Vocabulary

Respiratory Airways - tubes that carry air between the atmosphere and the alveoli.

Conducting zone - top of the trachea to the respiratory bronchioles, provides a low-resistance pathway for airflow.

Respiratory Zone - where the gas exchange occurs.

Total Alveolar Surface - large surface that enables rapid exchange of large quantities of O2 and CO2 by DIFFUSION.

Type I cells - form the walls of the aveoli

Type II cells - secrete a pulmonary surfactant that acts to reduce surface tension of water INSIDE the alveoli.

Surfactant - reduces cohesive forces between water molecules on alveolar surface. This lowers the surface tension -> increases lung compliance and makes it easier to expand lungs.

Surface Tension - tendency of liquid surfaces at rest to shrink into the minimum surface area possible.

Pleural Sacs - pair of thin, fluid-filled, membranes that enclose the lungs. Parietal pleura and Visceral pleura make up the sacs.

Pleural Cavity - space between the pleural sacs, is filled with intrapleural fluid.

Pressure Gradient - Air tends to move from an area of higher pressure to an area of lower pressure

Atmospheric Pressure - pressure exerted by the weight of the gas in the atmosphere on objects on Earth's surface (760 mm Hg at sea level).

Intra-alveolar Pressure - pressure within the alveoli

Intrapleural Pressure - pressure within the pleural sac

Boyle's Law - at a constant temperature, the pressure of gas varies INVERSELY with its volume.

Vocabulary (cont)

Transmural Pressure Gradient = intra-alveolar pressure - intrapleural pressure

Pneumothorax - air enters the pleural cavity, transmural pressure gradient is lost and lungs collapse.

Passive Expiration - ribs, sternum, and diaphragm return to resting position upon relaxation of inspiratory muscles.

Active Expiration - CONTRACTION of abdominal muscles. Diaphragm is pushed upwards. Contraction of internal intercostal muscles flatten the ribs and sternum. REDUCES the size of the thoracic cavity.

Elastin - protein which facilitates the stretching and recoiling of structures.

Pulmonary Ventilation - volume of air breathed in/out per minute.

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Gas Transport - process by which O2 and CO2 are transported between the systemic tissues and the lungs

Respiratory Mechanics

During INSPIRATION, Palv < Patm

During EXPIRATION, Palv > Patm

Remember BOYLE'S LAW: pressure and volume are inversely related so as the volume decreases the pressure will increase

Example: Inspiration: 1. the thoracic wall expands 2. the lungs expand 3. Boyle's law: Palv decreases

4 Pressures Important for Ventilation

1. Atmospheric Pressure - serves as a reference point for pressure changes

2. Intra-alveolar Pressure - changes during breathing, is a factor that drives air movement

Respiratory Mechanics (cont)

3. Intrapleural Pressure - helps prevent lung collapse

4. Transmural Pressure Gradient - pushes out on lungs and stretches them to fill the larger thoracic cavity

What is Pneumothorax?

- extremely dangerous: occurs when air is allowed to enter the plural cavity

- can occur either by a puncture wound to the chest or a hole in the lung

- RESULT: transmural pressure gradient LOST, lungs and thorax separate and assume own dimensions

- THIS MEANS: 1. lungs collapse - air in pleural space removes suction that keeps inflation -> recoil and collapse AND 2. Thoracic wall expands - no lung pull = chest wall recoils on its own

Inspiration and Expiration

Inspiration	Expiration
- The diaphragm CONTRACTS -> INCREASES vertical dimensions of thoracic cavity	- PASSIVE expiration: ribs, sternum, and diaphragm return to RESTING position upon RELAXATION of inspiratory muscles
- External intercostal muscles CONTRACT = ELEVATED rib cage	- ACTIVE expiration: abdominal muscles CONTRACT -> diaphragm pushes upwards = reduction vertical dimension of thoracic cavity

Inspiration and Expiration

Inspiration	Expiration
- The diaphragm CONTRACTS -> INCREASES vertical dimensions of thoracic cavity	- PASSIVE expiration: ribs, sternum, and diaphragm return to RESTING position upon RELAXATION of inspiratory muscles

What is Surfactant

- Surfactant: reduces COHESIVE forces between water molecules on alveolar surface. Lowers the SURFACE TENSION = INCREASE lung compliance
- Secreted by type II alveolar cells
- Effect is GREATER in smaller alveoli
- Deep breath increases secretion by stretching type II cells
- Concentration DECREASES when breaths are SMALL