Vascular Exchange Encyclopedia Article

Vascular Exchange

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Vascular Exchange

Vascular exchange refers to the movement of fluid and gas across the boundary between the **blood** and **tissue** (e.g., alveolar lung tissue) or between blood and **interstitial fluid**. The boundary of the exchange is the membrane of the network of tiny tubes called **capillaries** that transport blood

The membrane of a capillary, which in some places is only a single cell thick, is not impermeable. The **plasma** inside the capillary can move though pores to mingle with the fluid outside the capillary (the interstitial fluid). Concentration and hydrostatic forces drive the outward movement of plasma or the inward movement of water across the cell barriers. Osmotic pressure arises when there is an ion imbalance (i.e., more of a specific type of ion on one side of the membrane than on the other). Hydrostatic pressure arises because of the flow of blood through the capillary. Overall, there tends to be more movement of fluid out of a capillary than into it. Larger objects like protein and blood cells do not normally pass through the capillary membrane, and so are not subject to vascular diffusion.

Another way that substances can move across the capillary membrane is by diffusion. This is a movement that occurs passively, without the use of energy. Membranes, such as those of a capillary, are made of **lipids** interspersed with protein. Lipids are hydrophobic ("water-hating"). Thus, hydrophobic materials, such as the gases oxygen and carbon dioxide, will tend to partition into the membrane. If the concentration of a gas is low on one side of the membrane, relative to the other side, the concentration gradient (differences in concentration over a specified distance) drives gas diffusion across the membrane.

For example, the concentration of oxygen is high in the **lungs** following the intake of a breath, while the oxygen concentration in the blood entering the capillaries of the lung is low. Oxygen will diffuse from the air into the blood, to be subsequently dispersed through the body. Likewise, the concentration of carbon dioxide is higher in the blood entering the lung capillaries than it is in the air in the air sacs of the lung. So, carbon dioxide will diffuse from the blood to the lung to be exhaled.

The process of vascular exchange ensures that vital oxygen gets to the blood and that the carbon dioxide--generated as a waste product of metabolic activity--exits the body.