ORAL A2:

Laser techniques for studying the adenylyl cyclase activity in regulation of human erythrocytes deformability

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INTRODUCTION: Deformability is an essential intrinsic property of erythrocytes (red blood cells, RBC) which allows them to reversibly change shape and linear sizes and realize the gas transport function. RBC deformability is determined by cells internal viscosity and cytoskeleton structure. Understanding molecular mechanisms of the RBC deformability regulation according to the metabolic demands of the organism is an important task required for an effective control of the blood microrheology.AIM: To study the effect of activation of RBC membrane protein adenylyl cyclase on RBC deformability. This process may play a key role in the receptor-mediated stimulation of signaling pathways leading to the conformational changes of RBC cytoskeleton proteins.

METHODS: We implemented laser ektacytometer RheoScan AnD-300 to assess changes of deformability of RBC extracted from heparinized blood at presence of forskolin – the direct stimulator of adenylyl cyclase.

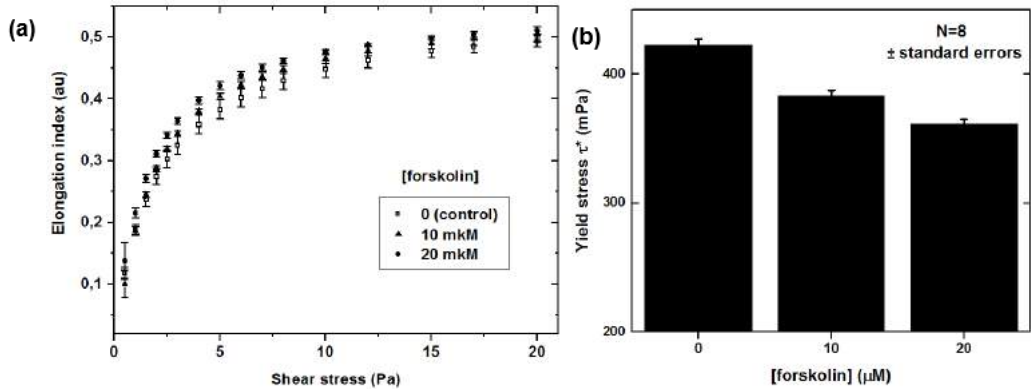

Fig. 1. RBC deformability curves and yield stress τ* at presence of forskolin.

RESULTS: We observed the dose-dependent rise of RBC elongation index curve (Fig.1(a)) at presence of forskolin in comparison with control RBC. Parametrization of these curves in semi-log scale revealed the decrease of yield stress τ*(the minimal stress required to initiate cells elongation) from 422.8 ± 4.2 mPa in control down to 361.3 ± 7.5 mPa at 20 μM forskolin (fig. 1(b)).

CONCLUSIONS: Results clearly indicate that adenylyl cyclase activation leads to the increase of RBC deformability. Decrease of yield stress supports the concept that the second messenger cAMP accumulated when the adenylyl cyclase is activated triggers the protein kinase A cascade resulting in the conformational changes of RBC cytoskeleton proteins.

ACKNOWLEDGEMENT: The study was funded by RFBR grant № 18-32-00756.