

- ◉ Lecture 21 Development of respiratory system
- ◉ Dr. Rehan Asad
- ◉ At the end of session students should be able to
- ◉ Describe formation of lung buds
- ◉ Describe development of larynx, trachea and bronchi.
- ◉ Describe the development of lungs.
- ◉ Describe the maturation of lungs.
- ◉ Correlate this knowledge to clinical conditions.
- ◉ DEVELOPMENT OF THE LUNG BUD
- ◉ Around 4 weeks of gestation
- ◉ **Respiratory diverticulum (lung bud)** appears as an outgrowth from the ventral wall of the foregut
- ◉ Retinoic acid produced by mesoderm controls its appearance

- ◉ Development of lung Bud
 - ◉ In early stages, the lung bud is in communication with the foregut.
 - ◉ On further growth, two longitudinal ridges termed as **tracheoesophageal ridges** appears
 - ◉ It separate trachea from the foregut
 - ◉ In later stages, when these ridges fuse to form the **tracheoesophageal septum**, the foregut is divided into a dorsal portion **esophagus** and a ventral portion, the **trachea and lung buds**.
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- ◉ Development of lung buds
 - ◉ Lung bud forms trachea
 - ◉ Its lateral out pockets, known as bronchial buds.

- ⊙ Primary bronchi start forming at beginning of fifth week.
- ⊙ Lobar bronchi appears at sixth week.

- ⊙ Development of lungs
- ⊙ During further development, lung buds expand in body cavity.
- ⊙ Cavity is known as **pericardioperitoneal canal**.
- ⊙ Mesoderm of lung form visceral pleura
- ⊙ Space between somatic and visceral pleura forms pleural cavity.
- ⊙ Development of lungs
- ⊙ Divided in **four** phases:
 - pseudoglandular
 - Canalicular
 - Terminal sac
 - Alveolar

- ◎ *Pseudoglandular phase*
- ◎ Absence of respiratory bronchioles
- ◎ 5 to 16 wks
- ◎ Branching continues to form terminal bronchiole.
- ◎ Canalicular phase
- ◎ 16-26 weeks
- ◎ Terminal bronchiole divide in respiratory bronchiole and formation of alveolar ducts.
- ◎ *Increase in vascularity*

- ◎ Terminal sac phase
- ◎ 26 weeks to birth.
- ◎ Formation of primitive alveoli.
- ◎ Close contact of capillaries.
- ◎ Formation of blood air barrier.

- ⦿ Alveolar phase
- ⦿ Eight months to childhood
- ⦿ Complete development of epithelium
- ⦿ Maturation of endothelial cells of capillaries
- ⦿ *Lungs before and after birth*
- ⦿ **Before birth, lungs half-filled with fluid, little protein, mucus and surfactant**
- ⦿ **Aeration of lungs at birth is replacement of intra-alveolar fluid by air**
- ⦿ **During delivery, some fluid expelled via bronchi and trachea**
- ⦿ **When respiration begins at birth, most of lung fluid absorbed by blood and lymphatic capillaries**

- ◎ **surfactant remains deposited as a thin, phospholipid, coating on alveoli**

- ◎ Clinical correlations

- ◎ Esophageal atresia with tracheo-esophageal fistula

- ◎ 90% present with upper esophageal blind pouch.

- ◎ 33% of the cases are involved with **VACTERL** association (**V**ertebral anomalies, **A**nal atresia, **C**ardiac defects, **T**racheoesophageal fistula, **E**sophageal atresia, **R**enal anomalies, and **L**imb defect).

- ◎ Complications: Polyhydramnios.

- ◎ Clinical correlations

- ◎ At birth, babies having trachesophageal defect need to be

carefully monitored for VACTREL defects.

◎ ***HYALINE MEMBRANE DISEASE***
Respiratory Distress Syndrome

◎ Most common in premature babies.

◎ Due to immature type II alveoli

◎ Deficiency of surfactant

◎ Congenital anomalies

◎ Agenesis of lungs

◎ Hypoplasia of lungs

◎ Ectopic lung lobes

◎ Congenital lung cysts due to dilation of terminal bronchi

◎ Summary

- ◎ References
- ◎ **Langman's Medical Embryology:
T.W. Sadler, 12th ed., CH. 14, P.
201-206**