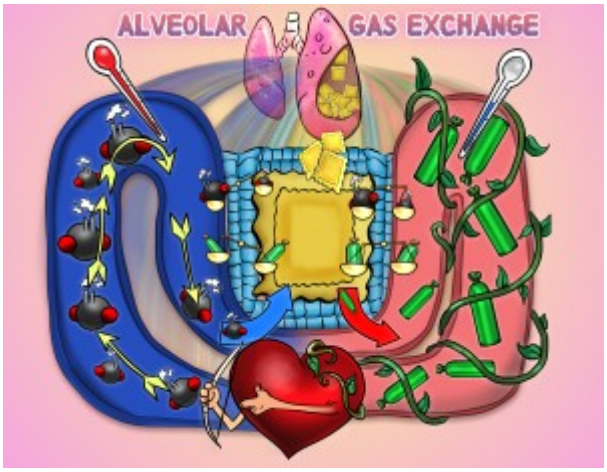
Alveolar Gas Exchange

Alveoli are locations for gas exchange. O2 from inhaled air can be exchanged for CO2, which will be exhaled. They are the most basic structural unit of the lungs. The pulmonary artery brings deoxygenated blood, which is O2-poor and CO2-rich, from the heart to the lungs. The CO2 comes from the byproduct of cellular respiration released by cells throughout the body and picked up by the blood. These gases then diffuse across a two-cell thick barrier. CO2 diffuses into the air of the alveoli to be exhaled, while O2 diffuses from the air into the blood for distribution to cells. The gases reach an equilibrium value (equal partial pressures in the blood and alveoli), and the blood leaves the alveoli back to the heart. Blood travels through the pulmonary vein to the left atrium and is now O2-rich and CO2-poor. Heat can also be exchanged across the alveoli. This exchange is a useful mechanism of thermoregulation, as the body can release excess heat through warm breaths and retain needed heat if the body temperature is too low.



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Characteristics

Pulmonary Artery Blood is O2-Poor, CO2-Rich

Arrow-vessel going to Lungs with lots of CO2 molecules

Blood in the pulmonary artery is low in O2 concentration because it has returned from dropping off oxygen to all cells in the body. It is high in CO2 concentration because it has picked up CO2, a metabolic byproduct, from those cells. From pulmonary artery the O2- poor blood goes into the lungs to become O2-rich blood.

Two-Cell Thick Air-Blood Barrier

Two Cell Barrier

The layer of cells between an alveolus and blood is only two cells thick, which allows for the diffusion of gas in both directions following separate concentration gradients.

CO2 Diffuses Into Air

CO2-molecule Diffuses Into Air

Carbon dioxide diffuses into the alveoli from the CO2-rich blood and is exhaled.

O2 Diffuses Into Blood

O2-tank Diffusing Into Blood

O2 is inhaled into the alveoli, where it diffuses across the alveolar-capillary membrane into oxygen-poor blood in the pulmonary capillaries and makes oxygen-poor blood oxygenated, which is then transported to the heart for systemic circulation.

Gases Equilibrate

Gas-scales at Equilibrium

The concentration of both CO2 and O2 equilibrate through diffusion until there are roughly equal concentrations of both in the alveoli and the blood.

Pulmonary Vein is O2-Rich, CO2-Poor

Vine from Lungs with lots of O2-tanks

The pulmonary vein runs from the alveoli to the left atrium of the heart and is eventually pumped out to the body. This blood is O2-rich and CO2-poor because it has just picked up oxygen and dropped off carbon dioxide at the alveoli.

Thermoregulation

Thermometers

The other exchange that occurs at the alveoli is heat exchange. Breathing contributes to body temperature regulation by breathing out warm air if the body temperature is high or retaining heat from the air if the body temperature is low.

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