MECHANICAL STRESS AND HEMIN PRETREATMENT EFFECTS ON KINETIC PARAMETERS OF ERYTHROCYTES RESPONSE TO HYPEROSMOTIC SHOCK

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Cytoskeleton-membrane interactions could strongly modify the osmotic behavior of red blood cells. The aim of this work is to investigate the influence of hydrodynamic shear stress and cytoskeleton proteins modification by hemin on dynamics of erythrocyte hyperosmotic shock caused by cell transferring into 4,0 M NaCl. The maximal lysis rate (V_{max}) was deduced from the curves of erythrocyte suspension optical density changes (λ=720 nm) during the lysis as the maximal value of the slope of tangent to the kinetic curve.

It has been shown that hydrodynamic shear stress in the range of 250-500 dyn/cm^2 acting on the cells directly before their transfer to 4,0 M NaCl increases V_{max} 1.5-3 times and hemolysis level by 20-30%. Erythrocyte treatment (hematocrit 20%) by hemin at 75 μM increases V_{max} 1.8 times. However, hemin concentration raising up to 150 μM decreases both hemolysis rate and level comparing to the control.

Since hemin has been shown to disrupt skeletal protein-protein interactions, in particular spectrin-band 4.1 and spectrin dimer-dimer, it is likely that this disruption could lead to the appearance of spectrin-depleted membrane regions. In these zones the lateral motion of integral membrane proteins, normally strongly restricted by their interactions with peripheral network, could be facilitated. Since it is supposed that the structure of the long living membrane pore should be stabilized by proteins the fact that hemming treatment increases hemolysis rate may be explained taking into consideration the possible facilitation of pore-stabilizing proteins assemblage. Somewhat similar should happen when mechanical stress acts on the cells accelerating the subsequent hyperosmotic damage.