Institute of Molecular Biology and Genetics
NAS of Ukraine

ALL-UKRAINIAN CONFERENCE ON MOLECULAR AND CELL BIOLOGY WITH INTERNATIONAL PARTICIPATION

dedicated to the heroic struggle
of the Ukrainian people against russian invadors

June 15-17, 2022

CONFERENCE PROCEEDINGS

Edited by:
Mankovska O., Papuga O., Nesterenko Ye., Sobolevskyi M., Antonenko S.

Organizing committee:

Oksana Mankovska

Inessa Skrypkina

Oksana Piven

Maksym Sobolevskyi

Dmytro Gerasymchuk

Svitlana Antonenko

Oleksandr Papuga

Contacts:

e-mail: rmv.imbg@gmail.com

postal address:

Institute of Molecular Biology and Genetics NAS of Ukraine

150, Akademika Zabolotnogo Str.,

Kyiv, Ukraine, 03143

Web-site: www.imbg.org.ua

24 th February 2022 Russia invaded Ukraine and this terrible war with destruction of civil infrastructure, including cultural, educational, and scientific objects interrupted the scientific work in our country. A lot of scientists were displaced within Ukraine or abroad. Our foreign colleagues immediately demonstrated great support and created a lot of opportunities for Ukrainian scientists in their countries. Despite this, most scientists stayed in Ukraine, some of them even in temporary occupied territories. Therefore, Young Scientist Council and in the Scientific Council of the Institute of Molecular Biology and Genetics NAS of Ukraine created the idea of All-Ukrainian conference with international participation with the aims to encourage Ukrainian scientists, to give the opportunity to colleagues from abroad to demonstrate their staunch support to Ukraine and to keep scientific process ongoing even on the background of the war.

The All-Ukrainian Conference on Molecular and Cell Biology with international participation was held as an online event on Zoom platform, from 15 th to 17 th of June 2022.

KEYNOTE SPEAKERS

Pernilla Wittung-Stafshede
Chalmers University of Technology, Gothenburg, Sweden

Cecilia Lanny Winata
International Institute of Molecular and Cell Biology, Warsaw, Poland

Petr Svoboda
Institute of Molecular Genetics ASCR, Prague, Czech Republic

Michał Komorowski
Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw, Poland

Volodymyr Berest
V.N.Karazin Kharkiv National University, Kharkiv, Ukraine

Andrii Domanskyi
University of Helsinki, Finland,
Orion Pharma, Turku, Finland

Anton Nekrutenko
Penn State University, PA, USA

Andreas Ladurner
Ludwig-Maximilians-Universität Munich, Germany,
Eisbach Bio GmbH
Planegg/Martinsried, Germany

Jan Barciszewski
Adam Mickiewicz University,
Institute of Bioorganic Chemistry, Polish Academy of Sciences, Poznan, Poland

Mikko Airavaara
University of Helsinki, Helsinki, Finland

And **Vitaly Kordium (*Institute of Molecular Biology and Genetics, NAS of Ukraine, Kyiv, Ukraine) with* special *lecture***

ATP DEPLETION OF ERYTHROCYTES "CANCELS" THE PROTECTIVE ACTION OF SOME AMPHIPHILIC SUBSTANCES UNDER POSTHYPERTONIC SHOCK

Shpakova N.M., Yershova N.A., Nipot O.E., Shapkina O.O., Orlova N.V., Yershov S.S.

[1]*Department of Cryocytology, Institute for Problems of Cryobiology and Cryomedicine, NAS of Ukraine, Kharkiv, Ukraine*

nipotel71@gmail.com

Aim. To study the protective action of trifluoperazine and sodium decyl sulfate under posthypertonic shock of ATP-depleted erythrocytes.

Methods. Rabbit erythrocytes were depleted of ATP by incubation with 2-deoxyglucose (10 mmol/L) for 2 hours at 37°C. Posthypertonic shock (PHS) was performed by transferring red blood cells from 2.0 to 0.15 mol/L NaCl at 0°C. Trifluoperazine (TFP) (150 μmol/L) and sodium decyl sulfate (C10) (600 μmol/L) were added to 0.15 mol/L NaCl. The level of posthypertonic hemolysis was estimated. Statistical processing of the experimental results was performed using Statistica 6.0 software (StatSoft Inc., USA).

Results. We found that the hemolysis rate of the control rabbit's erythrocytes at 0°C was 64 ± 6%, and that of ATP-depleted red blood cells – was 53±6%. TFP and C10 reduce the level of posthypertonic hemolysis of control red blood cells by 55±6% and 66±7% respectively. ATP depletion of erythrocytes does not affect the efficacy of C10, while TFP loses its ability to protect rabbit erythrocytes under PHS. It is known that metabolic depletion of erythrocytes leads to a strong association of the 4.1R-spectrin-actin complex by changing the level of protein phosphorylation. This may be the cause in a certain decrease of erythrocyte hemolysis rate under PHS since the mechanical resistance of the membrane is increased. The protective effect of amphiphilic compounds under PHS is associated with their ability to integrate into the lipid bilayer and increase the surface area of erythrocytes, which allows cells to avoid damage when moving into the rehydration medium. The loss of the ability of TFP to protect erythrocytes under PHS after ATP depletion of erythrocytes can be explained by the peculiarities of its incorporation into the membrane. TFP is a cationic amphiphilic compound. It is mainly distributed in the inner membrane monolayer enriched in anionic lipids. During metabolic depletion of erythrocytes, the levels of some negatively charged lipids in the inner monolayer are reduced, which may lead to a decrease in TFP membrane binding. In contrast, C10 is distributed mainly in the outer monolayer, which according to available data does not change at ATP-depletion of cells. Therefore, this amphiphilic compound retains its protective properties under PHS.

Conclusions. Protective agents' activity under stress conditions depends on the state of the cells. Thus, during prolonged storage of erythrocytes, their energetic status can change and they can be partially or fully depleted of ATP. This fact should be taken into account in the selection of protective agents that can be used in the thawing of cells for protection against PHS.