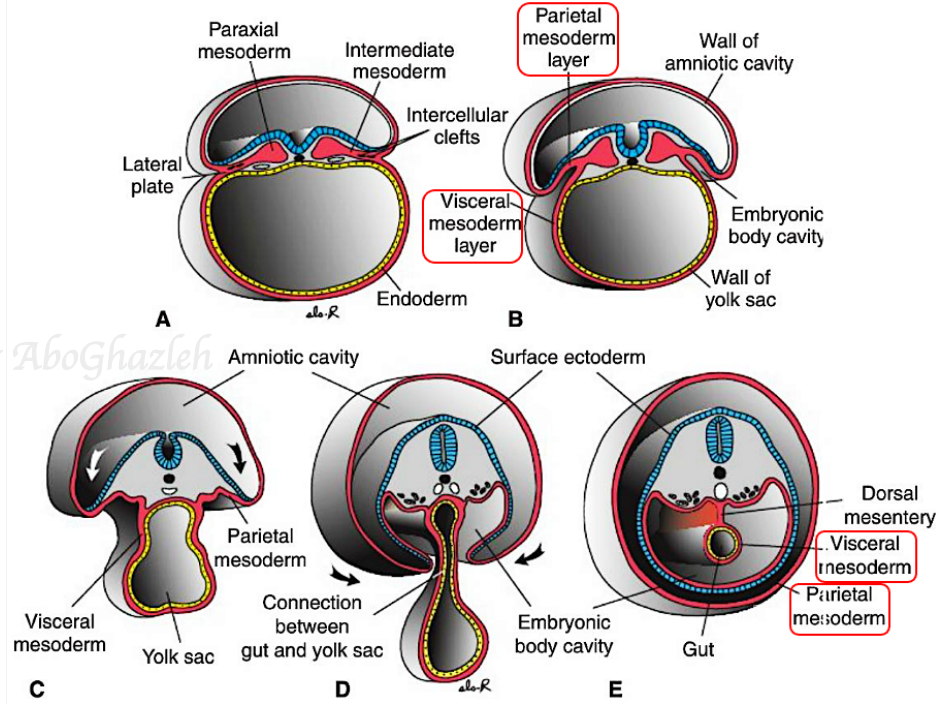
- The primordium of the **embryonic body cavity**.
- Appears as a horseshoe-shaped cavity in the cardiogenic area and lateral mesoderm by the **4th week.**
- The **bend** in this cavity indicates the future **pericardial cavity** & the limbs indicate the future **pleural** and **peritoneal** cavities.
- The distal part of each limb opens laterally into **extra-embryonic coelom (EEC).**

- During **cranial folding** of embryo, the pericardial cavity becomes **ventral to** the foregut.
- The **pericardioperitoneal canals**:
  - Pass on each side of the foregut (future esophagus)
  - Lie dorsal to septum transversum
  - Open into the peritoneal cavity



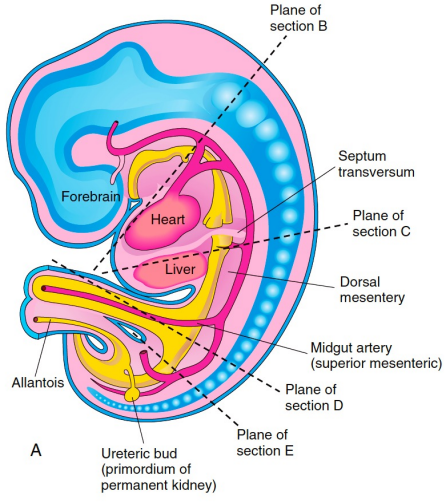
- During **horizontal folding**, the limbs of the coelom are brought together on the ventral aspect of the embryo.
- The coelom is lined by mesothelium derived from the **somatic mesoderm** (parietal layer) and the **splanchnic mesoderm** (visceral layer).
- The peritoneal cavity loses its connection with the extraembryonic coelom during the **10th week.**

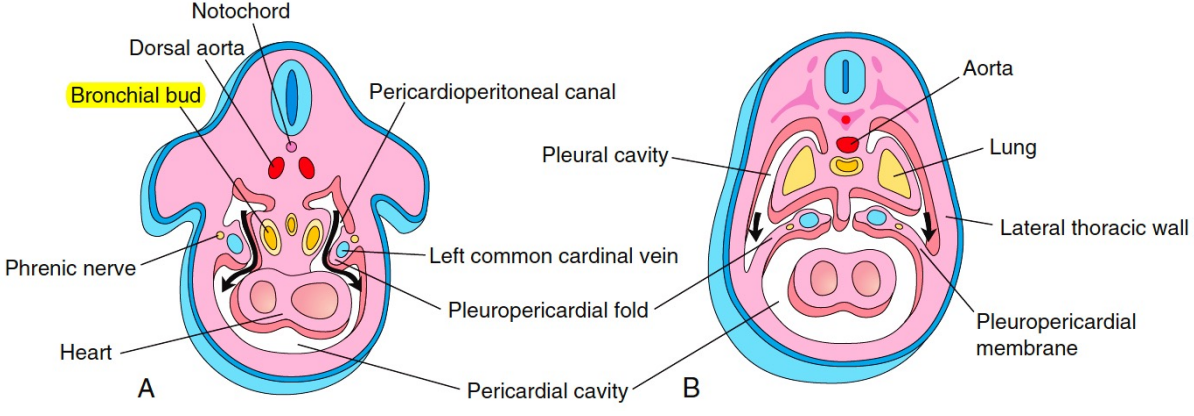




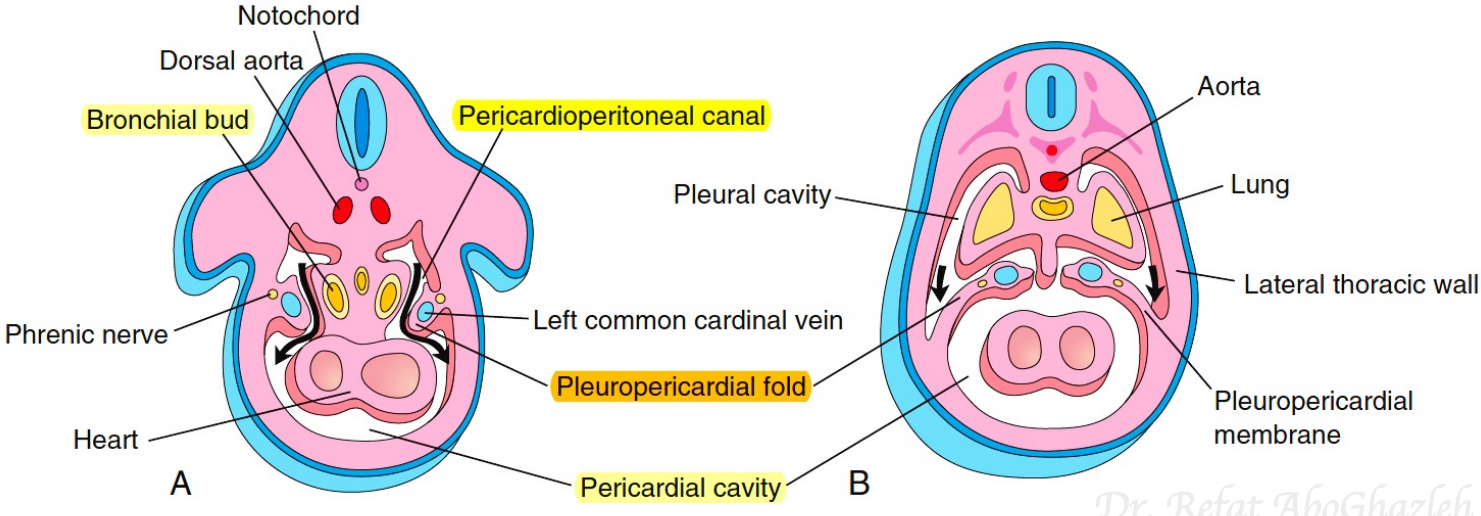
Division of Embryonic Body Cavity

- Partitions form in each **pericardioperitoneal canal,** separating the **pericardial cavity** from the pleural cavities, and the pleural cavities from **peritoneal cavity.**
- As the **bronchial buds** grow into the pericardioperitoneal canals, a pair of membranous ridges is produced in the lateral wall of each canal:
  - **Pleuropericardial folds** superior to the developing lungs.
  - **Pleuroperitoneal folds** inferior to the developing lungs.





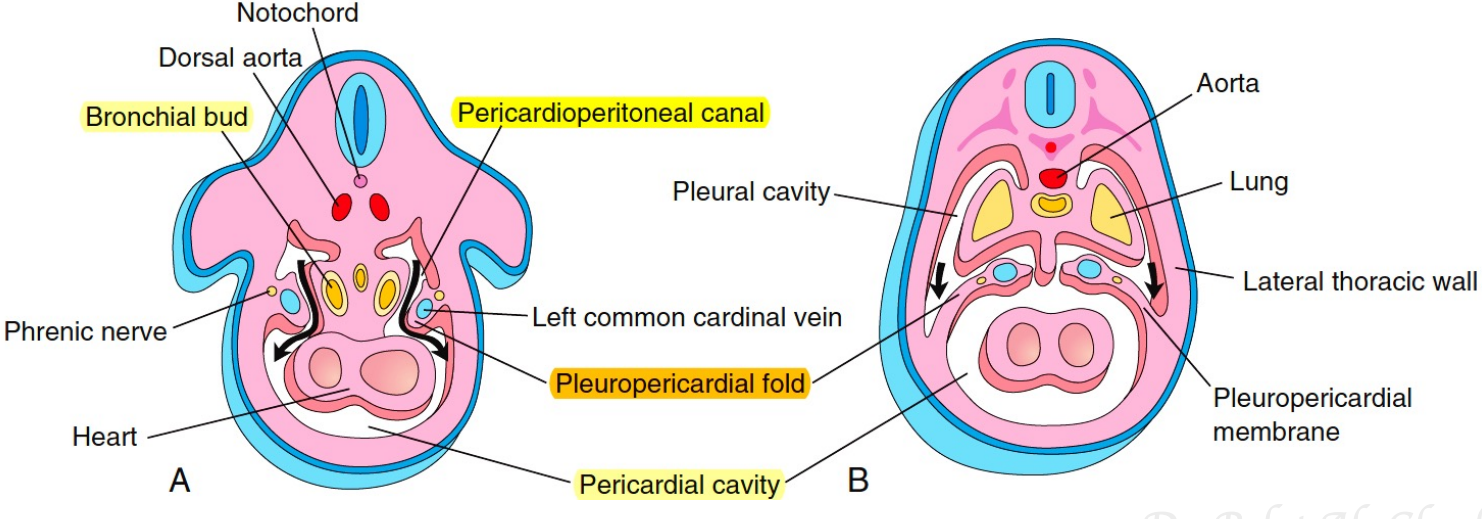
Pleuropericardial Membranes



- As the **pleuropericardial folds** enlarge, they form partitions that **separate** the **pericardial cavity** from the **pleural cavities**.

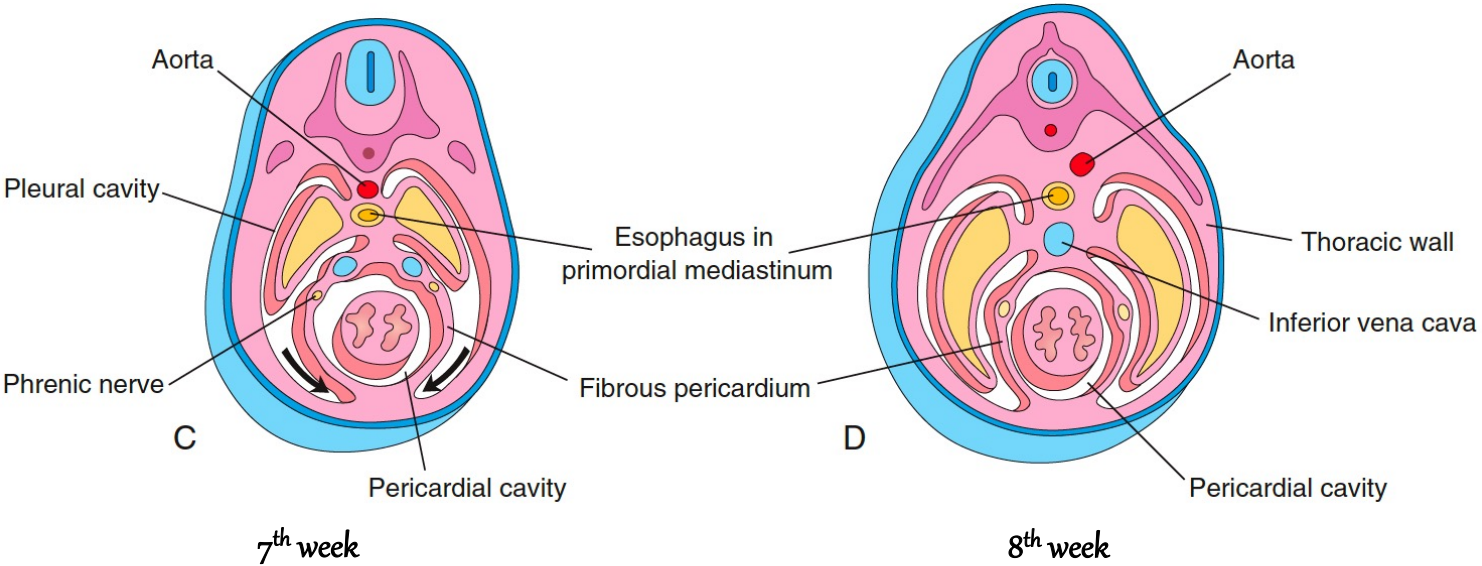
- The **bronchial buds** grow laterally from the caudal end of the trachea into the **pericardioperitoneal canals** (future pleural cavities).
- As the pleural cavities expand ventrally, they grow into the body wall in the angle between the body wall and a ridge raised by the common cardinal vein and the phrenic nerve.

- The expansion of the pleural cavities results in splitting the mesenchyme into:
  - **An <u>outer layer</u>** that forms the thoracic wall.
  - An **<u>inner layer</u>** that forms the pleuropericardial membrane **(becomes the <u>fibrous pericardium</u>).**

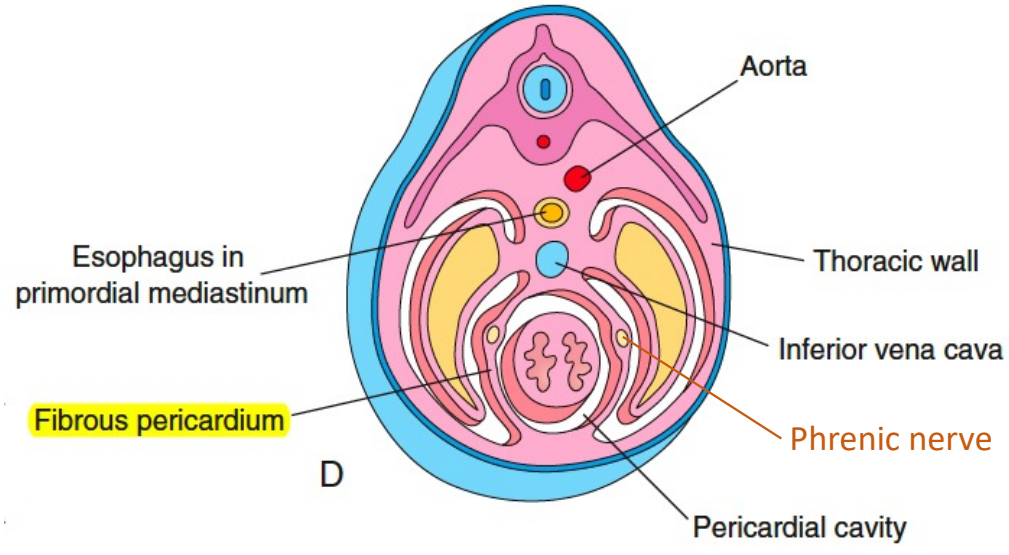


The **pleuropericardial membranes** project into the cranial end of the **pericardioperitoneal canals.**

- With the growth & descent of the heart and expansion of the pleural cavities, the pleuropericardial membranes **expand & move medially.**



By **7th week**, the membranes fuse with the mesenchyme ventral to the esophagus forming the **primordial mediastinum**, thus, closing the pleuropericardial openings.



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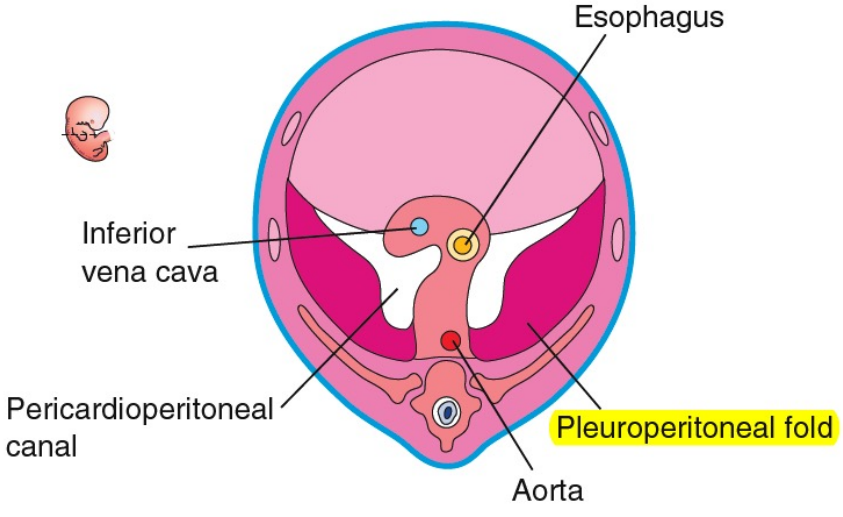
The fused pleuropericardial membranes form the *fibrous pericardium*.

(Note the position of **phrenic nerve** in the fibrous pericardium).

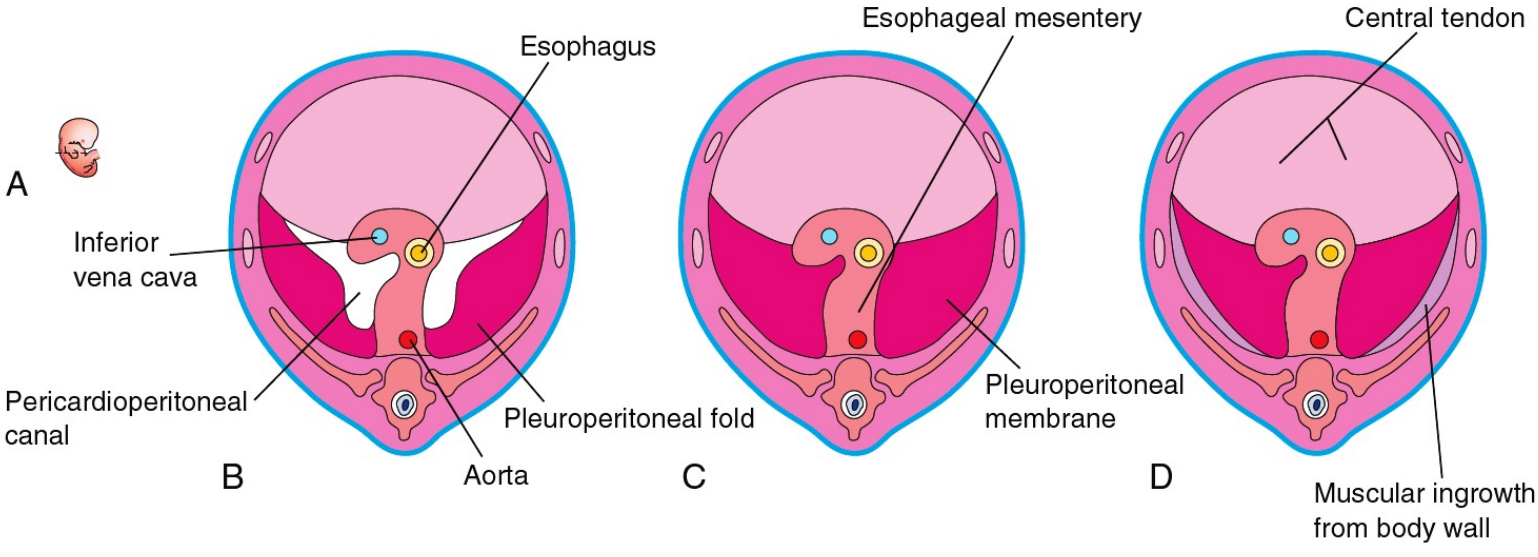
Pleuroperitoneal Membranes

- Develop from the **pleuroperitoneal folds** that are attached dorsolaterally to the abdominal wall and their free edges project into the caudal end of the **pericardioperitoneal canals.**



- As the developing lung enlarges cranially and liver expands caudally, these folds become more prominent and gradually become membranous.
- Are soon invaded by the myoblasts (primitive muscle cells).

- During 6th week, the **pleuroperitoneal membranes** extend ventromedially and fuse with the dorsal mesentery of the esophagus and the septum transversum.



This results in **closure of** the pericardioperitoneal openings.
The right opening closes slightly earlier than the left.

Mesenteries

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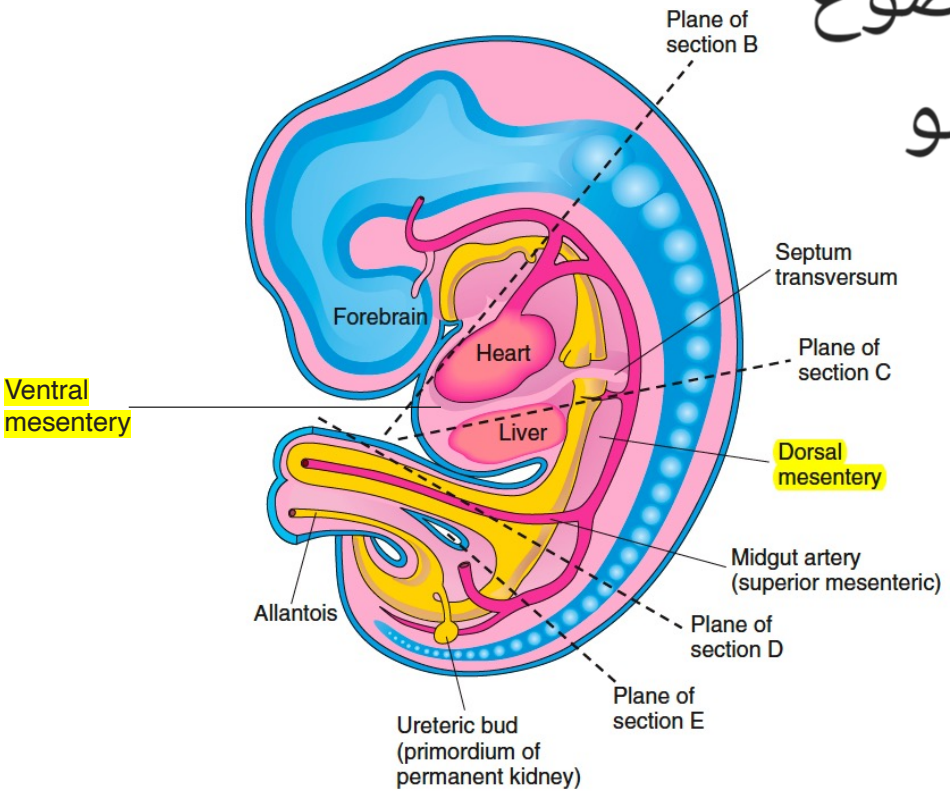
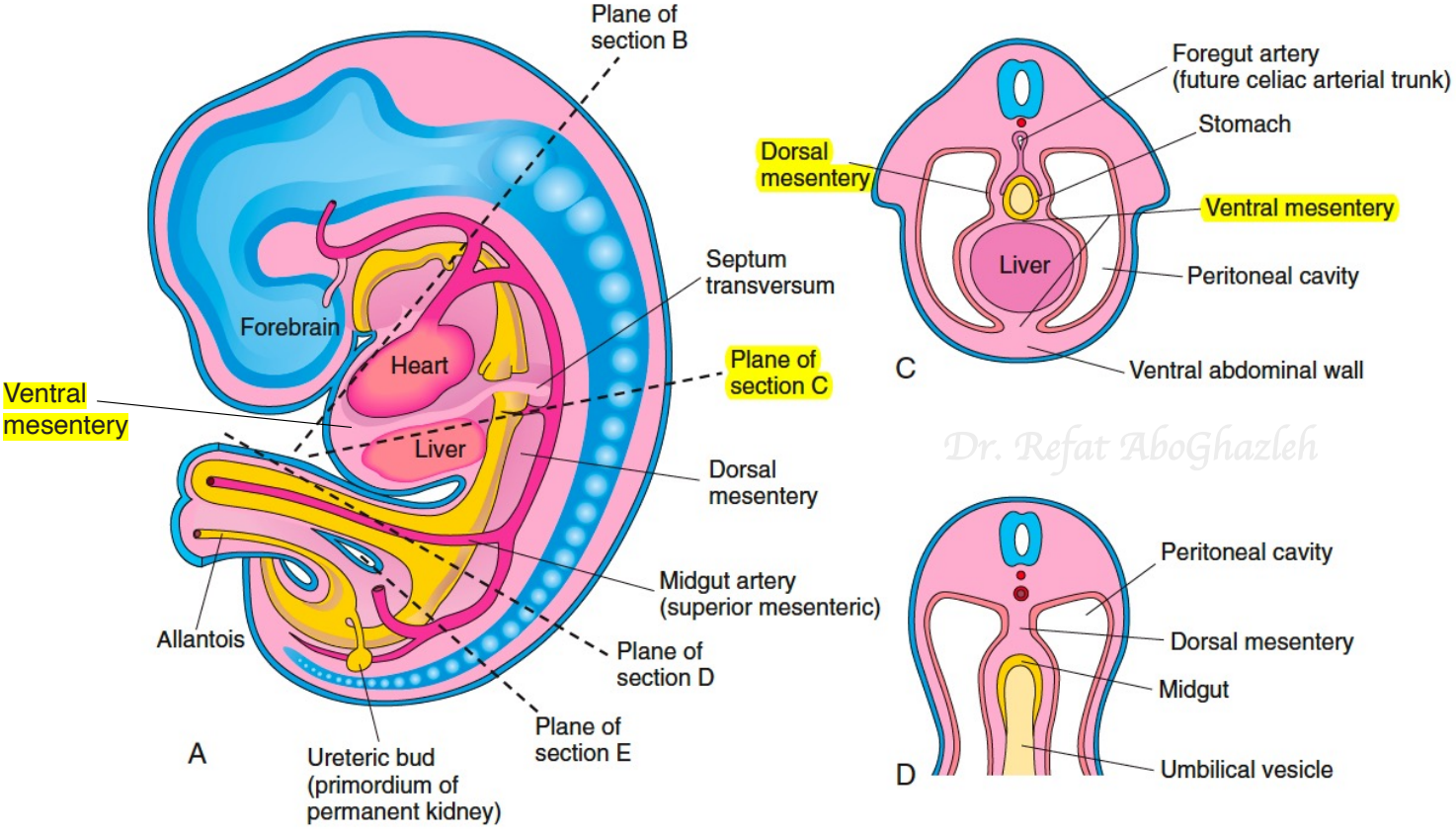
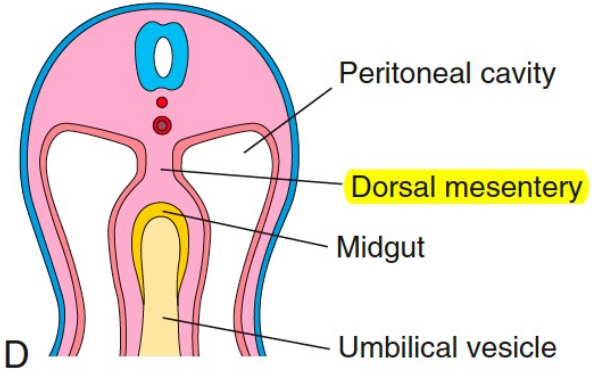


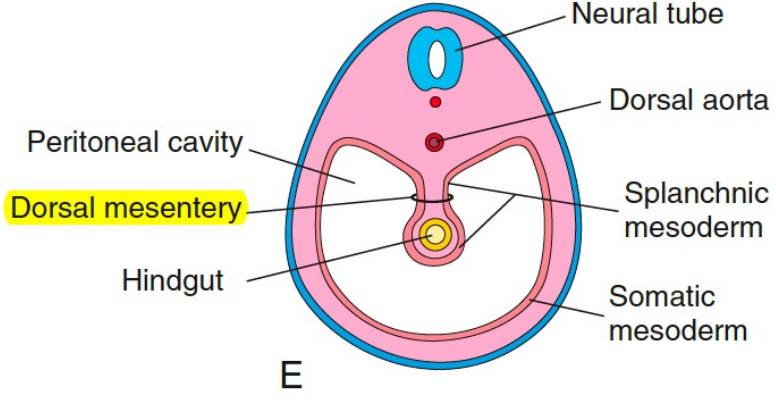
After embryonic folding

- The caudal part of the foregut is connected to the anterior and posterior abdominal walls by the ventral & dorsal mesentery respectively.

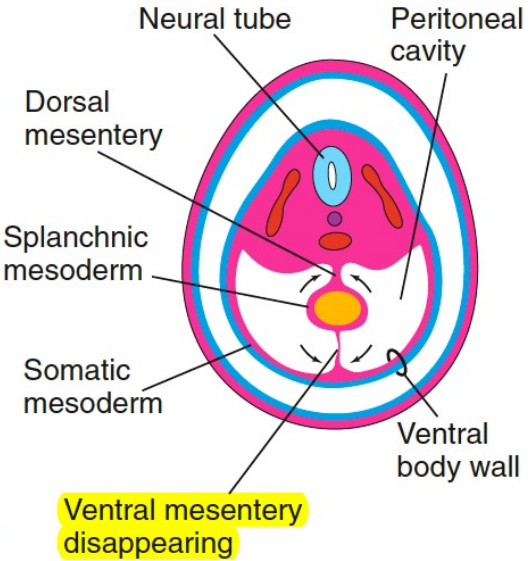


- The **midgut** and the **hindgut** are suspended in the peritoneal cavity from the posterior abdominal wall by the **dorsal mesentery.**





- The ventral mesentery **degenerates** in the region of the future peritoneal cavity, extending from the heart to the pelvic region.



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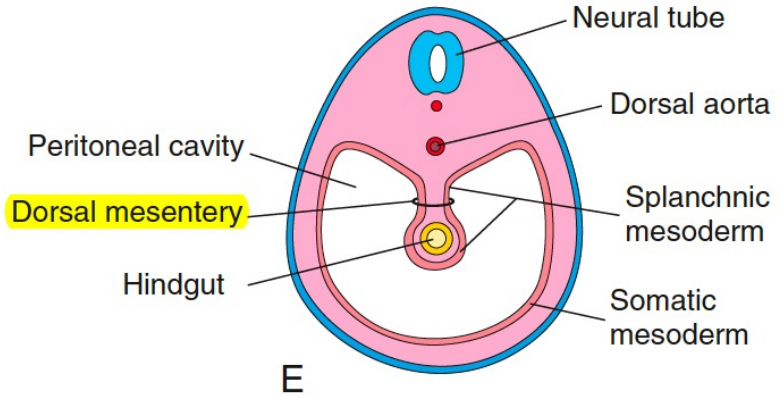

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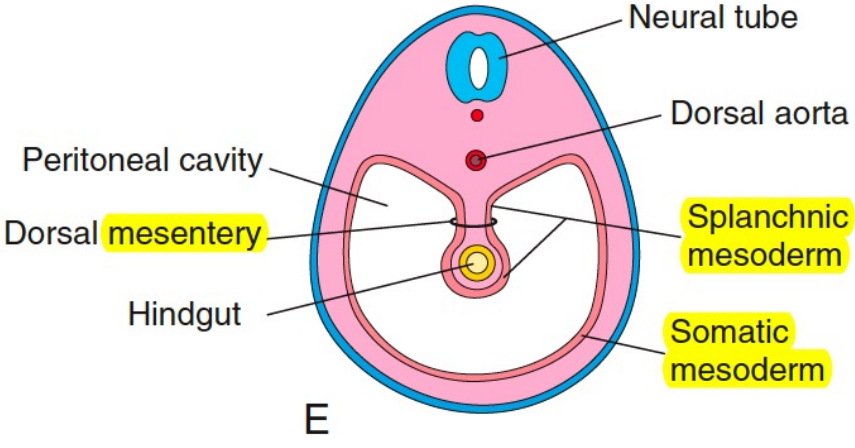
What is a mesentery?

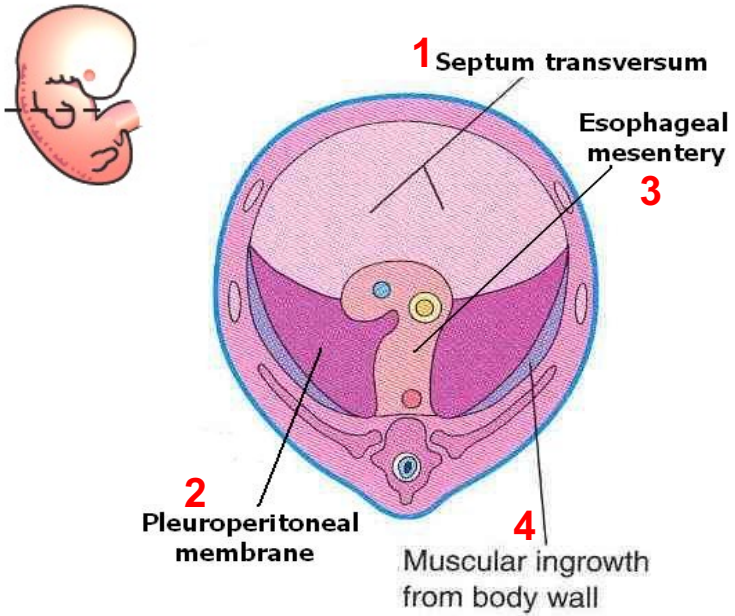


- **Double layer of peritoneum** enclosing a mass of mesoderm.
- Connects the organ to the body wall
- Carries vessels, nerves & lymphatics for the organ.
- Is the site where the **visceral (Splanchnic) peritoneum** continues as **parietal (Somatic) peritoneum**

Development of Diaphragm

❑ The diaphragm develops from four embryonic components:

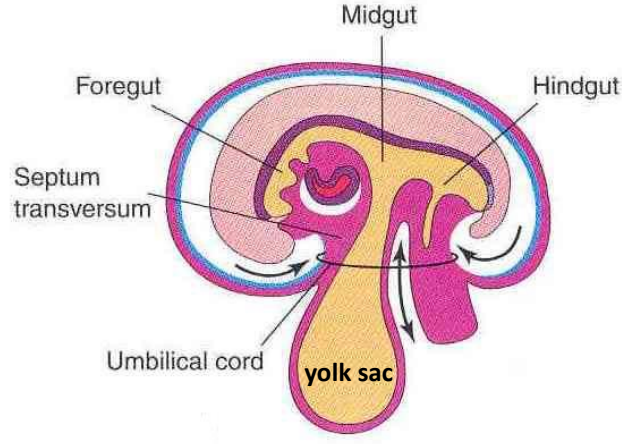
1. Septum transversum
2. Pleuroperitoneal membranes
3. Dorsal mesentery of esophagus
4. Muscular ingrowth from lateral body walls

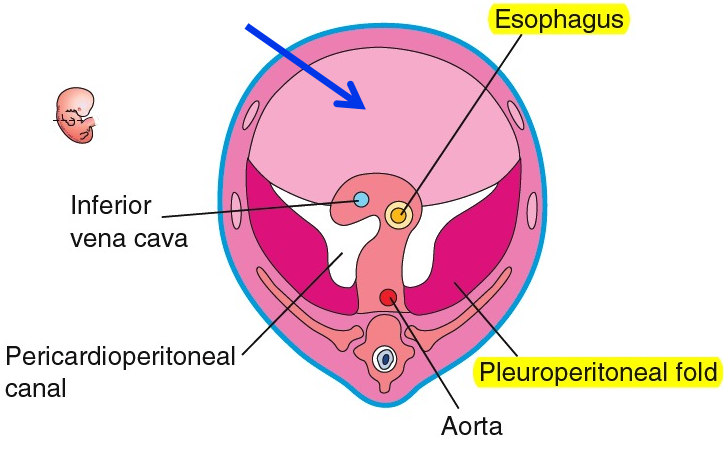


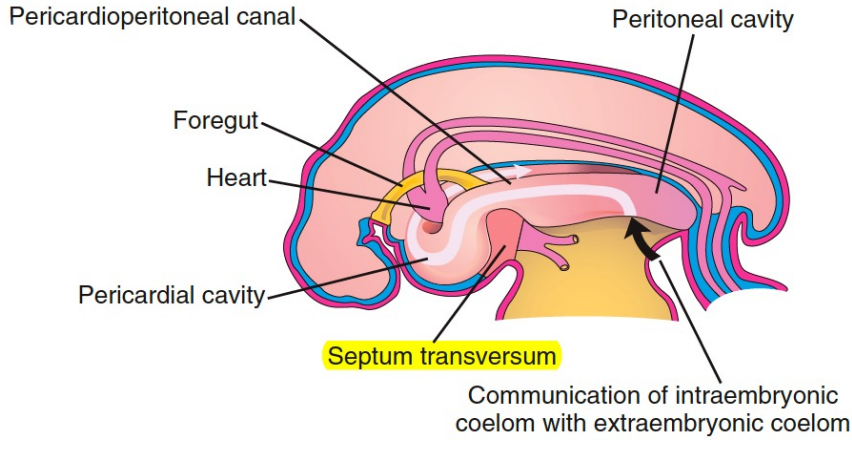
Transverse section of a 12-week embryo

Septum Transversum

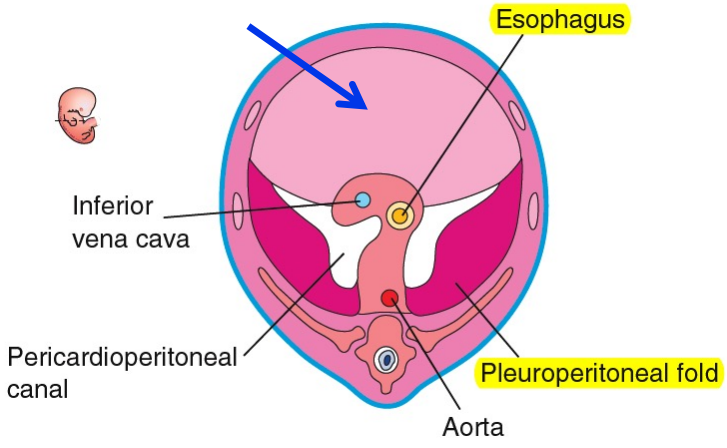
- A mesodermal tissue
- **Located**:
  - Between the **pericardial cavity** and the **yolk sac.**
  - Ventral to the **foregut** and the **pleuroperitoneal membrane**
- Grows dorsally from the ventrolateral body wall.



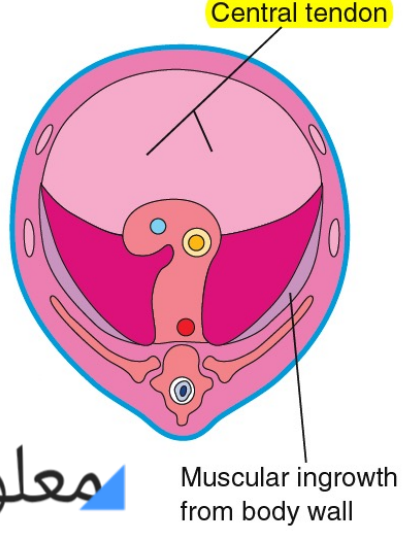




- Forms an incomplete partition between the thoracic cavity and the abdominal cavity.
- Expands and fuses with the **pleuroperitoneal membranes** and the mesenchyme ventral to the esophagus.



Septum transversum is the primordium of the central tendon of the diaphragm.



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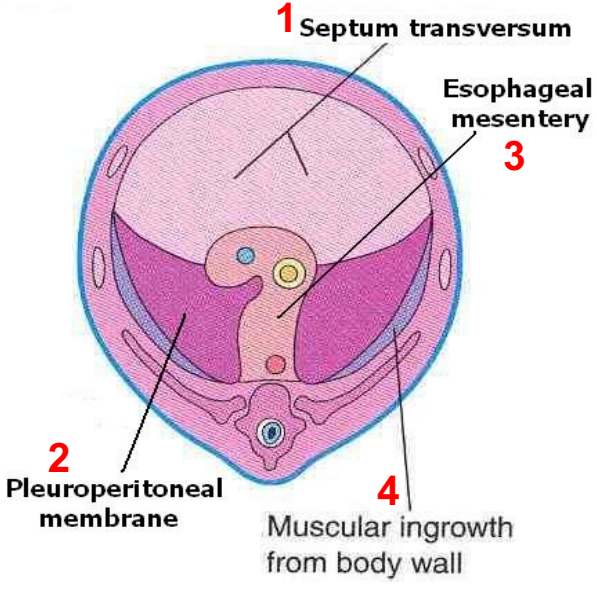
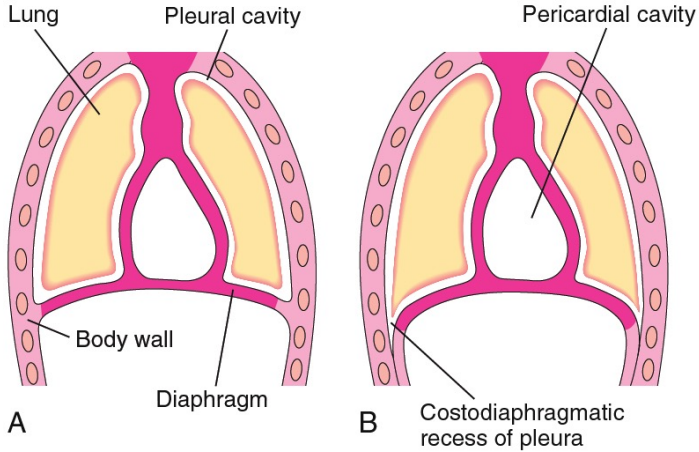
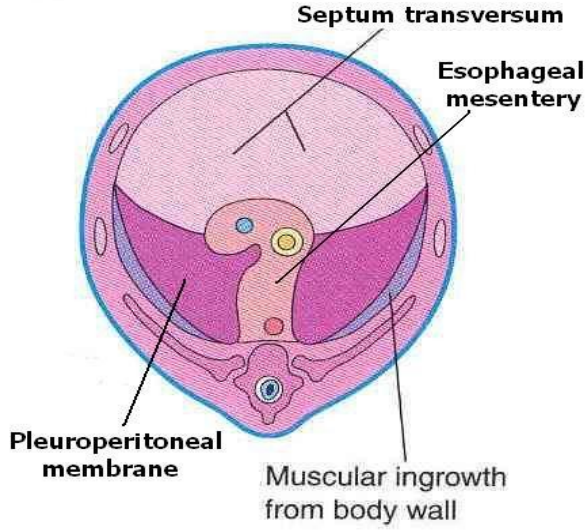
- During 6th week, the three basic components:
  1. **Septum transversum**
  2. **Pleuroperitoneal membranes**
  3. **Mesentery of esophagus**

Fuse with each other and form a complete partition between the thoracic and abdominal cavities



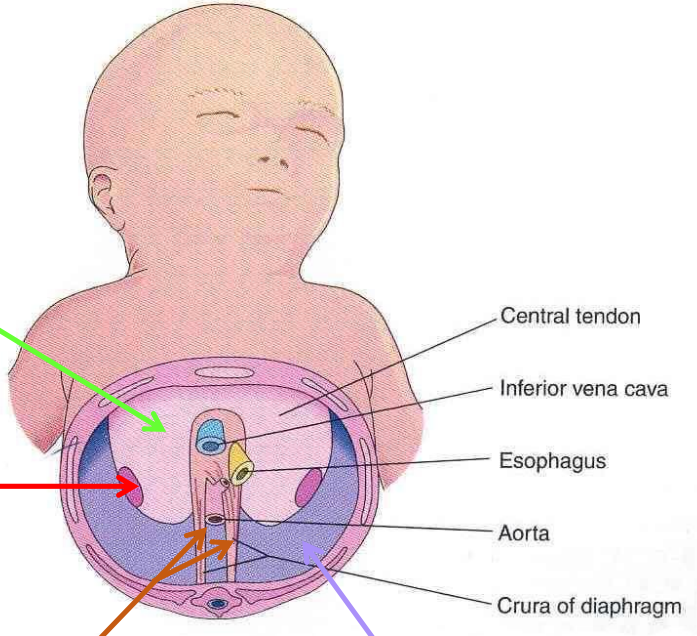
- During **9th – 12th weeks** the lungs and pleural cavities enlarge, burrowing into the body wall, splitting it into:
- **External layer** that becomes part of the body wall.
- **Internal layer** that contributes muscles to peripheral portions of diaphragm, external to the parts derived from the pleuroperitoneal membranes.





Septum transversum:
Central tendon

Pleuroperitoneal membranes: form large portion of fetal diaphragm but represent a smaller portion in infants.



Dorsal mesentery of esophagus: Crura

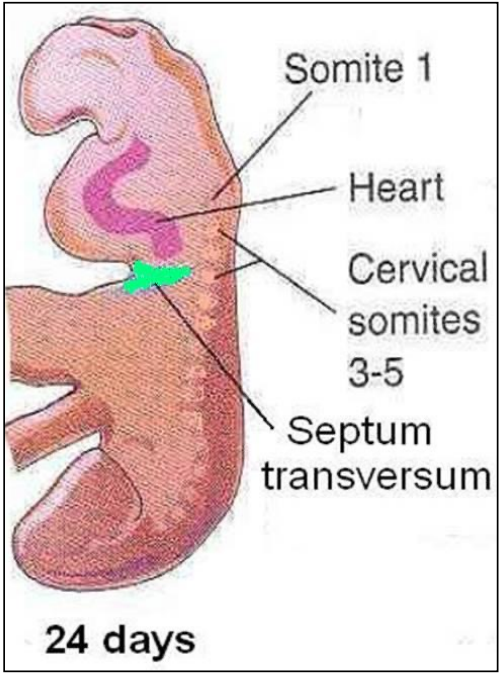
Body wall: peripheral muscular part

Positional Changes & Innervation of Diaphragm

- During the **4th week**, the **septum transversum** lies opposite the **3rd – 5th cervical somites.**

- During **5th week**, myoblasts from these somites move to the developing diaphragm bringing their **nerve fibers** with them (**phrenic nerve**).

- Thus, because the the diaphragm development originated in the cervical region, it is innervated by **phrenic nerve C3-5**.



- Rapid growth of the body of embryo results in further descent of diaphragm
- By the **6th week**, the **diaphragm** lies at the level of the **thoracic somites.**
- By the end of **8th week** the dorsal end of **diaphragm** lies at the level of **first lumbar vertebra.**

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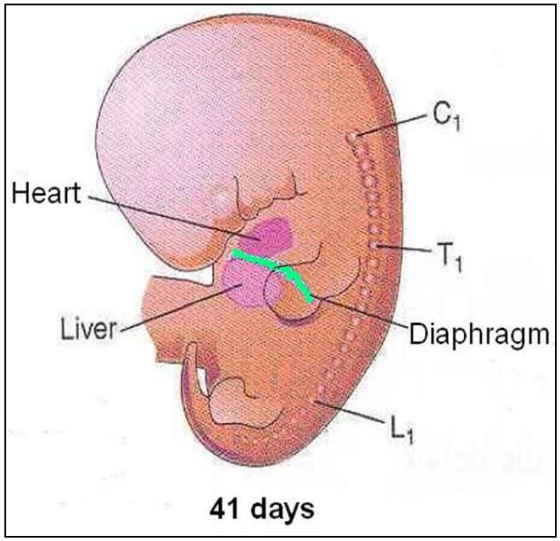
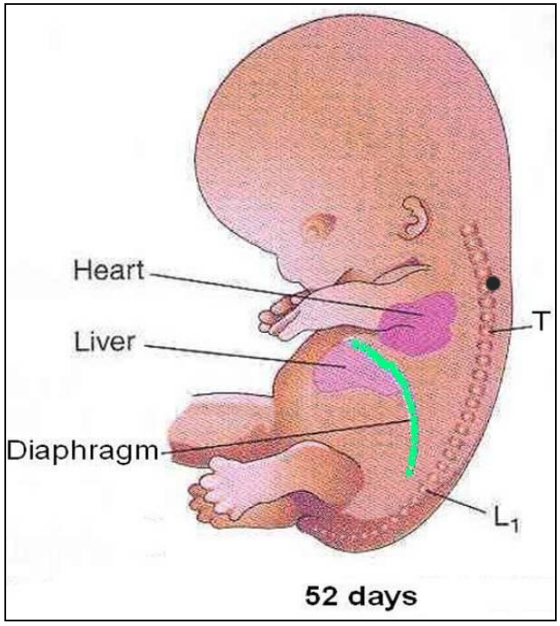
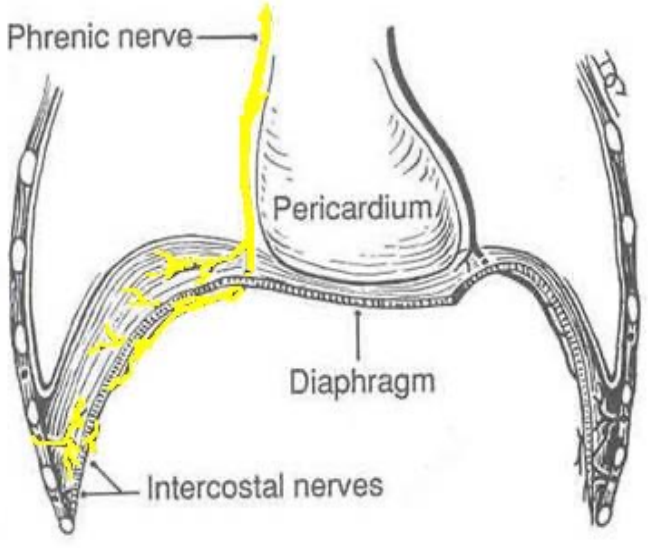


41 days



52 days

- When the **4 parts** of the diaphragm fuse, the mesenchymal cells from the septum transversum extend into the other three parts, change into myoblasts, and give rise to the muscles of the diaphragm.
  Thus, **phrenic nerve** supplies all the muscles of diaphragm



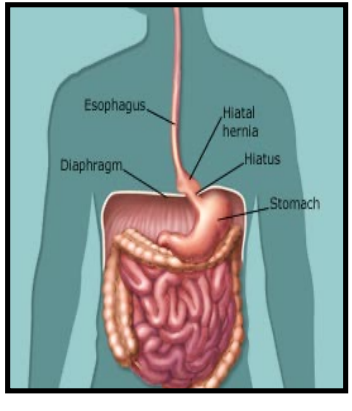
The **phrenic nerve** also supplies sensory fibers to diaphragm **except** in the **peripheral region** which is derived from the body wall and brings its nerve supply **(lower intercostal nerves)** with it.

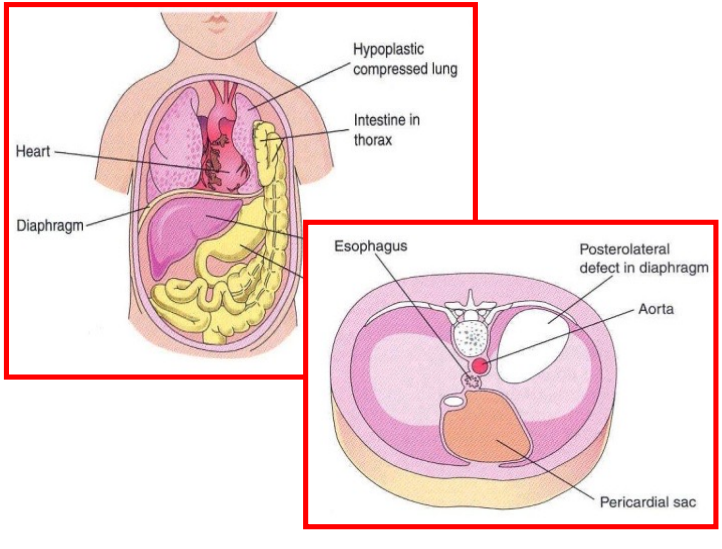
Congenital Anomalies

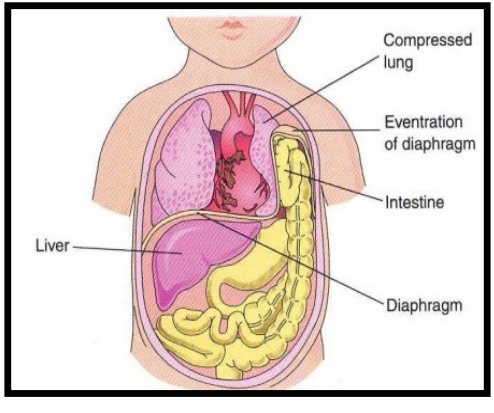
Congenital hiatal hernia: because of large esophageal hiatus

Congenital diaphragmatic hernia: Commonly through a posterolateral defect in diaphragm. Mostly on left side. Left lung shows hypoplasia

Eventration of diaphragm: because of defective musculature







Thank You

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