A 3-compartmental Model to Estimate O_2 and CO_2 Exchange Concentrations via Erythrocytes

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Abstract

A mathematical model has been devised to estimate the concentration of O_2 and CO_2 using 3-compartment scheme over lungs, blood and tissues. The formulation is based on the transport of O_2 from atmosphere to alveoli and subsequently to capillary bed through inspiration and back flow of CO_2 through expiration. Ordinary differential equations and balance law have been used to formulate compartment-wise transport phenomenon of both O_2 and CO_2 in the respiratory tract via RBC's. The solution of the model obtained provide the information regarding absorption and release rates of O_2 and CO_2 gases at lungs, blood and capillary bed. The results may be helpful in medical sciences to deal with asthma patients and other respiratory ailments. In addition, these results may have utility in biomedical engineering and physiological research problems.

Keywords: Mathematical model; O_2 and CO_2 exahange in human body, Diffusion; Compartment models.

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