NAME: OLOKOBA ADEKUNLE **MAT NO:** 18/MHS01/290

DEPARTMENT: ANATOMY **COURSE:** SYSTEMIC EMBRYOLOGY **COURSE CODE:** ANA 206

A) DEVELOPMENT OF THE LUNGS

There are five developmental stages that have been outlined

1. Embryonic stage (3-7 weeks)
2. Pseudoglandular stage (5-16 week)
3. Canalicular stage (16-26 week)
4. Saccular stage (26 week to birth)
5. Alveolar (8 month through infancy)

The early embryonic and pseudoglandular stages elaborate the conducting airways; the latter canalicular, saccular, and alveolar stages are characterized by reduction of mesenchyme and vascularization to form a thin air-blood barrier. Birth does not signal the end of lung development.

EMBRYONIC STAGE

The embryonic phase takes place between the **third and seventh** week of gestation.

The development of the lungs begins during the third week, with the appearance of a respiratory diverticulum (lung bud) as an outgrowth from the ventral wall of the foregut.

During its separation from the foregut, the respiratory diverticulum forms;the trachea and 2 lateral outpocketigs, called the bronchial buds(lungs buds).

a dorsal portion called the esophagus, and **a ventral portion** called the trachea and lung buds

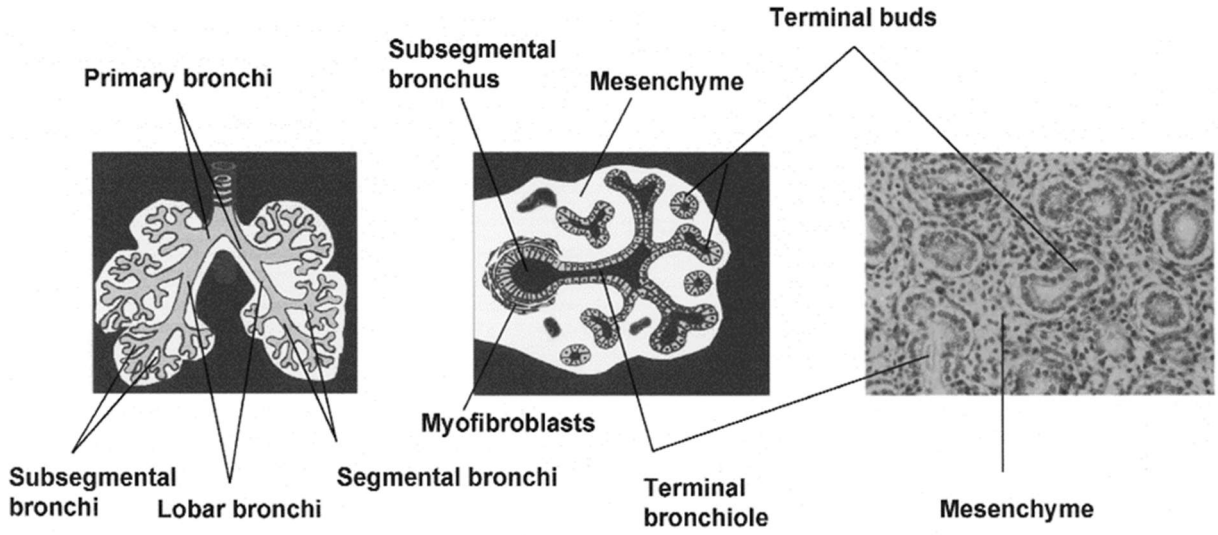
At the beginning of the fifth week, these buds enlarges to form : right main(primary)bronchus and left main(primary) bronchus

The right then forms 3 secondary bronchi, the left forms 2 secondary bronchi . There are the 3 lobes on the right side and 2 on the left. These buds grow laterally into the pericardioperitoneal canals, the primordia of the pleural cavities. Each secondary bronchial bud gives rise to ten tertiary bronchial buds on both sides, demarcating the end of the embryonic phase.

Pseudoglandular

The pseudoglandular phase takes place during between the **Fifth and sixteenth week** of gestation. The respiratory tree undergoes twelve to fourteen more generations of branching, resulting in the formation of terminal bronchioles. This passageway will be lined with a

specific type of respiratory epithelium, simple columnar epithelium (ciliated) transitioning to simple cuboidal epithelium (some cilia).



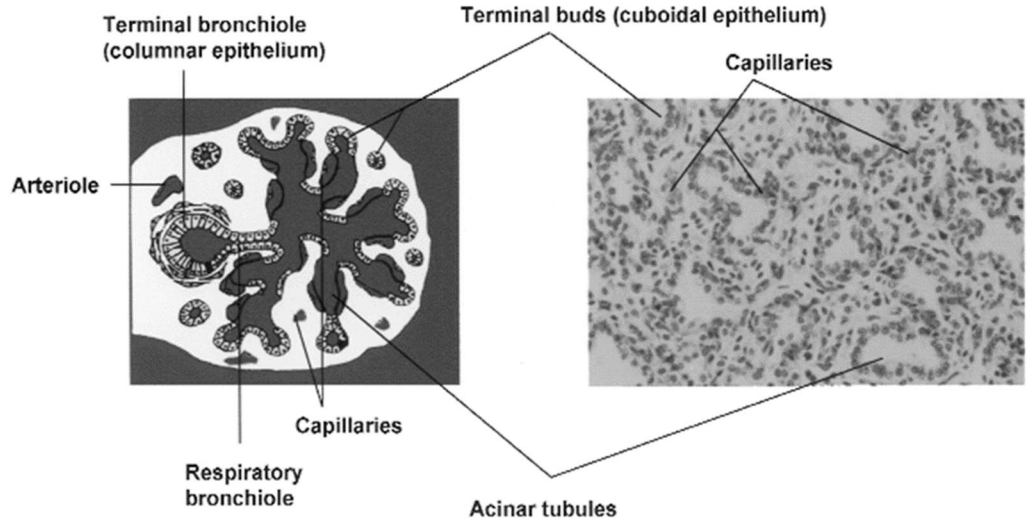
Canalicular

The canalicular phase takes place during the **sixteenth and twenty-sixth week** of gestation.

Up to the 7th prenatal month, tertiary bronchi divide repeatedly to

form terminal bronchioles. Terminal bronchioles divide to form respiratory bronchioles

(canaliculi phase) and the vascular supply increases steadily. Respiration becomes possible when some of the cells of the cuboidal respiratory bronchioles change into thin, flat cells. This process sets up the differentiation of specialized cell types associated with the lungs.



Saccular

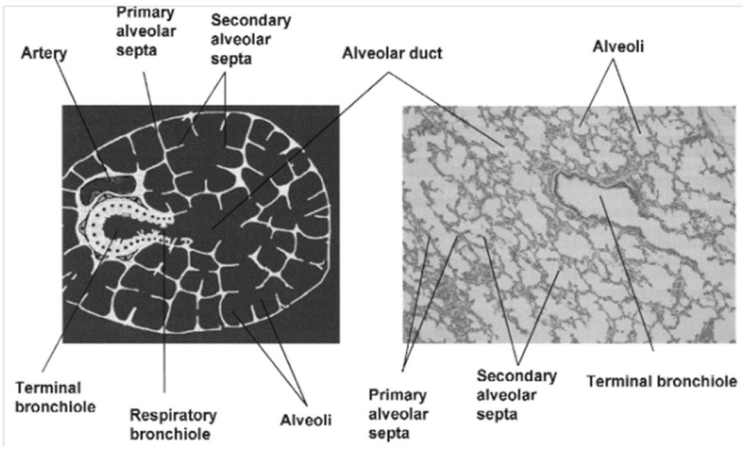
The saccular phase takes place between the **twenty-fourth and thirty-sixth week** of gestation. The respiratory bronchioles give rise to a final generation of terminal branches. These branches become invested in a dense network of capillaries, forming the terminal sacs (primitive alveoli) that are lined with type I and type II alveolar cells.

respiratory bronchioles divides into 3 to 6 alveolar ducts. The ducts end in terminal sacs (primitive alveoli) that are surrounded by flat alveolar cells in close contact with neighboring capillaries. By the end of the seventh month, sufficient numbers of mature alveolar sacs and capillaries are present to guarantee adequate gas exchange, and the premature infant is able to survive note.

During the last 2 months of prenatal life and for several years thereafter, the number of terminal sacs increases steadily, cells lining the sacs, known as type I alveolar epithelial cells, become thinner .The surrounding capillaries protrude into the alveolar sacs .This intimate contact between epithelial and endothelial cells makes up the blood–air barrier .Mature alveoli are not present before birth

In fact, the formation of the terminal sacs continues during fetal and postnatal life. Prior to birth, there are approximately twenty million to seventy million terminal sacs, whereas the total number in a mature lung is approximately three-hundred to four-hundred million.

Alveolar The alveolar phase is characterized by the maturation of the alveoli, a process that takes place during the end of fetal life and many years after birth.



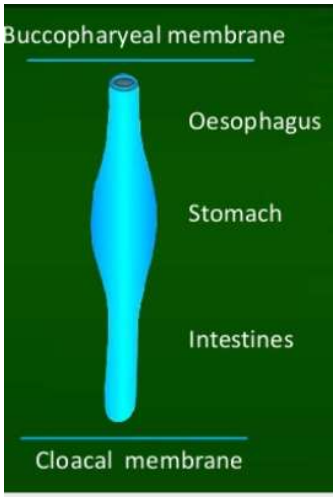
Postnatal lung growth

During the postnatal phase, lung growth is geometric, and there is no increase in airway number. There is proportionately less growth in the conducting airways in comparison with alveolar-capillary tissue. Estimates of the number of alveoli at birth vary widely, but an average of 50 million is generally accepted. These alveoli provide a gas-exchanging surface

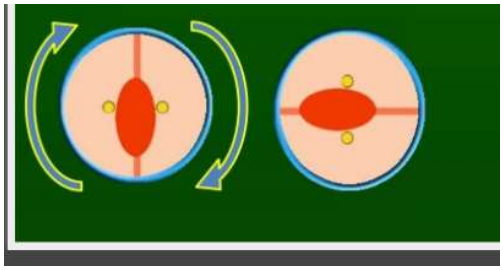
of approximately 3 to 4 m2. Alveoli greatly increase in number after birth, to reach the adult range of 300 million by 2 years of age and the surface area of 75 to 100 m2 by adulthood. There is substantial remodeling of the parenchyma after birth, with morphologic changes in the septa. Alveolarization occurs through the formation of numerous short, blunt tissue crests or ridges, and their protrusion into alveolar sacs increases the internal surface of the lung.

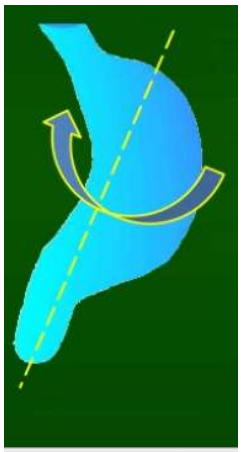
B) ROTATION OF THE STOMACH AND FORMATION OF THE OMENTAL BURSA

- *As stomach enlarges, it slowly rotates 90 degrees, clockwise around its longitudinal axis*
- *As a result of this, the:*
- *The ventral border moves to the right and the dorsal border to the left*
- ✓ *The original left side becomes the ventral surface and the original right side becomes the dorsal surface*
- ✓ *the left vagus nerve, initially innervating the left side of the stomach now innervates the anterior wall*
- ✓ *similarly, the right vagus nerve innervates the posterior wall*



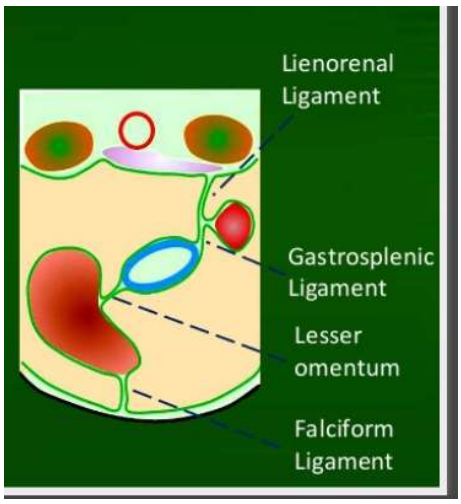
- *Before rotation, the cranial and caudal ends of the stomach are in the median plane*
- *During rotation and growth of the stomach, the cephalic or **cardiac portion** moves to the **left and slightly downward***
- *the caudal or **pyloric part** moves to the **right and upward***
- *After rotation, stomach assumes its final position with its long axis almost transverse to the long axis of the body*





Mesenteries of the Stomach

- ***the stomach is attached to the dorsal body wall by the dorsal mesogastrium/mesentery and to the ventral body wall by the ventral mesogastrium /mesentery***
- ***its rotation and disproportionate growth alter the position of these mesenteries***
- ***Rotation about the longitudinal axis pulls the dorsal mesogastrium (dorsal mesentery) to the left, creating a space behind the stomach contributing to the formation of the omental bursa (lesser peritoneal sac)***
- ***The rest of the peritoneal cavity is now called the greater peritoneal sac***

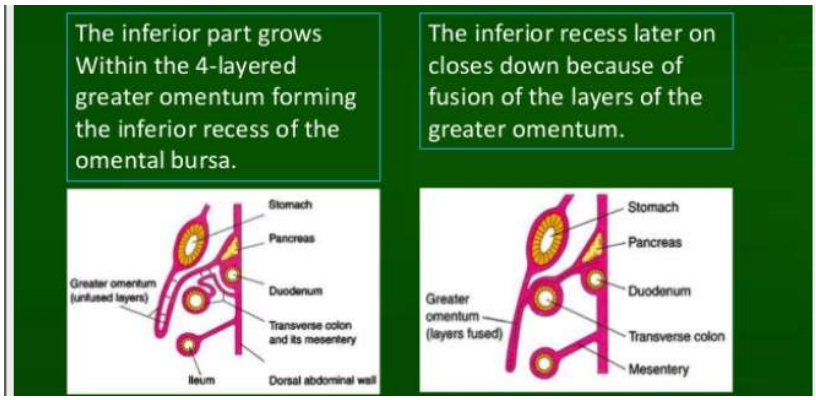


Omental Bursa- Lesser Peritoneal Sac – a space behind the stomach

It begins as small isolated clefts in the dorsal mesogastrium that soon join to form a single cavity

Rotation of the stomach pulls the dorsal mesogastrium to the left thus enlarging the cavity

The bursa expands transversely and cranially and lies between the stomach and the posterior abdominal wall. The superior part of the bursa is cut off as the diaphragm develops . inferiorly it persists as the superior recess of the omental bursa



<u>Development of the esophagus</u>

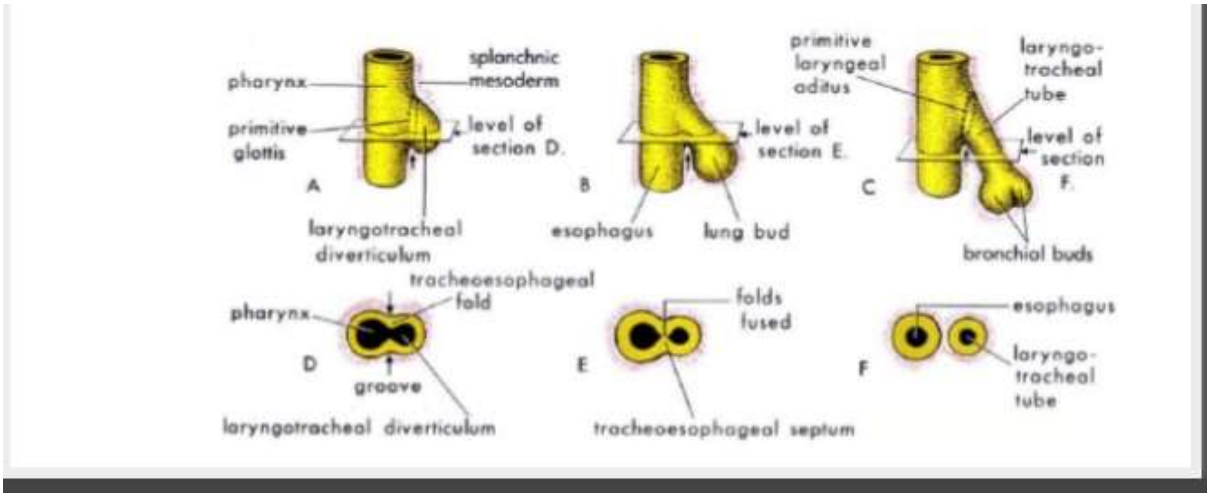
- ***When the embryo is approximately 4 weeks old, the respiratory diverticulum appears at the ventral wall of the foregut at the border with the pharyngeal gut***
- ***The tracheoesophageal septum gradually partitions this diverticulum from the dorsal part of the foregut***
- ***In this manner, the foregut divides into;***

✓ ***a ventral portion called the respiratory primordium***

✓ ***a dorsal portion called the esophagus***

- ***At first the esophagus is short but as the heart and lungs descend, it lengthens rapidly.***
    - ***The upper 2/3 of the esophagus has a muscular coat which is made up of striated muscles (derived from the mesenchyme in the caudal pharyngeal aches) and it is innervated by the vagus nerve***
- ***the lower 1/3 muscular coat is smooth (formed from surrounding splanchnic mesenchyme) and is innervated by the splanchnic plexus***
- ***The epithelial cells proliferate and obliterate the lumen (partly or completely) but this obliteration is temporary***
- ***Recanalization normally occurs by the end of the embryonic period***
- ***Failure of proper recanalization leads to narrowing of the lumen (stenosis)***

- ***note***
- ***Epithelium & glands:***
  - ***Derived from endoderm***
- ***Striated muscles (mainly in the superior third):***
  - ***Derived from the mesenchyme in the caudal pharyngeal aches***
- ***Smooth muscles (mainly in the inferior third):***
  - ***Derived from the surrounding splanchnic mesoderm***
-



Muscle is striated in upper 1/3

Mixed in the middle 1/3

Smooth in the lower 1/3(vagus)