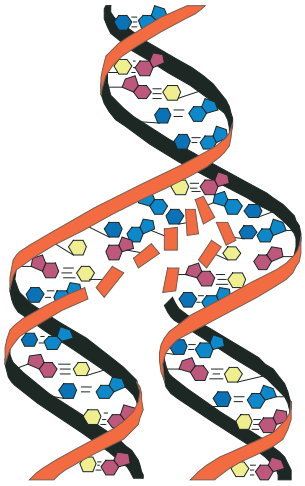
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МЕДИЧНА ТА КЛІНІЧНА ХІМІЯ

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За зміст рекламних матеріалів відповідальність несе рекламодавець.
При передруці або відтворенні повністю чи частково матеріалів журналу “Медична та клінічна хімія” посилання на журнал обов’язкове.

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compared to group two. However, individuals from group two did not survive to the end of the experiment. We registered a 2-fold increase of hypersegmented neutrophil cells and 3-fold decrease of monocytes in diabetic group, which were gavaged by NPs compared to the control group. We did not observe significant changes in erythrocytes and leukocytes amount between these groups.

Our results showed that nanoparticles have antidiabetic properties, as they reduce the glucose level in the blood of diabetic mice. Immune cells percentages changing can be caused by diabetes. The reason of neutrophil percentage increasing in group three can be an inflammatory process. We also plan to measure different metabolites to confirm this hypothesis. Further experiments may help to develop effective drugs, which will make diabetes care more efficient and safe.

REACTIVE OXYGEN SPECIES PRODUCTION AND ASSESSMENT OF PROTEIN OXIDATION IN HUMAN ERYTHROCYTES EXPOSED TO CRYOPROTECTIVE AGENTS

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Cryoprotective agents (CPAs) ensure the survival of cells during freeze-thawing to ultralow temperatures. CPAs implement protective effects through endocellular or extracellular mode of action. However, the effects of both types of CPAs on different subcellular systems can cause negative changes in them, which reduce the cryoprotective efficacy. In particular, the presence of CPAs in the environment of cells can be essential for the redox balance disturbance.

The aim of the study was the examination of the effects of endo- (glycerol and DMSO) and extracellular (sucrose and PEG) CPAs on the production of reactive oxygen species (ROS) in human erythrocytes, as well as the assessment of the possibility of the protein oxidation in the membrane-cytoskeleton complex by blocking –SH groups with diamide. The ROS in erythrocytes was determined by flow cytometry with FACS Calibur (Becton Dickenson, USA) according to the fluorescence data of DCF originated from DCFH-DA (2′,7′-Dichlorofluorescin diacetate) after its oxidation in cells with ROS. The erythrocytes were incubated with CPAs for 18 h; some of the samples were treated with diamide before the incubation. The results were analyzed using the software "WinMDI 2.8". Changes in the intensity of DCF fluorescence in erythrocytes were characterized by the value of the median of the distribution histograms. The results were statistically processed using the software "Statgraphics plus 2.1 for Win"

Glycerol and DMSO, despite the differences in their protective efficacy under cryopreservation, did not manifest the discrepancy in ROS production in erythrocytes. While erythrocytes have been pretreated with diamide, a slight increase in DCF fluorescence was only noticed attesting a minor involvement of protein oxidation in response to the effects of those CPAs. The extracellular CPAs, sucrose and PEG, manifested the opposite effects on ROS production during erythrocyte incubation. Wherein the sucrose induced the decrease in ROS production, meanwhile PEG raised their level. Pretreatment of erythrocytes with diamide, which has blocked –SH groups in proteins of the membrane-cytoskeleton complex, showed the large increase in ROS production only in PEG presence. That attested the possibility of oxidative protein disturbance in erythrocytes incubated with PEG. The discrepancies in ROS production in response to incubation of erythrocytes with sucrose and PEG may be stipulated by their different effects on Ca^{2+}-ATPase activity and changes in intracellular Ca^{2+} level. The data obtained allow us to speculate that the increase in ROS production under cell contact with PEG might result from Ca^{2+}-dependent activation of NADPH-oxidases.

Thus, the activation of ROS production in erythrocytes depends on specific characteristics of each certain CPA, and it is not attributed to their cryoprotective efficacy. Nevertheless, if the action of CPA, such as PEG, causes an increase in ROS production that certainly can entail the erythrocyte instability at cryopreservation, especially when cryopreserved cells return to physiological conditions due to oxidative protein disturbances.

NEW DERIVATIVES OF STEROID HORMONES WITH A FLUORESCENT LABEL: ANALYSIS OF THEIR BIOLOGICAL ACTIVITY AND LOCALIZATION IN PLANT TISSUES

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Plant growth and development are tightly regulated by phytohormones. Brassinosteroids (BS) are recently discovered plant hormones of steroid nature. BS regulate the formation of the root system, respiration and responses to various environmental stresses. Being active in nanomolar concentrations, BS are synthesized in almost all plant organs. However, the mechanisms of their distribution within tissues are currently unclear. While the BS-associated signaling cascades are extensively studied on a cellular level, the research on BS translocation *in planta* is strongly limited by the lack of molecular tools.

Here we present a new biologically active derivate of epibrassinolide with a fluorescent label – *4,4-difluoro-4-bora-3a,4a-diaza-s-indacene* (EBL-BODIPY). This compound has shown biological activity similar to that for the non-labelled epibrassinolide in a model plant *Arabidopsis thaliana*. EBL-BODIPY inhibited root elongation in *A. thaliana* seedlings in 1-10nM concentration and affected the expression of BS-related genes. Fluorescence of the EBL-BODIPY enabled the visualization of the molecule inside living cells. Using laser confocal microscopy, we were able to detect EBL-BODIPY associated signal from the cytoplasm of the root tip cells after 6h of exposure to 10nM of the compound. EBL-BODIPY fluorescence was strongly increased in root hair cells and associated with vesicles of the trans-Golgi network. We propose EBL-BODIPY as a new tool to study not only brassinosteroid intake and cellular localization, but also short- and long-distance transport in plant tissues.

METABOLIC PROCESSES OF ADAPTATION IN ORGANISMS UNDER CONDITIONS OF THE EFFECT OF EXOGENOUS AND ENDOGENOUS FACTORS

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All living organisms have the ability to adapt to the influence of exogenous factors within certain limits of their adaptive capacity and the power of these factors. If under natural conditions, such ability of an organism is lost, then the possibility of its functioning and life disappears. Under conditions of exogenous influence, the metabolism changes, generating endogenous levers of further changes in metabolic processes. Therefore, in some cases, biochemical studies may indicate the effect of exogenous factors on the functioning of the organism and the depth of metabolic processes, while in others – on adaptive capacity, the ability to overcome the harmful effects of exogenous and endogenous factors which may be the basis for the search for the correction of pathological changes.

The purpose of this work was the study of the regulation of biosynthesis of proteins, lipids and carbohydrates in the context of the continuation of research on the molecular aspects of exogenous regulation of metabolism in cells of microorganisms symbionts and host animals and the clarification of regulatory mechanisms of metabolic processes and their interconnecting links in a result of the actions of factors toxic to the organism (experimental simulation of alcohol-induced hepatosis and pre-diabetes condition) and correcting factors (bio-protectors, magnesium and magnesium nanoparticles, and diet therapy).

Changes in the biochemical parameters of the metabolism were studied under pathological deviations (experimental simulation of alcohol-induced hepatosis and pre-diabetic state in rats caused by the enhanced