1. **DEVELOPMENT OF THE LUNGS**

The development of the lungs is divided into four histologic stages: the pseudoglandular, canalicular, terminal sac, and alveolar stages.

1. **Pseudoglandular Stage (5 to 17 Weeks)**: From a histologic standpoint, the developing lungs somewhat resemble exocrine glands during the pseudoglandular stage. By 16 weeks, all major elements of the lung have formed, except those involved with gas exchange. Respiration is not possible; therefore fetuses born during this period are unable to survive.
2. **Canalicular Stage (16 to 25 Weeks)**: The canalicular stage overlaps the pseudoglandular stage because cranial segments of the lungs mature faster than caudal ones. During the canalicular stage, the lumina of bronchi and terminal bronchioles become larger and the lung tissue becomes highly vascular. By 24 weeks, each terminal bronchiole has formed two or more respiratory bronchioles, each of which divides into three to six passages, the primordial alveolar ducts. Respiration is possible at the end of the canalicular stage (26 weeks) because some thin-walled terminal sacs (primordial alveoli) have developed at the ends of the respiratory bronchioles and lung tissue is well vascularized. Although a fetus born toward the end of this period may survive if given intensive care, this premature neonate may die because its respiratory and other systems are still relatively immature.
3. **Terminal Sac Stage (24 Weeks to Late Fetal Period):** During the terminal sac stage, many more terminal sacs (primordial alveoli) develop and their epithelium becomes very thin. Capillaries begin to bulge into these sacs. The intimate contact between epithelial and endothelial cells establishes a blood–air barrier, which permits adequate gas exchange for survival of the fetus if it is born prematurely. Scattered among the squamous epithelial cells are rounded secretory epithelial cells, type II pneumocytes, which secrete pulmonary surfactant, a complex mixture of phospholipids and proteins. Surfactant forms as a monomolecular film over the internal walls of the alveolar sacs and counteracts surface tension forces at the air−alveolar interface. Surfactant production begins at 20 to 22 weeks, but surfactant is present in only small amounts in premature infants; it does not reach adequate levels until the late fetal period. Fetuses born at 24 to 26 weeks after fertilization may survive if given intensive care; however, they may suffer from respiratory distress because of surfactant deficiency.
4. **Alveolar Stage (Late Fetal Period to 8 Years):** Exactly when the terminal sac stage ends and the alveolar stage begins depends on the definition of the term alveolus. Terminal sacs analogous to alveoli are present at 32 weeks. The epithelial lining of the sacs attenuates to a thin squamous epithelial layer. The type I pneumocytes become so thin that the adjacent capillaries bulge into the alveolar sac. By the late fetal period (38 weeks), the lungs are capable of respiration because the alveolocapillary membrane (pulmonary diffusion barrier or respiratory membrane) is sufficiently thin to allow gas exchange. Although the lungs do not begin to perform this vital function until birth, they are well developed so that they are capable of functioning as soon as the baby is born. At the beginning of the alveolar stage (32 weeks), each respiratory bronchiole terminates in a cluster of thin walled alveolar sacs, separated from one another by loose connective tissue. These sacs represent future alveolar ducts. The transition from dependence on the placenta for gas exchange to autonomous gas exchange requires the following adaptive changes in the lungs:

● Production of surfactant in the alveolar sacs

● Transformation of the lungs from secretory organs into organs capable of gas exchange

● Establishment of parallel pulmonary and systemic circulations. Lung development during the first few months after birth is characterized by an exponential increase in the surface area of the air–blood barrier through the multiplication of alveoli and capillaries. Approximately 150 million primordial alveoli, one half of the adult number, are present in the lungs of a full-term neonate.

2.)  **Rotation of the Stomach**

As the stomach enlarges and acquires its final shape, it slowly rotates 90 degrees in a clockwise direction (viewed from the cranial end) around its longitudinal axis. The effects of rotation on the stomach are:

● The ventral border (lesser curvature) moves to the right, and the dorsal border (greater curvature) moves to the left.

● The original left side becomes the ventral surface, and the original right side becomes the dorsal surface.

● Before rotation, the cranial and caudal ends of the stomach are in the median plane. During rotation and growth of the stomach, its cranial region moves to the left and slightly inferiorly and its caudal region moves to the right and superiorly.

● After rotation, the stomach assumes its final position, with its long axis almost transverse to the long axis of the body. The rotation and growth of the stomach explain why the left vagus nerve supplies the anterior wall of the adult stomach and the right vagus nerve innervates its posterior wall.

**Formation of the Omental Bursa**

The stomach is suspended from the dorsal wall of the abdominal cavity by a dorsal mesentery, the primordial dorsal mesogastrium. This mesentery, originally in the median plane, is carried to the left during rotation of the stomach and formation of the omental bursa or lesser sac of the peritoneum. The mesentery also contains the spleen and celiac artery. The primordial ventral mesogastrium attaches to the stomach; it also attaches the duodenum to the liver and ventral abdominal wall. Isolated clefts develop in the mesenchyme, forming the thick dorsal mesogastrium. The clefts soon coalesce to form a single cavity, the omental bursa or lesser peritoneal sac. Rotation of the stomach pulls the mesogastrium to the left, thereby enlarging the bursa, a large recess in the peritoneal cavity. The bursa expands transversely and cranially and soon lies between the stomach and posterior abdominal wall. The pouch-like bursa facilitates movements of the stomach. The superior part of the omental bursa is cut off as the diaphragm develops, forming a closed space, the infracardiac bursa. If the space persists, it usually lies medial to the base of the right lung. The inferior region of the superior part of the bursa persists as the superior recess of the omental bursa. As the stomach enlarges, the omental bursa expands and acquires an inferior recess of the omental bursa between the layers of the elongated dorsal mesogastrium, the greater omentum. This membrane overhangs the developing intestines. The inferior recess disappears as the layers of the greater omentum fuse. The omental bursa communicates with the peritoneal cavity through an opening, the omental foramen.

3.) **Development of Esophagus**

The esophagus develops from the foregut immediately caudal to the pharynx. The partitioning of the trachea from the esophagus by the tracheoesophageal septum. Initially, the esophagus is short, but it elongates rapidly, mainly because of the growth and relocation of the heart and lungs. The esophagus reaches its final relative length by the seventh week. Its epithelium and glands are derived from endoderm that proliferates and, partly or completely, obliterates the lumen of the esophagus. However, recanalization of the esophagus normally occurs by the end of the eighth week. The striated muscle forming the muscularis externa (external muscle) of the superior third of the esophagus is derived from mesenchyme in the fourth and sixth pharyngeal arches. The smooth muscle, mainly in the inferior third of the esophagus, develops from the surrounding splanchnic mesenchyme. Both types of muscle are innervated by branches of the vagus nerves (cranial nerve X), which supply the caudal pharyngeal arches.