

Respiratory System

Trivia Time . . .

- What is the 'fastest sneeze speed?'
- What is the surface area of the lungs?
(hint . . . think of how large the small intestine was)
- How many breaths does the average person take a minute?

Trivia Time . . .

- What is the 'fastest sneeze speed?' **165 km/hr**
- What is the surface area of the lungs? (hint . . . think of how large the small intestine was) **Tennis Court, 260 m²**
- How many breaths does the average person take a minute? **12-15**

Just Breathe

- * Between 17 000 and 29 000 breaths a day
- * Take a deep breath
- * You just captured 3-4L of air in your lungs!
- * Breathing is so important that it cannot be left to conscious control . . .

Need for Oxygen

- * **Aerobic Cellular Respiration = the series of chemical reactions that occur in the cell that provide energy and consume oxygen (happens in the mitochondria)**

Four parts of respiration

- * Ventilation – movement of air between the atmosphere and alveoli
- * Perfusion – blood flow through the lungs
- * Diffusion – oxygen and carbon dioxide are transferred between alveoli and blood
- * Regulation – respiratory muscles and nervous system

Respiratory Tract

- * Series of tubes that function as airway passages
- * Filter, warm and humidify incoming air

Nose



Pharynx



Larynx



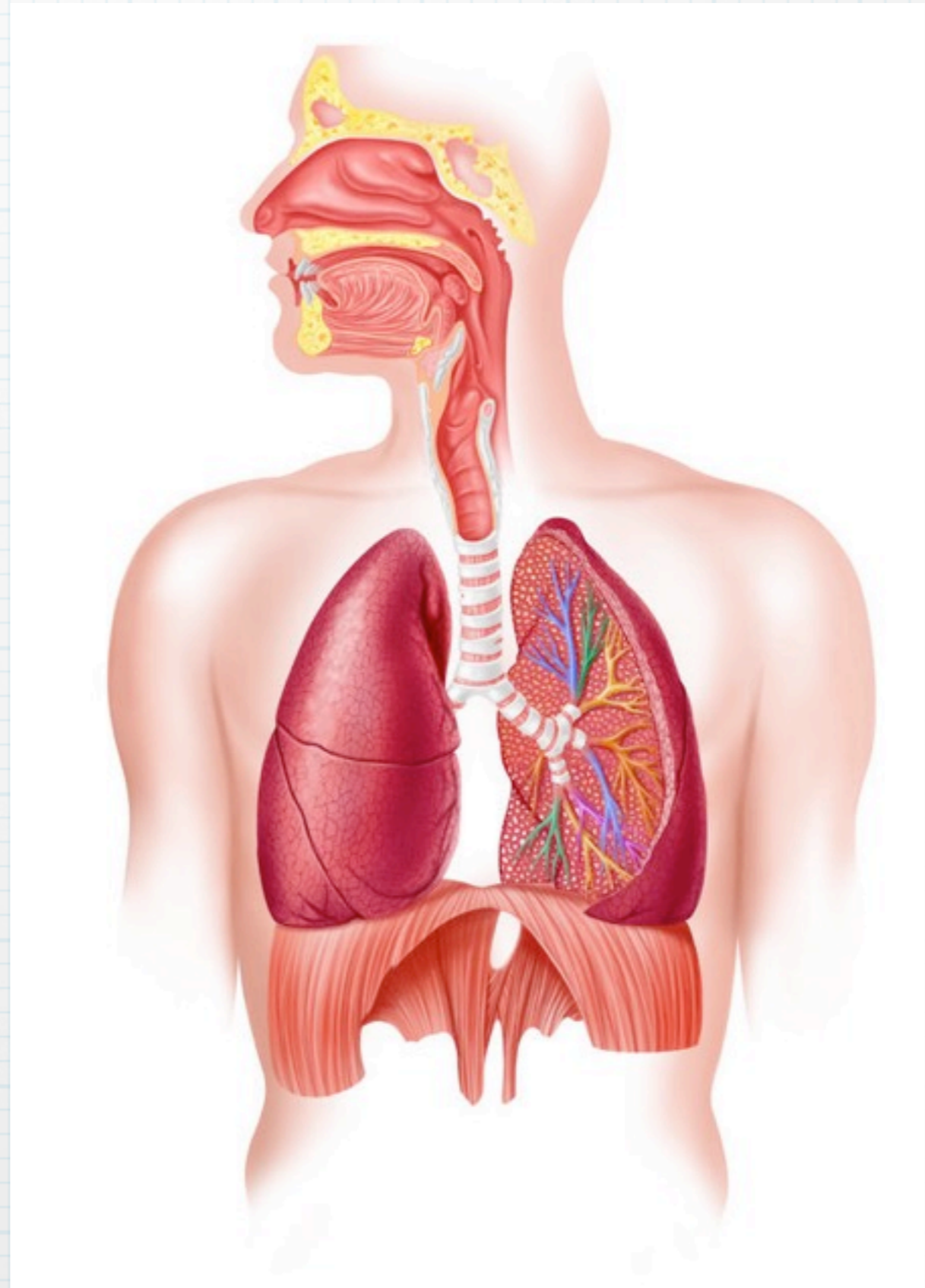
Trachea

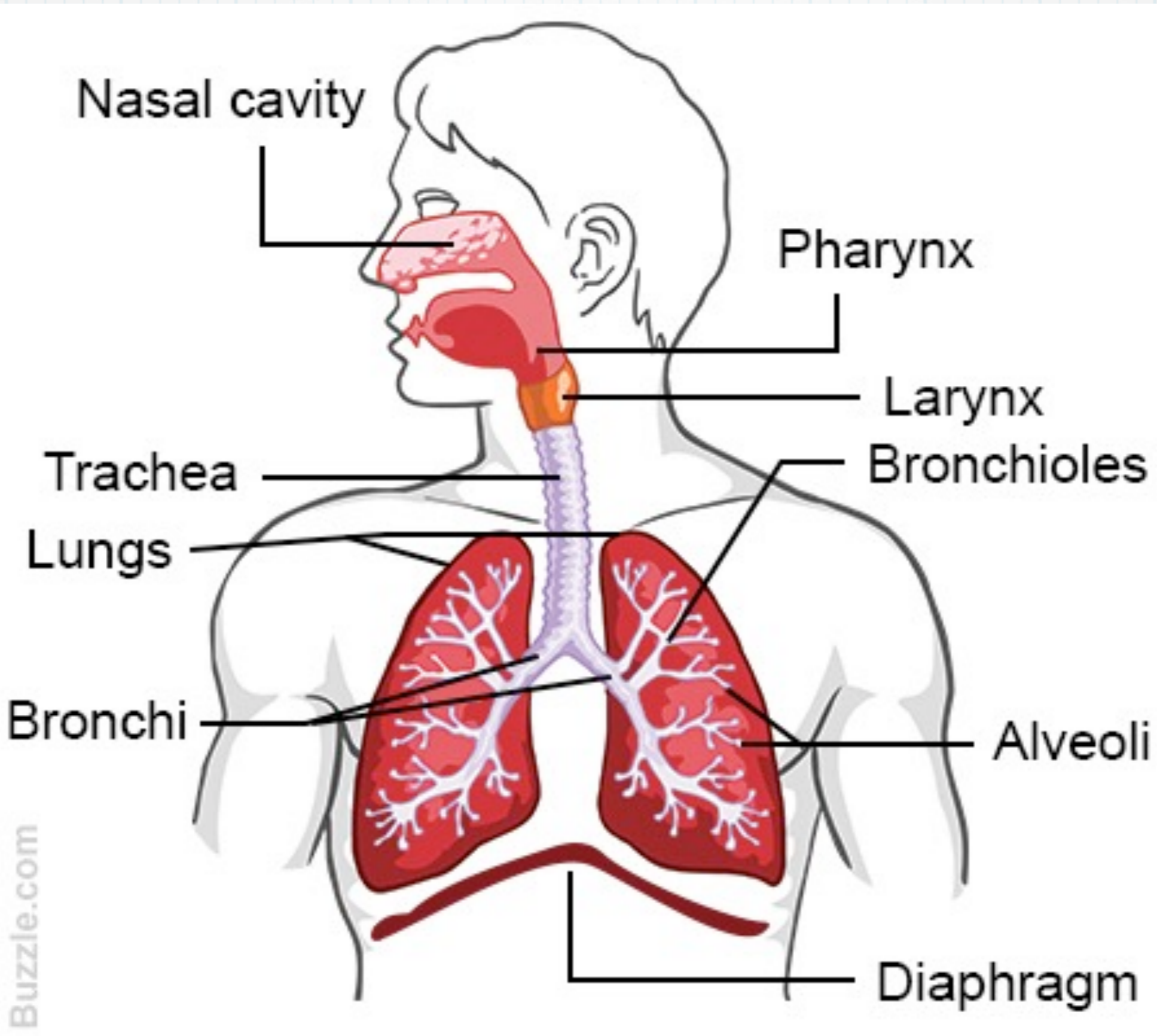


Bronchus



Bronchioles





Nose/Mouth

- * Air comes into your nose it gets filtered by tiny hairs and it is moistened by the mucus that is in your nose.

Nose/Mouth

- * Sinuses help to moisten and heat the air that you breath
- * Mouth/oral cavity lets in air but is not filtered as much when it enters in through your mouth

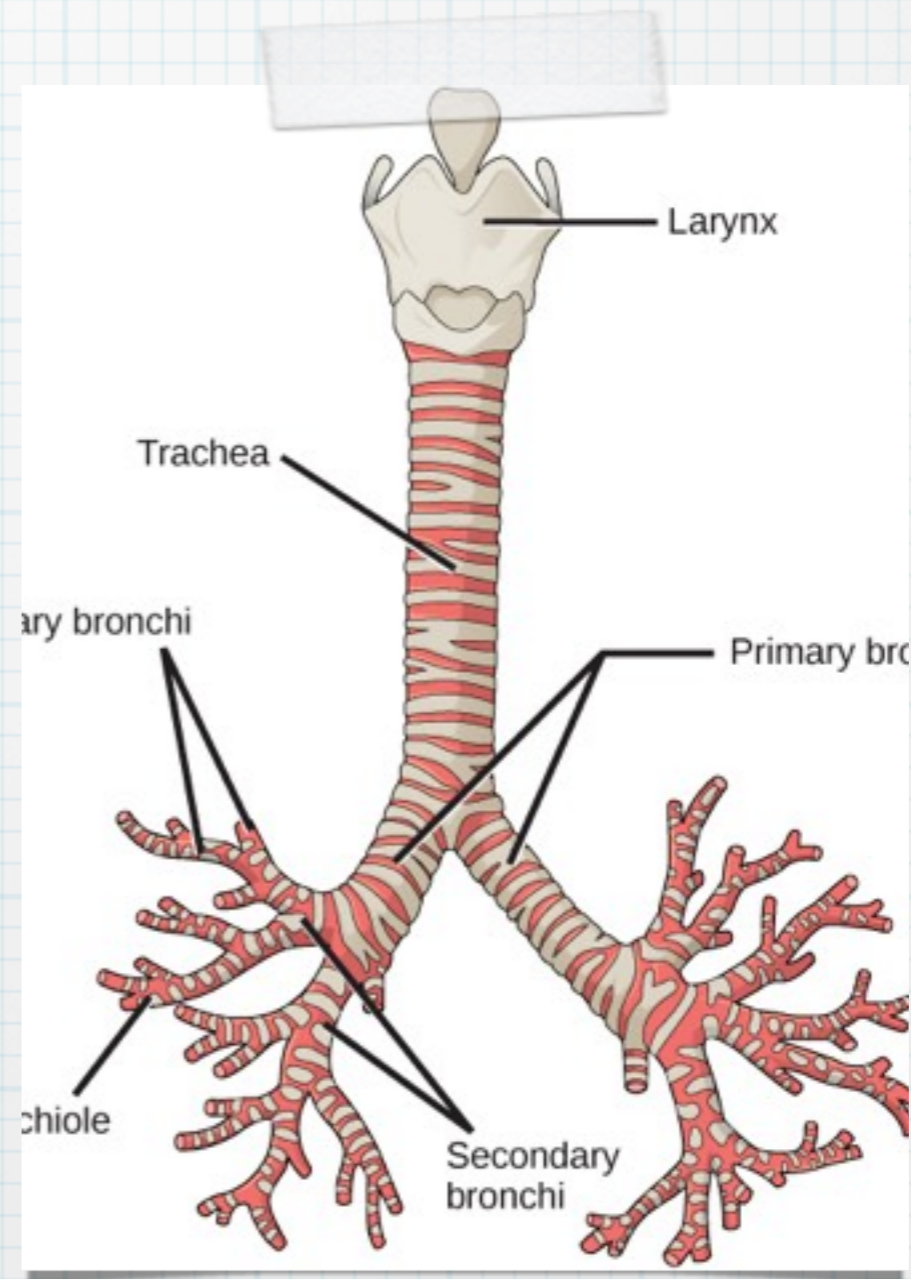
Pharynx

- * Contain the tonsils – normal function is to fight infection.
- * Prevents air from being swallowed.
- * Section where food and water mix.

Larynx - Vocal Chords

Trachea

- * Is held open by rings of "C" shaped cartilage.
- * Without these rings your trachea might close off and air would not be able to get to and from your lungs



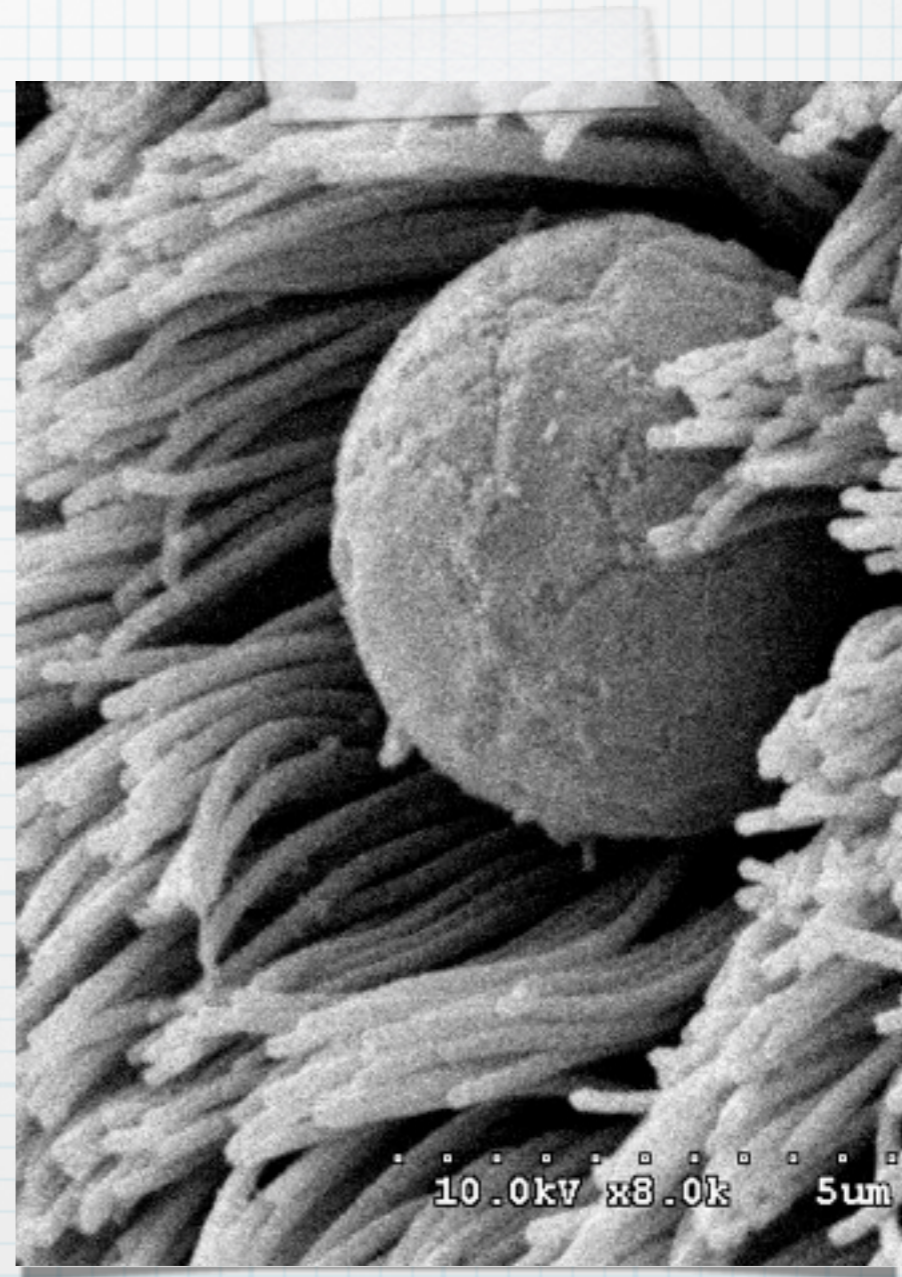
Trachea

- * The trachea is lined with mucus-producing cells and cilia



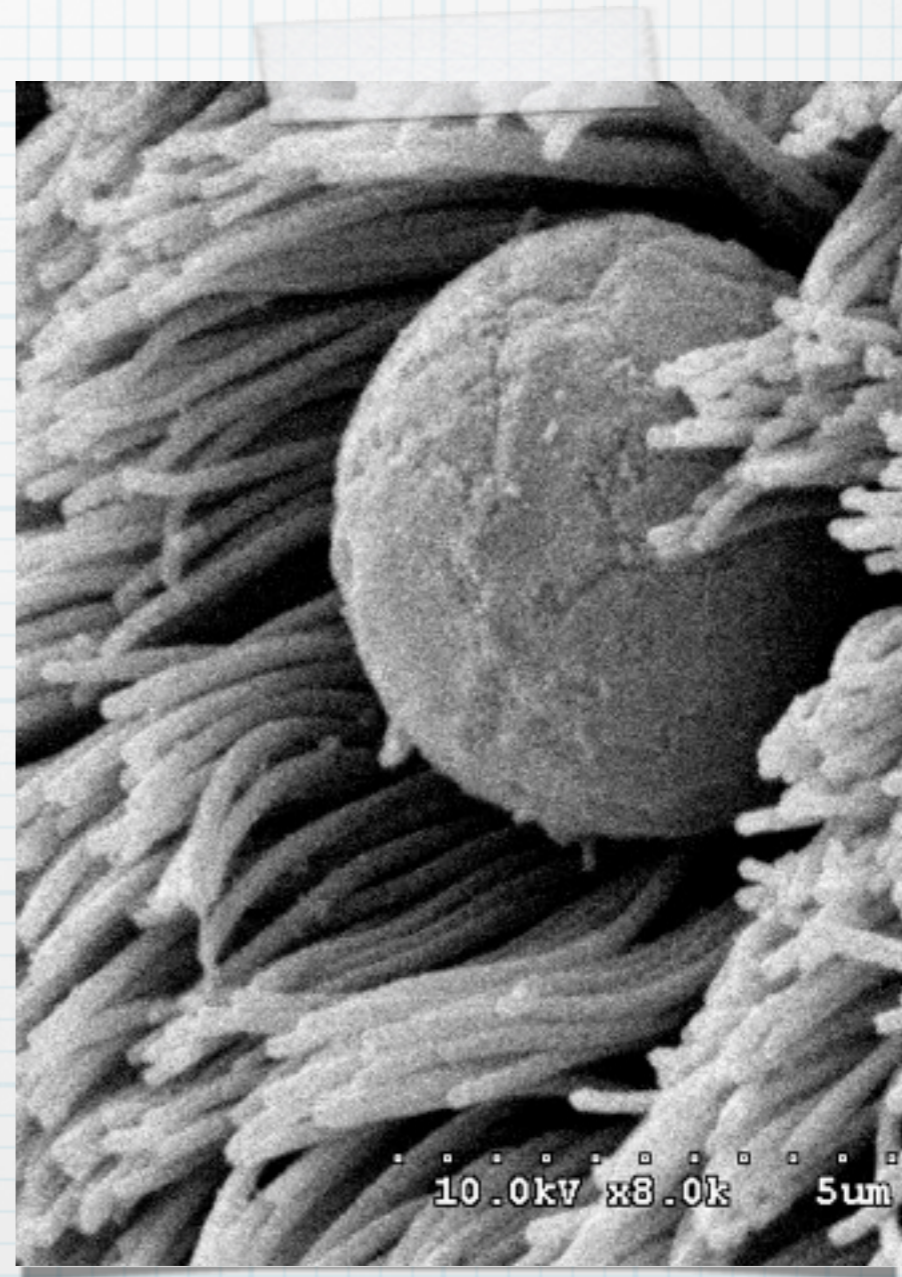
Trachea

- * Mucus producing cells – cells secrete mucus that traps dust and other airborne particle



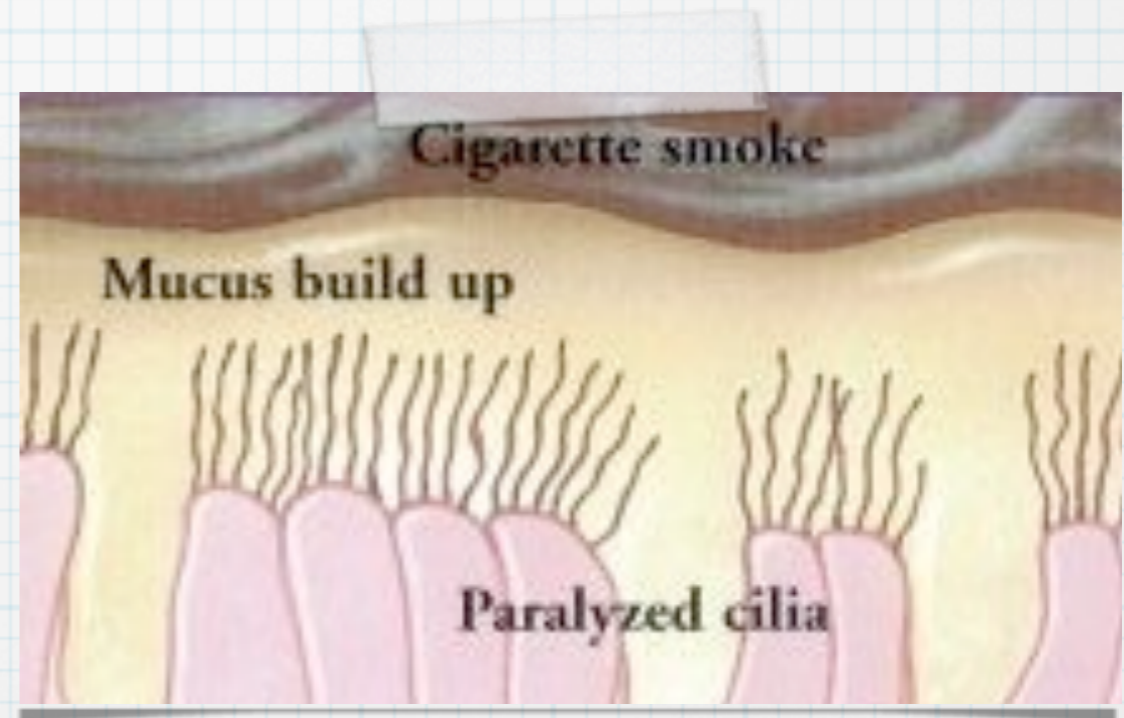
Trachea

- * Cilia - sweep the trapped material out of the trachea (wave like motion)
- * Ether swallowed, or expelled by coughing or sneezing



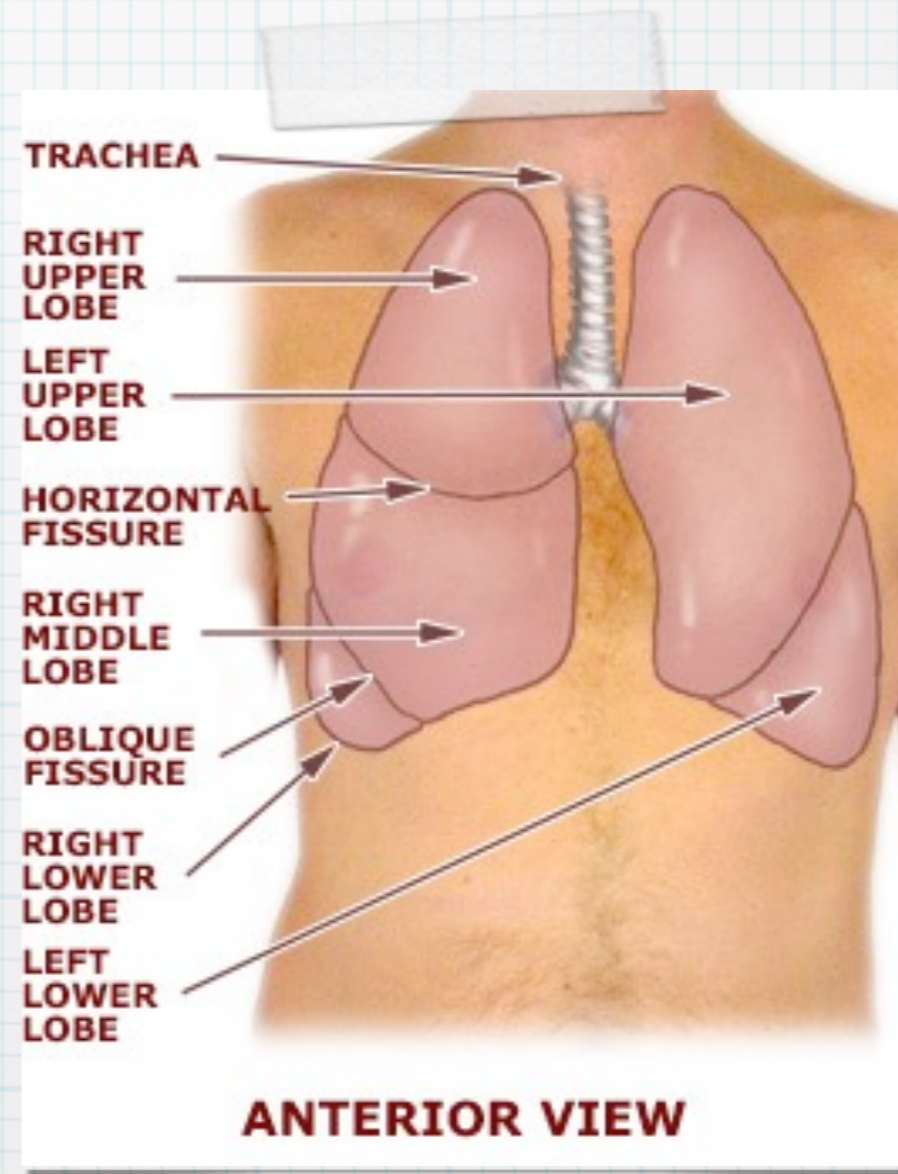
Trachea

- * The chronic cough of smokers is caused by damage to cilia.



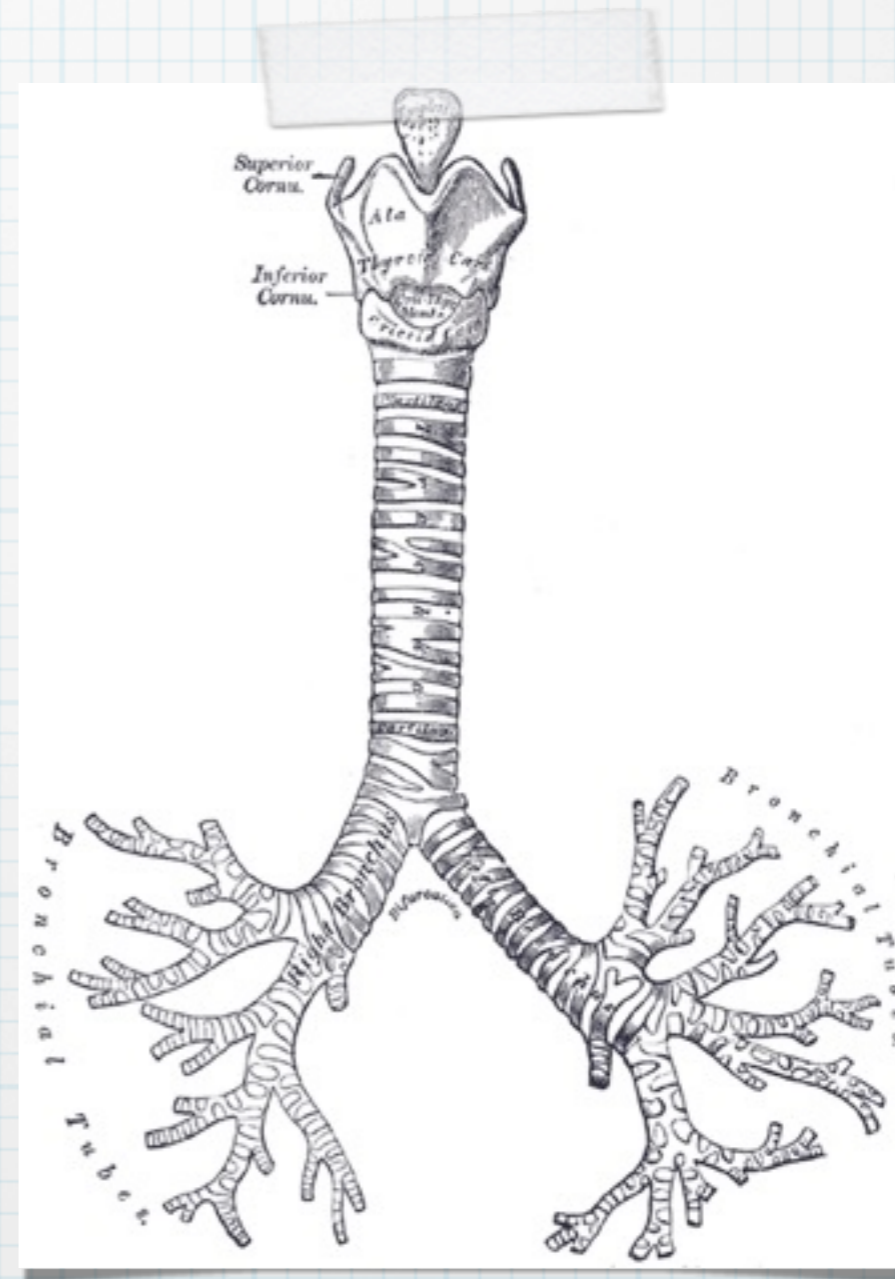
Lungs

- * Right side has 3 lobes
- * Left side 2 lobes
- * Contains the lower respiratory structures



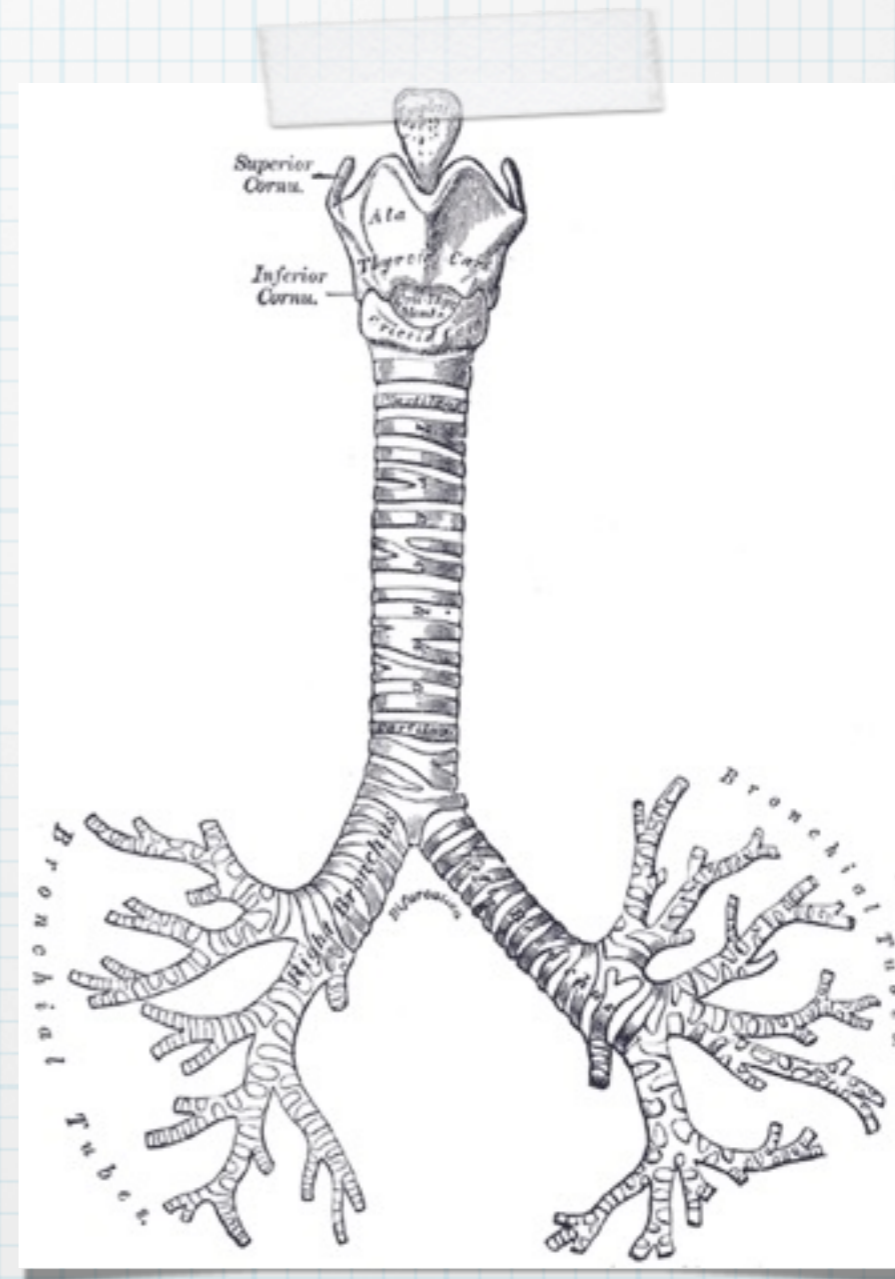
Bronchi

- * Trachea (windpipe) splits up into two bronchi tubes moving air in/out of the left and right lung.



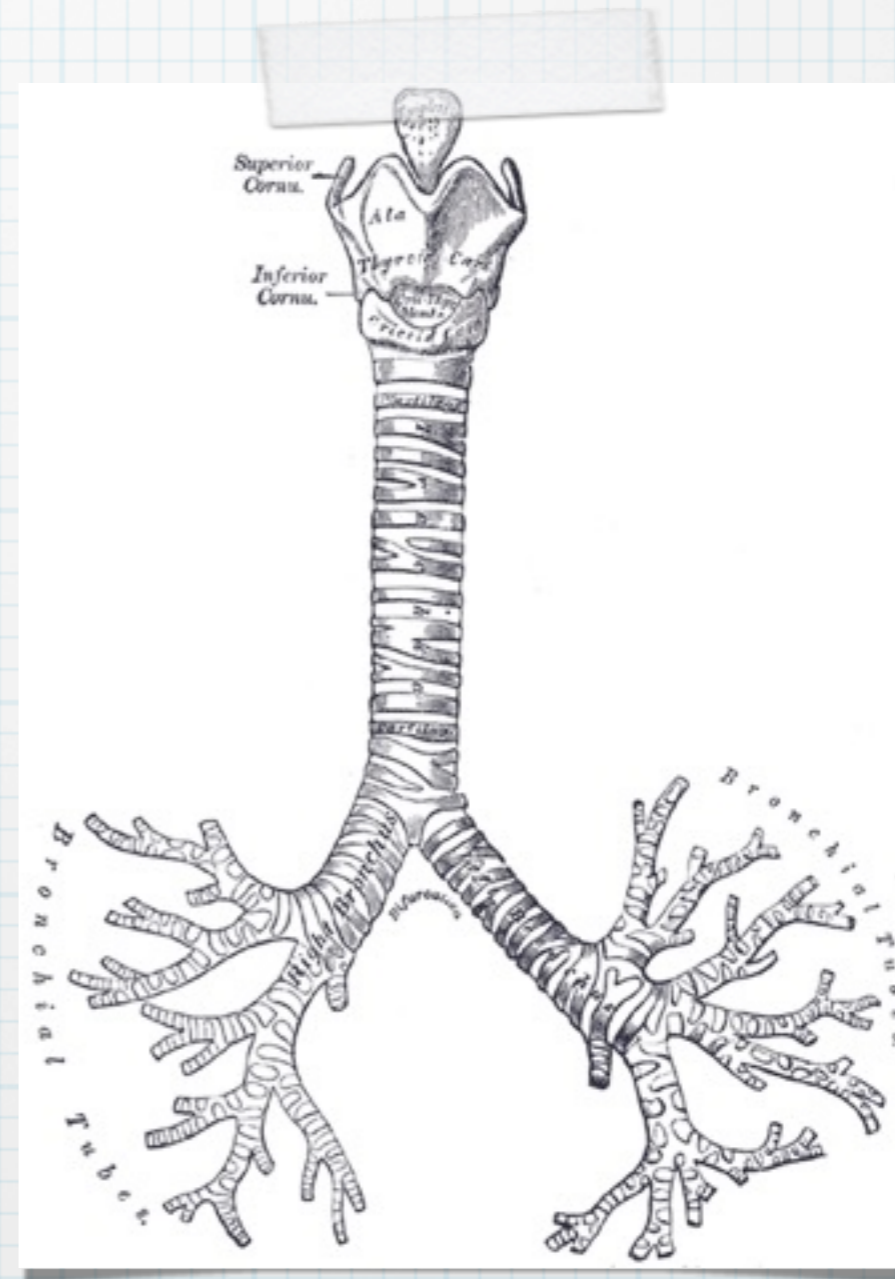
Bronchi

- * There are two bronchi in the human body that branch off from the trachea. Bronchi then split into bronchioles.



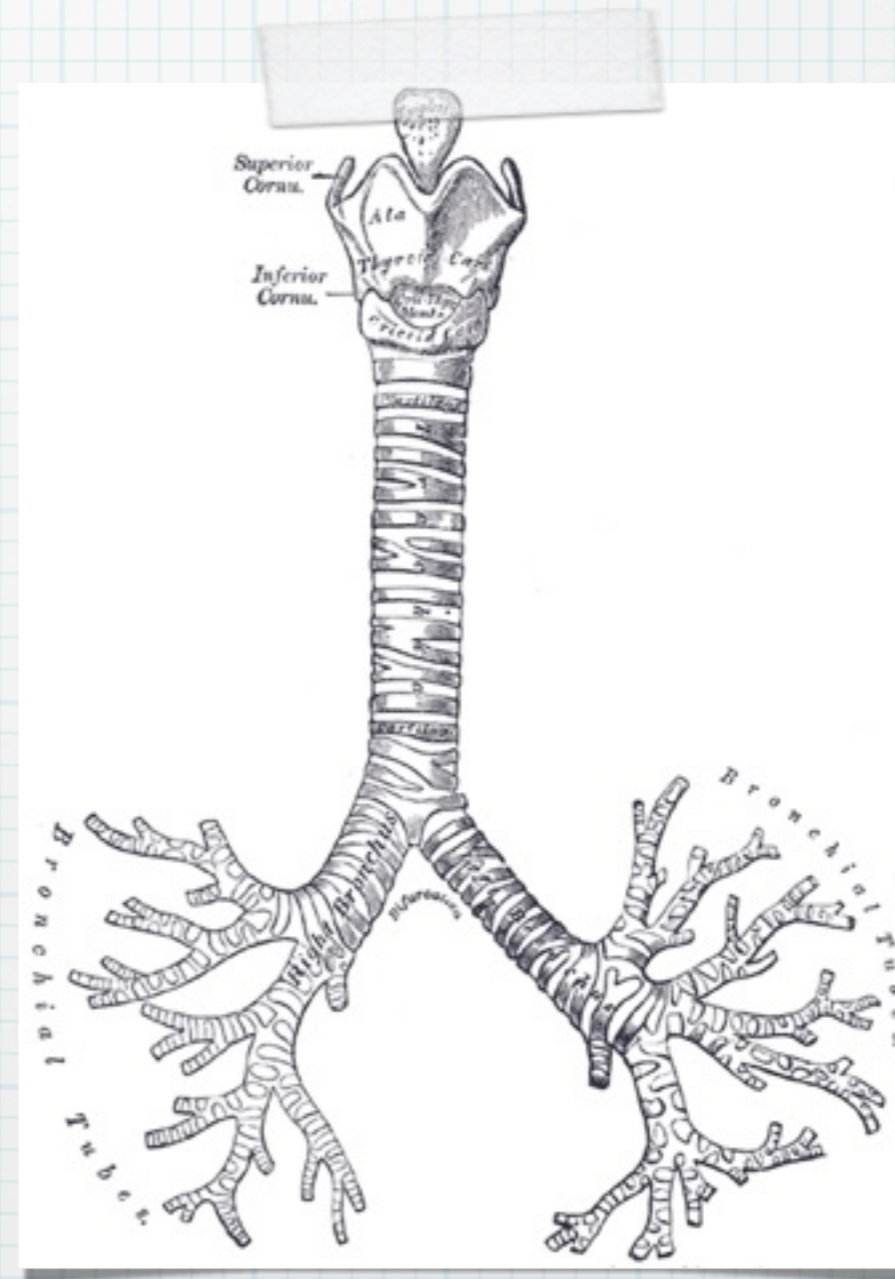
Bronchi

- * The bronchi are lined with mucous membranes that secrete mucus and cilia that sweep the mucus and particles up and out of the airways.



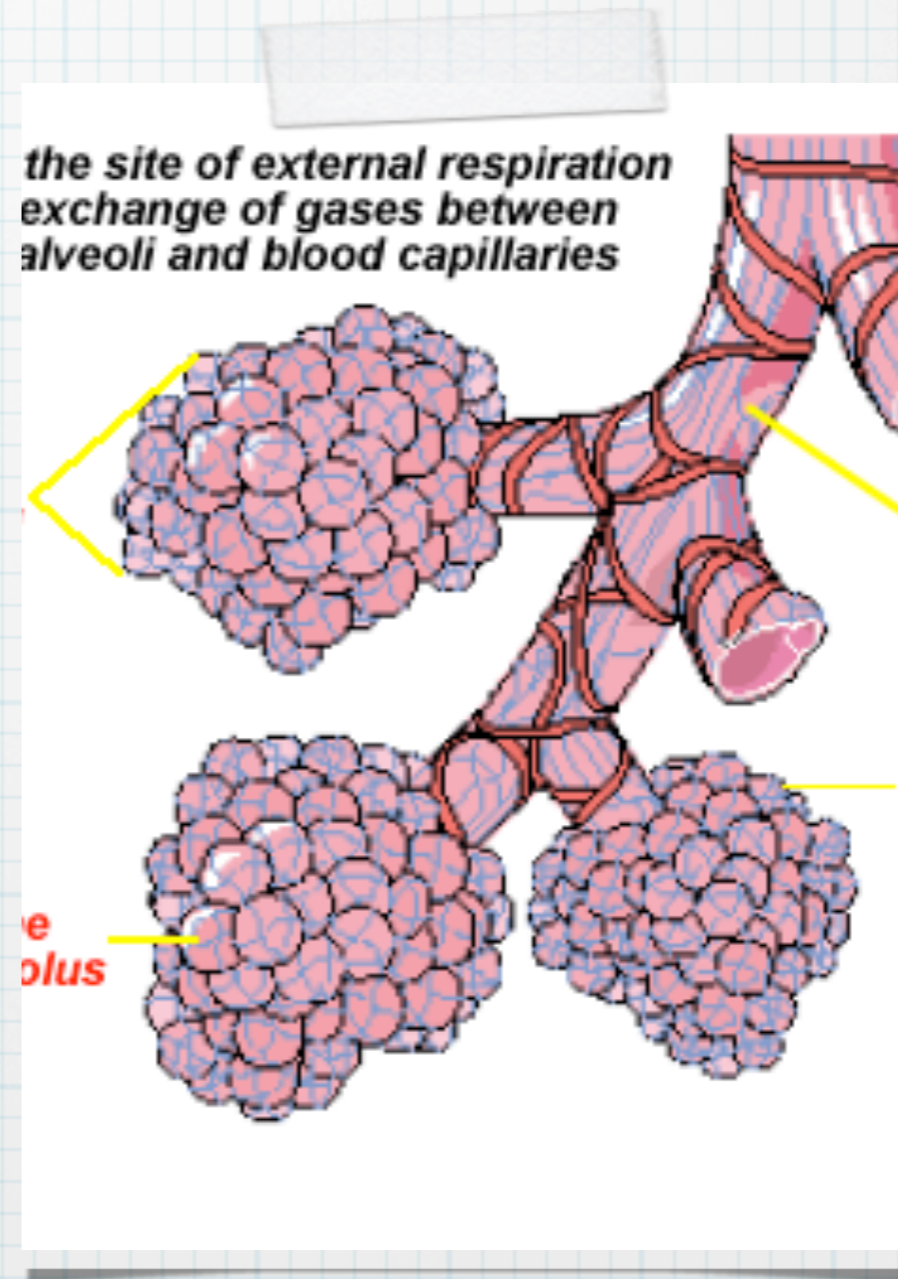
Bronchioles

- * These two tubes keep splitting up and form your bronchioles.
- * Bronchioles keep getting smaller and smaller until they finally end with small air sacs called alveoli



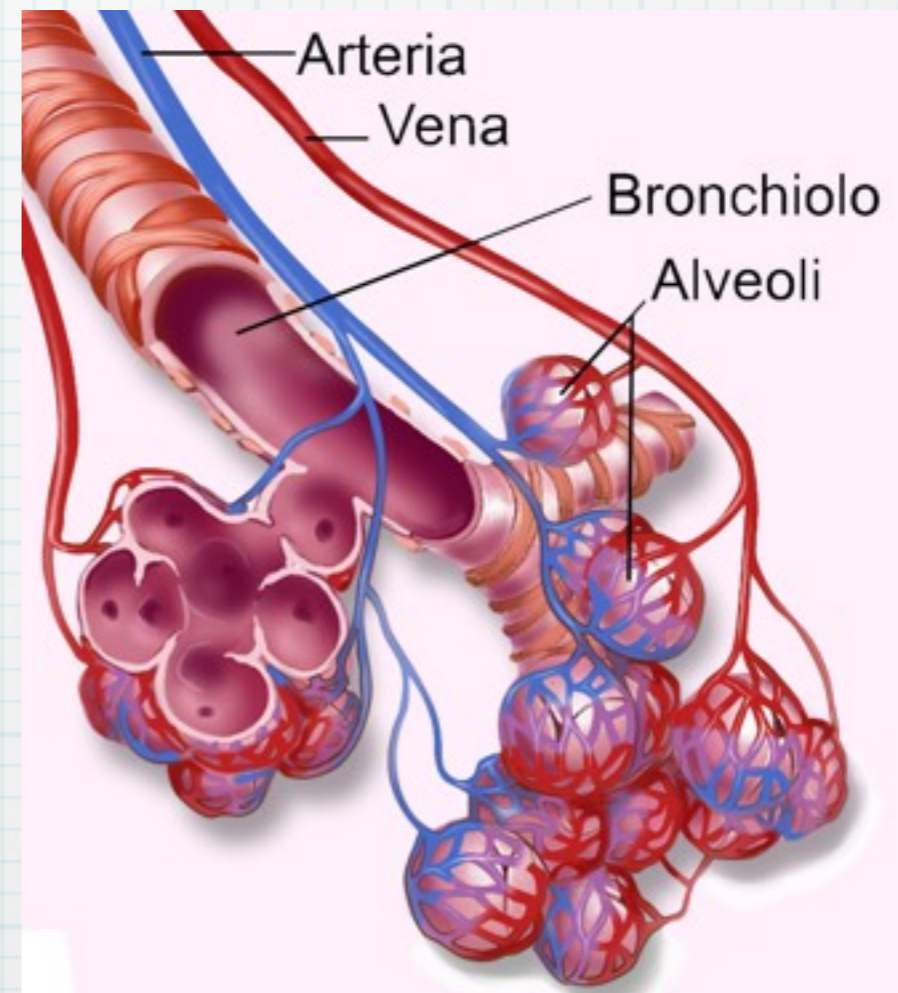
Alveoli

- * Alveoli are tiny air sacs that fill up with air/oxygen when you breath in.



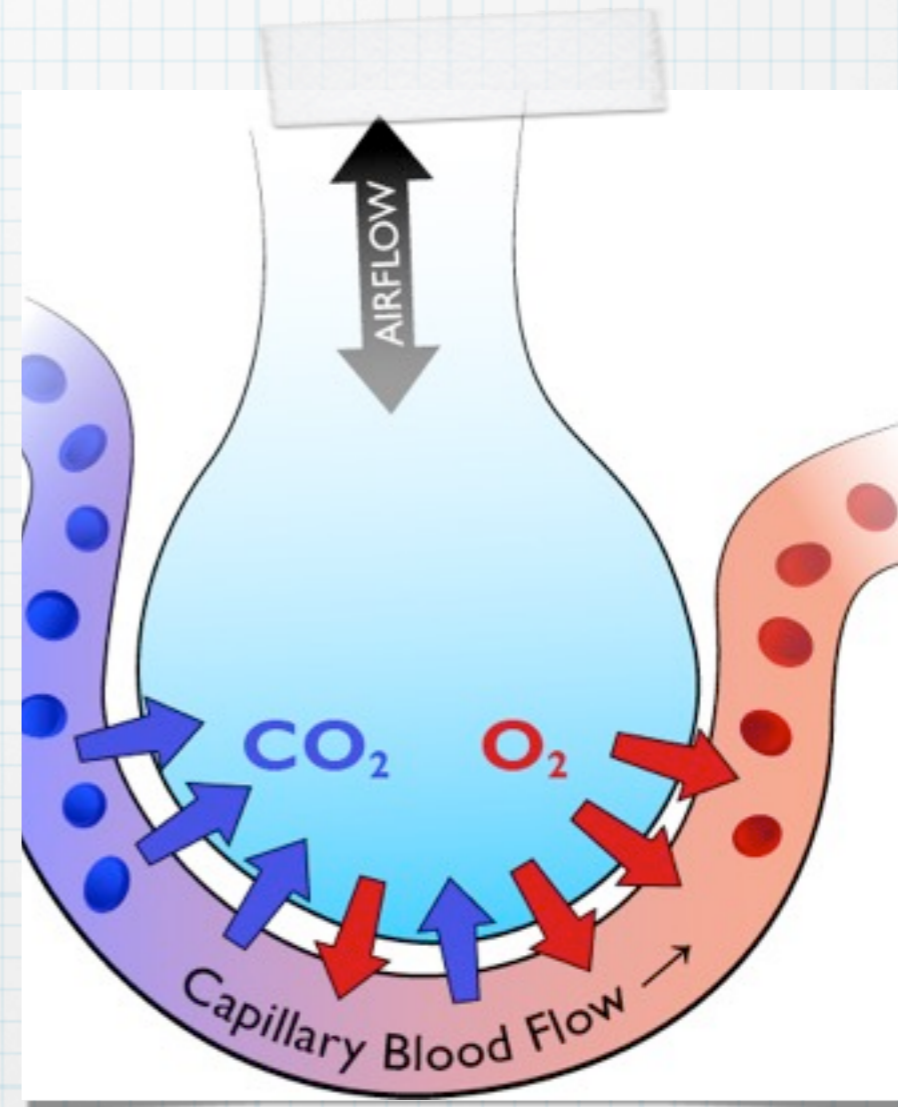
Alveoli

- * The walls of your alveoli (and capillaries) are so thin that the oxygen or carbon dioxide can pass through them, traveling right into, or out of your blood stream



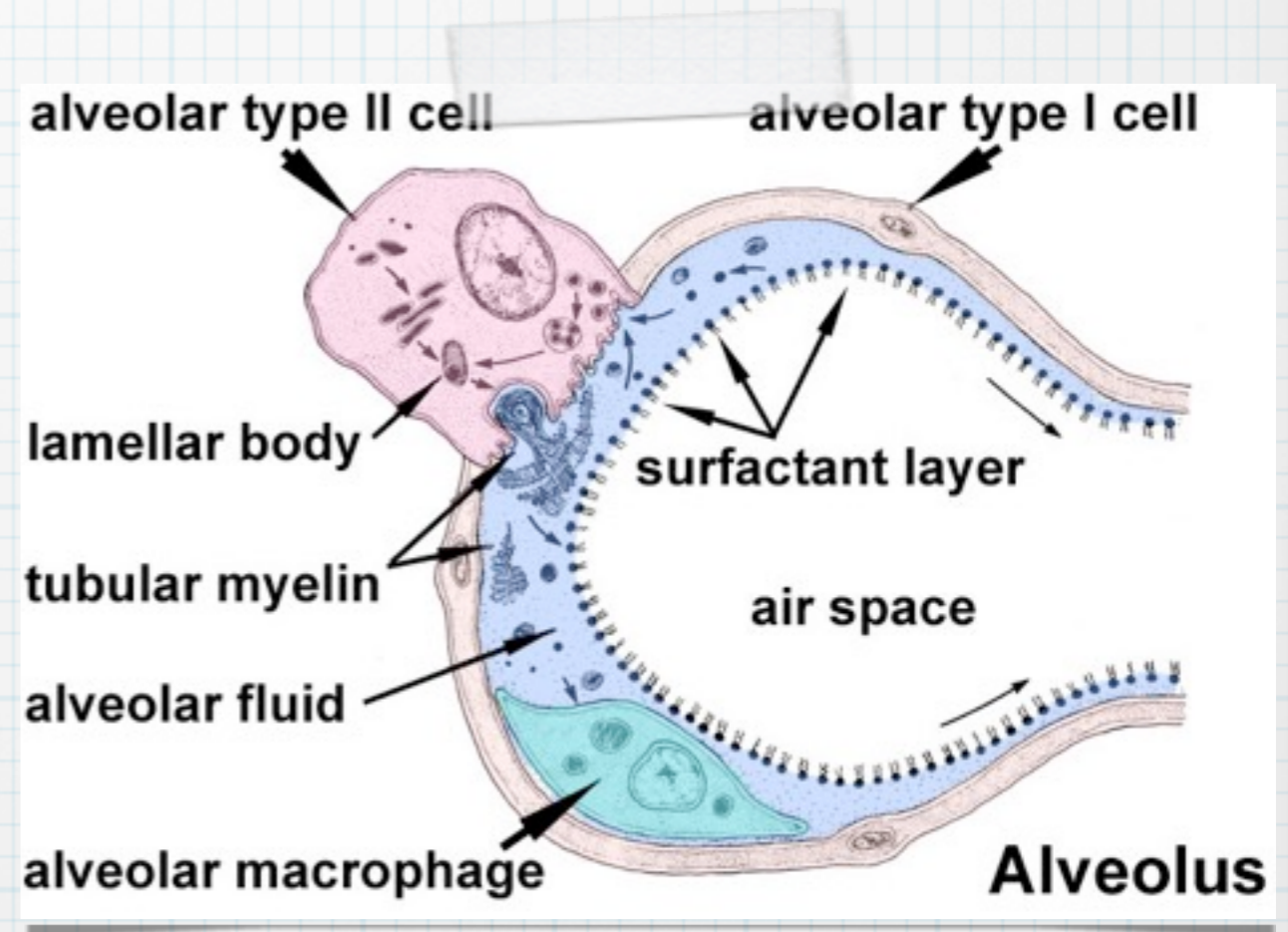
Alveoli

- * Have a very thin membrane that allows rapid diffusion of oxygen and carbon dioxide between capillary blood and alveolar air spaces.



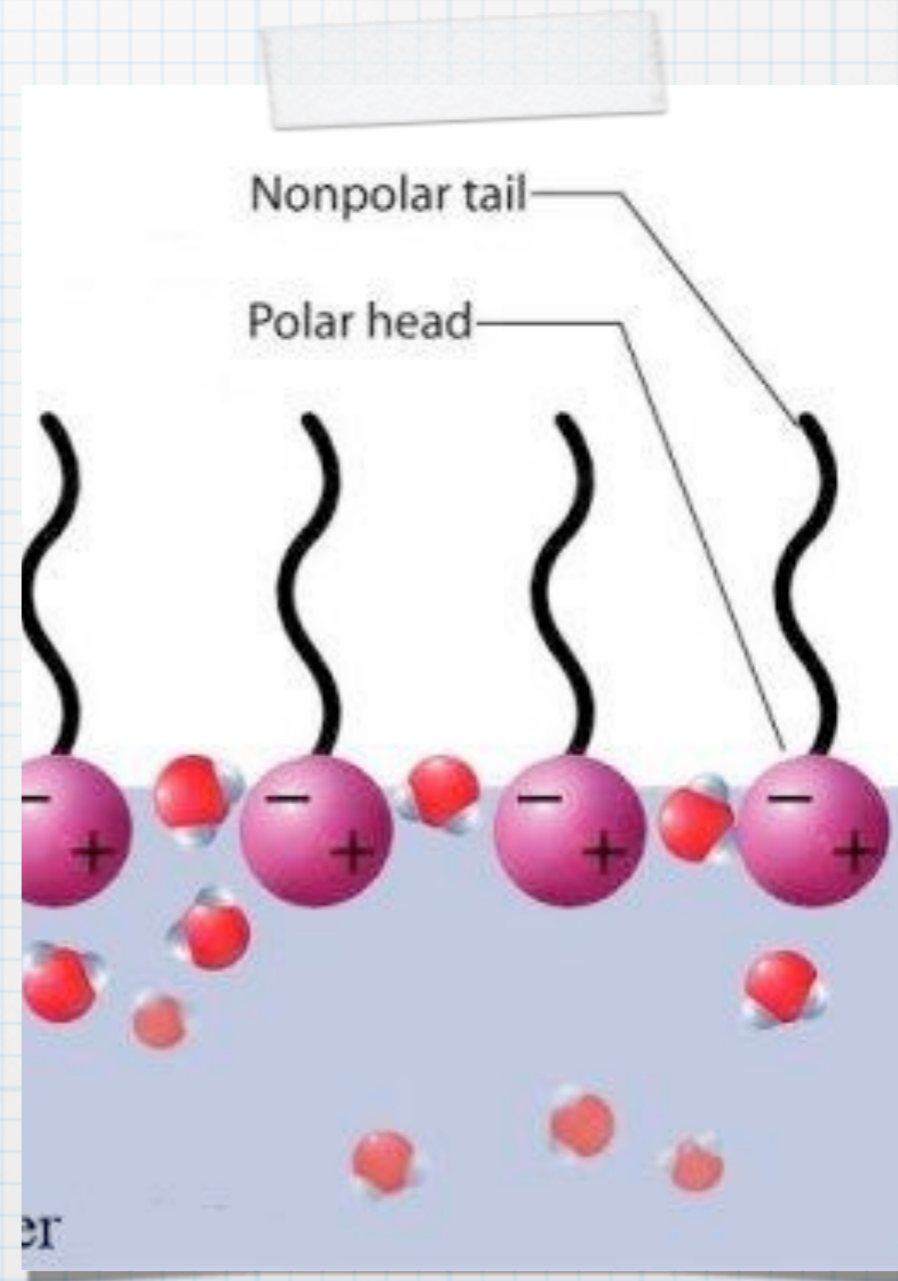
Alveoli

- * Lined with surfactant to prevent alveolar collapse.



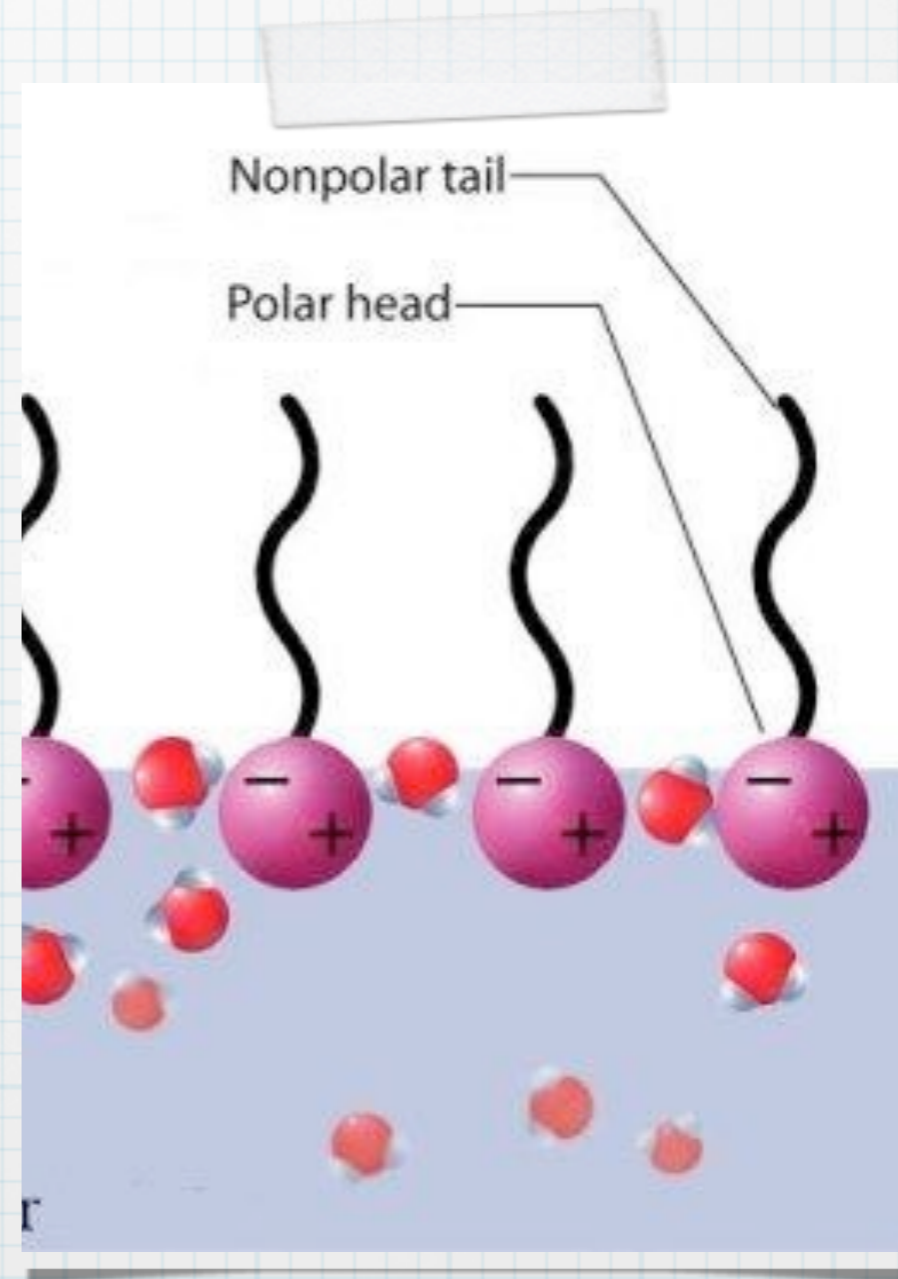
Surfactant

- * Essential fluid that lines the alveoli and smallest bronchioles.

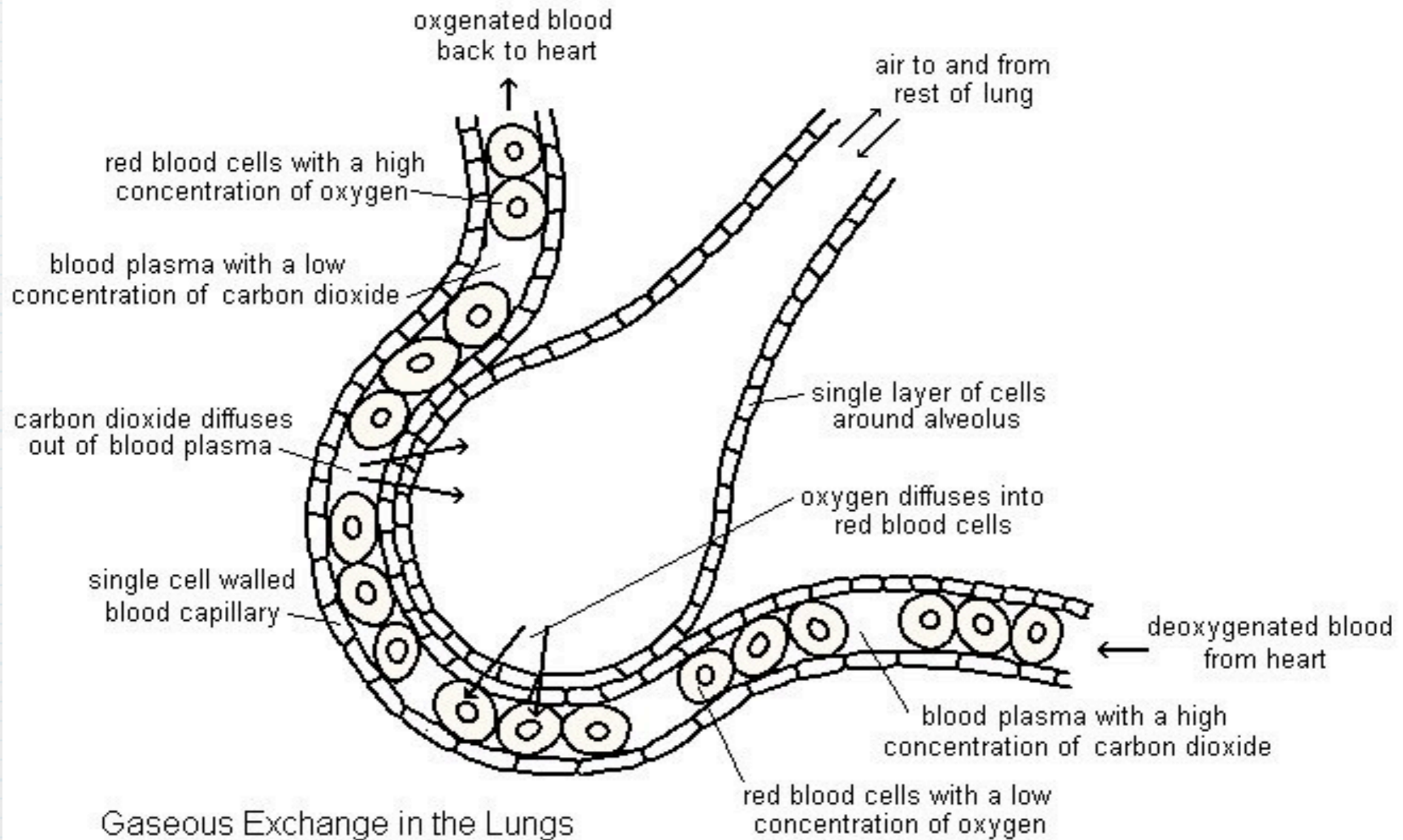


Surfactant

- * Reduces surface tension of the lung allowing the oxygen and carbon dioxide across the membrane.



Gas Exchange



Gaseous Exchange in the Lungs

Mechanics of Breathing

- * Diaphragm = large sheet of muscle located beneath the lungs that is the primary muscle in breathing
- * Intercostal Muscle = a muscle that raises the rib cage, decreasing pressure inside the chest cavity

Breathing In

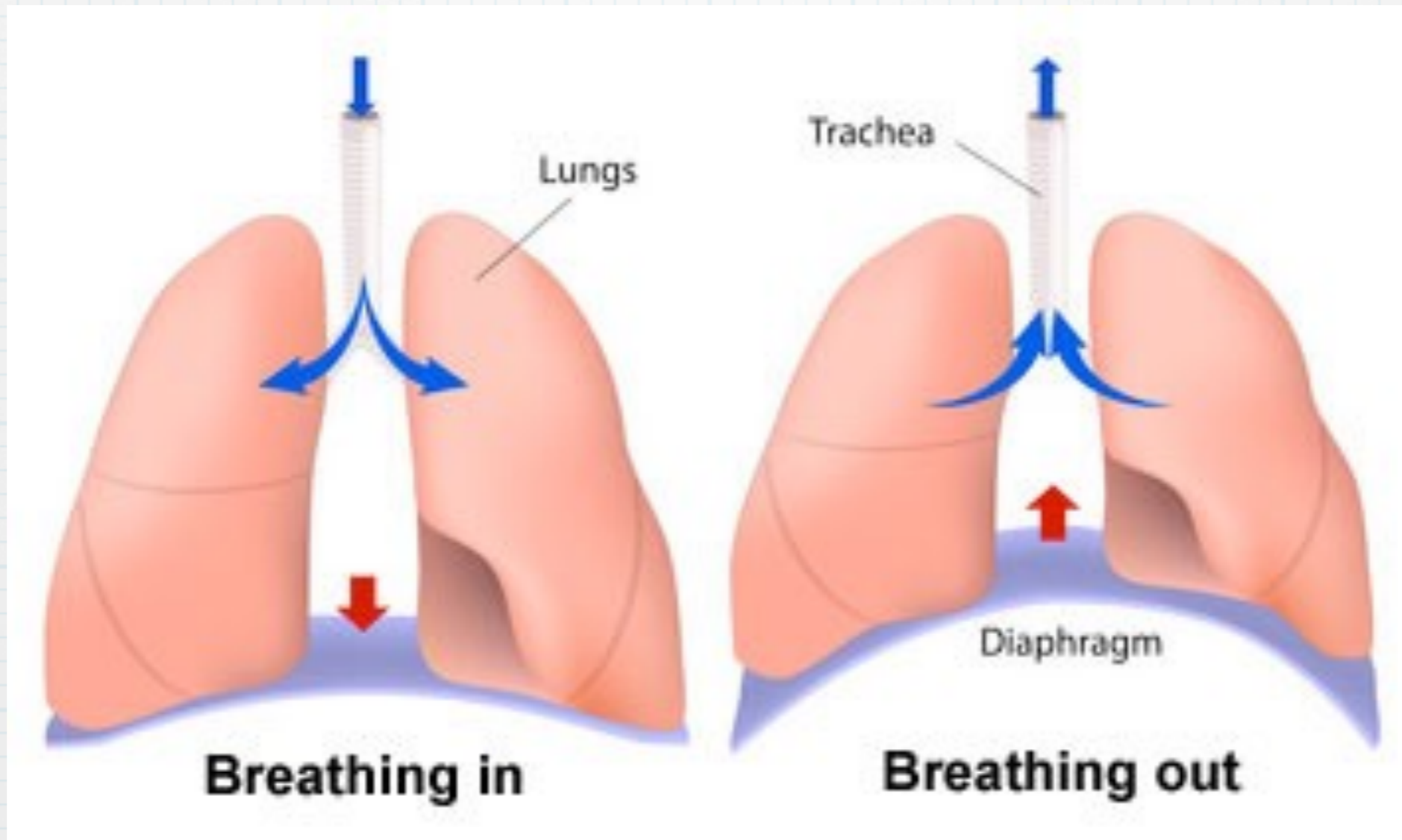
- When we inhale the intercostal muscles (between the ribs) and diaphragm contract to expand the chest cavity.
- The diaphragm flattens and moves downwards and the intercostal muscles move the rib cage upwards and out.

Breathing In

- This increase in size decreases the internal air pressure and so air from the outside rushes into the lungs to equalise the pressures.

Breathing Out

- When we exhale the diaphragm and intercostal muscles relax and return to their resting positions.
- This reduces the size of the thoracic cavity, thereby increasing the pressure and forcing air out of the lungs.



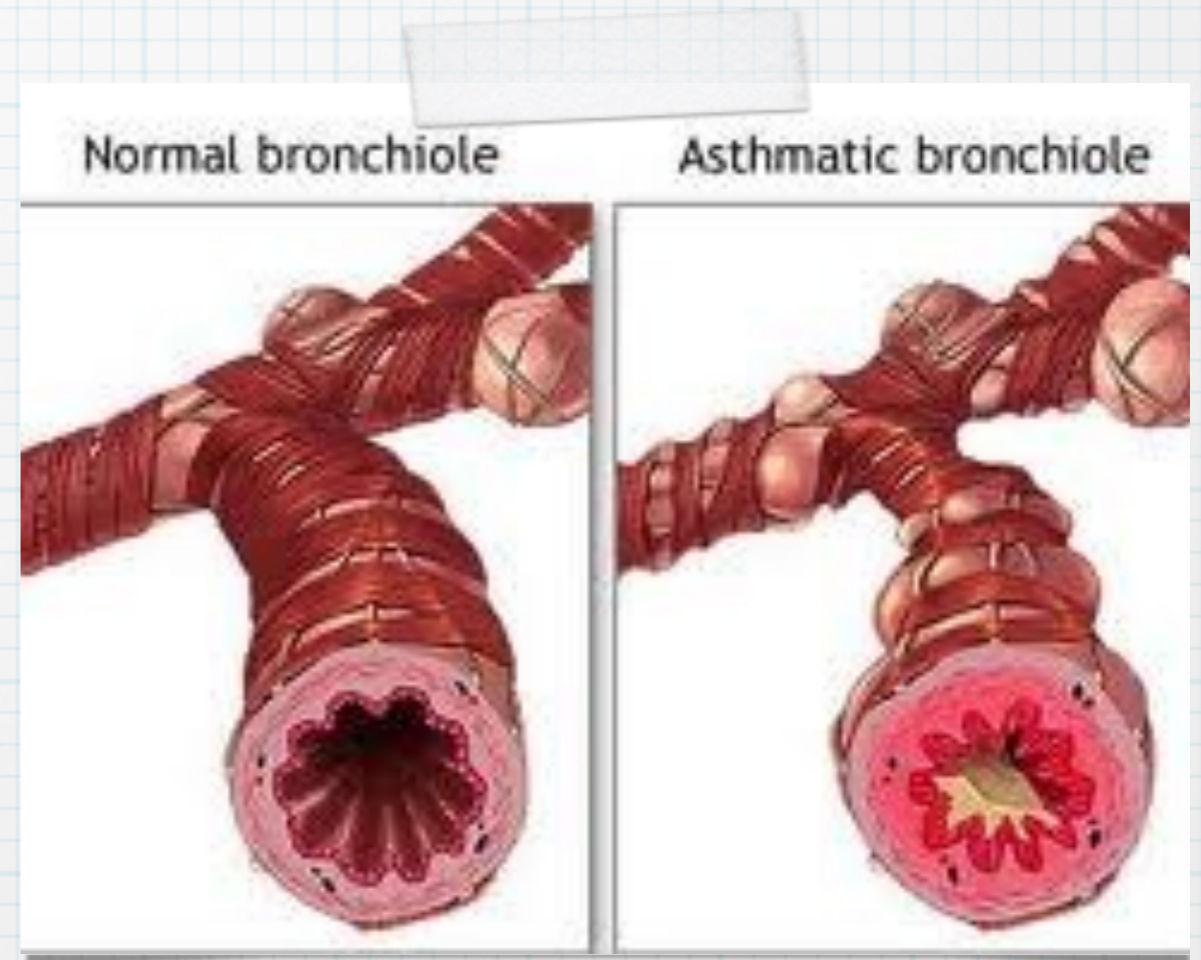
Control of Breathing

- The rate at which we inhale and exhale is controlled by the respiratory centre, within the Medulla Oblongata in the brain.
- Sensors detect either CO_2 or O_2 and signal to increase/decrease breathing rates.

Respiratory Disorders

Asthma

- * A chronic respiratory disease characterized by inflammation and swelling of the bronchi and bronchioles that obstructs airflow



Asthma

- * Inflammation is a protective reaction designed to eliminate some foreign substances or infection
- * Swelling – more blood to the area
- * Production of mucus
- * Muscles around the bronchi and bronchioles contract
- * ALL this = reduced air flow

Medication for Asthma

- * Open up or dilate the bronchi and bronchioles to allow greater airflow
- * Puffers: Corticosteroids suppress the multiple inflammatory genes that are activated

Chronic Obstructive Pulmonary Disease

- * 90% of COPD caused by smoking
- * a chronic, progressive disease that involves both:
 - * Obstructive Bronchitis : inflammation and mucus (similar to asthma)
 - * Emphysema: Causes permanent damage to the alveoli, they lose elasticity and shape = decrease surface area for gas exchange

