

# RESPIRATORY ANATOMY & PHYSIOLOGY

revised 17 March 2016

S&M 590, KE: 72-77, Martini's 5th: 798-842, 7th: 822-850, 8th 835-871, 10th: 839-878

**TRACHEA:** lies anterior to esophagus, reinforced with hyaline cart. rings cilia beat upwards to remove debris

p. 840 As it passes behind arch of aorta, branches to bronchi.

Repeated branching leads ultimately to **terminal** then **respiratory bronchioles**

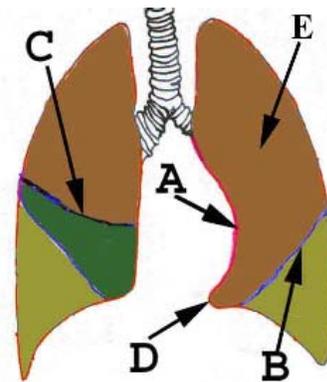
Entire tract lined with **pseudostratified ciliated columnar epith.** (PCCE...)

(Except alveoli bronchioles lined with smooth muscle, constrict under asthma)

**LUNGS:** (p. 842)

left: two lobes, superior(E) and inferior, cardiac notch (A), oblique fissure (B) (up to L)

right: three lobes, also has horizontal fissure (C) as well as oblique (up to R)



**PLEURA:** as before: visceral, parietal, cavity containing serous fluid adhere tightly due to negative pressure

**ALVEOLI** (P 844, 845)

**Respiratory membrane:** double layer, endo and epithelium, 2 basal laminae fused (p 845)

**surfactant** (reduces surface tension) is produced which causes alveoli to open up at birth.

Premature infants may have inadequate surfactant, resulting high surface tension leads to **hyaline membrane disease**

**MECH OF BREATHING:** ~500 mL enters and leaves per breath, 8000 mL/min

only 5% actually exchanged in alveoli per each breath

**diaphragm** contraction is the greatest contributor to inspiration (p 850)

**Intercostal muscles** also cause breathing. (p. 853):

**exhale:** internal intercostal muscles, pulls ribs down

**inhale:** external intercostal muscles, pulls ribs up

**inspiration:** **Phrenic** nerve to **diaphragm** and **external intercostal** muscles (via intercostal nerves) to:.

**exhalation:**

passive: elastic recoil

forceful:

1) **internal intercostals**

2) serratus posterior

3) external and internal obliques

4) rectus abdominis

**LUNG VOLUMES:** (p. 855)

residual 1000-1200 mL

expiratory reserve 800-1200 (beyond resting expiration)

tidal volume 500

inspiratory reserve 2100-3000 (beyond resting inspiration)

vital capacity 4800 (maximum air which can be expelled after deep breath)

**Deep breathing:** more efficient than shallow due to dead space in resp system.

**REGULATION OF BREATHING:**

**respiratory center** (P 868-869):

Medulla **dorsal respiratory group** controls quiet breathing

Pons **apneustic** triggers inspiration,  
**pneumotaxic** stimulates exhalation

**Trigger for breathing:** high CO<sub>2</sub> forms carbonic acid, lowers pH, stimulates breathing. (Acidosis)

Hemoglobin can transport CO<sub>2</sub>, carbaminohemoglobin.

**RESPIRATORY PROBLEMS:** (p 873)

**Cyanosis** ("blue condition") due to hypoxic hemoglobin, darker

**Emphysema** ("an inflation") breakdown of alveolar partitions. Sign: "barrel chested"

**Asthma** ("panting") constricted airways: hyper reactive due to histamine, etc

**Pneumothorax** ("air chest") air in the pleural space, causes collapsed lung.

**cystic fibrosis** thick mucus accumulates in lungs (inherited error in chloride transport)

**CO poisoning** forms carboxyhemoglobin, cherry red, CO binds 200x more strongly than O<sub>2</sub>.

