Ukrainian Society of Cell Biology

International conference

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11-13 October 2015

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POSSIBILITY OF INTERACTION BETWEEN SIGNAL SYSTEMS WHEN INDUCING CELL RESISTANCE TO COLD STRESS

Zinchenko V.D., Goriacha I.P., Golovina K.M., Volovelskaya E.L.
Institute for Problems of Cryobiology and Cryomedicine, National Academy of Sciences of Ukraine,
Pereyaslavskaya Street 23, 61015 Kharkov, Ukraine
Email address: vd_zin@mail.ru

Recent studies have demonstrated the reactive oxygen species (ROS), being metabolic products of living systems, to take an active part in different biological processes, including normal cell growth, induction and transformation of transition states, ageing and programmed cell death. The ozone as the ROS can adversely affect the living systems at high doses, but at low ones it reveals a positive effect on physiological functions both at the level of certain cells and the whole body as well. We used here a weak oxidative stress, caused by means of low-dose ozone for inducing cell resistance to impact of temperatures lower than physiological ones. The low-dose ozone effect on the *Saccharomyces cerevisiae* yeast cell resistance before freeze-thawing (-196 – 30°C), as well as the capability of sheep red blood cells to form rosettes with human lymphocytes after storage under hypothermic (2 – 4°C) conditions were investigated.

The freeze-thawing (-196 – 30°C) of *Saccharomyces cerevisiae* cells in physiological saline leads to membrane damaging in 65.6±1.6% of cells. If cells were treated with ozone in a dose of 29 pmol $O_3/10^6$ cells before freezing, the membrane damage after freeze-thawing was observed in 16.1±0.8% of cells. In this experiment the *Saccharomyces cerevisiae* cells acquired an induced resistance to freeze-thawing in a state of adaptive response to oxidative stress. The effect pronouncement depended on the degree of stress-factor impact, *i. e.* homeostasis disorder extent in living system.

Sheep red blood cells were treated with ozonated physiological saline with ozone content of 0.16 mg/l and stored for 12 weeks under hypothermic conditions at 2 – 4°C in different media: 1) 0.9% sodium chloride; 2) 7% sucrose solution; 3) glucose-citrate Alsever's solution; 4) 5% mannitol solution; 5) 10% dextran one. After storing we studied the red blood cell osmotic resistance by measuring their osmotic fragility, as well as the capability of rosette formation with human lymphocytes. The ozone-treated red blood cells lose an osmotic resistance in a less degree than the non-treated ones. Those ozone treated cells in the medium (4) preserve their ability to form rosettes with human lymphocytes after 12 weeks of storage. Our findings with both red blood cells and yeast are explained by the existence of general mechanisms of perception and a rapid body's response to external effect: any organism has a set of defence reactions. Both non-specific and specific reactions typical for this stress effect occur as a response to the effect of unfavourable environmental factors. Namely non-specific defence reactions are the most economic and universal way to preserve the balance of biosystem with external environment, ensuring the reliability of their existence under rapidly changing conditions. At this stage of response the living system, affected by one stress-factor may augment its capability to resist other adverse factors: a cross adaptation. A weak oxidative stress is an alerting signal for adaptive systems of a cell, the response on which foresees a genetically determined protection against adverse environmental factors.