

Respiratory System

Tubular branching system - controlled by inductive interactions between the mesoderm and the endoderm. Control is in the mesoderm

Adult anatomy

Trachea

Primary Bronchi

Secondary Bronchi

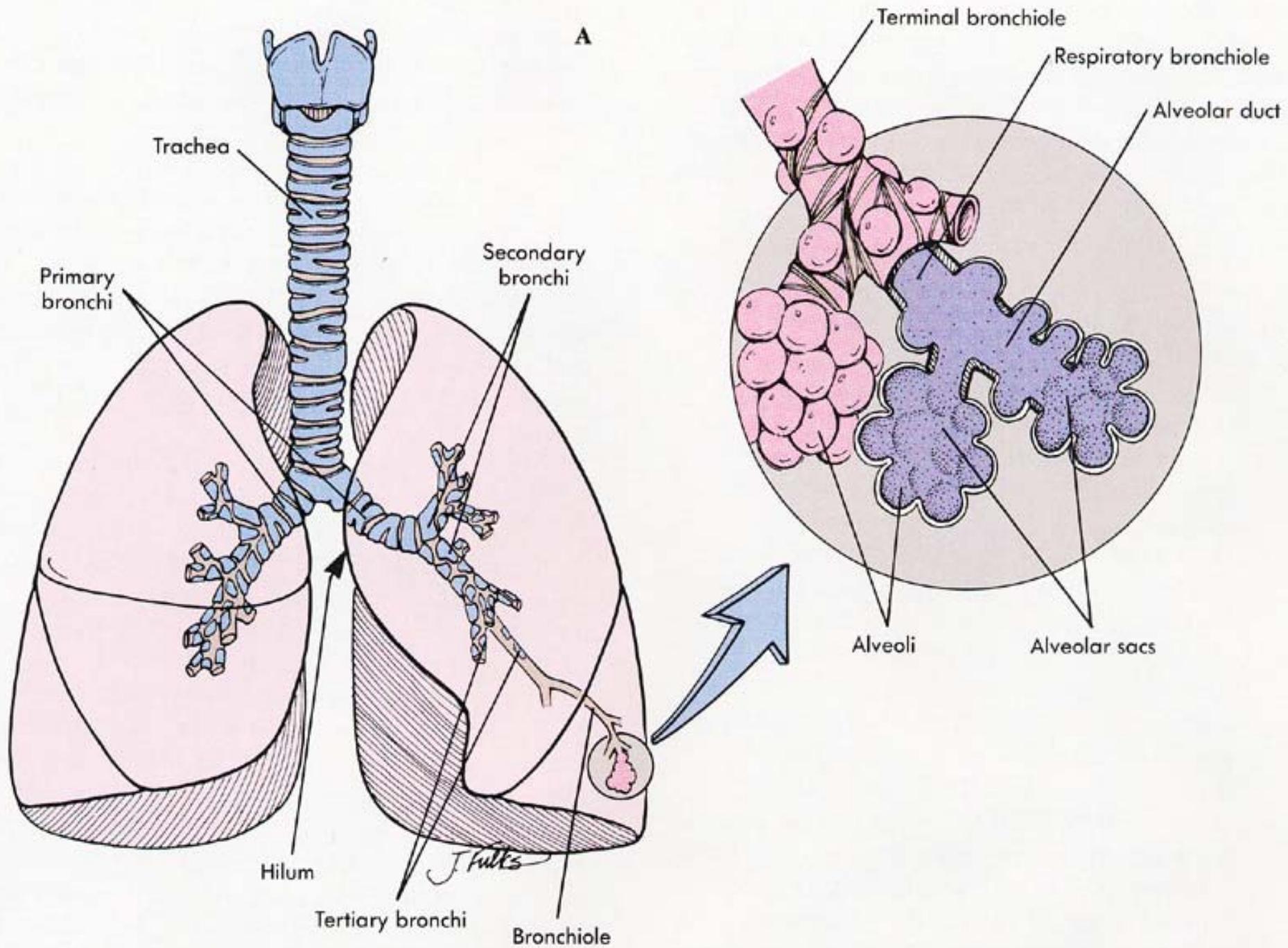
Tertiary Bronchi

Bronchiole

Terminal Bronchiole

Alveolar Duct

Alveolar Sac



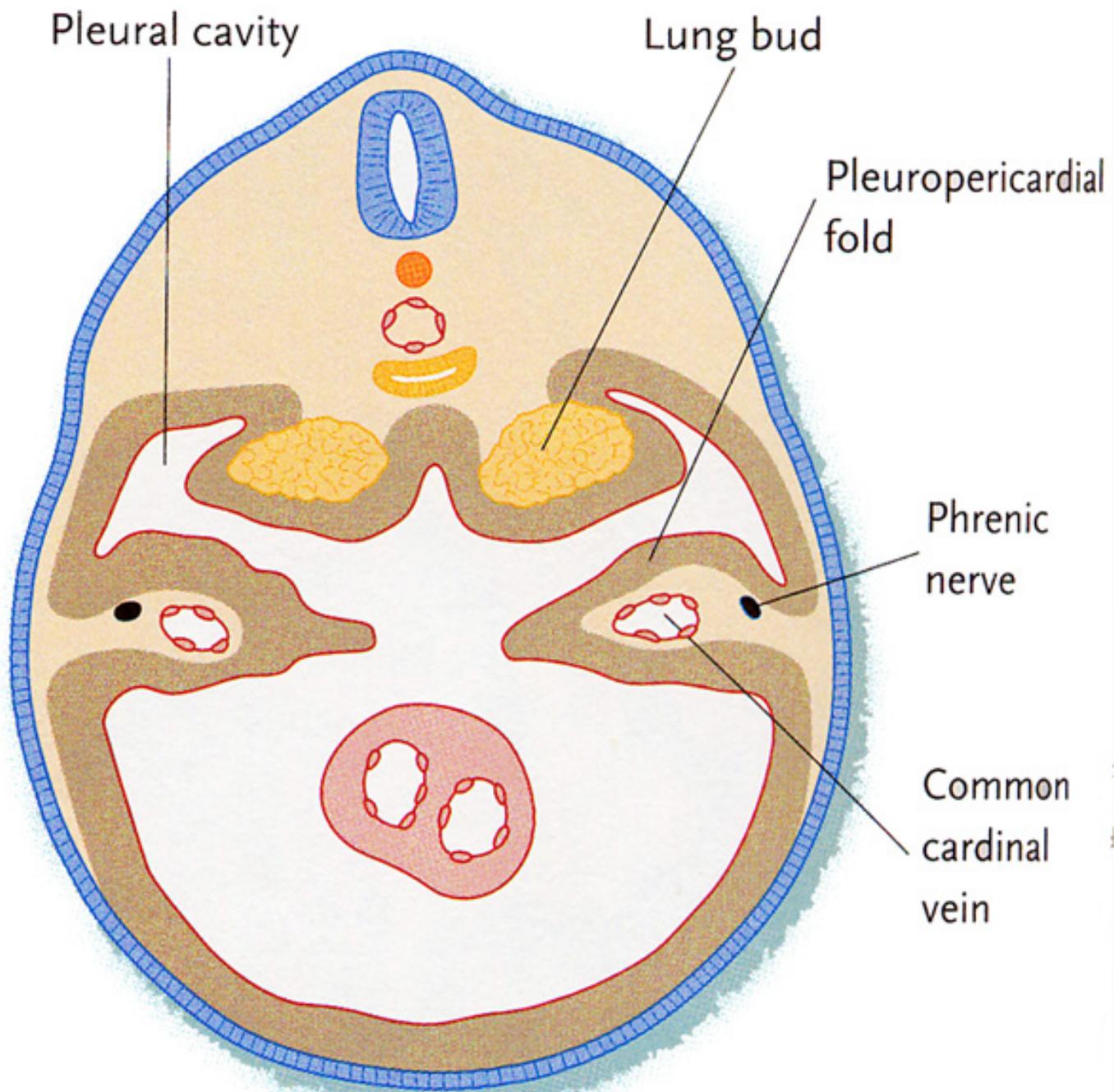
Embryonic Period

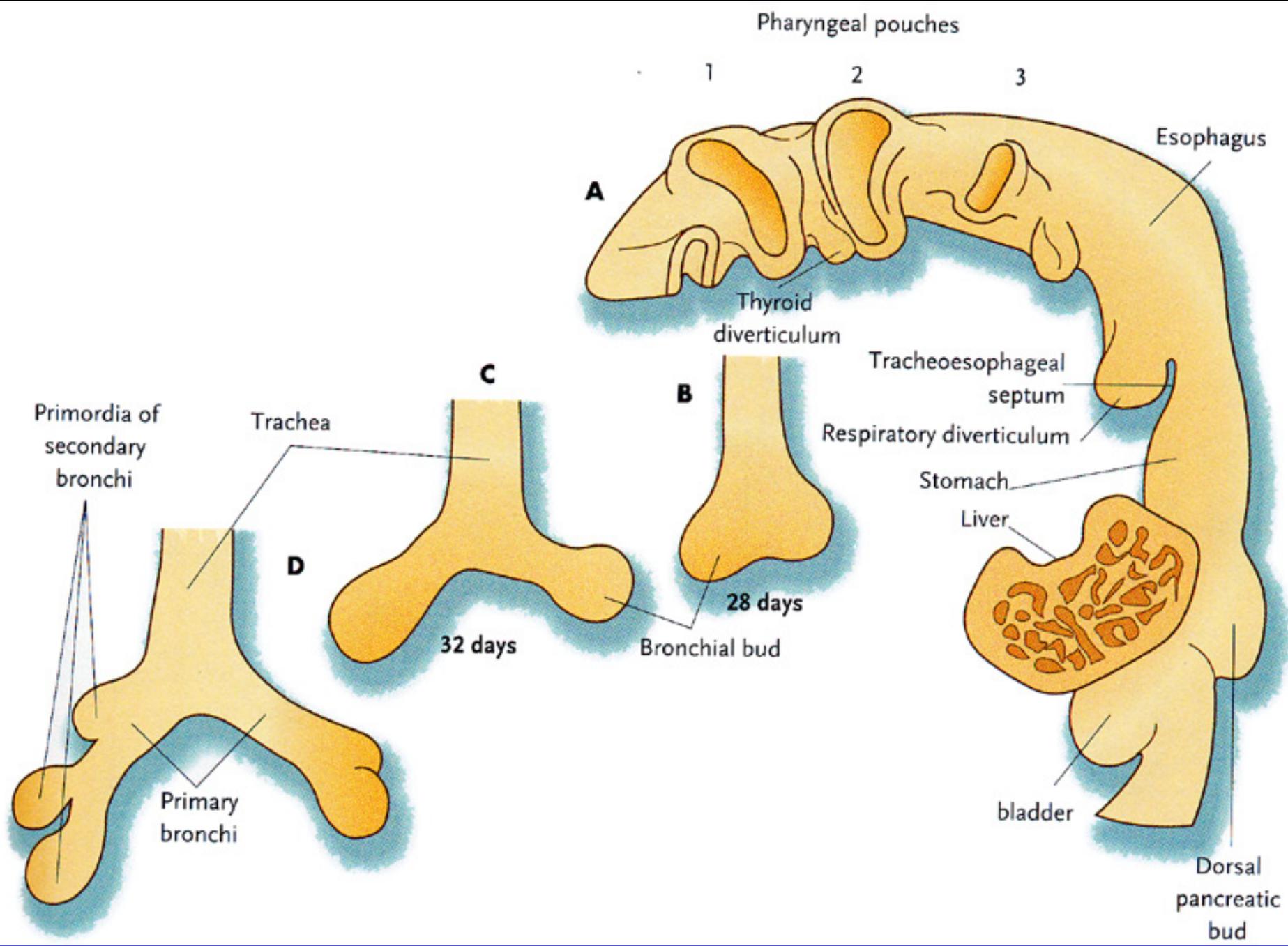
Until week 7 – Formation of the trachea and bronchial tree

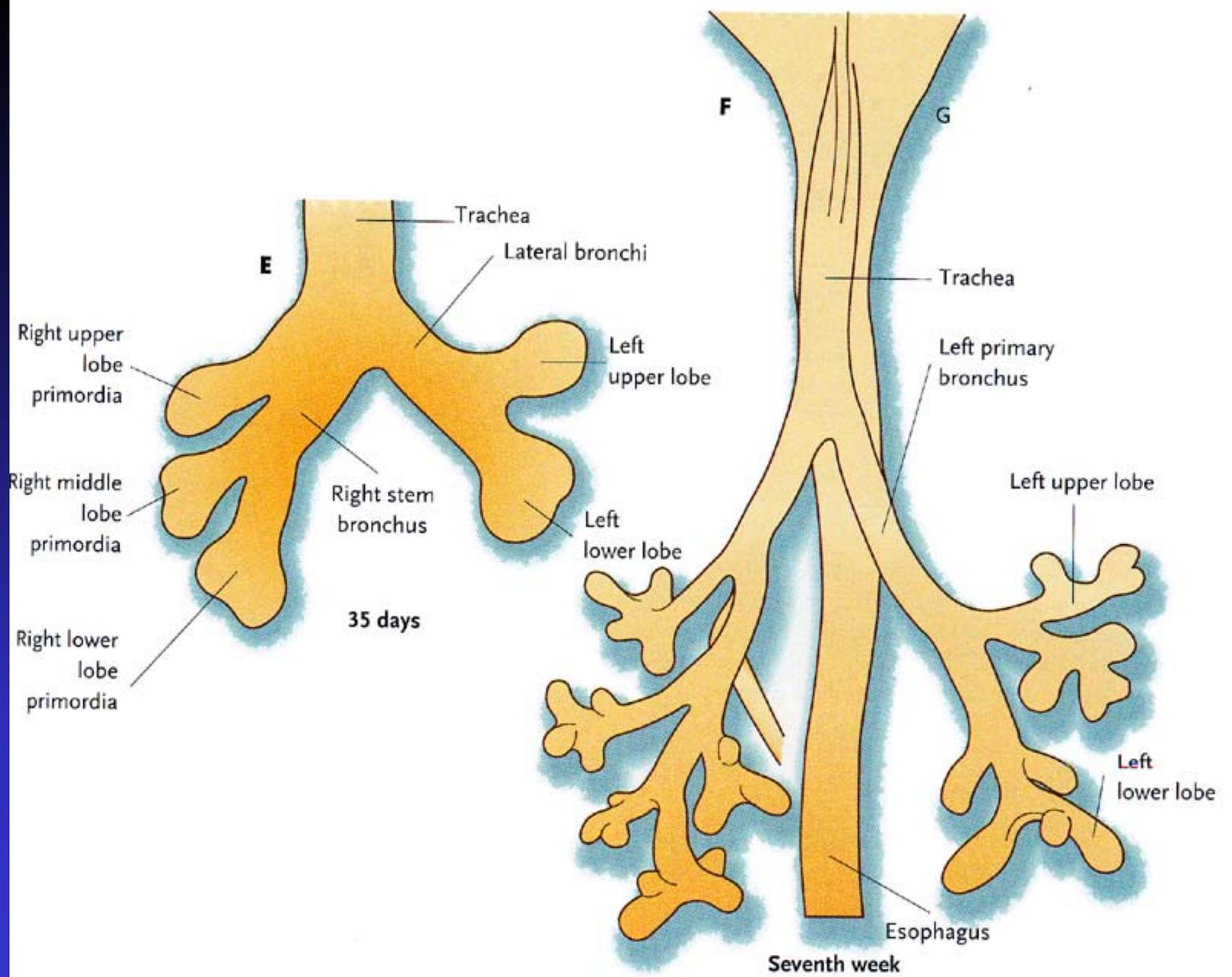
1st branching - Lung bud comes off ventrally from the foregut
- called respiratory diverticulum. Growth is ventral and caudal.

2nd branching - bifurcation to left and right primary bronchial buds - trachea and larynx is formed.

3rd branching - asymmetric – Right and Left Primary Bronchi
Right side - 3 secondary bronchial buds
Left side - 2 secondary bronchial buds.
Buds are primordia for lung lobes







Pseudoglandular Period (8-16 weeks)

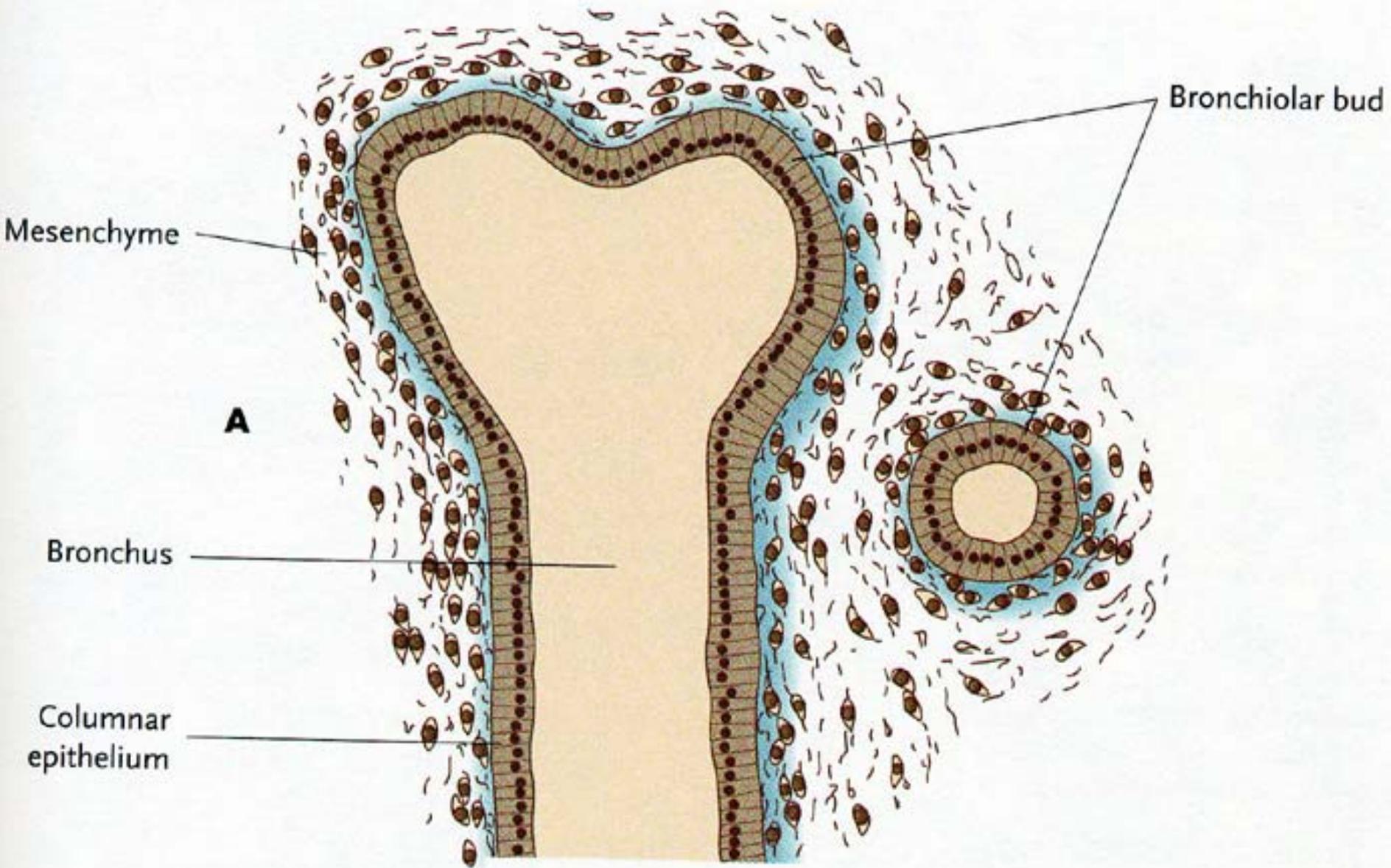
4th branching

right - 10 tertiary bronchi

left - 8 tertiary bronchi

14 more branchings to form the respiratory tree -
producing terminal bronchioles

Histologically resembling a gland



Canalicular Period (16-26 weeks)

Terminal bronchiole divides into 2 or more respiratory bronchioles

Surrounding mesoderm becomes highly vascularized

Completion of this period is required for survival of premature infants

Terminal Sac Period (26 weeks - Birth)

Final branching of respiratory bronchioles associated with dense network of capillaries - terminal sacs or primitive alveoli.

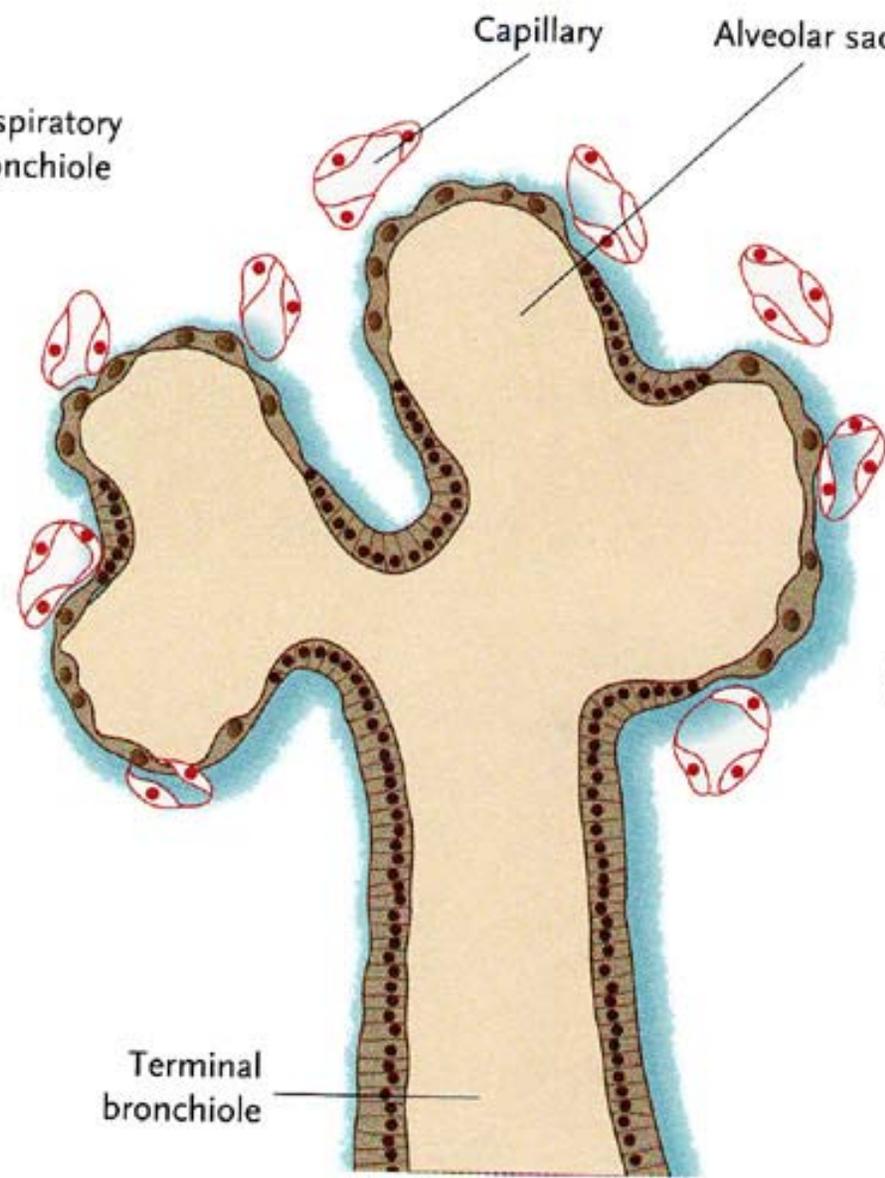
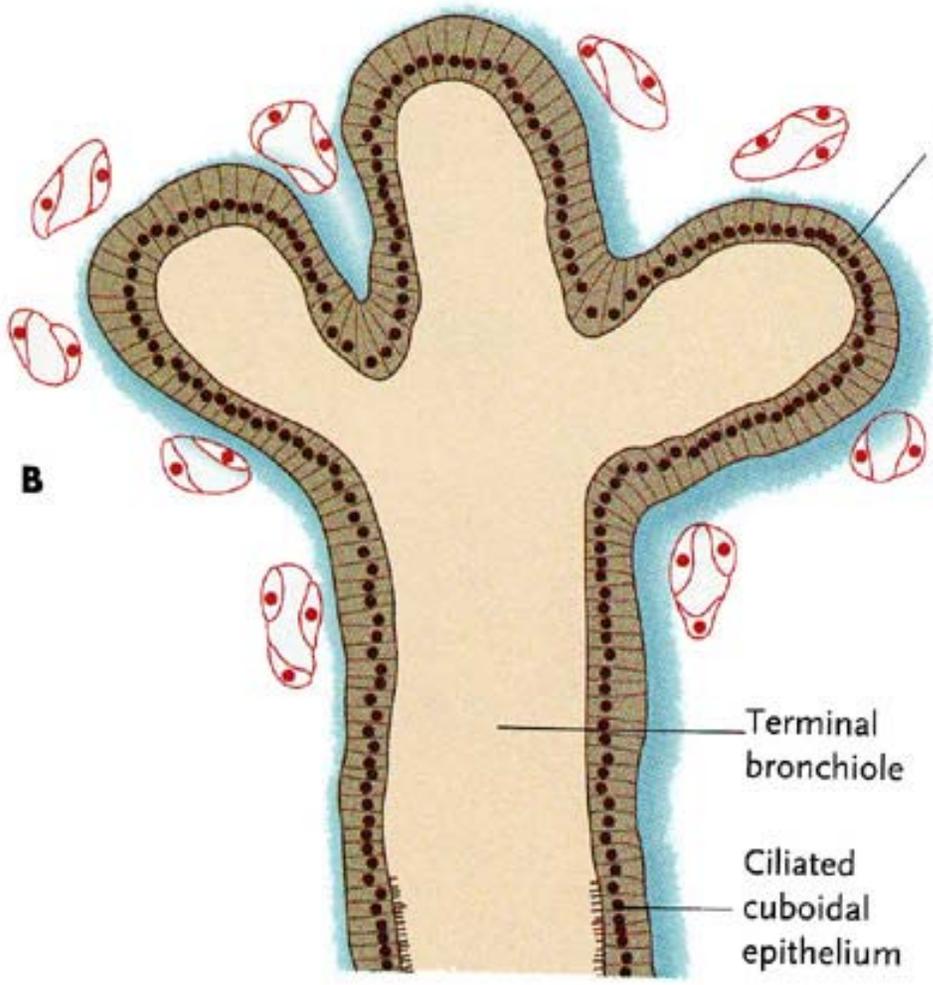
Differentiation of cells –

Type I alveolar cells – pneumocytes – gas exchange

Type II secretory alveolar cells – pulmonary surfactant production

Differentiation continues until 8 years old.

Final 4 weeks – Alveolar period of lung development – enhanced formation of alveoli



Alveolar Period (36 weeks to term)

Maturation of alveoli - thinning of epithelial lining of terminal sac; increase in capillary network

Close association of epithelium with capillaries

Mature lung has 300-400 million terminal sacs.

Anomalies

Pulmonary agenesis - failure of lung bud or bronchial bud to branch or differentiate correctly. Abnormal number of lobes to complete absence of lung.

Pulmonary hypoplasia - reduced number of terminal air sacs - results from reduced volume of pleural cavity

Respiratory Distress Syndrome - Inadequate pulmonary surfactant results in infant death.

Pulmonary Surfactants are mixture of phospholipids and surfactant proteins that reduces surface tension of the alveolar lining - inhibiting alveolar collapse

Common Coelom / Mesentery

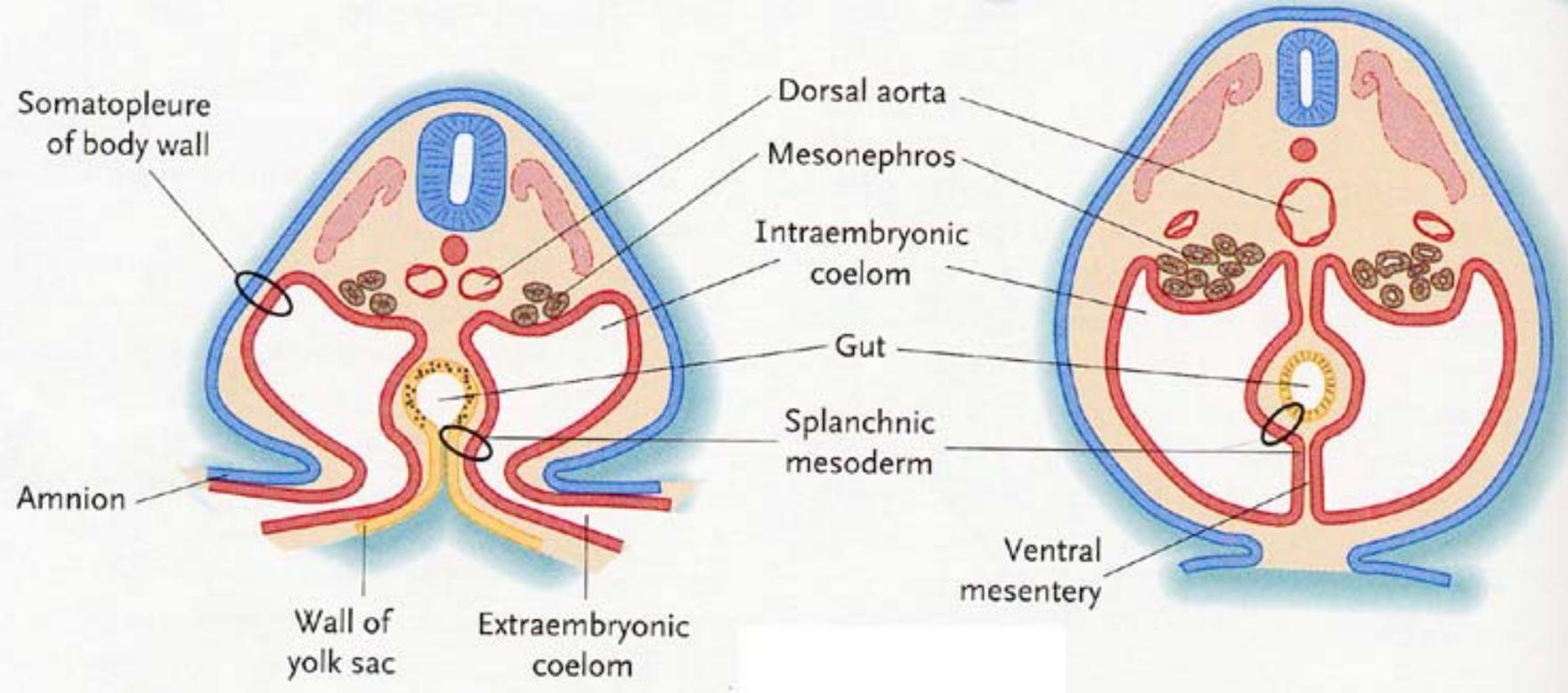
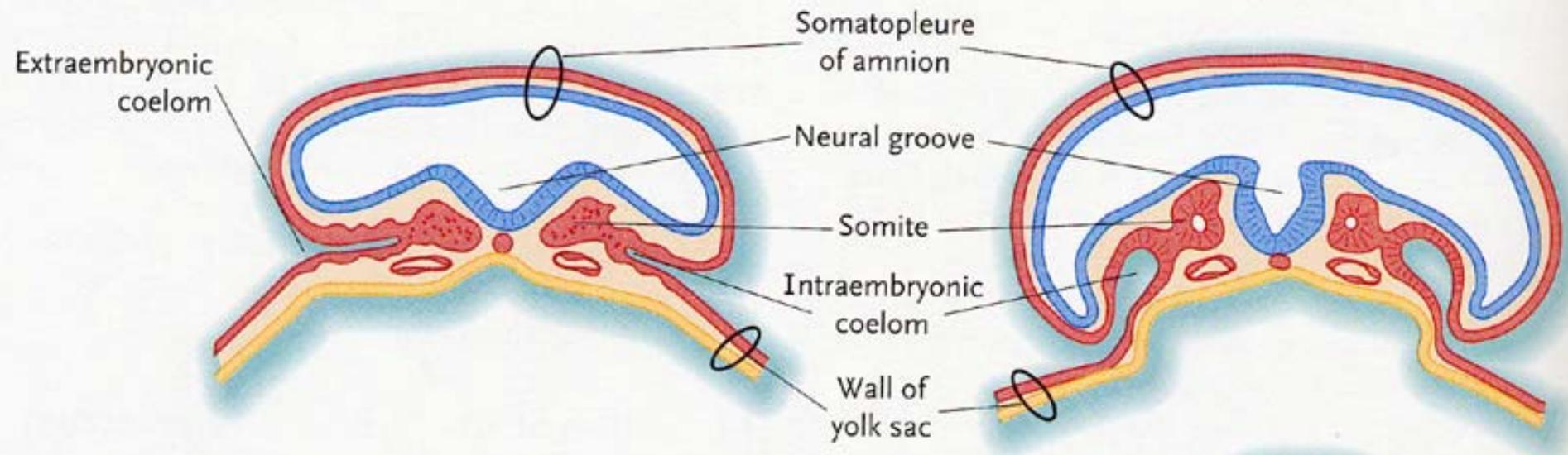
Somatic and Splanchnic Mesoderm line the common intraembryonic mesoderm

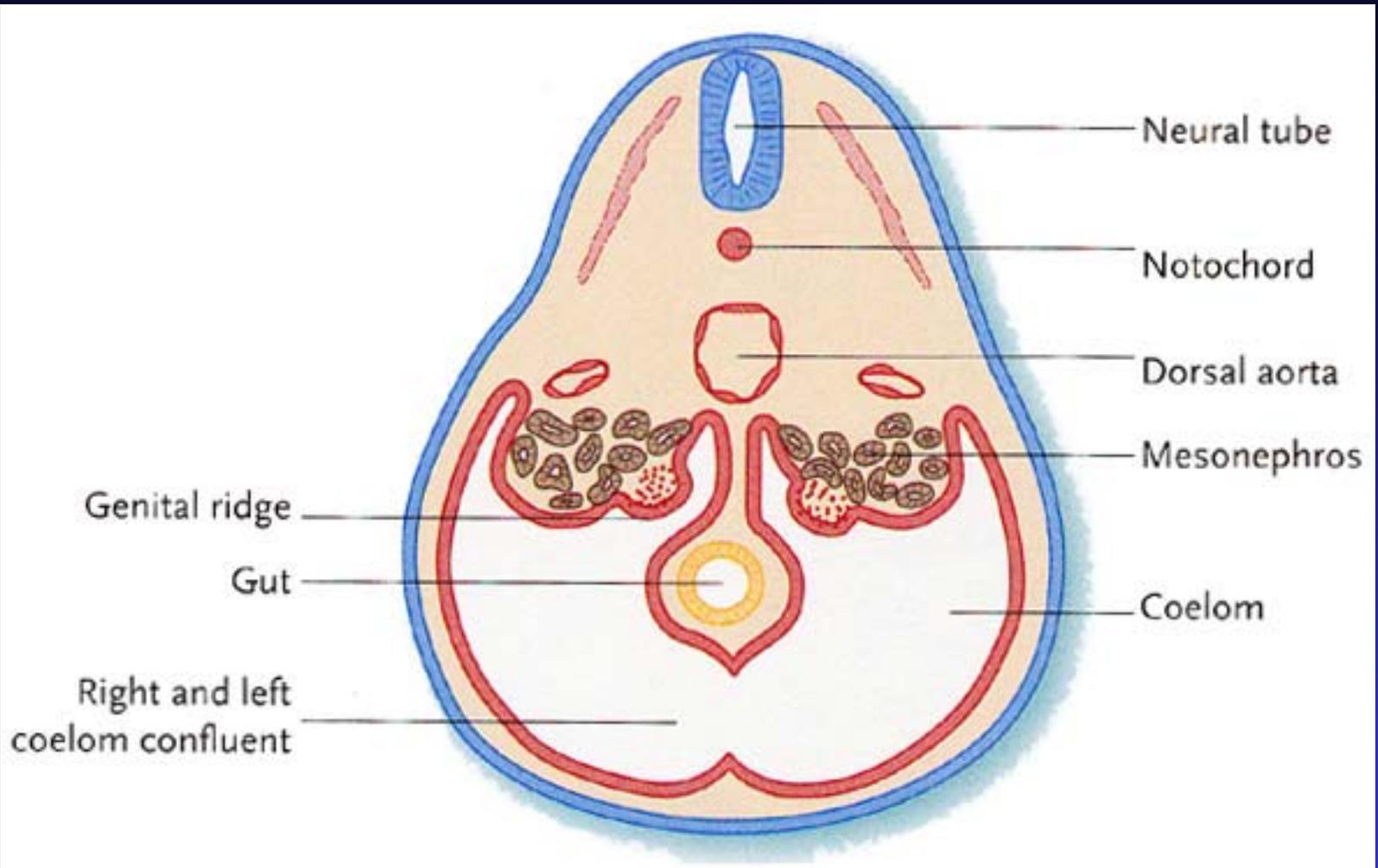
Dorsal and Ventral Mesenteries are derived from Splanchnic Mesoderm

Transient left and right components of the coelom

Ventral Mesentery mostly breaks down

Persist at level of stomach and liver - Ventral Mesogastrium and Falciform ligament of the liver



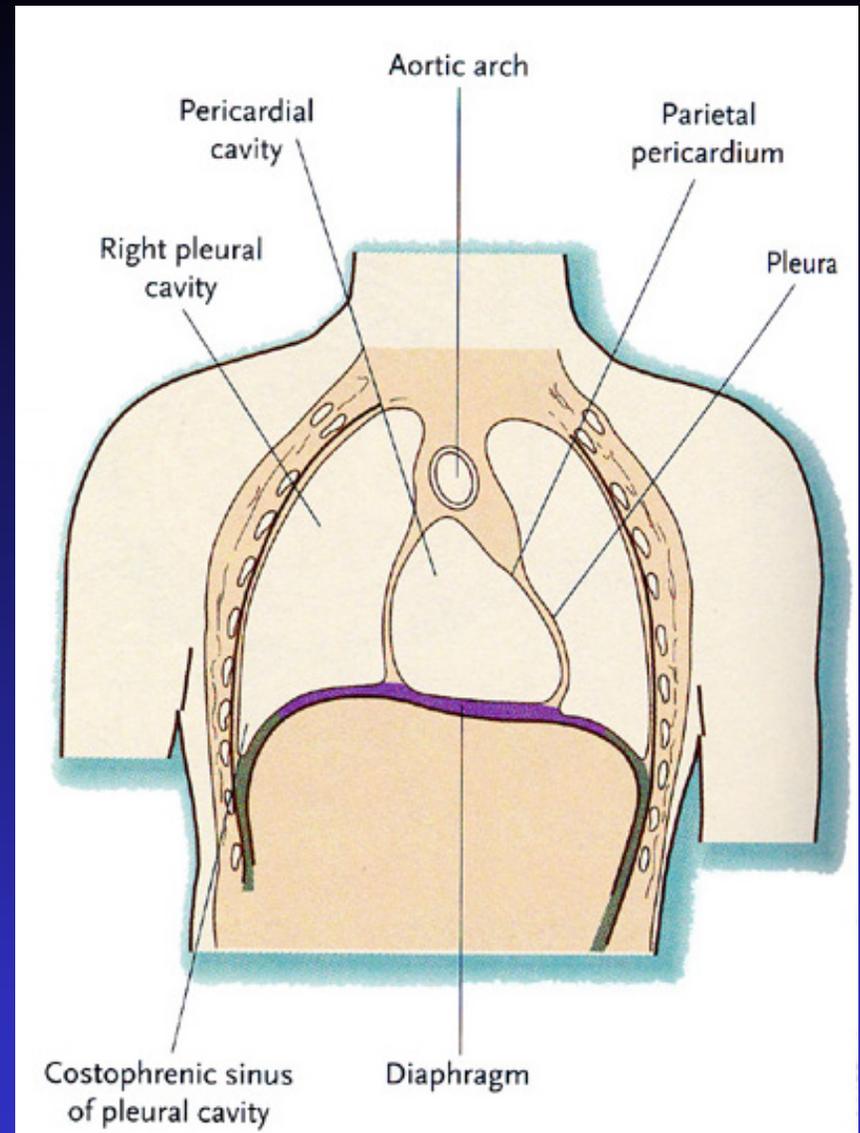


Diaphragm

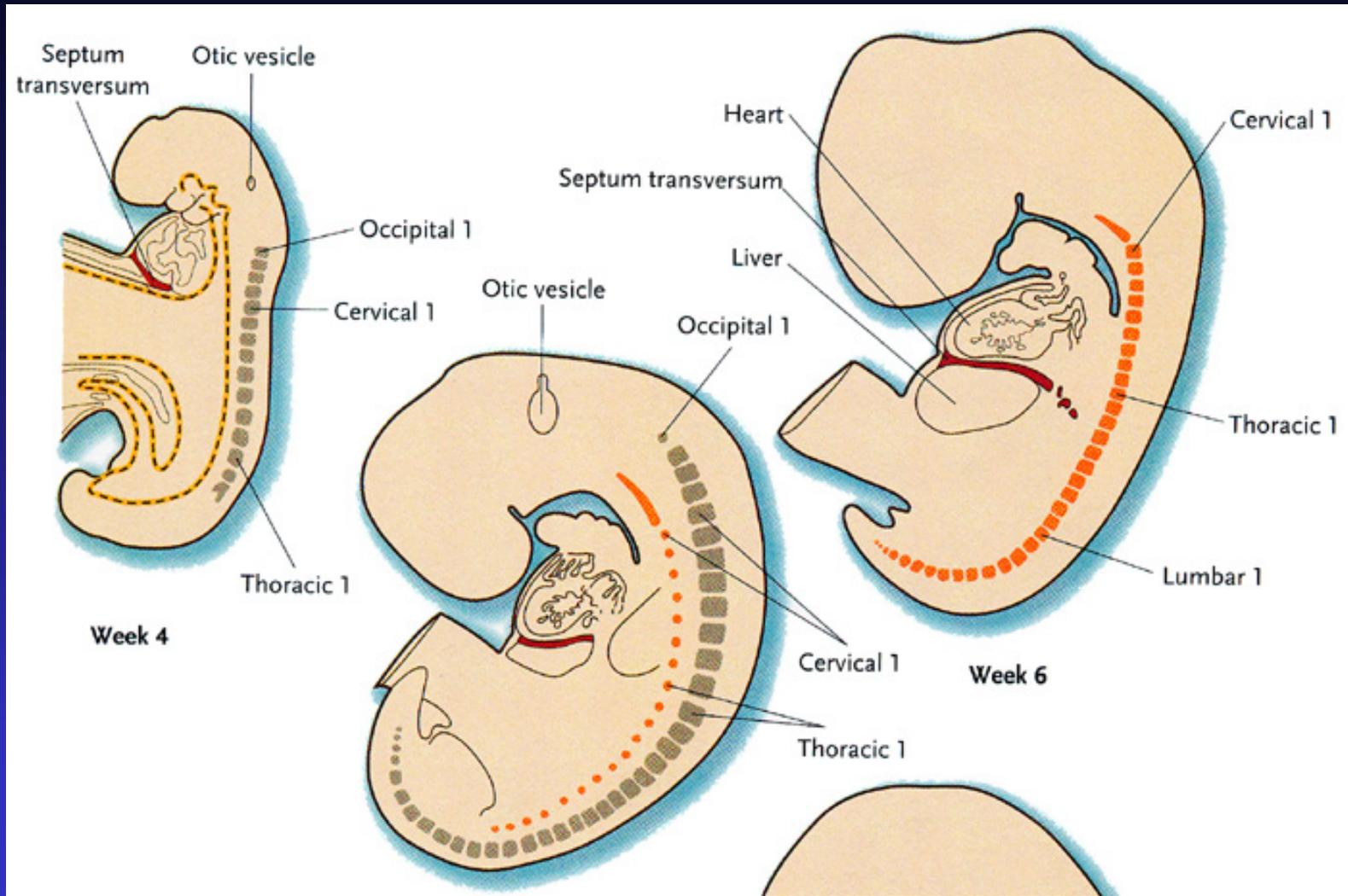
The Diaphragm separates the Common Coelom into thoracic and abdominal components

Abdominal cavity – peritoneal cavity

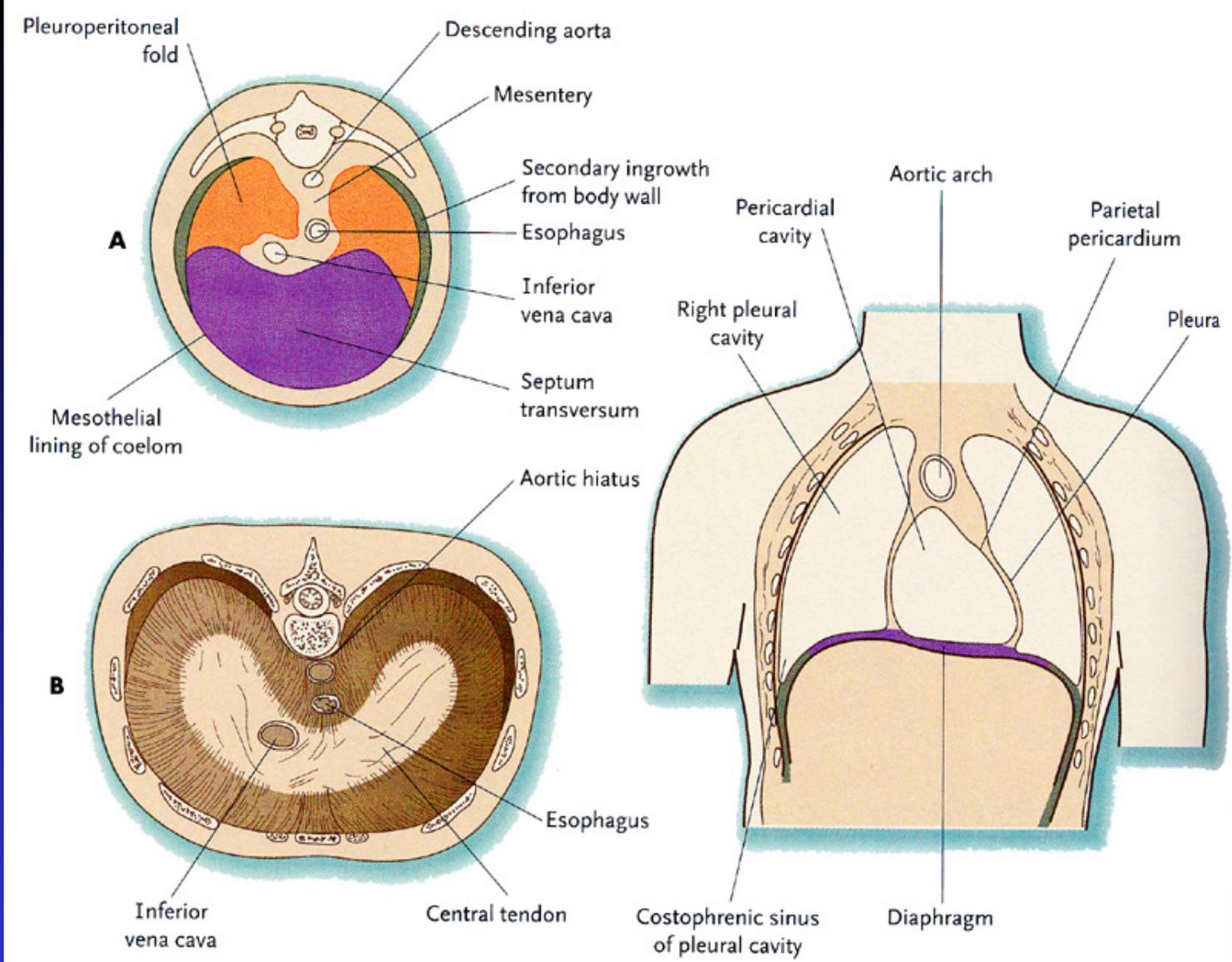
Thoracic component – pleural cavities and pericardial cavity



Transverse Septum



Develops as a shelf from the ventral body wall caudal to the heart



Transverse septum → ventral component of the diaphragm

Also 1) pleuroperitoneal folds, 2) mesentery, and 3) body wall

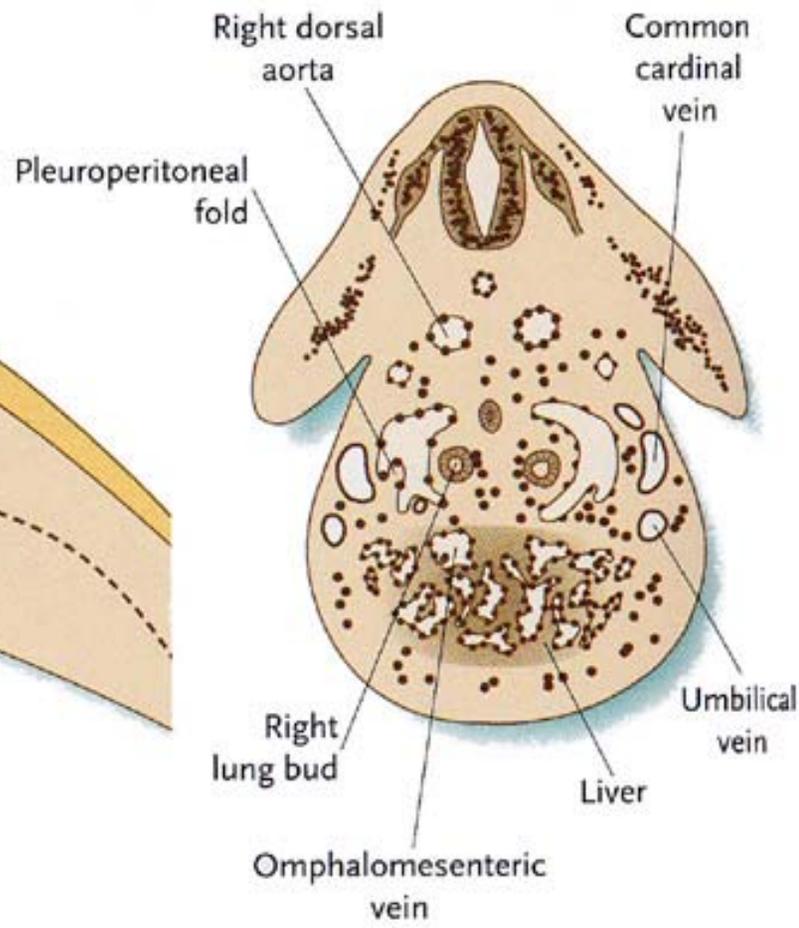
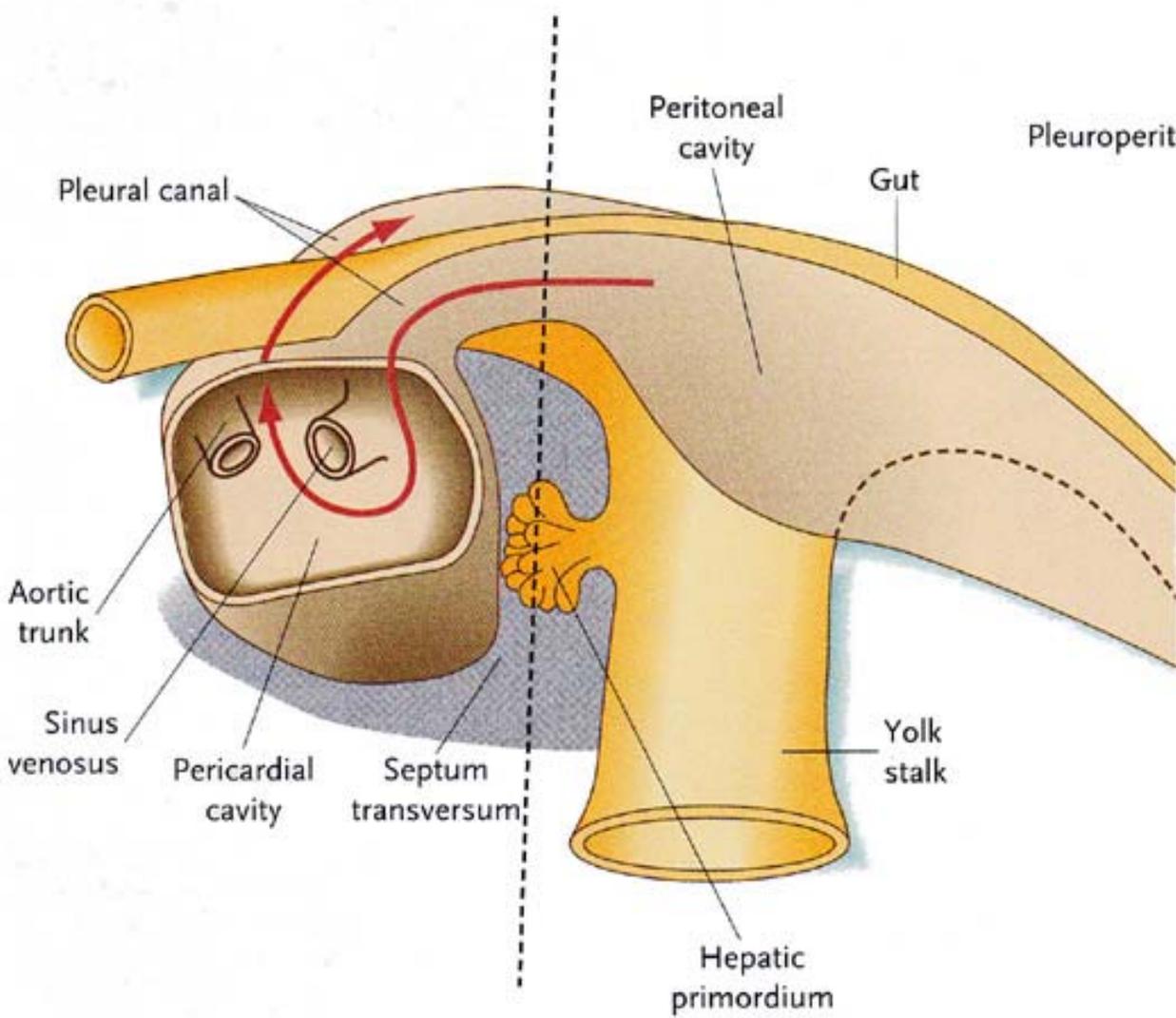
Pleural Cavities

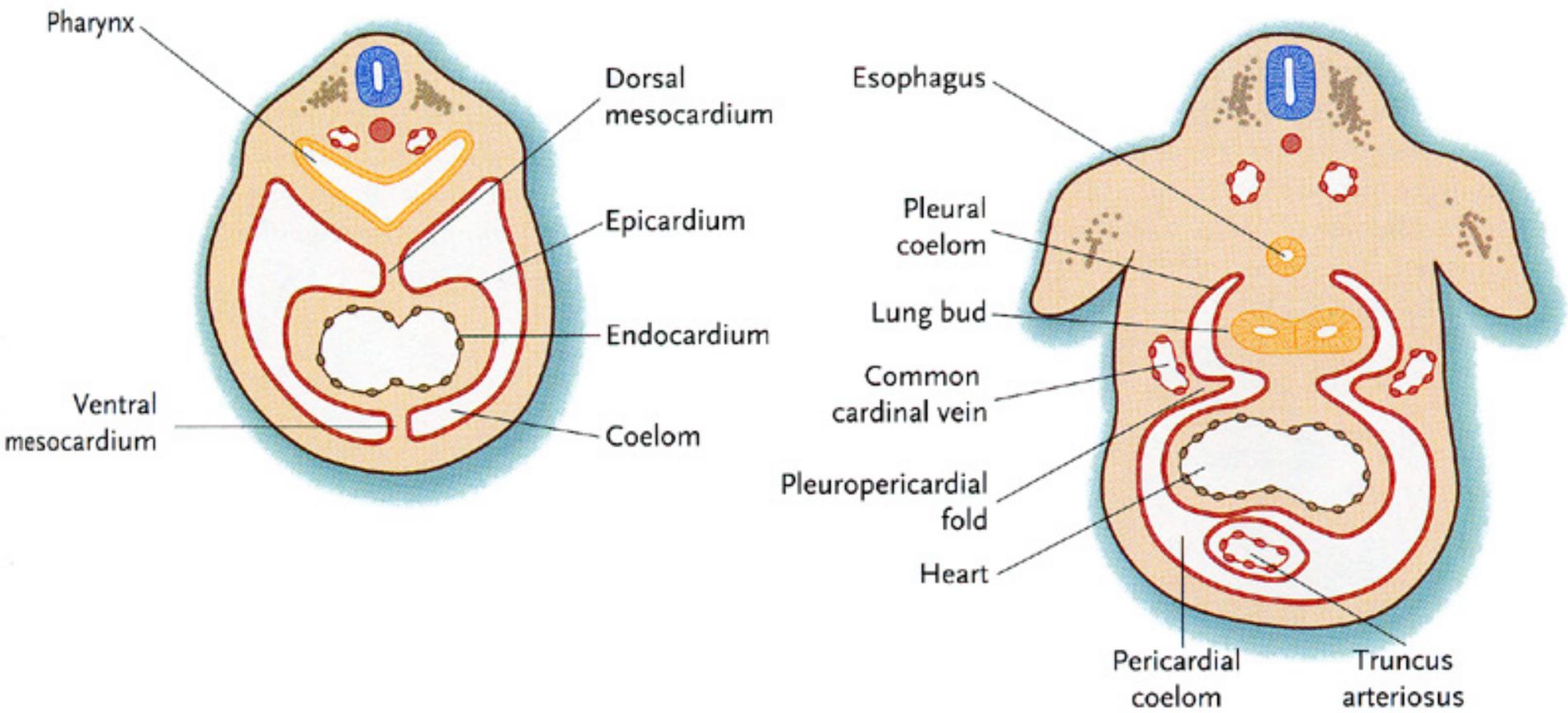
Pleural canals lateral to the gut

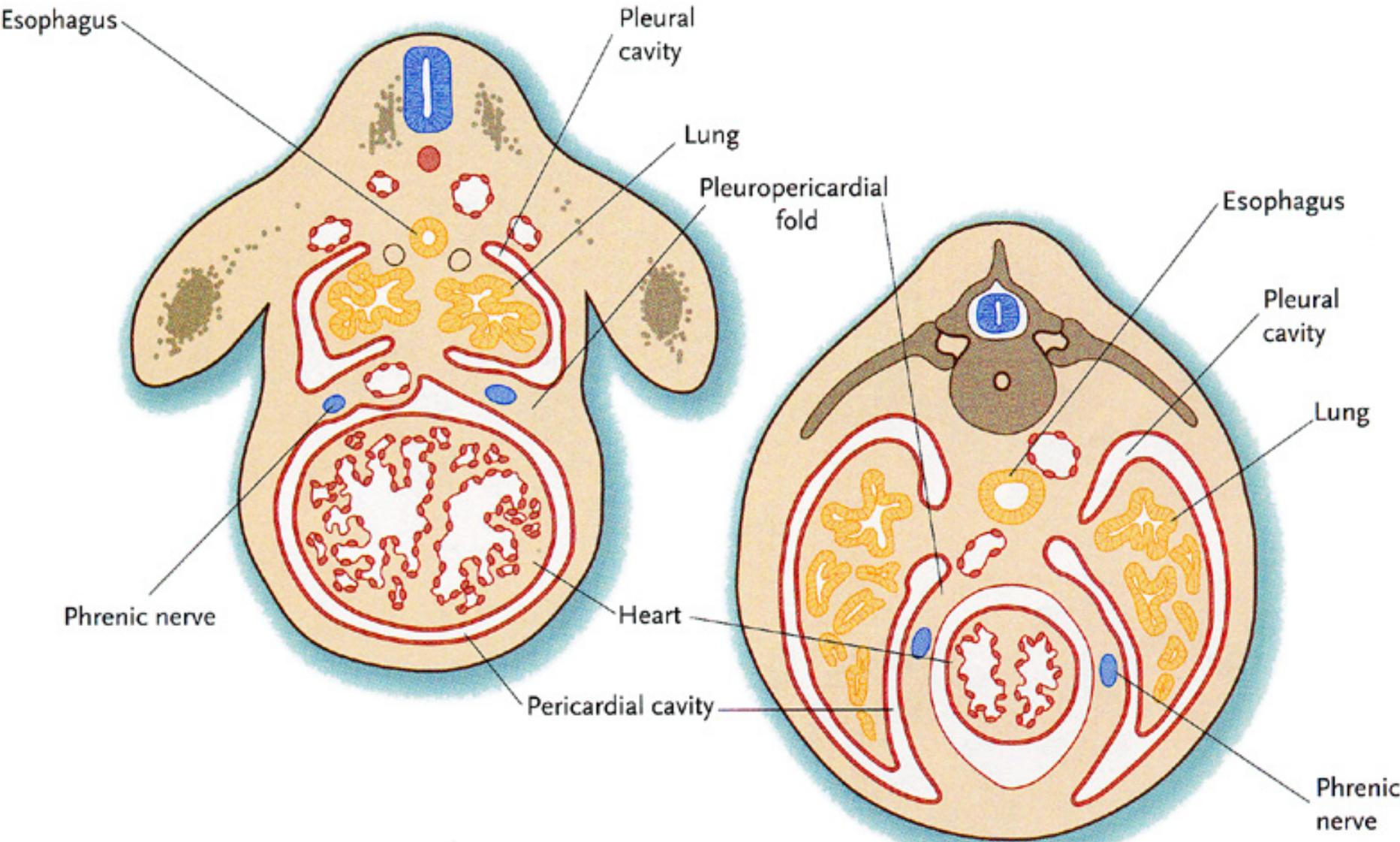
Initially contiguous with the pericardial and peritoneal cavities

Pleuropericardial folds separate pericardial and pleural cavities

Pleuroperitoneal folds separate pleural and peritoneal cavities







Diaphragmatic Hernias

