

1. Kaluzhskiy L.A., Gnedenko O.V., Gilep A.A., Strushkevich N.V., Shkel T.V., Chernovetsky M.A., Ivanov A.S., Lisitsa A.V., Usanov S.A., Stonik V.A., Archakov A.I.

The screening of the inhibitors of the human cytochrome P450(51) (CYP51A1): the plant and animal structural lanosterol's analogs.

The cholesterol biosynthesis regulation is the important part of the hypercholesterolemia diseases therapy. The inhibition of the post-squalene cholesterol biosynthesis steps provide the alternative to classic statin therapy. Sterol-14a-demethylase (CYP51) is one of the hypothetical targets for it. In this work the screening of the ability to interact with human CYP51 (CYP51A1) for the nature low-weight compounds with steroid-like scaffold were performed by integration of the surface plasmon resonance biosensor and spectral titration methods. The results of the selection were 4 compounds (betulafolientriol, holothurin A, teasaponin, capsicoside A) which had high affinity to the CYP51A1 active site. These data extend the range of compounds which may be used as specific inhibitors of CYP51 and give the permission to suggest the dynamic of the enzyme.

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2. Presnova G.V., Rubtsova M.Yu., Presnov D.E., Grigorenko V.G., Yaminsky I.V., Egorov A.M.

Conjugates of streptavidin with gold nanoparticles for the visualization of dna single interactions on the silicon surface.

The potential of the method of scanning electron microscopy (SEM) to visualize the results of individual acts of DNA and oligonucleotides hybridization using gold nanoparticles as label was investigated. Molecule of biotin was introduced into DNA or oligonucleotide, and then it was detected in DNA duplex using a conjugate of streptavidin with gold nanoparticles. Effective imaging of DNA duplexes was possible using a conjugate prepared by covalent binding. The detection limit of the model oligonucleotide of 19 bases was 20 pg.

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3. Dubrovin E.V., Presnova G.V., Rubtsova M.Yu., Grigorenko V.G., Ivanin A.I., Egorov A.M., Yaminsky I.V.

Implementation of scanning probe microscopy for the solution of molecular diagnostics tasks.

We present new approaches to improve the efficiency of DNA by scanning probe microscopy using a highly specific hybridization on affine surfaces and nanostructures of gold as a labels. Scanning probe microscopy allows to register of individual acts of hybridization by the detection of gold labels on the surface affinity followed by automatic calculation of the total.

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4. Pravosudova N.A., Bykova I.O.

Comparison of basic carboxypeptidases activity in male rats tissues at a single injection of haloperidol.

The influence of a single injection of haloperidol on basic carboxypeptidases (biologically active peptide processing enzymes) activity in rat tissues was studied. Acute exposure to haloperidol increased the activity of carboxypeptidases H (CP H) in hypothalamic-pituitary-adrenal system and cerebellum and reduced such activity in testes. Multidirectional changes of PMSF-inhibited carboxypeptidases activity (PMSF-CP) were observed after a single haloperidol injection in all studied tissues except testes. It is suggested that changes of CP H and PMSF-CP activity might affect levels of regulatory peptides in the brain and blood and thus may be involved in general and side effects of haloperidol on the organism.

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5. Zharkova I.I., Staroverova O.V., Voinova V.V., Andreeva N.V., Shushkevich A.M., Sklyanchuk E.D., Kuzmicheva G.M., Bespalova A.E., Akulina E.A., Shaitan K.V., Olkhov A.A.

Biocompatibility of electrospun poly(3-hydroxybutyrate) and its composites scaffolds for tissue engineering.

Development of biodegradable polymers-based scaffolds for tissue engineering is a promising trend in bioengineering. The electrospun scaffolds from poly(3-hydroxybutyrate) (PHB) were produced using different additives that changed the physical and chemical characteristics of the products. As a result, the construct consisting of interwoven threads of different diameter (0.8-3.4 mm) were obtained, the smallest diameter was observed in the threads from the PHB using tetrabutylammonium iodide (TBAI) and titanium oxide II (TiO₂) as additives. Mesenchymal stem cells (MSC) were cultivated on the scaffolds for the biocompatibility evaluation of obtained materials. Cells viability was determined by the XTT assay test. It was shown that the scaffold from the interwoven threads of lowest diameter is most favorable for MSC growth in comparison with the polymer film and scaffolds from the threads of larger diameter. Thus, it was shown that the biocompatibility of electrospun PHB scaffolds depended on their microstructure. The obtained data can be used for development of scaffolds for tissue engineering.

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6. Lelevich V.V., Vinitskaya A.G., Lelevich S.V., Doroshenko Ye.M.

Particularities of g-aminobutyric acid metabolism in the liver of rats during different types of alcohol withdrawal.

Activities of GABA-catabolising enzymes and the contents of some amino acids have been studied in the liver of the rats with different types of alcohol cessation after its systemic administration. Intermittent alcohol intoxication was accompanied by activation of liver GABA catabolism in case of the

lowest alcohol load. However ethanol in higher doses and prolongation of intermittent alcohol administration decreased GABA catabolism. It is suggested that the observed changes may reflect non-specific adaptation of hepatocytes to the excessive alcohol consumption and its further cessation.
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7. *Labudzynski D.O., Lisakovska O.A., Shymanskyi I.A., Riasnyi V.M., Veliky N.N.*

The role of vitamin D3 in the regulation of the mineral metabolism in experimental type 1 diabetes.

Diabetes was shown to be associated with a considerable lowering of 25(OH)D3 in blood serum of mice. Vitamin D3 deficiency was correlated with impaired mineral metabolism in bone tissue, indicating the development of secondary osteoporosis. A decrease in weight, length and diameter (diaphysis, proximal metaepiphysis) of tibia in diabetic animals was observed as compared with control. Diabetes caused hypocalcemia, hypophosphatemia and increased enzymatic activity of alkaline phosphatase (ALP) and its isoenzymes in serum. These changes were accompanied by the impairments of vitamin D3 25-hydroxylase isoforms (CYP27A1 and CYP2R1) expression, which are the main enzymes of cholecalciferol biotransformation to 25(OH)D3 – precursor of hormonally active form of vitamin D3. A decrease in bone resorption processes was established after vitamin D3 administration as it is evident from normalization of bone morphometrical parameters and mineral metabolism in diabetic mice. Vitamin D3 ability to counter diabetes-induced alterations in bone tissue can be ascribed, at least in part, to its positive effects on the formation of vitamin D3 hormonally active forms.

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8. *Gorbenko N.I., Borikov A.Y., Ivanova O.V., Taran E.V., Zvyagina T.S.*

Effect of 17 β -estradiol on bioenergetic processes in the heart mitochondria of ovariectomized rats with insulin resistance.

The bioenergetic processes in the heart mitochondria of Wistar rats with fructose-induced insulin resistance was investigated in female animals with different estrogen status. Respiration studies on isolated heart mitochondria by the polarographic method revealed that estrogen deficiency reduced complex IV activity, while its combination with high-fructose diet induced additional disturbances in the coupling of respiration and oxidative phosphorylation at the level of complex I of the electron transport chain. Exogenous 17 β -estradiol inhibited the development of mitochondrial dysfunction in cardiomyocytes of ovariectomized rats with insulin resistance.

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9. *Lebedynskaya E.A., Makarenkova I.D., Lebedynskaya O.V., Akhmatova N.K., Zvyagintseva T.N.*

Effect of sulfated polysaccharides from brown seaweed laminaria japonica on the morphology of lymphoid organs and functional characteristics of immunocompetent cells.

The effect of sulfated polysaccharide fucoidan from the brown alga *Laminaria japonica* on morphological characteristics of mouse lymphoid organs, subpopulations of spleen mononuclear leukocytes, cytokine production and cytotoxic activity of splenocytes has been investigated. Fucoidan promoted activation and proliferation of lymphoid hematopoietic cells in primary and secondary immunogenesis bodies, increased expression of markers CD19, NK, NKT, CD25, MHC II, TCR, TLR2 and TLR4, the cytotoxic activity of splenocytes and production of immunoregulatory and proinflammatory cytokines (IL-2, IL-12, IFN- γ , TNF- α , IL-6). This suggests activation of effector mechanisms of innate immunity and adaptive immune responses via the Th-1 type.

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10. *Petrushova O.P., Mikulyak N.I.*

Blood acid-base balance of sportsmen during physical activity.

The aim of this study was to investigate the acid-base balance parameters in blood of sportsmen by physical activity. Before exercise lactate concentration in blood was normal. Carbon dioxide pressure (pCO₂), bicarbonate concentration (HCO₃⁻), base excess (BE), were increased immediately after physical activity lactate concentration increased, while pH, BE, HCO₃⁻, pCO₂ decreased in capillary blood of sportsmen. These changes show the development of lactate-acidosis which is partly compensated with bicarbonate buffering system and respiratory alkalosis. During postexercise recovery lactate concentration decreased, while pCO₂, HCO₃⁻, BE increased. The results of this study can be used for diagnostics of acid-base disorders and their medical treatment for preservation of sportsmen physical capacity.

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11. *Pogorelova T.N., Gunko V.O., Linde V.A.*

Imbalance of system of glutamine – glutamic acid in the placenta and amniotic fluid at placental insufficiency.

Metabolism of glutamine and glutamic acid has been investigated in the placenta and amniotic fluid under conditions of placental insufficiency. The development of placental insufficiency is characterized by the increased content of glutamic acid and a decrease of glutamine in both placenta and amniotic fluid. These changes were accompanied by changes in the activity of enzymes involved in the metabolism of these amino acids. There was a decrease in glutamate dehydrogenase activity and an increase in glutaminase activity with the simultaneous decrease of glutamine synthetase activity. The compensatory decrease in the activity of glutamine keto acid aminotransferase did not prevent a decrease in the glutamine level. The impairments in the system glutamic acid-glutamine were more pronounced during the development of premature labor.

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12. *Orishaka O.V., Vovchuk I.L., Petrov S.A.*

Extracting and study of biochemical properties of thiamine pyrophosphokinase from non-malignant and tumor tissue of myometrium.

The method of extraction and purification of thiamine pyrophosphokinase from non-malignant and tumor tissue of myometrium has been elaborated. Kinetic characteristics of T-kinase from non-malignant and tumor tissue of women myometrium have been studied. It has been shown, that malignization

of myometrium is accompanied by a decrease in affinity of thiamine pyrophosphokinase from tumor to thiamine and by an increase in sensitivity of the enzyme from tumor to thiochrome.

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