MESENTERIES AND COMPARTMENTALIZATION

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Embryology Course

MESENTERIES

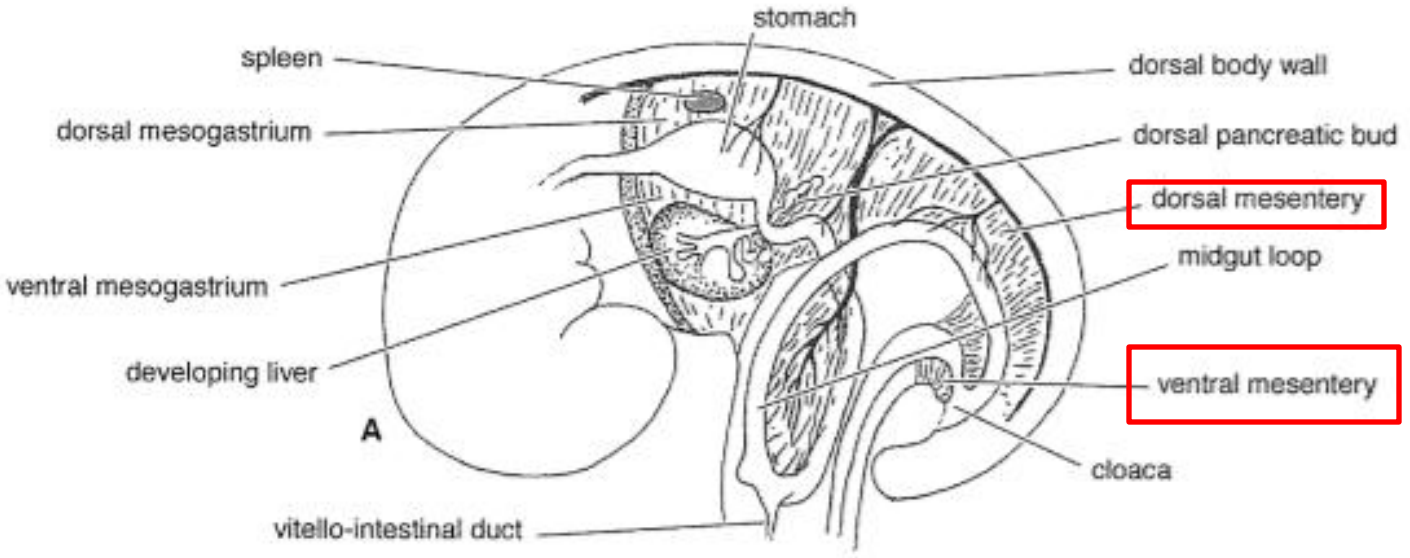
- **is a double layer of peritoneum**
- **begins as an extension of the visceral peritoneum**
- **covers the organs**
- **connects the organ to the body wall**
- **conveys its vessels and nerves**

FORMATION OF MESENTERIES

- **the primitive mesenteries formed from the splanchnopleura in the area between the thoracic esophagus and the rectum**

a. ventral mesentery

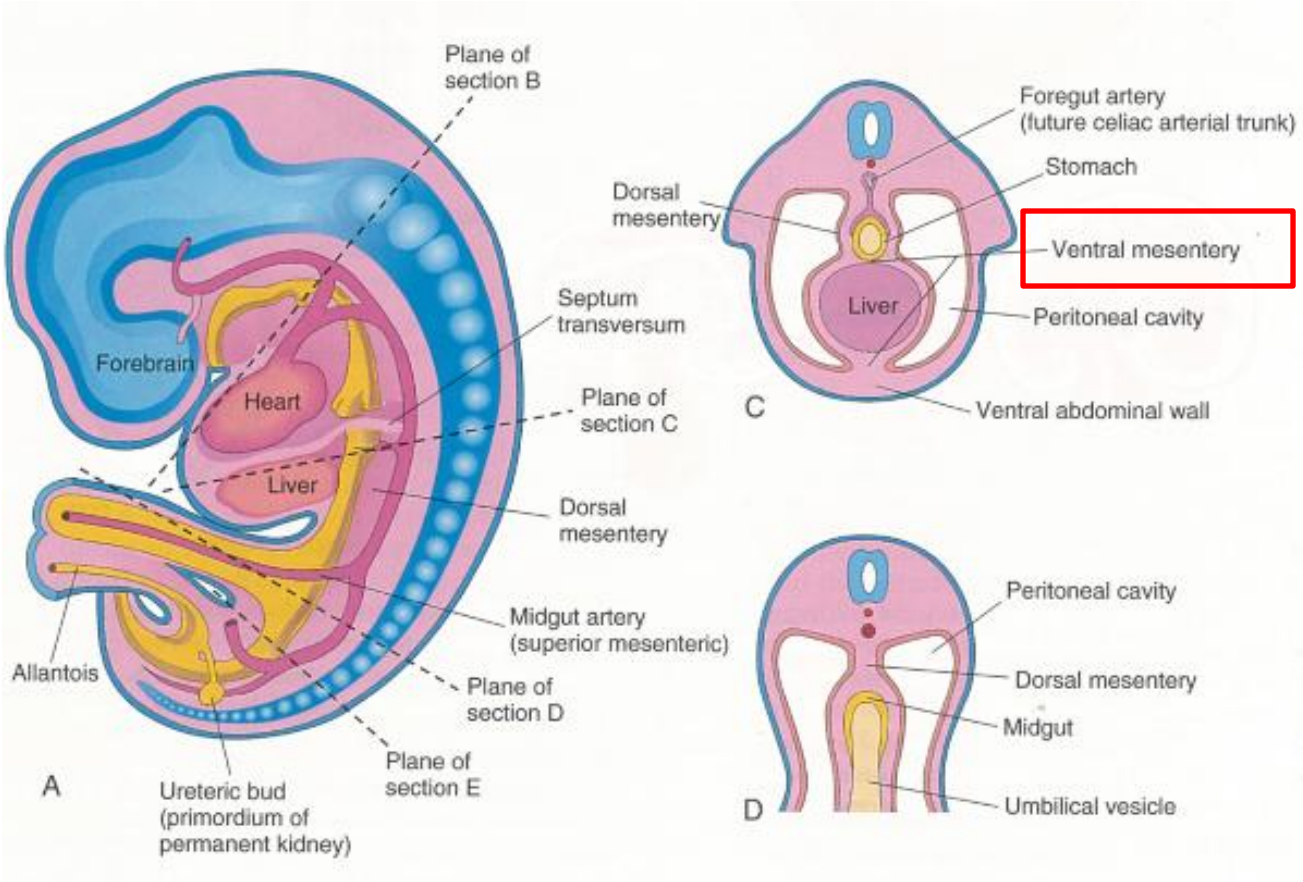
b. dorsal mesentery



FORMATION OF MESENTERIES

VENTRAL MESENTERY:

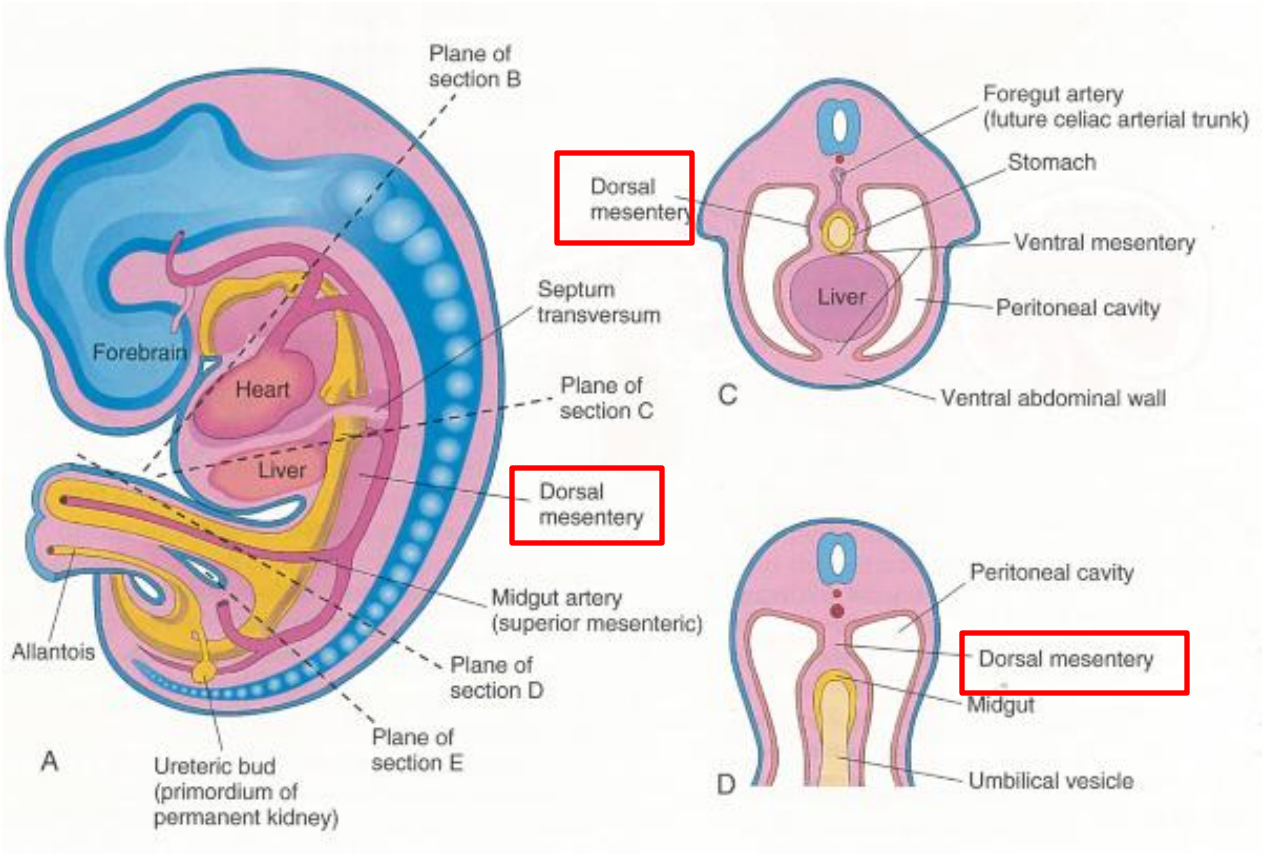
- **caudal to the foregut disappears**
- **the intestinal tract caudal to the descending duodenum has no ventral mesenteric attachment to the body wall**



FORMATION OF MESENTERIES

DORSAL MESENTERY:

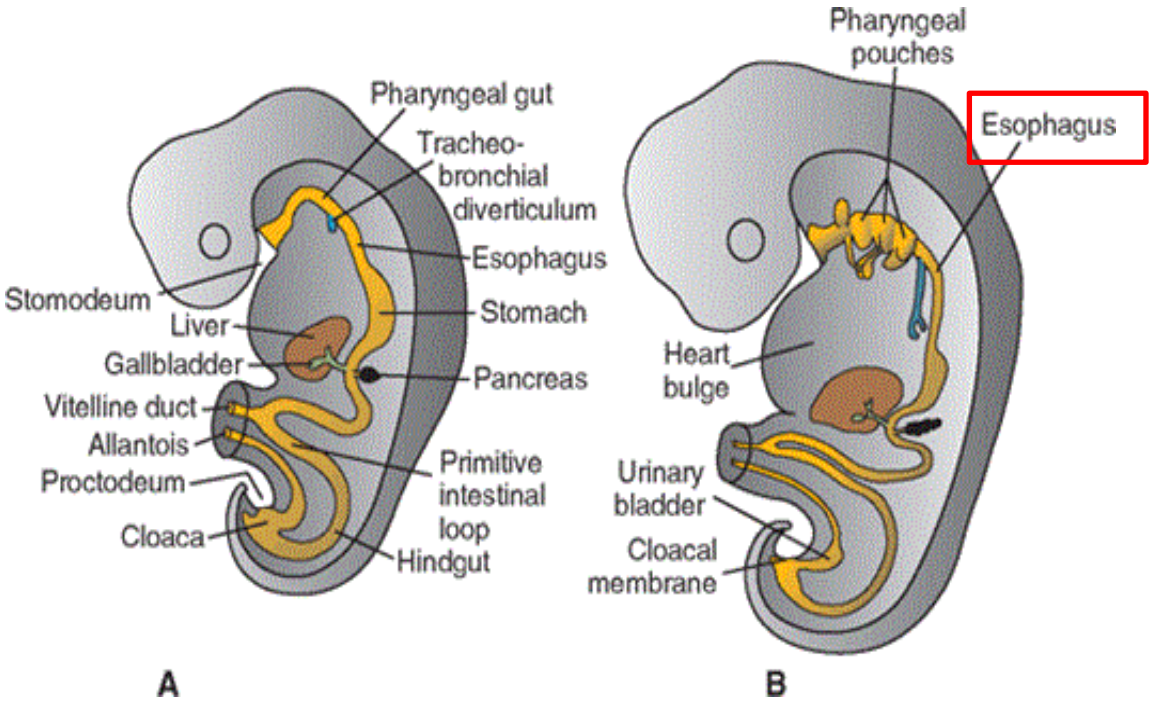
- **it grows at the same rate as does the intestinal tube to wich it is attached**
- **since the intestinal tube grows much faster in length than does the body wall, the dorsal mesentery becomes fan – shaped**
- **its long visceral border allows the torsion and coiling of the intestinal loop**



FORMATION OF MESENTERIES

MESOESOPHAGUS:

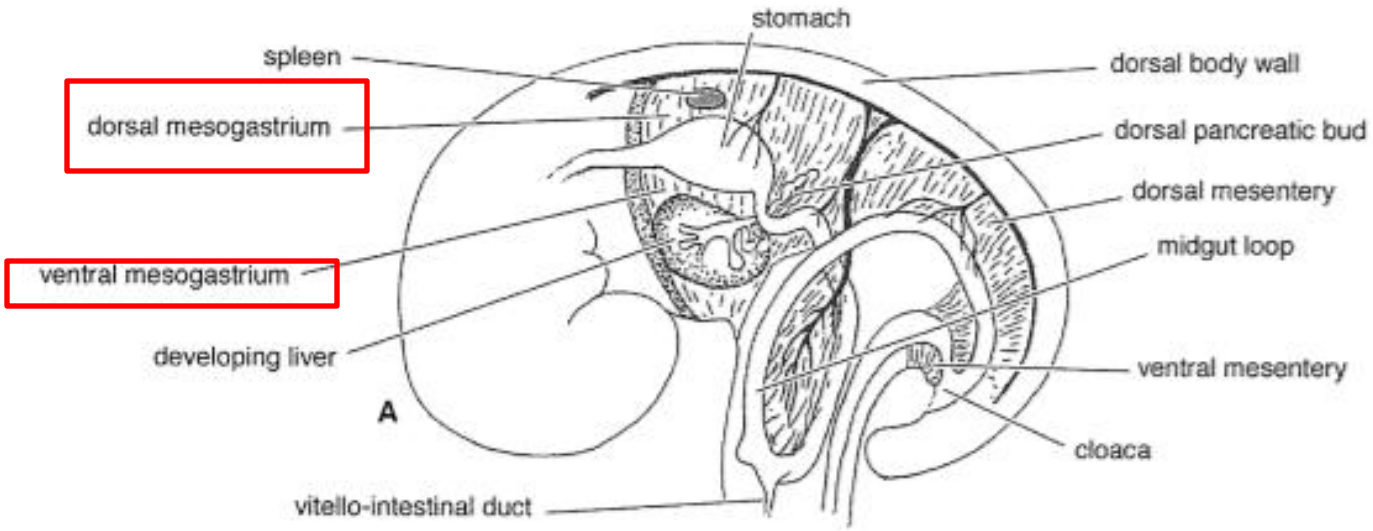
- **this part of mesentery found between the pharynx and the stomach**
- **formed from the dorsal and the ventral mesentery of the foregut**
- **in adult becomes the mediastinal pleura**



FORMATION OF MESENTERIES

MESOGASTRIUM:

1. **when the gerater curvature of the stomach rotates from the dorsal position to a position on the left – its pulls the dorsal mesogastrium to the left**
2. **small clefts form in the dorsal mesogastrium – which coalesce to form a cavity**
3. **the cavity is a space between the wall of the stomach and the dorsal mesentery**
4. **the cavity communicates with the peritoneal cavity – omental bursa**



FORMATION OF MESENTERIES

DORSAL MESOGASTRIUM:

- **continues to grow ventrally and caudally and the mesenteric cavity keeps pace with this growth**
- **the dorsal mesogastrium become modified into a sac called greater omentum**

GREATER OMENTUM (OMENTUM MAJUS):

- **lies on the ventral floor of the abdomen**
- **attached to the dorsal body wall**
- **attached to the greater curvature of the stomach**
- **its cavity is the omental bursa (bursa omentale), it communicates with the peritoneal cavity via the epiploic foramen**

FORMATION OF MESENTERIES

DORSAL MESOGASTRIUM:

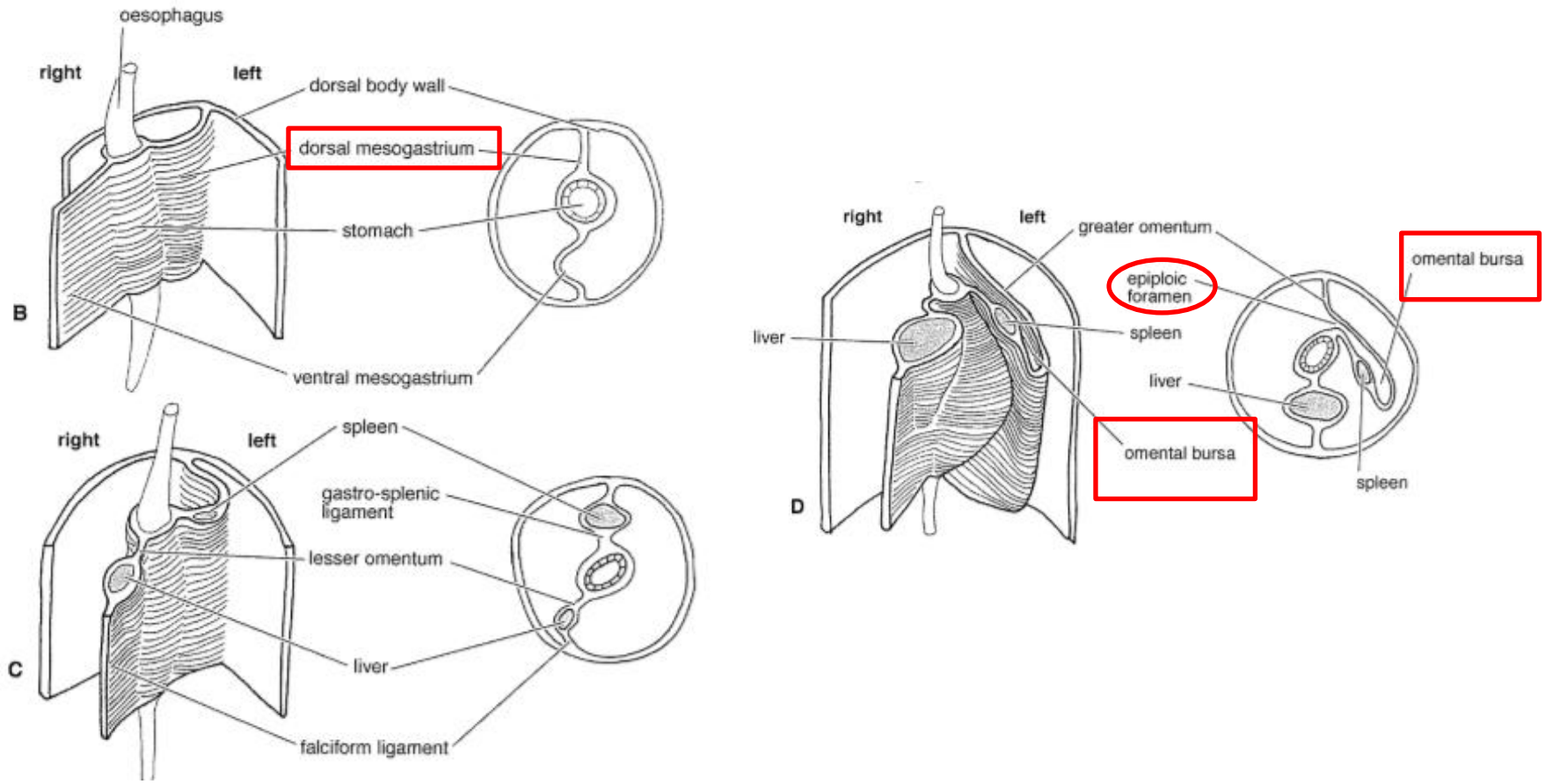


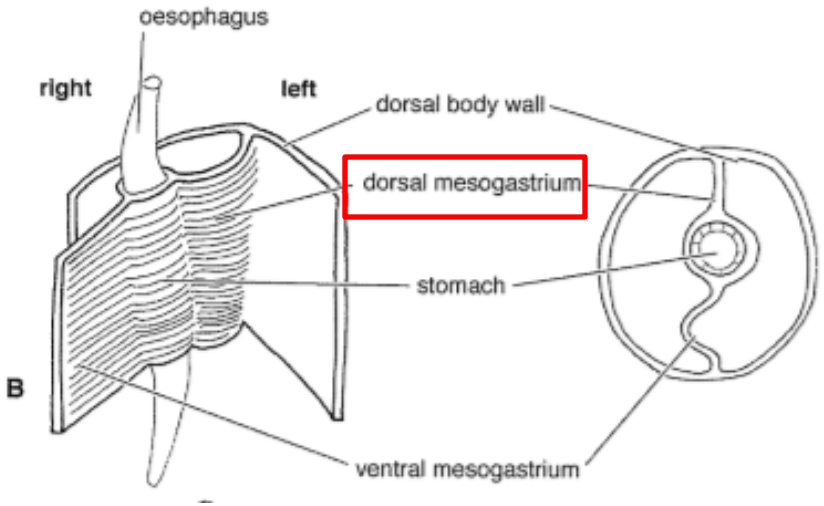
Figure 15.4 Lateral view, A, and ventro-lateral views and cross-sections through the abdominal region at the level of the stomach in a monogastric embryo. B, Developing stomach showing position of the dorsal mesogastrium and the ventral mesogastrium. C, Commencement of gastric rotation to the left and the position of the spleen in the dorsal mesogastrium and the liver in the ventral mesogastrium. D, Elongation of the dorsal mesogastrium and formation of the omental bursa. Growth of the liver in the ventral mesogastrium results in the formation of the lesser omentum dorsal to the liver and the falciform ligament ventrally.

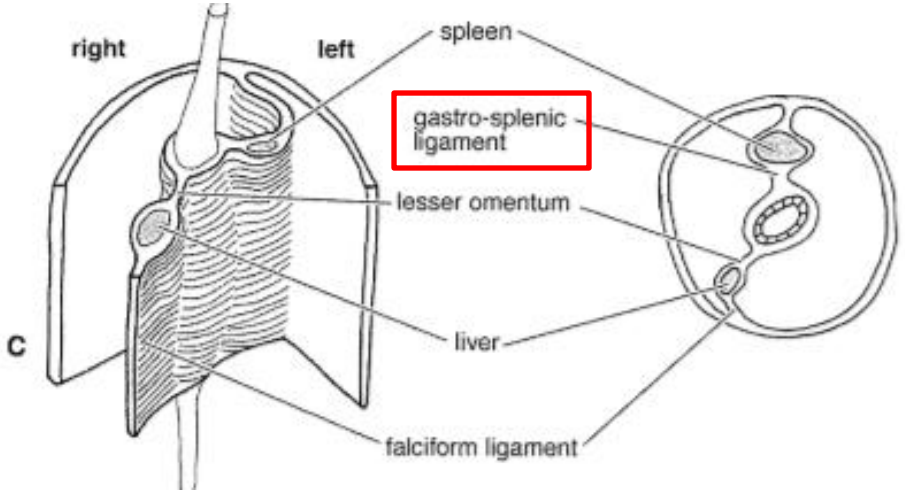
FORMATION OF MESENTERIES

DORSAL MESOGASTRIUM:

GREATER OMENTUM (OMENTUM MAJUS):

- **the spleen develops from a plexus of blood vessels, that branche into the greater omentum from the coeliac artery**
- **the part of the omentum between the stomach and the spleen is the gastrosplenic ligament**

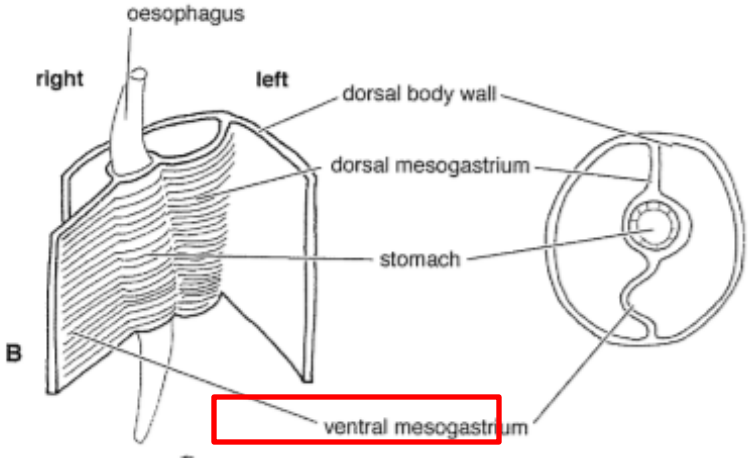


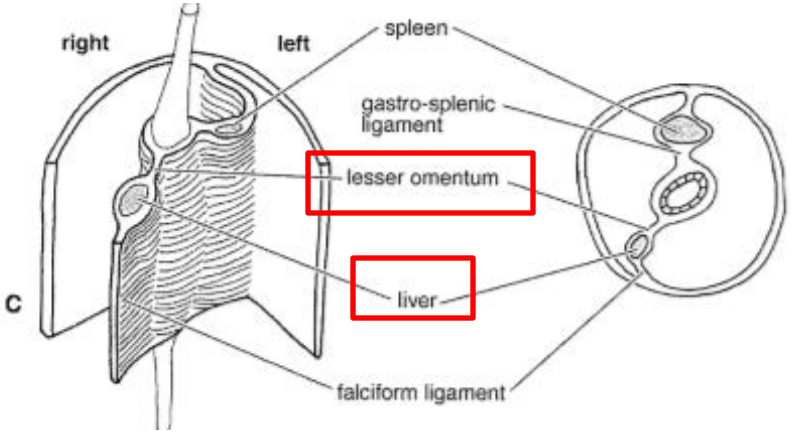


FORMATION OF MESENTERIES

VENTRAL MESOGASTRIUM:

- **contains the developing liver**
- **the ventral mesogastrium connects the liver to the lesser curvature of the stomach – this connection will be the lesser omentum (omentum minus)**
- **the liver is connected to the diaphragm - the ventral mesenterium continous with the peritoneum to form the coronary ligament**





FORMATION OF MESENTERIES

THE RUMINANT OMENTA:

- **because of the more complex development of the ruminant stomach, the attachment of the greater omentum are more complex**
- **the rumen and the reticulum are outgrowth of the areas of the embryonic stomach - the greater omentum will be attached to these parts of the ruminant stomach**
- **the attachment of the greater omentum continous onto the greater curvature of the abomasum**
- **the rumen and other parts of the stomach displaced during their development and they carry their original mesenteric attachments with them**

FORMATION OF MESENTERIES

THE RUMINANT OMENTA:

a. the developing rumen:

- **grows dorsocaudally and to left**
- **displaces the abomasum cranioventrally and to the right**

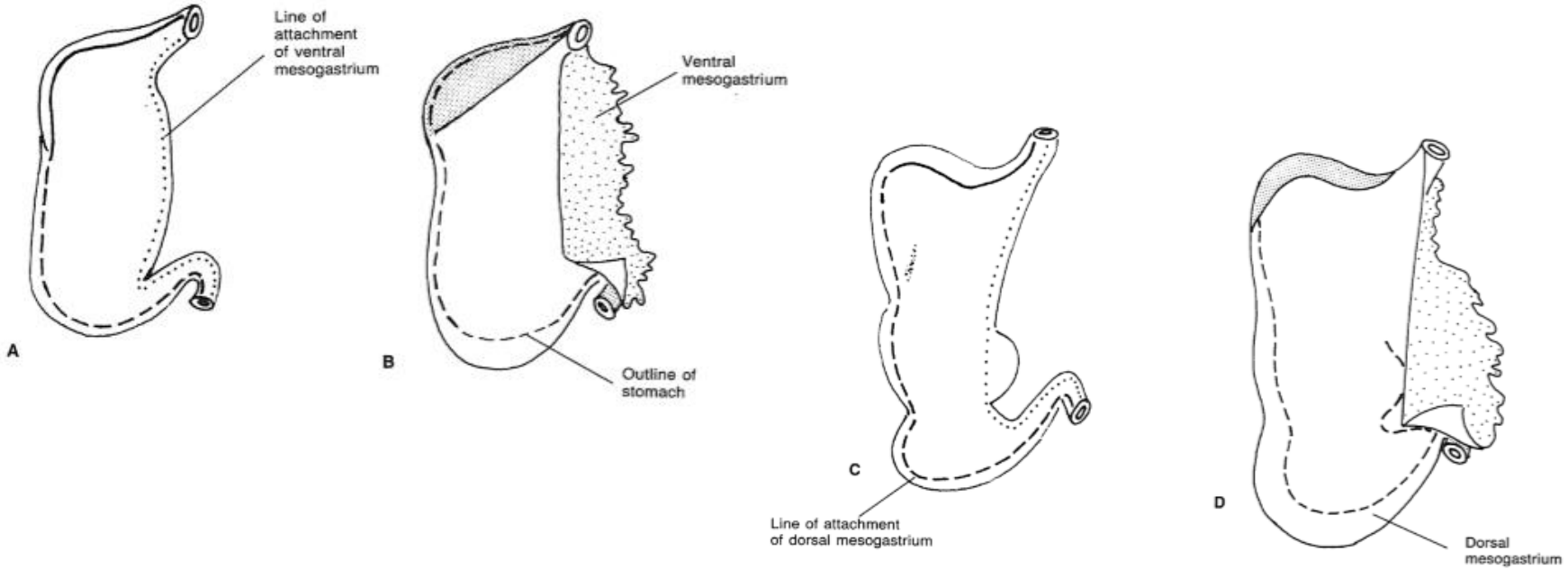


Figure 11–1 Development of ruminant omentum. *A, C, E,* and *G* illustrate the stages of ruminant stomach development with the omenta removed, but with the lines of omental attachment indicated by broken lines. *B, D, F,* and *H* are the same respective stages with omenta in place. Broken lines in *B, D, F,* and *H* represent the outlines of stomach. (Modified after Horowitz.) *(Continued on next page)*

FORMATION OF MESENTERIES

THE RUMINANT OMENTA:

b. the inital part of the descending duodenum:

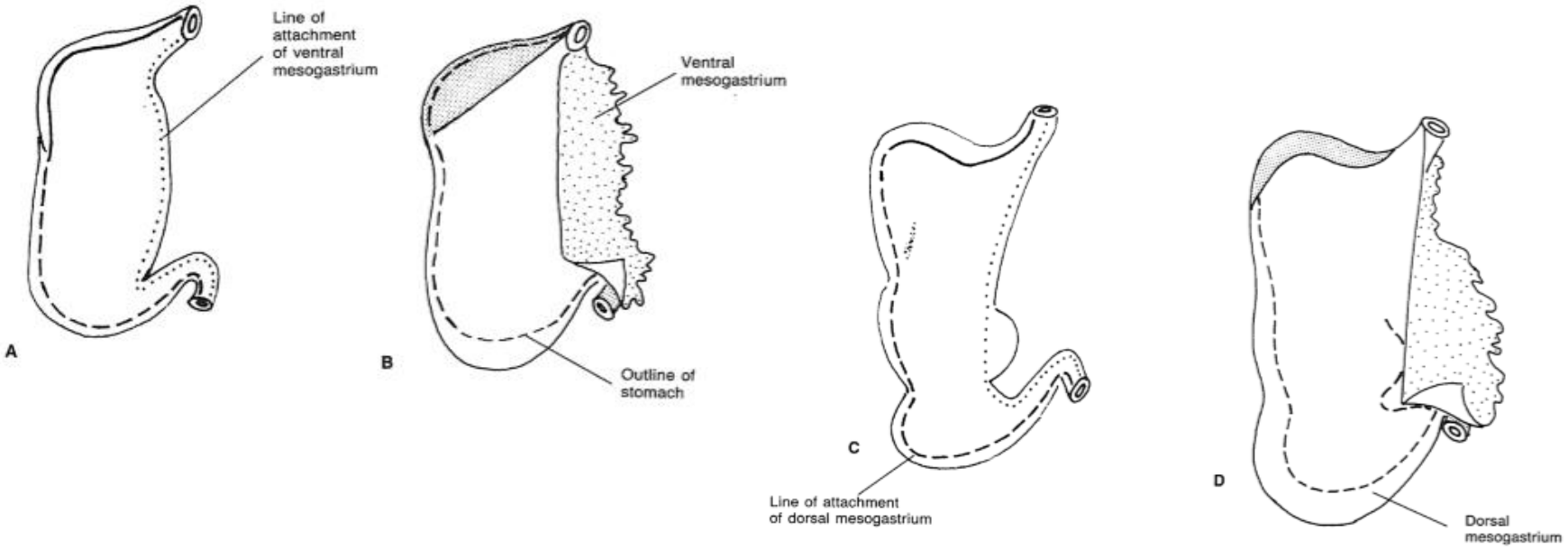
- **displaced cranially**
- **folds back upon itself as it leaves the abomasum**
- **this brings the superficial and deep layer of the omentum close to the mesoduodenum of the descending duodenum – and these mesenteries fuse**
- **the folding of the initial part of the duodenum brings the omental attachment of duodenum and rumen close to the omental attachment of the abomasum – this allows the omenta of two structures to fuse**
- **the superficial and deep layer of the greater omentum and mesoduodenum have common attachment to the dorsal body wall**

FORMATION OF MESENTERIES

THE RUMINANT OMENTA:

c. the abomasum:

- attaches via the attachment of the duodenum and rumen – this permits the abomasum to have freedom of movement



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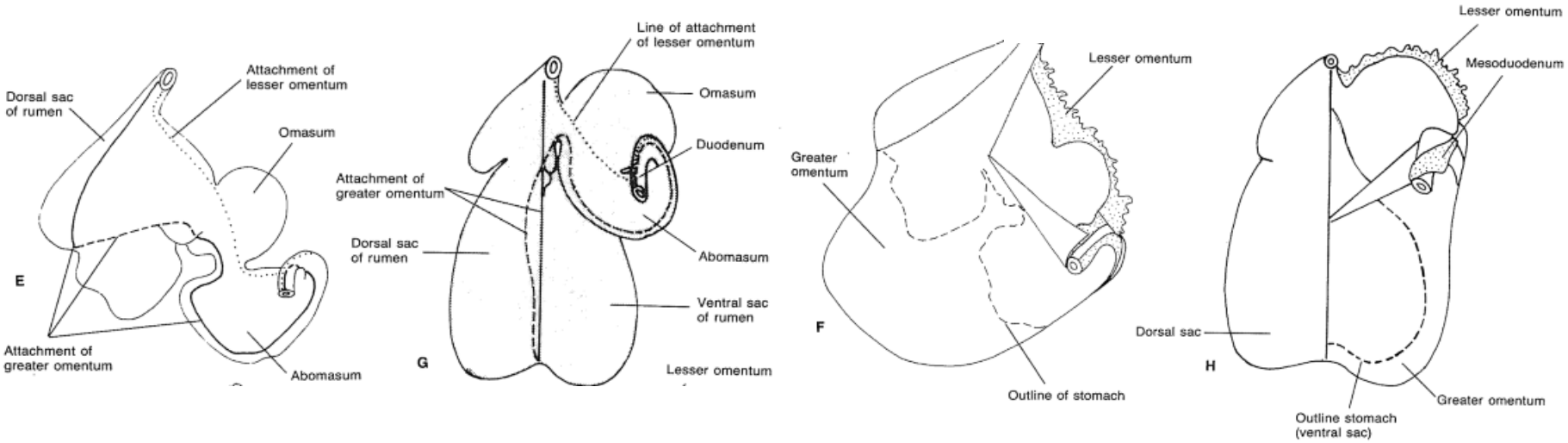
FORMATION OF MESENTERIES

THE RUMINANT OMENTA:

releation of the omental attachments to the development of the sacs of the rumen:

a. the dorsal sac:

- **cranial part covered by dorsal mesogastrium**
- **the dorsal sac grows dorsally, fuses with the dorsal body wall**
- **pulls the gastrosplenic portion of the omentum with it**
- **the gastrosplenic fold and the dorsal part of the spleen fuse to the dorsal sac**

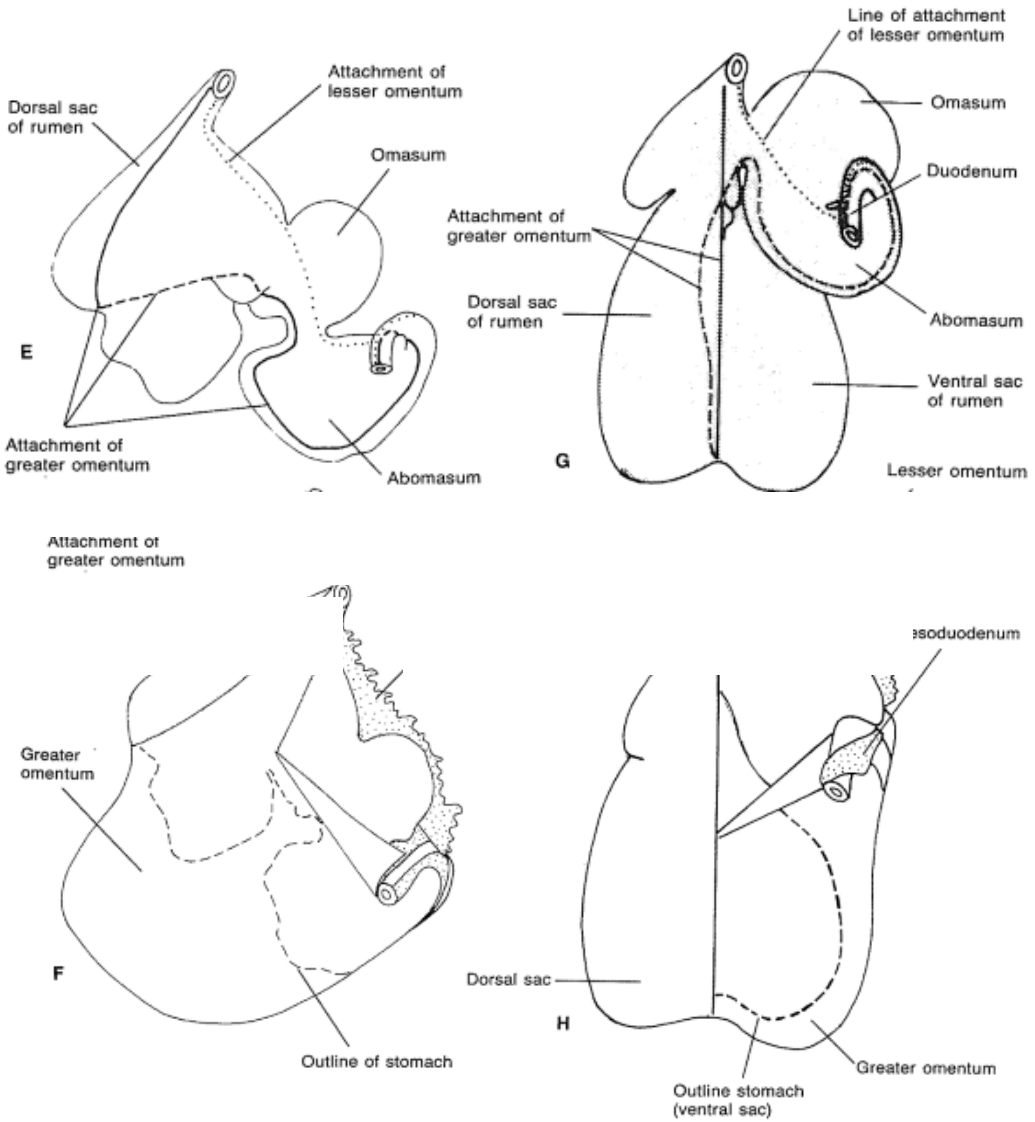


FORMATION OF MESENTERIES

THE RUMINANT OMENTA:

the ventral sac:

- **surrounded by the mesogastrium,**
- **lies in the omental bursa**

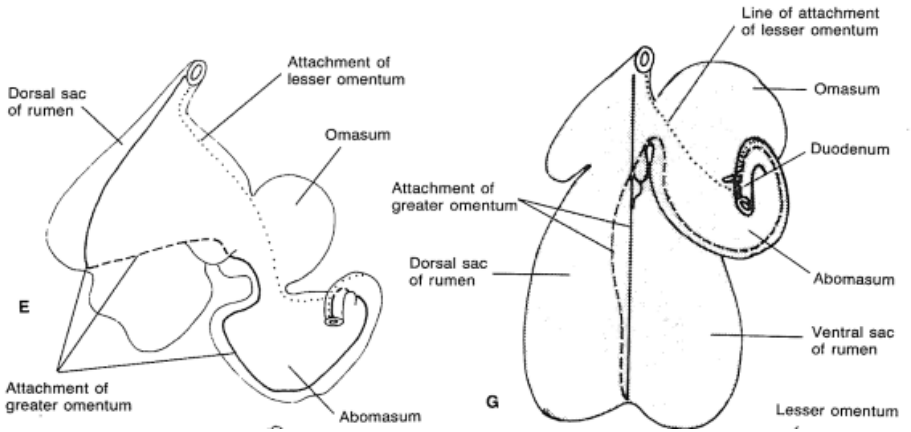


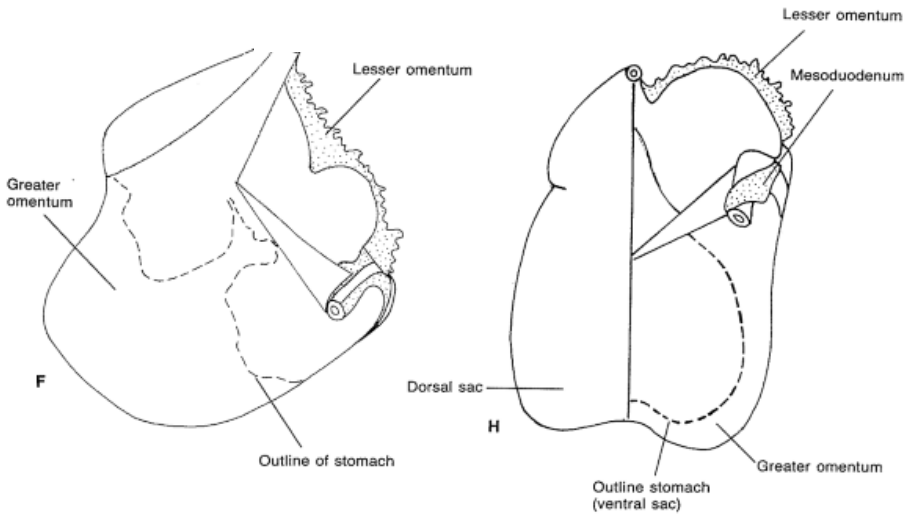
FORMATION OF MESENTERIES

THE RUMINANT OMENTA:

Reticulum:

- **develops along the greater curvature of the embryonic stomach, caudal to the rumen**
- **the attachment of the greater omentum continues from the left longitudinal groove of the rumen onto the reticulum, from here onto the greater curvature of the abomasum**



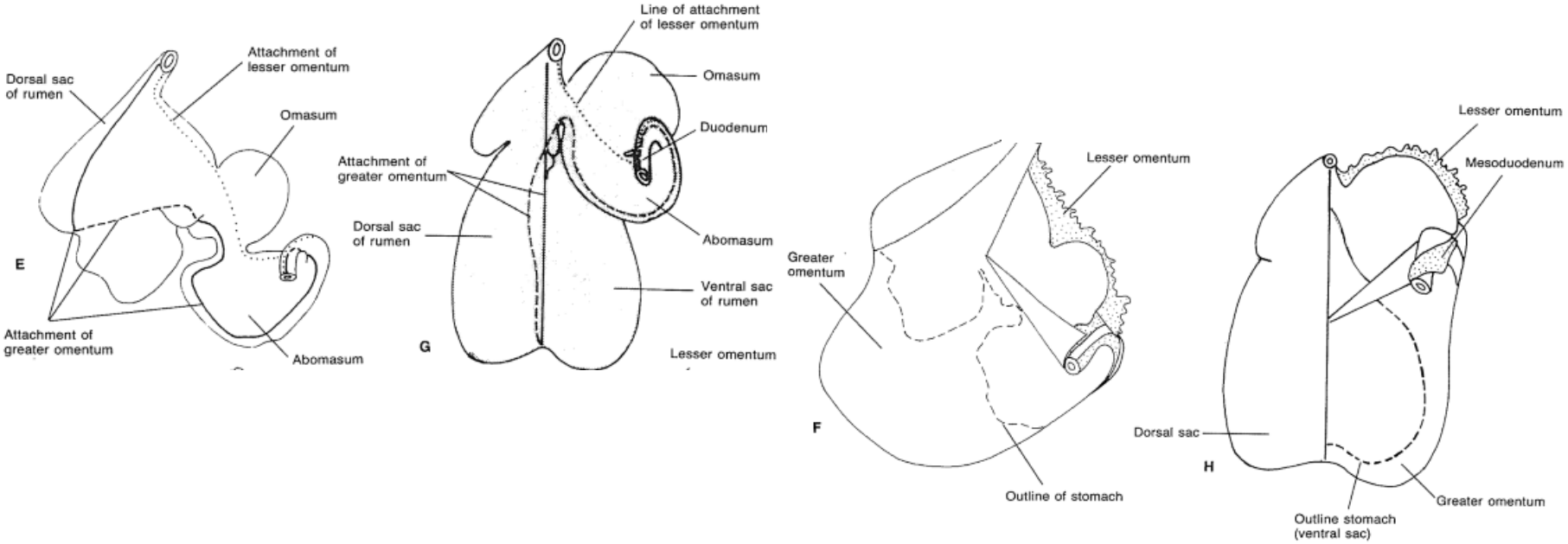


FORMATION OF MESENTERIES

THE RUMINANT OMENTA:

Omasum :

- **does not attached to the greater omasum, because the omasum derived from an area along the lesser curvature of the stomach**
- **omasum and lesser curvature of abomasum attached to the ventral mesogastrium**
- **ventral mesogastrium becomes the lesser omentum**

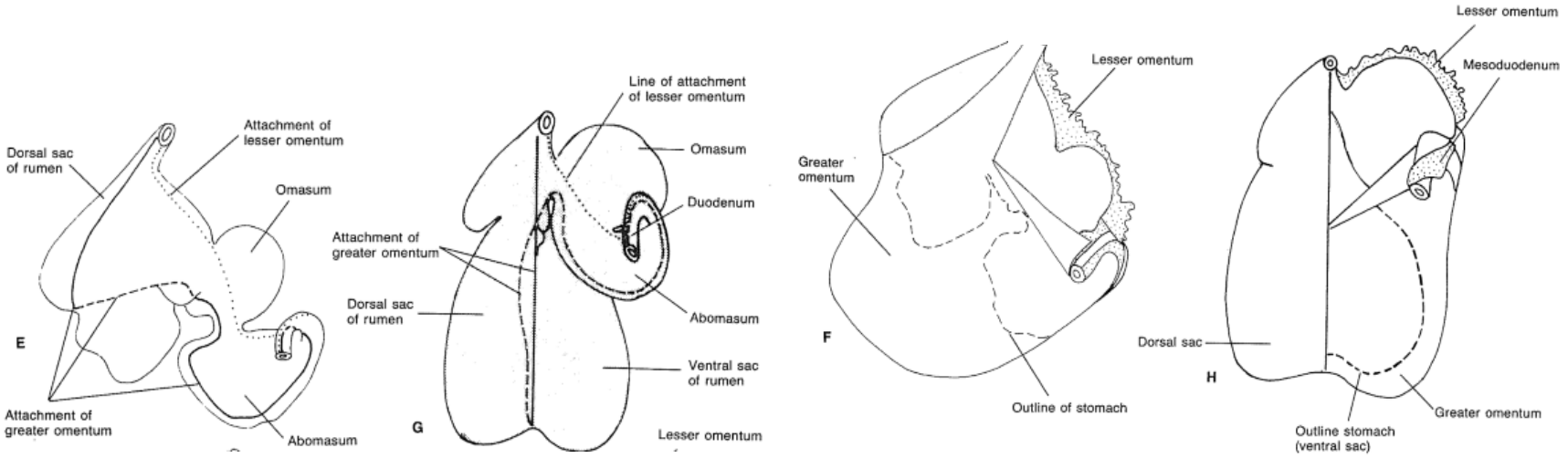


FORMATION OF MESENTERIES

THE RUMINANT OMENTA:

OMENTUM MAJUS:

1. **the attachment of the greater omentum begins at the dorsal esophagus**
2. **it goes along the right longitudinal groove of the rumen**
3. **it goes along the caudal boundary between the dorsal and ventral sacs to the left longitudinal groove**
4. **from here goes to the reticulum**
5. **and along the greater curvature of the abomasum to the mesoduodenum**



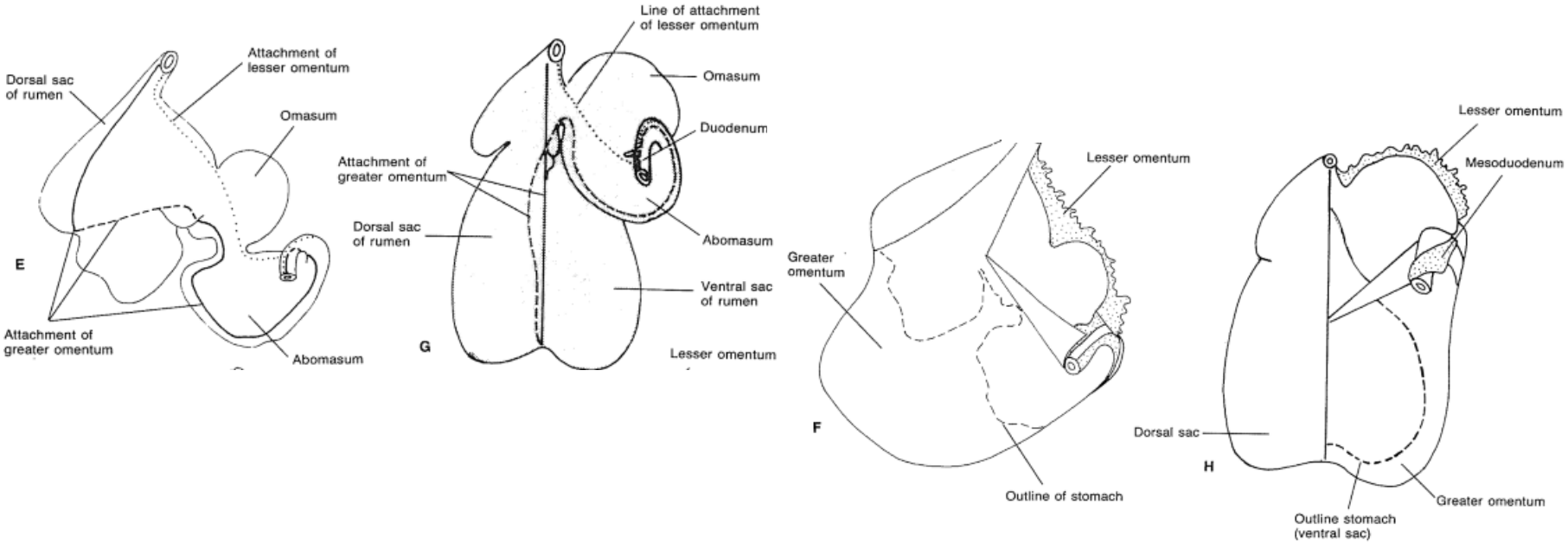
FORMATION OF MESENTERIES

THE RUMINANT OMENTA:

OMENTUM MINUS:

1. **begins at the omasum along the lesser curvature of the abomasum**

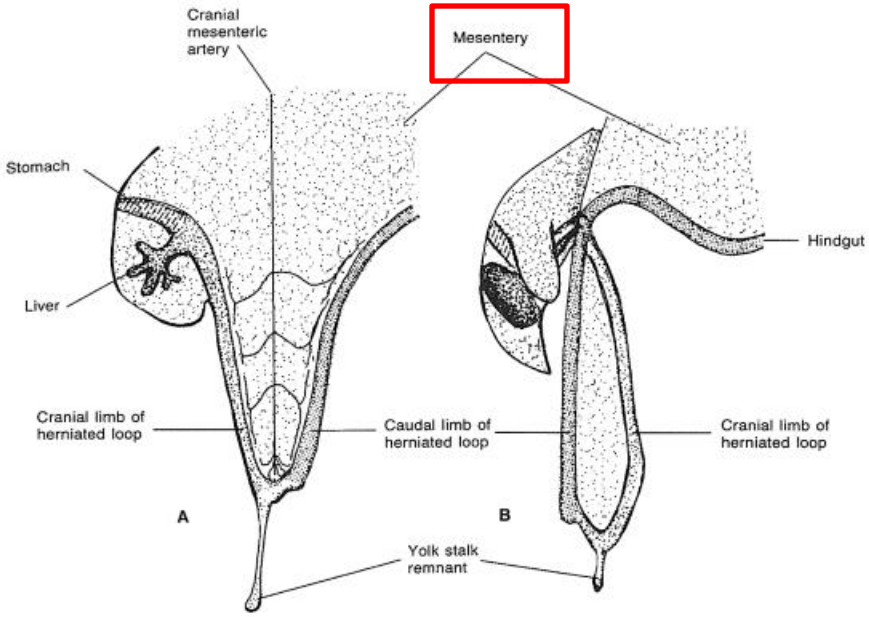
2. **ends by attaching to the liver**

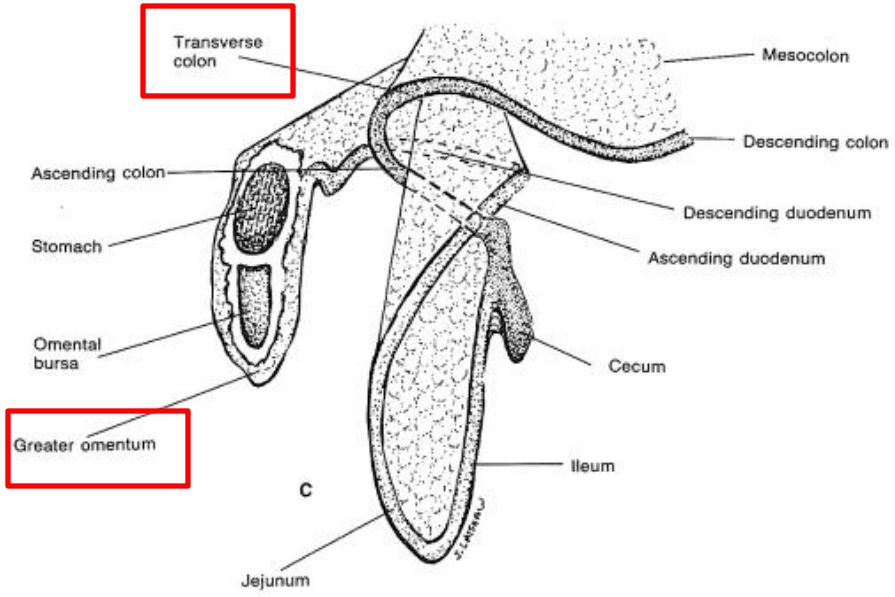


FORMATION OF MESENTERIES

Other changes in the dorsal mesentery during development involve fusion of some of its various parts

1. **the torsion of the intestinal loop brings the mesoduodenum, mesojejunum, mesocolon into close apposition, and near the root of the cranial mesenteric artery**
2. **these elements of the mesentery fuse, the fusion marked between the descending colon and ascending duodenum – duodenal – colic ligament**
3. **the first twist of the intestinal lop brings the transverse mesocolon and the gerater omentum close togehter**





FORMATION OF MESENTERIES

Other changes in the dorsal mesentery during development involve fusion of some of its various parts

in ox and horse:

- **the greater mesocolon fused with the descending mesoduodenum**
- **the part of the mesoduodenum containing pancreas and the dorsal body wall fuse – the result is the retroperitoneal position of the pancreas in ox and horse**

FORMATION OF MESENTERIES

Other changes in the dorsal mesentery during development involve fusion of some of its various parts

in horse:

- **the left dorsal and ventral parts of the ascending colon have no mesenteric attachments**
- **these are not fixed by mesentery – may normally „move about”**
- **when the caecum grows over the distal ileum and proximal colon – the mesoileum becomes attached to the caecum – and the mesenteric fold runs from the ileum to the caecum – ileocecal fold**

FORMATION OF MESENTERIES

Other changes in the dorsal mesentery during development involve fusion of some of its various parts

In ruminants:

- **the mesocolon of ascending colon is lost as the colon coils to form the spiral colon**

COMPARTMENTALIZATION OF THE COELOM

FORMATION OF EMBRYONIC COELOM:

1. the coelom formed by splitting the lateral mesoderm into somatic and splanchnic layers

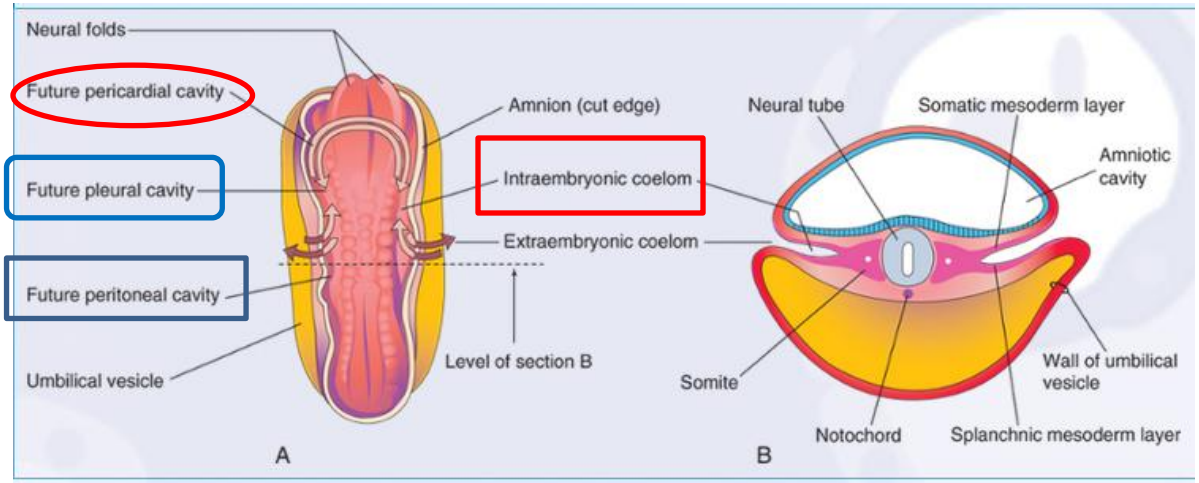
- the space between the somatic and splanchnic layer is the coelom

2. the intraembryonic coelom (primordium of the body cavities) appears as a horseshoe – shaped cavity

a. the curve in this cavity at the cranial end of the embryo represents the future pericardial cavity

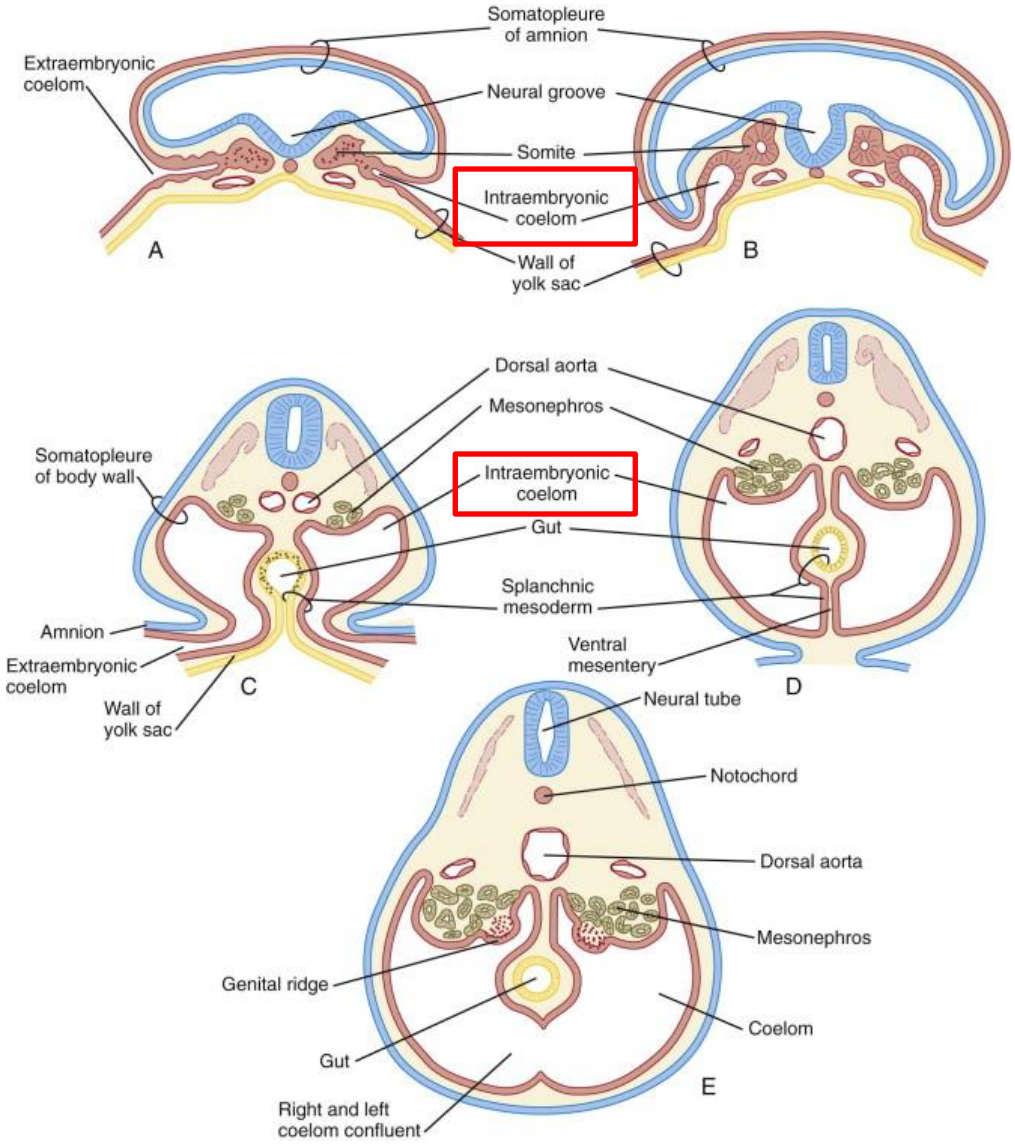
b. the limbs of this cavity indicate the future pleural and peritoneal cavity

c. the distal part of each limb of the intraembryonic coleom continuous with the extraembryonic colelom at tha lateral edge of the embryonic disc



COMPARTMENTALIZATION OF THE COELOM

FORMATION OF EMBRYONIC COELOM:



COMPARTMENTALIZATION OF THE COELOM

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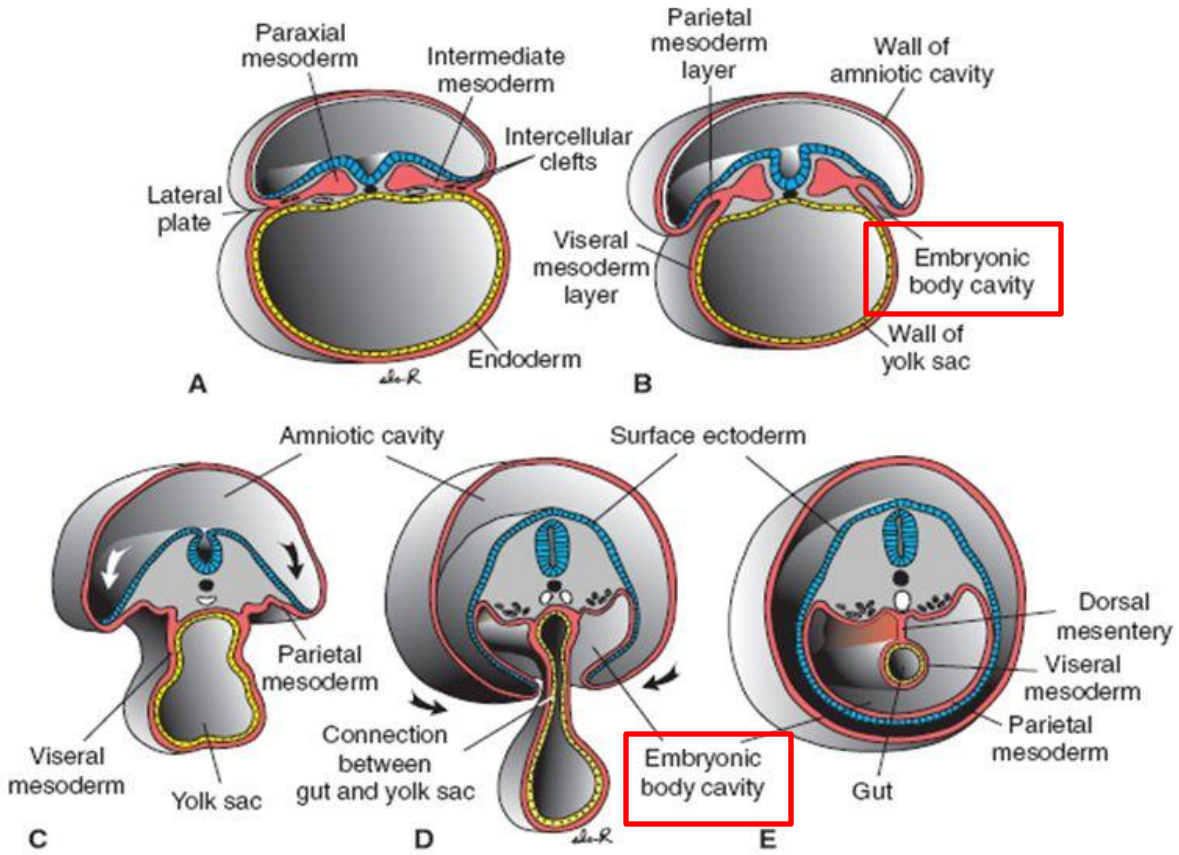
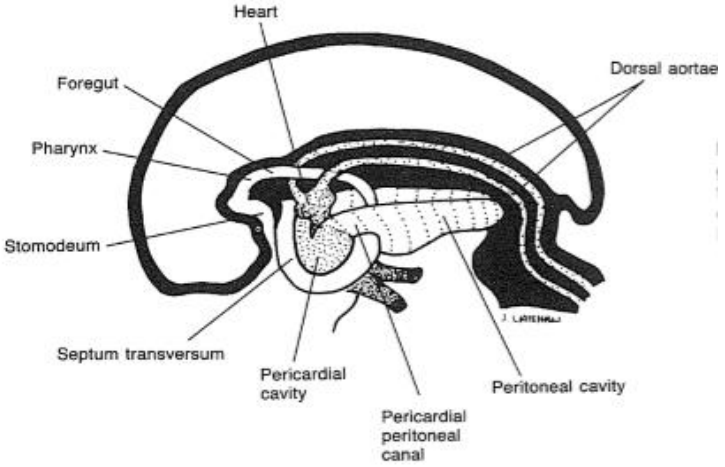


Figure 7.1 Transverse sections through embryos at various stages of closure of the gut tube and ventral body wall. **A.** At approximately 19 days, intercellular clefts are visible in the lateral plate mesoderm. **B.** At 20 days, the lateral plate is divided into somatic and visceral mesoderm layers that line the primitive body cavity (intraembryonic cavity). **C.** By 21 days, the primitive body cavity (intraembryonic cavity) is still in open communication with the extraembryonic cavity. **D.** By 24 days, the lateral body wall folds, consisting of the parietal layer of lateral plate mesoderm and overlying ectoderm are approaching each other in the midline. **E.** At the end of the fourth week, visceral mesoderm layers are continuous with parietal layers as a double-layered membrane, the dorsal mesentery. Dorsal mesentery extends from the caudal limit of the foregut to the end of the hindgut.

COMPARTMENTALIZATION OF THE COELOM



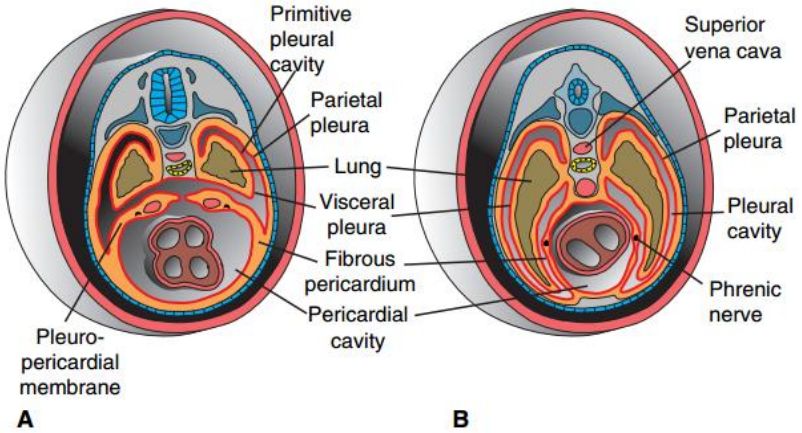
EMBRYONIC BODY CAVITY:

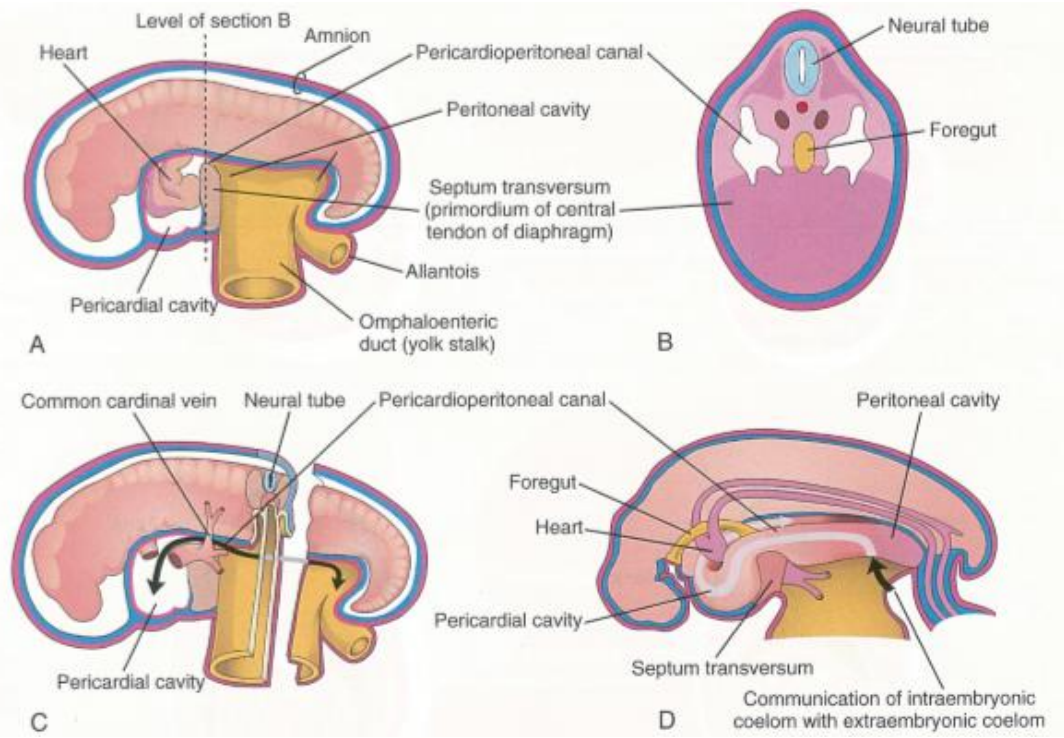
the intraembryonic coelom gives rise to:

a. pericardial cavity

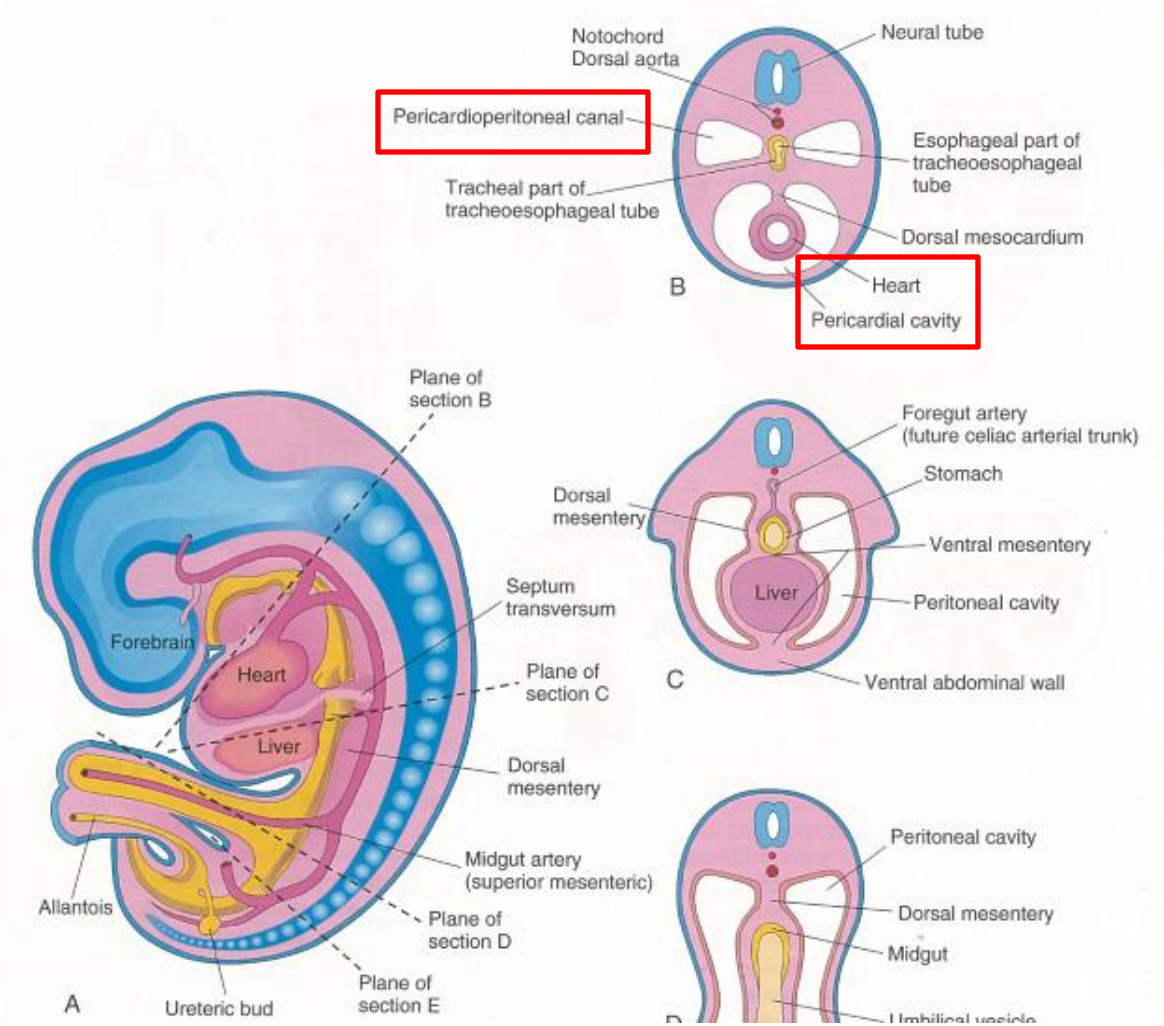
b. two pericarioperitoneal canals connecting the pericardial and peritoneal cavities

c. large peritoneal cavity





COMPARTMENTALIZATION OF THE COELOM

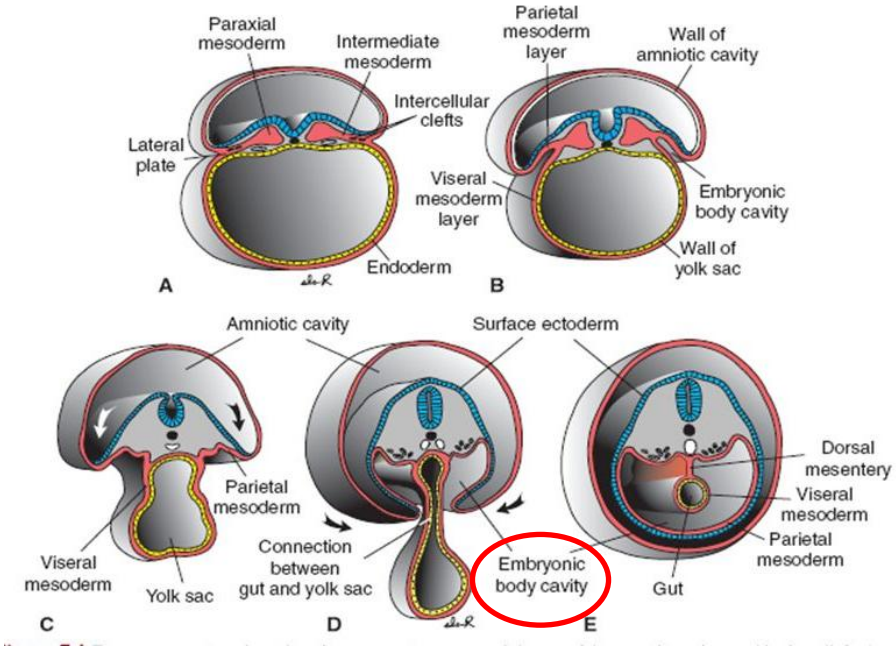


COMPARTMENTALIZATION OF THE COELOM

EMBRYONIC BODY CAVITY:

-these cavities lined by mesothelium

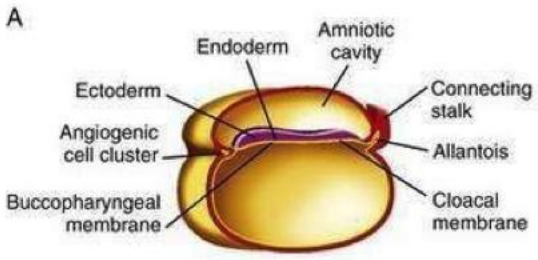
- **parietal wall derived from the somatic mesoderm**
- **viscreal wall derived from the splanchnic mesoderm**
- **the peritoneal cavity connceted to the extraembryonic coelom at the umbilicus**
- **the peritoneal cavity loses its connection with the extraembryonic coleom as the intestines return to the abdomen from the umbilical cord**

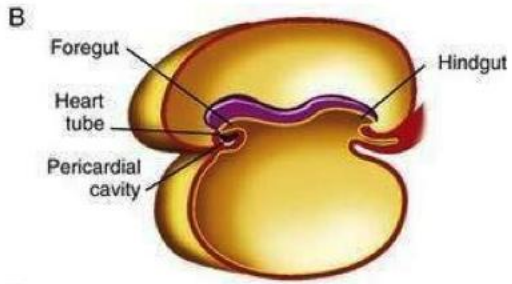


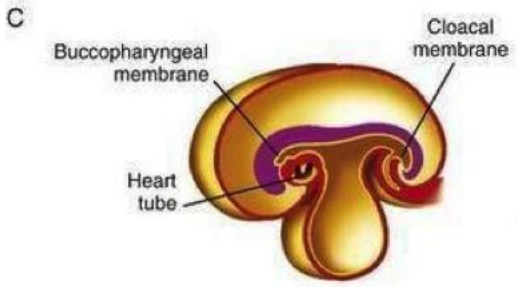
COMPARTMENTALIZATION OF THE COELOM

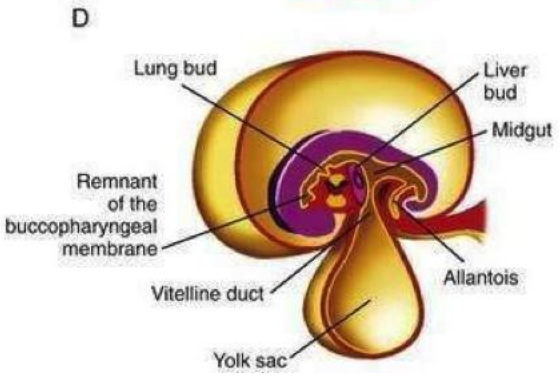
EMBRYONIC BODY CAVITY:

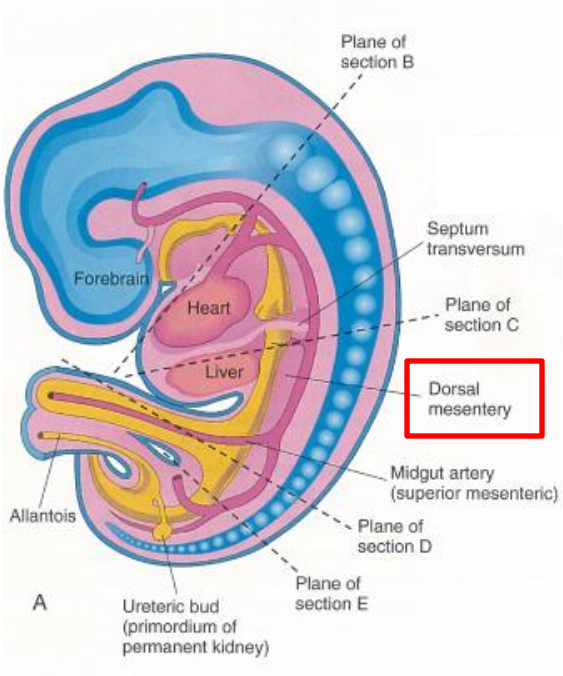
1. **during the formation of the head fold, the heart, and pericardial cavity move ventrocaudally, anterior to the foregut**
2. **the pericardial cavity opens into the pericardioperitoneal canals**
3. **after embryonic folding the caudal parts of the foregut, midgut, hindgut are suspended in the peritoneal cavity from the dorsal abdominal wall by the dorsal mesentery**







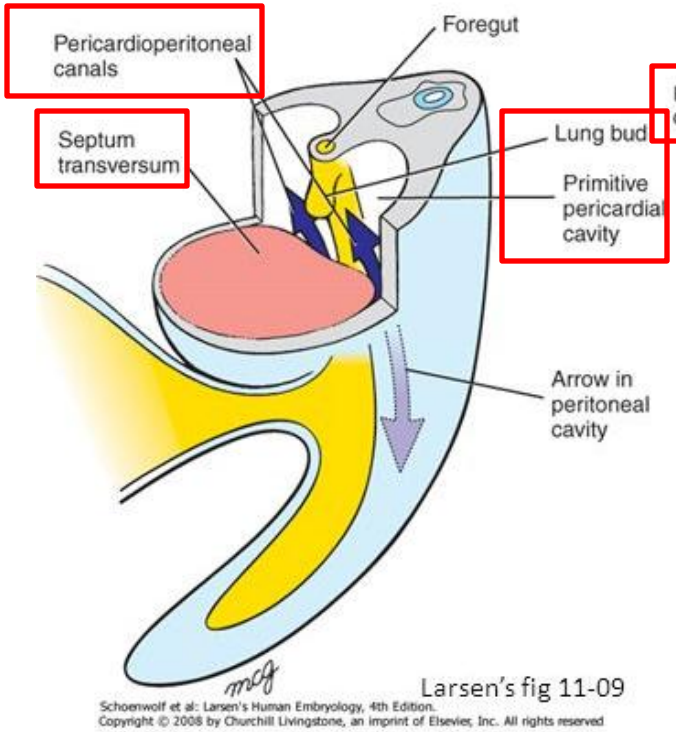




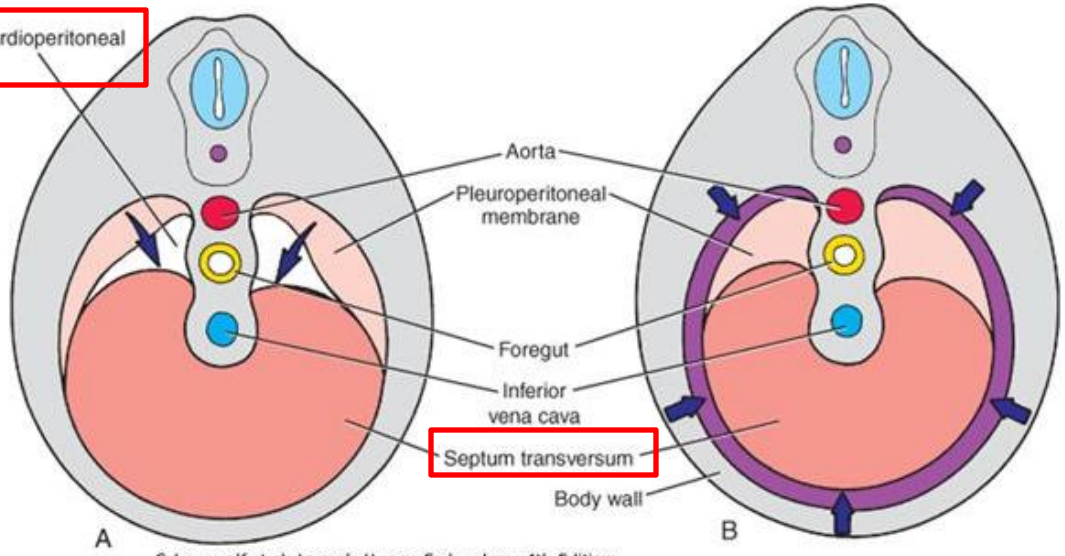
COMPARTMENTALIZATION OF THE COELOM

DIVISION OF THE EMBRYONIC BODY CAVITY:

1. **each pericardioperitoneal canal lies lateral to the proximal part of the foregut (future esophagus) and dorsal to the septum transversum (thick plate occupies the space between the thoracic cavity and the omphalonteric duct)**



Larsen's fig 11-09



Larsen's fig 11-10

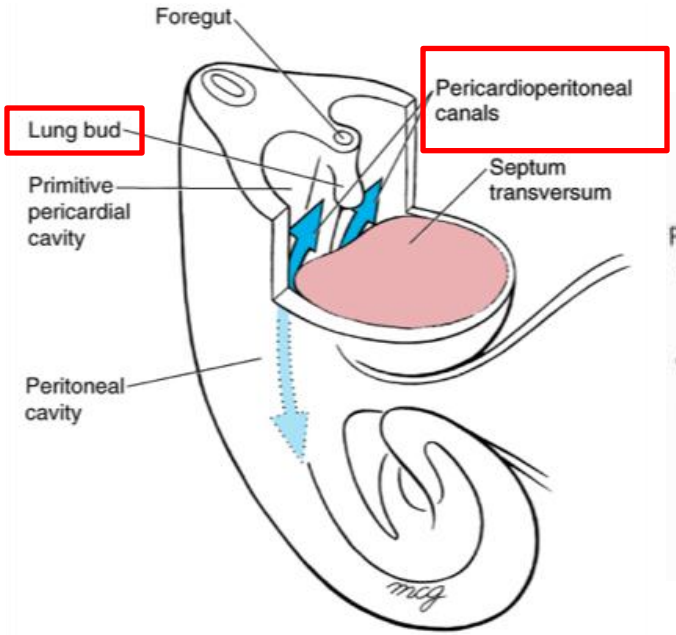
COMPARTMENTALIZATION OF THE COELOM

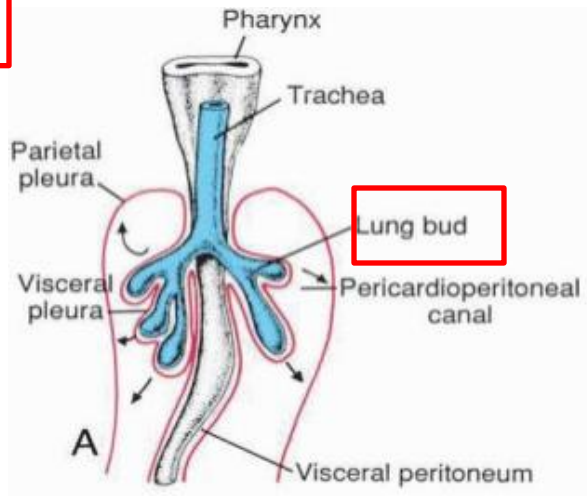
DIVISION OF THE EMBRYONIC BODY CAVITY:

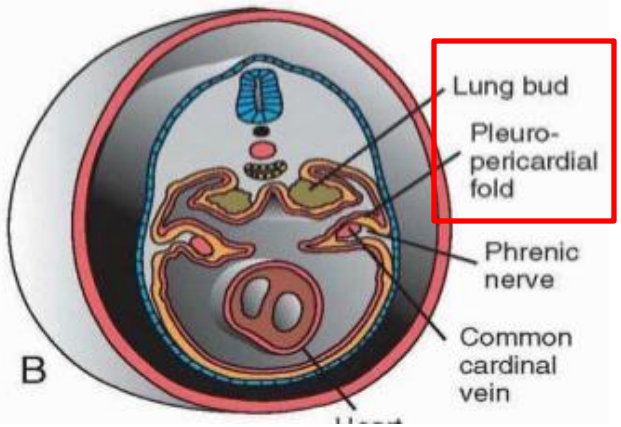
1. **because of the growth of the bronchial buds (primordia of bronchi and lungs) into the pericardioperitoneal canals – a pair of membranous ridges is produced in the lateral wall of each canal**

a. **the cranial ridges (pleuropericardial folds) located cranial to the developing lungs**

b. **the caudal ridges (pleuroperitoneal folds) located caudal to the lungs**





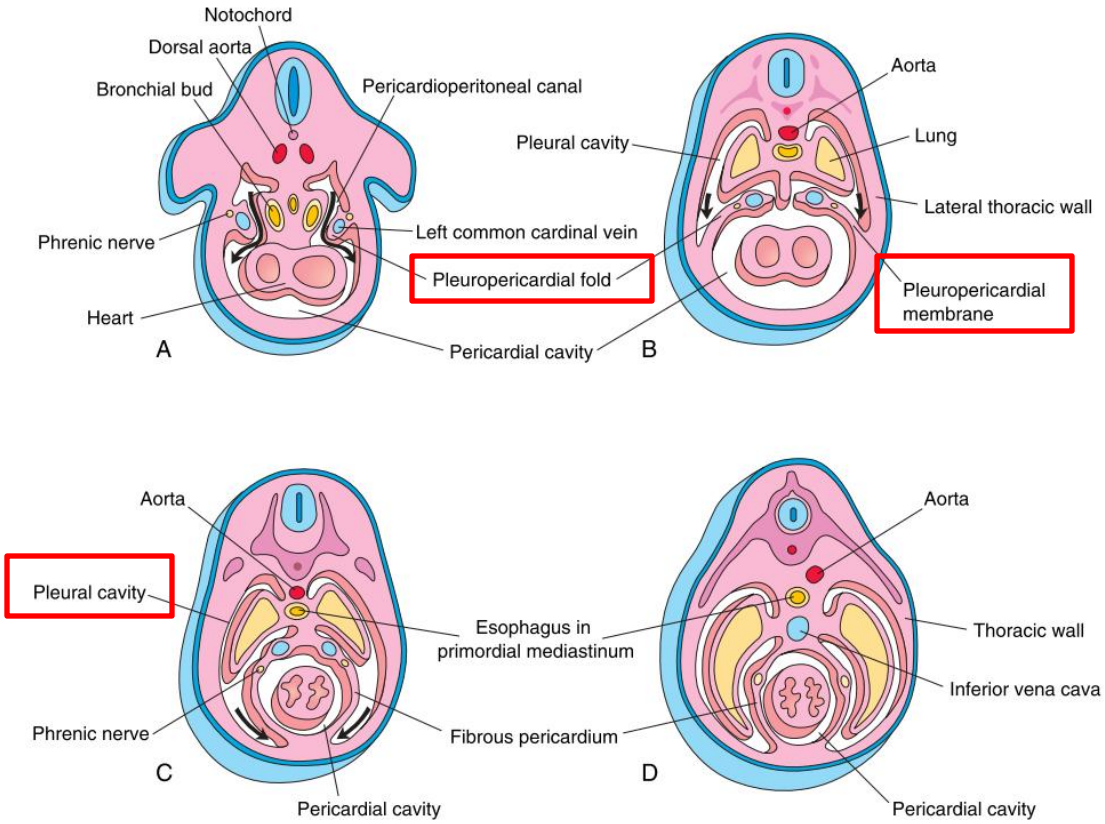


COMPARTMENTALIZATION OF THE COELOM

DIVISION OF THE EMBRYONIC BODY CAVITY:

3. the pleuropericardial folds enlarge, they form the pleuropericardial membranes, that separate the pericardial cavity from the pleural cavity

- the pleuropericardial membranes contain the common cardinal veins



COMPARTMENTALIZATION OF THE COELOM

DIVISION OF THE EMBRYONIC BODY CAVITY:

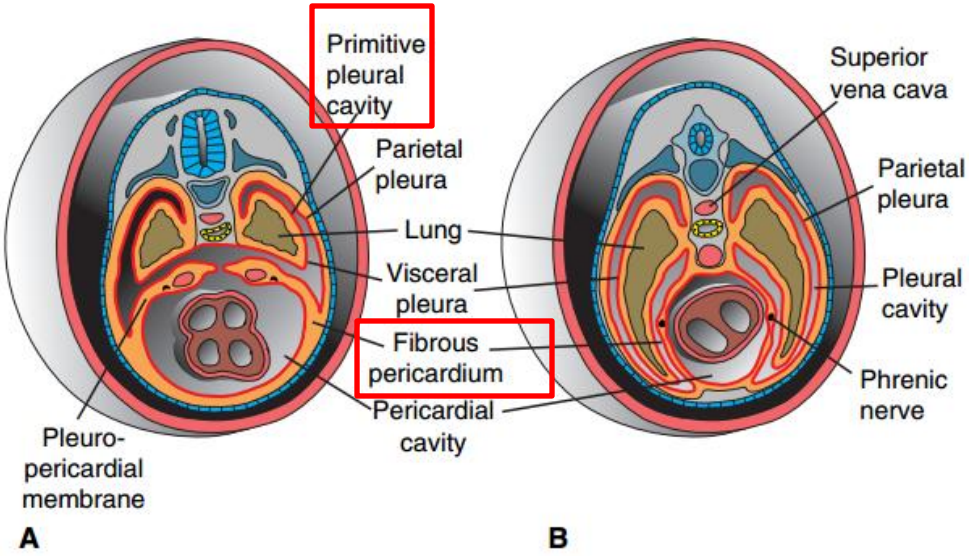
4. the primordial pleural cavities:

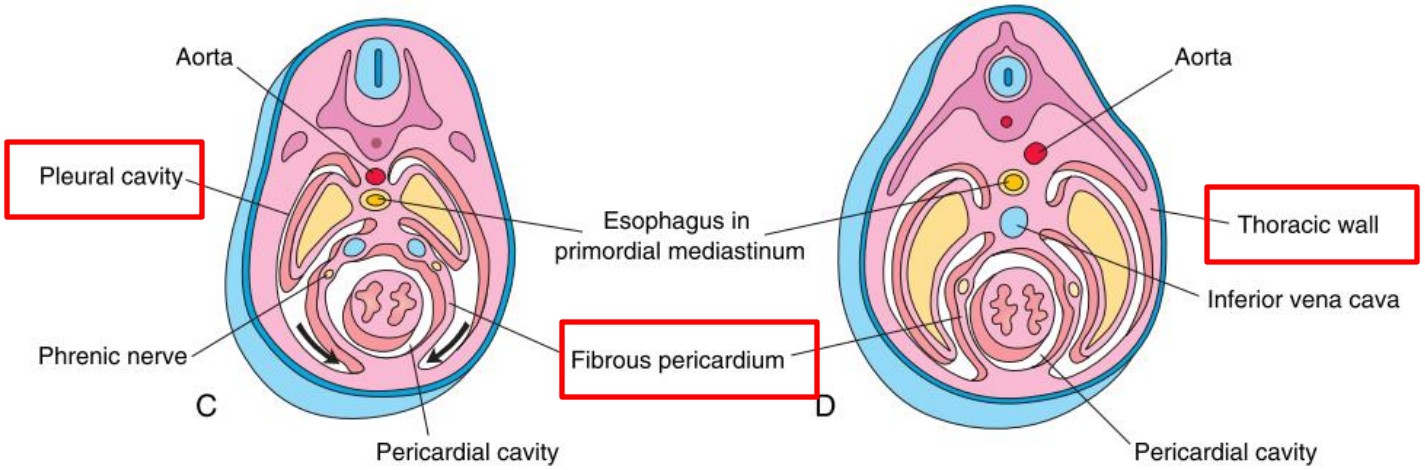
a. expand ventrally around the heart

b. expand into the body wall

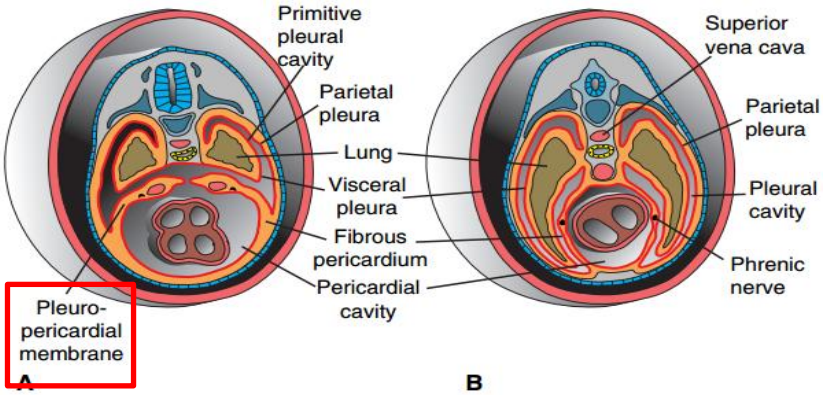
c. splitt the mesenchyme into two layers:

- **an outer layer – becomes the thoracic wall**
- **an inner layer (pleuropericardial membrane) – becomes the fibrous pericardium**





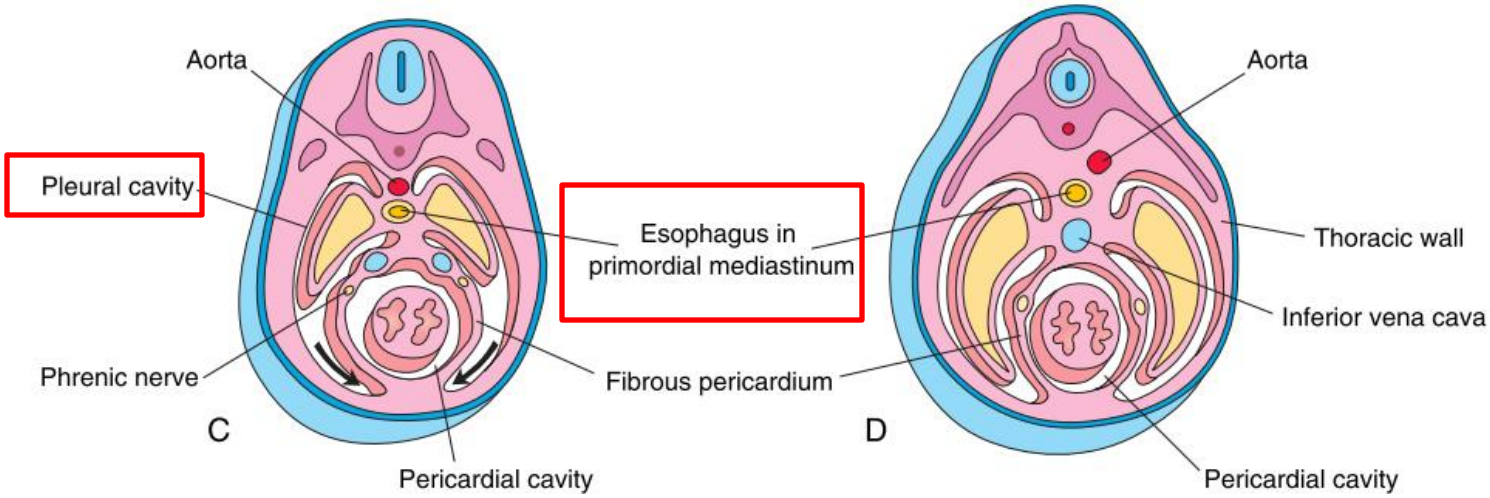
COMPARTMENTALIZATION OF THE COELOM



DIVISION OF THE EMBRYONIC BODY CAVITY:

pleuropericardial membranes:

1. **project into the cranial ends of the pericardioperitoneal canals**
2. **fuse with the mesenchyme ventral to the esophagus**
3. **separate the pericardial cavity from the pleural cavity**



COMPARTMENTALIZATION OF THE COELOM

DIVISION OF THE EMBRYONIC BODY CAVITY:

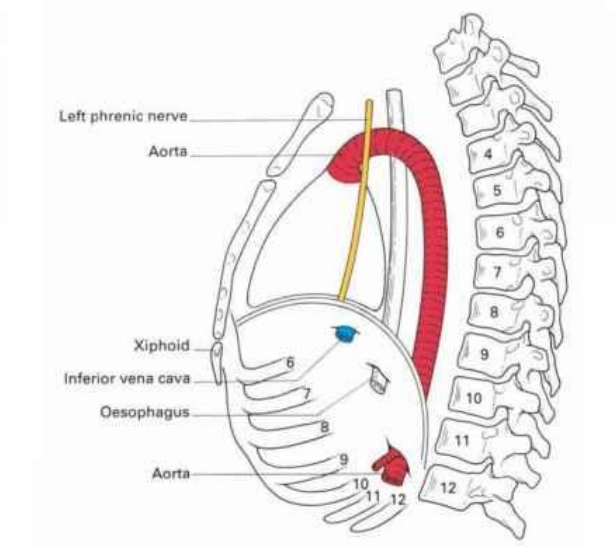
Pleuroperitoneal membranes:

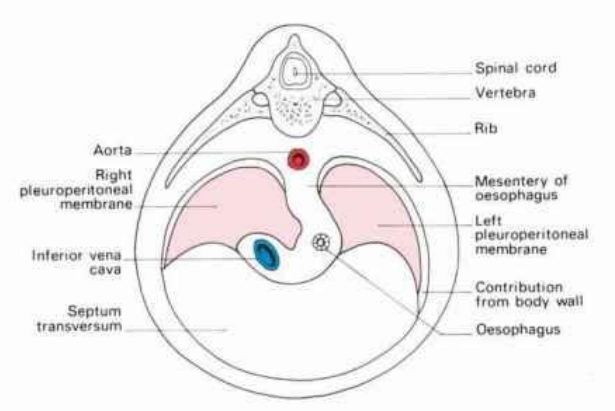
1. **enlarge**
2. **project into the pericardioperitoneal canals**
3. **the folds become membranous – foming the pleuroperitoneal membranes**
4. **the pleuroperitoneal membranes separate the pleural cavities from the peritoneal cavity**
5. **the pleuroperitoneal membranes exted ventromedially until their free edges fuse with the septum transversum**
6. **closure of the pleuroperitoneal openings is assisted by the migration of the myoblasts into the pleuroperitoneal membranes**

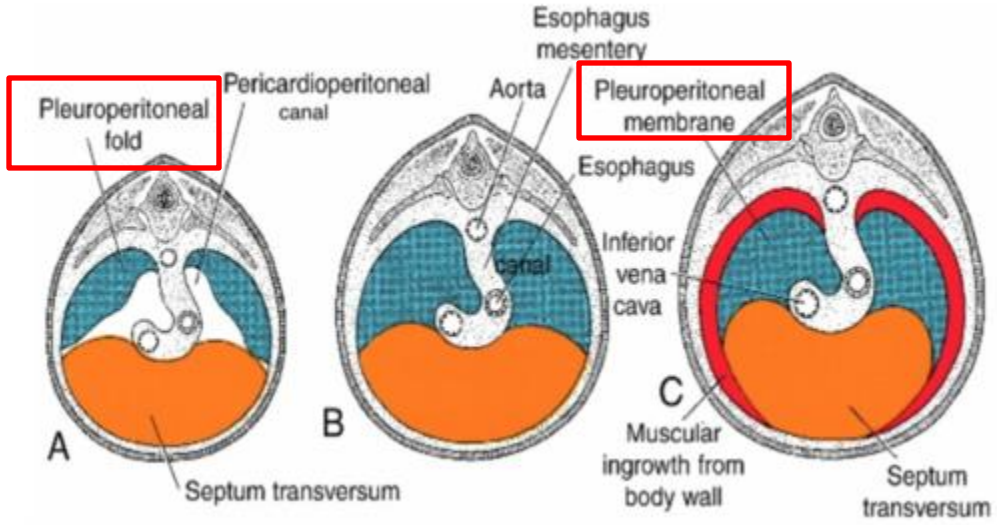
COMPARTMENTALIZATION OF THE COELOM

DIVISION OF THE EMBRYONIC BODY CAVITY:

Pleuroperitoneal membranes:







https://www.clicktocurecancer.info/clinical-features/the-development-of-the-diaphragm-and-the-anatomy-of-diaphragmatic-herniae.html

DEVELOPMENT OF THE DIAPHRAGM

- **a dome – shaped, musculotendinous partition**
- **separates the thoracic and abdominal cavites**

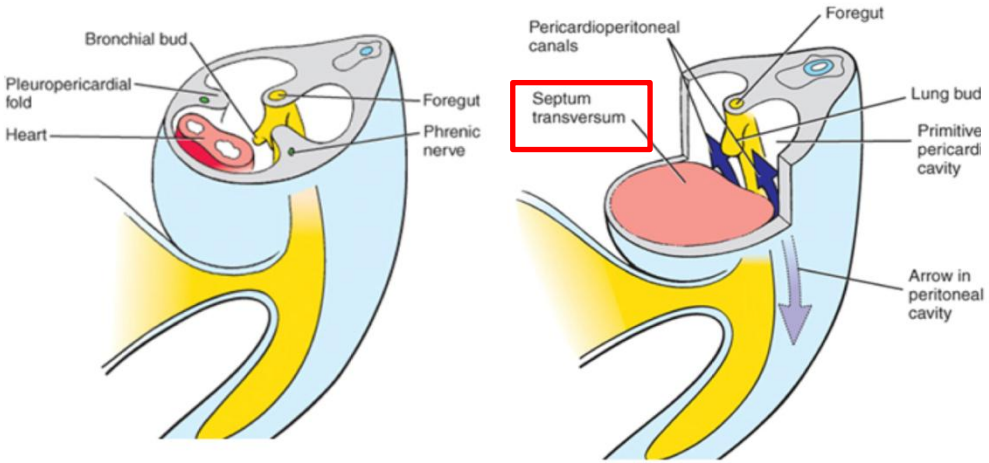
develops from:

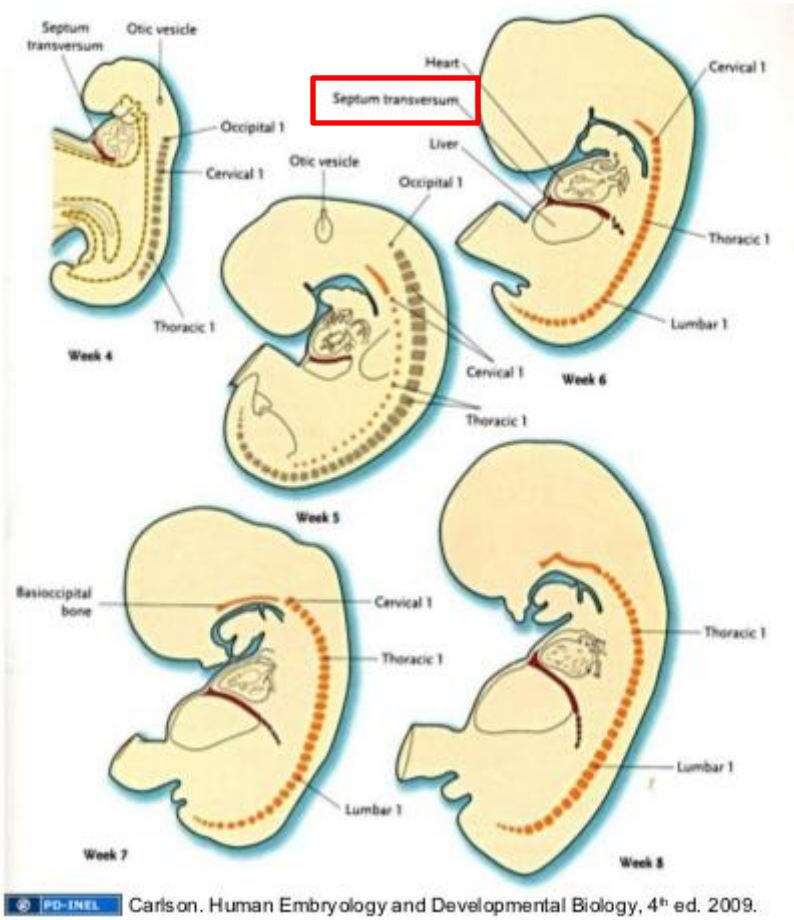
a. septum transversum

b. pleuroperitoneal membranes

c. dorsal mesentery of esophagus

d. muscular growth from the lateral body wall



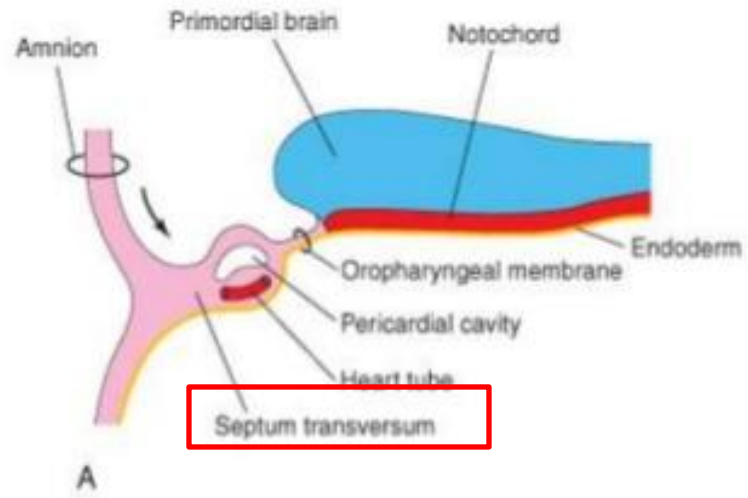


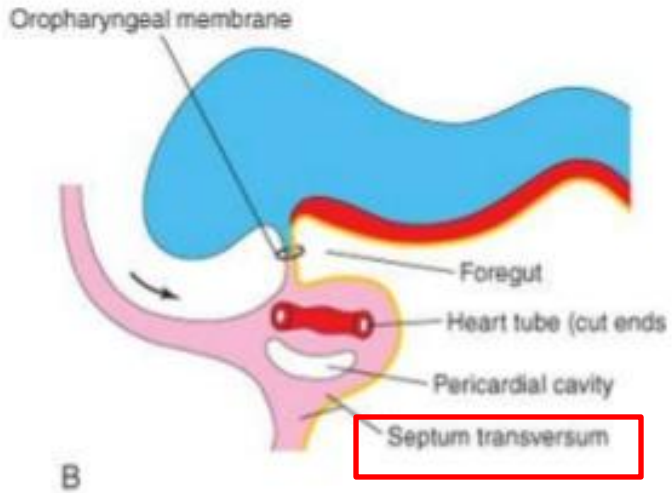
DEVELOPMENT OF THE DIAPHRAGM

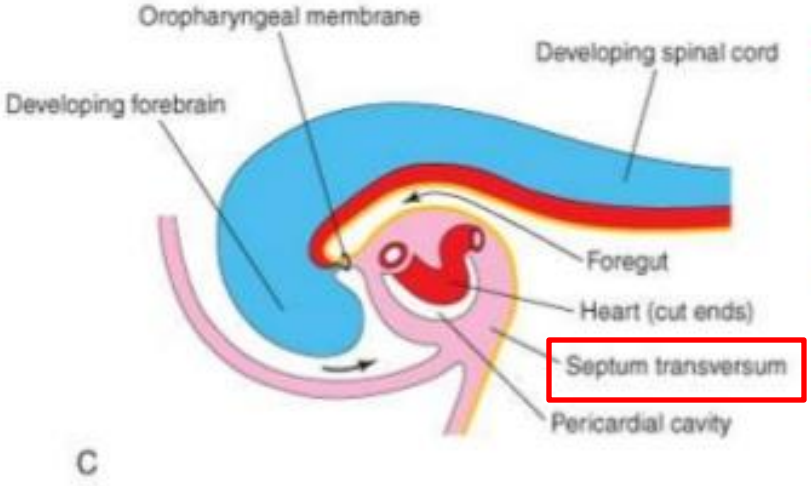
SEPTUM TRANSVERSUM:

- **composed of mesodermal tissue**
- **primordium of the central tendon of the diaphragm**
- **grows dorsally from the ventrolateral body wall**
- **separates the heart from the liver**
- **after the head folds ventrally, the septum forms a thick incomplete partition between the pericardial and abdominal cavities**
- **expands and fuses with the mesenchyme ventral to the esophagus and the pleuroperitoneal membranes**

DEVELOPMENT OF THE DIAPHRAGM





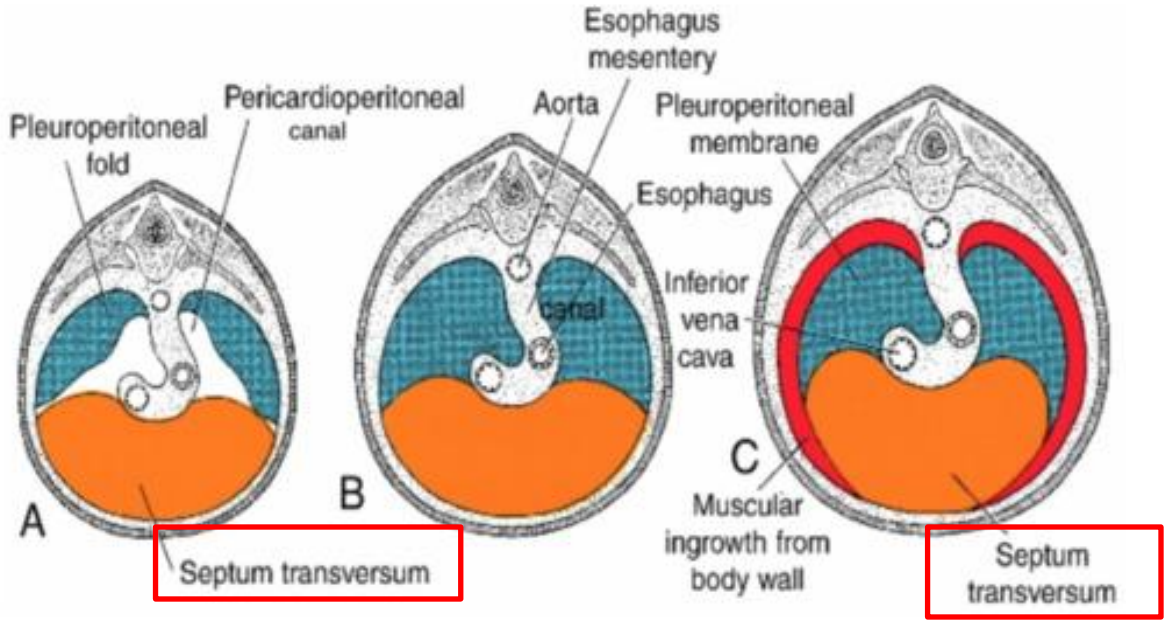


- 4th week
- Effect of head fold on position of Heart
- Septum transversum-central tendon of Diaph.

DEVELOPMENT OF THE DIAPHRAGM

PLEUROPERITONEAL MEMBRANE:

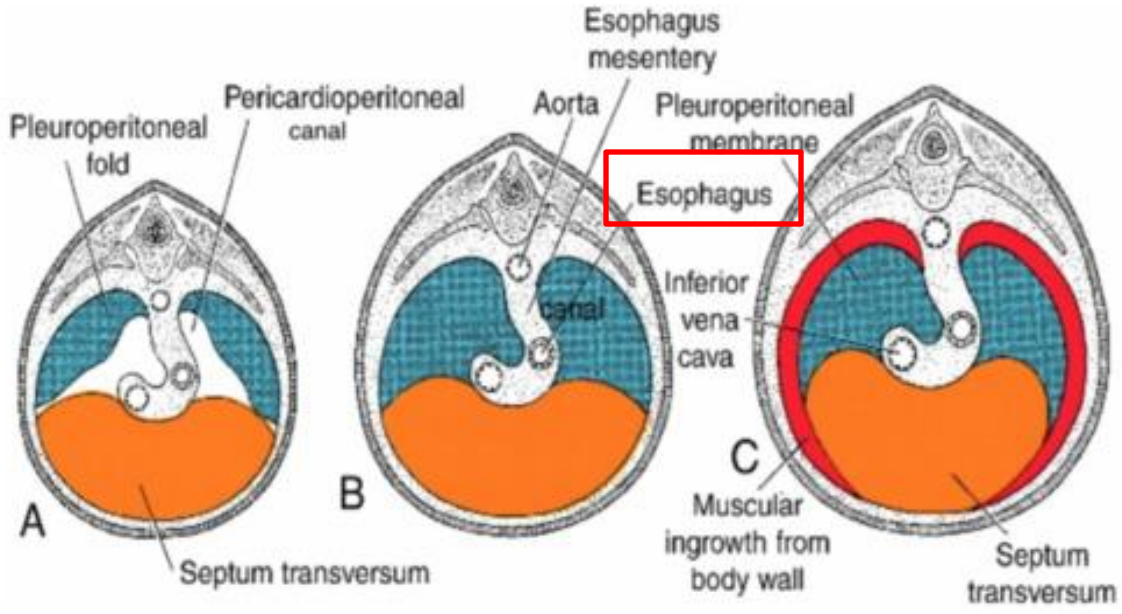
- **fuse with the dorsal mesentery of the esophagus and the septum transversum**
- **this fusion completes the partition between the thoracic and abdominal cavities**
- **forms the primordial diaphragm**



DEVELOPMENT OF THE DIAPHRAGM

DORSAL MESENTERY OF ESOPHAGUS:

- **septum transversum and the pleuroperitoneal membranes fuse with it**
- **becomes the median portion of the diaphragm**
- **the crura of the diaphragm develop from myoblasts – that grow into the dorsal mesentery of the esophagus**



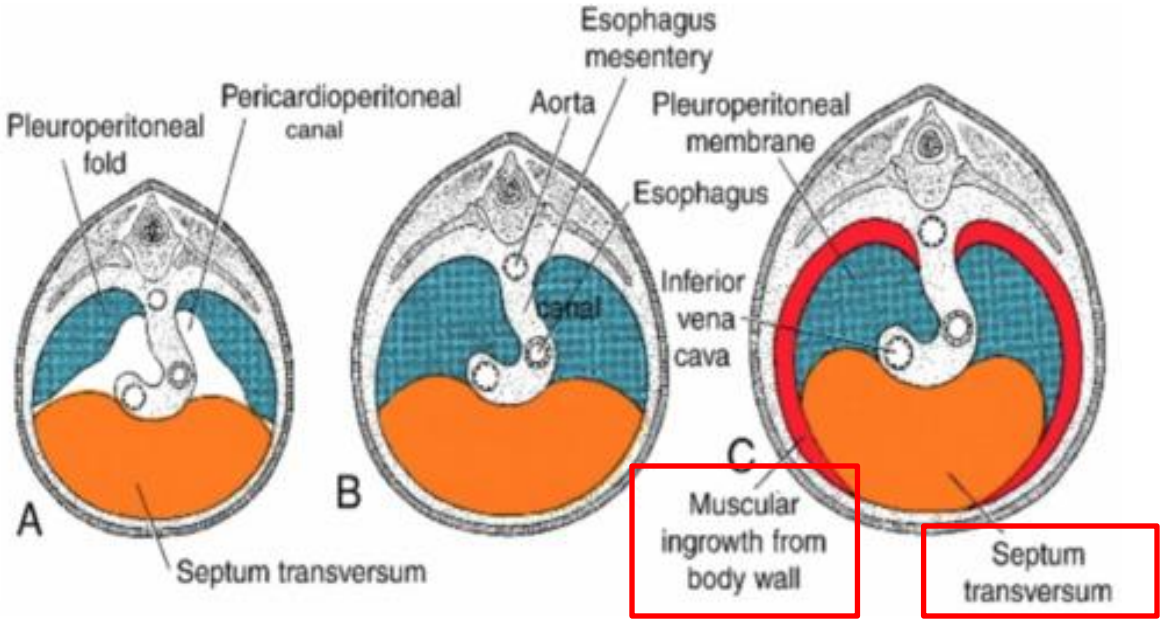
DEVELOPMENT OF THE DIAPHRAGM

MUSCULAR GROWTH FROM LATERAL BODY WALLS:

- **the lungs and the pleural cavities enlarge – „burrowing" into the lateral body walls – durnig this process, the tissue of the bodywall is split into two layers:**

a. an external layer – becomes part of the definitive thoracic and abdominal wall

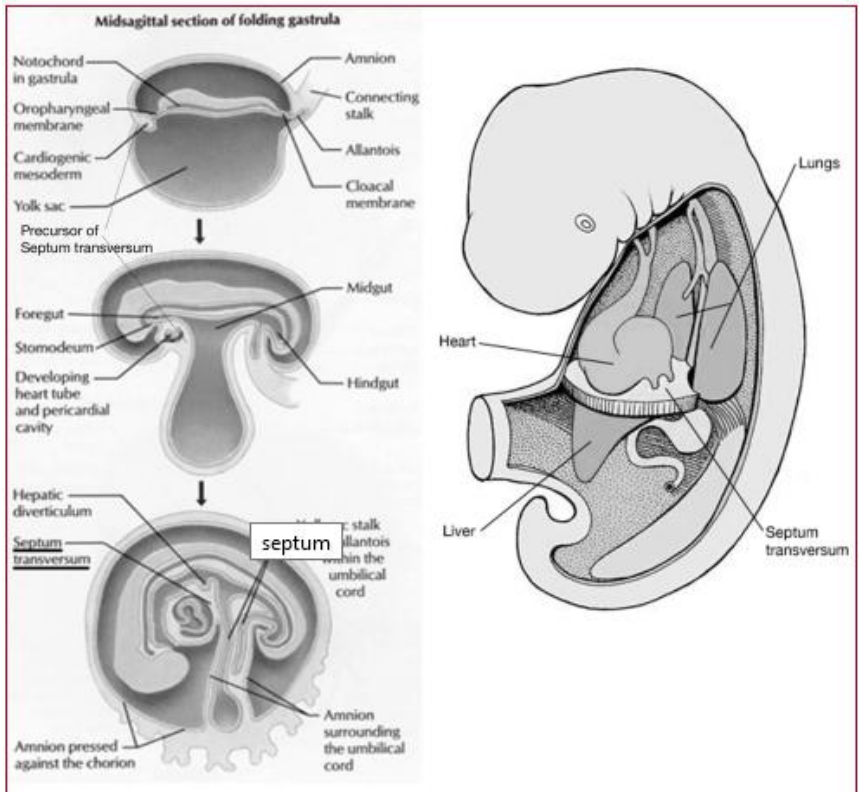
b. an internal layer - contributes muscle to the peripheral portions of the diaphragm

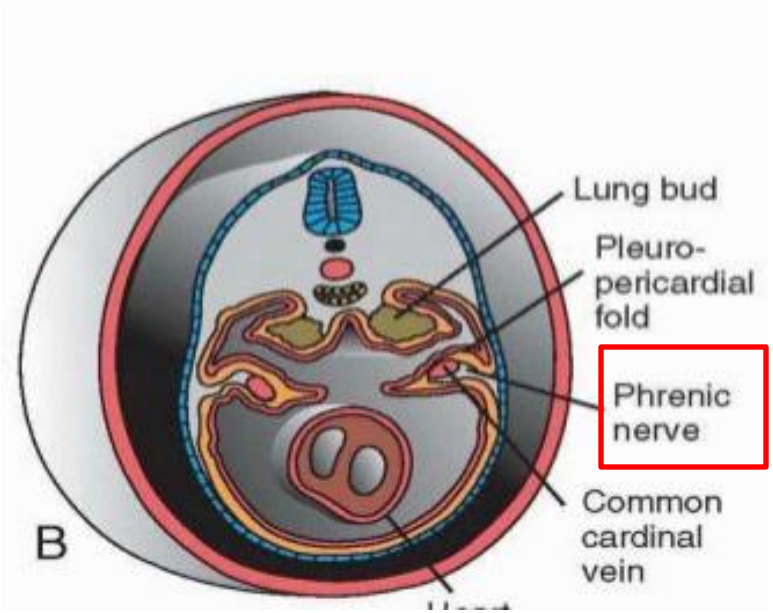


DEVELOPMENT OF THE DIAPHRAGM

POSITIONAL CHANGES AND INNERVATION OF THE DIAPHRAGM:

- **the septum transversum lies opposite the 3rd to 5th cervical somites**
- **myoblasts migrate into the developing diaphragm, bringing their nerve fibers (phrenic nerve) with them**
- **rapid growth of the dorsal part of the embryo's body results in an apparent descent of the diaphragm**





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