

Erythrocyte: A systems model of the control of aggregation and deformability

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Abstract

© 2015 The Authors. Human erythrocytes are highly specialized enucleate cells that are involved in providing efficient gas transport. Erythrocytes have been extensively studied both experimentally and by mathematical modeling in recent years. However, understanding of how aggregation and deformability are regulated is limited. These properties of the erythrocyte are essential for the physiological functioning of the cell. In this work, we propose a novel mathematical model of the molecular system that controls the aggregation and deformability of the erythrocyte. This model is based on the experimental results of previously published studies. Our model suggests fundamentally new mechanisms that regulate aggregation and deformability in a latch-like manner. The results of this work could be used as a general explanation of how the erythrocytes regulate their aggregation and deformability, and are essential in understanding erythrocyte disorders and aging.

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Keywords

Aggregation, Calcium, Calmodulin, Deformability, Erythrocyte