

1. Ivanov Yu.D., Bukharina N.S., Frantsuzov P.A., Pleshakova T.O., Krohin N.V., Kanashenko S.L., Archakov A.I.

Oligomeric state investigation of flavocytochrome CYP102A1 using afm with standard and supersharp probes.

Atomic force microscopy with two types of probes – standard (radius of curvature $R \sim 10$ nm) and supersharp ($R \sim 2$ nm) – was used to determine CYP102A1 oligomeric state. CYP102A1 images were obtained in a liquid, air and vacuum environment using the standard probes, also a ratio of monomers to oligomers (a) of CYP102A1 were determined as $a = 0.48:0.52$. At the same time use of standard probes did not allow to resolve the structure of these oligomers. Supersharp probes allowed to obtain the data about the monomers to oligomers ratio, and also about the dimers/trimers/tetramers ratio in air and vacuum. So, a ratio a of CYP102A1 in liquid can be determined by the standard probes, and an oligomeric state of protein can be specified by the supersharp probes.

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2. Gnedenko O.V., Kaluzhskiy L.A., Molnar A.A., Yantsevich A.V., Mukha D.V., Gilep A.A., Usanov S.A., Stonik V.A., Ivanov A.S., Lisitsa A.V., Archakov A.I.

SPR-biosensor assay for analysis of small compounds interaction with human cytochrome P450 51A1 (CYP51A1).

The SPR assay for human cytochrome P450 51A1 (CYP51A1) ligand screening was developed. Assay has been validated with knownazole inhibitors of cytochrome P450s. The studied azoles selectively interacted with human cytochrome P450 51A1, which showed the highest affinity towards ketoconazole. The efficiency of the SPR assay was showed with 19 steroid and triterpene compounds, which were not investigated as potential ligands of CYP51A1.

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3. Sirota T.V.

Use of nitro blue tetrazolium in the reaction of adrenaline autooxidation for the determination of superoxide dismutase activity.

Addition of nitro blue tetrazolium (NBT) into the reaction of adrenaline autooxidation allows to identify directly superoxide anion formation ($\text{O}_2^{\cdot -}$) in this superoxide-generating system. The kinetics of formation of adrenochrome and $\text{O}_2^{\cdot -}$ were compared under the same conditions. Three possible approaches to the use of the adrenaline autooxidation reaction for determining the activity of superoxide dismutase (SOD) and revealing the antioxidant properties of various compounds are discussed. Two of these approaches have been described previously: the spectrophotometric method of the registration of adrenochrome, the final product of adrenaline autooxidation, at 347 nm (Sirota, 1999) and the polarographic method, based on determination of oxygen consumption for $\text{O}_2^{\cdot -}$ formation (Sirota, 2011). Here, a novel approach to this problem is presented; it consists in the spectrophotometric determination of $\text{O}_2^{\cdot -}$ using NBT. The application of this approach enables one to lower the pH of carbonate buffer from 10.5 to 9.7 and to decrease (4-fold) the amount of added adrenaline, i.e., to generate milder and more effective conditions for revealing and studying the antioxidant properties of examined materials.

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4. Machneva T.V., Kosmacheva N.V., Vladimirov Yu.A., Osipov A.N.

Effects of low power laser radiation of blue, green and red ranges on free radical processes in rat blood in endotoxic shock.

This study was performed to investigate the effects of low power laser radiation in blue (441.2 nm), green (532.5 nm) and red (632.8 nm) wavelength ranges on free radical processes in experimental endotoxic shock in rats. The experimental model was produced by intraperitoneal injection of lipopolysaccharide B (25 mg/kg) (LPS). The following parameters were assayed in the study: the chemiluminescent assay (to evaluate the free radical production by blood leukocytes), nitro blue tetrazolium assay (to monitor the superoxide dismutase activity of plasma) and cis-parinaric acid fluorescence (to estimate the intensity of lipid peroxidation in erythrocyte membranes). It was found that the low power laser radiation significantly influenced all investigated processes, in animals both treated and untreated without LPS injection. The most pronounced effects were observed in all groups of animals subjected to the low power laser radiation: at the dose of 0.75 J/cm² green laser was most effective and at the dose of 1.5 J/cm² green and red lasers provided maximal effects. The mechanisms of the observed phenomena are discussed.

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5. Haretskaya M.V., Sheibak V.M.

A monoclonal antibody to tumor necrosis factor alpha modify metabolic activity in lymphocytes from rats exposed chronic ethanol consumption.

Administration of infliximab (a monoclonal antibody to tumor necrosis factor- α 1-10 mg/kg for 10 days) to Wistar rats consuming ethanol for 10 weeks significantly changed levels of free amino acids and their nitrogenous metabolites in liver lymphocytes.

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6. Agarkov A.A., Popova T.N., Matasova L.V.

Effect of melatonin on antioxidant state under type II diabetes at rat.

The effect of melatonin on the intensity of free radical processes and activities of superoxide dismutase (SOD, EC 1.15.1.1.) and catalase (EC 1.11.1.6) has been investigated in liver and blood serum of rats with diabetes mellitus type II. The development of diabetes was accompanied by the increase in biochemiluminescence parameters and the enzyme activities studied. Melatonin administration changed the parameters studied towards control values.
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7. Kosenko E.A., Tikhonova L.A., Poghosyan A.C., Kaminsky Y.G.

Antioxidants in erythrocytes in aging and dementia.

Age of patients and brain oxidative stress may contribute to pathogenesis of Alzheimer's disease (AD). Erythrocytes (red blood cells, RBC) are considered as passive "reporter cells" for the oxidative status of the whole organism and are not well studied in AD. The aim of this work was to assess whether the antioxidant status of RBC changes in aging and AD. Blood was taken from AD and non-Alzheimer's dementia patients, aged-matched and younger controls. In vivo antioxidant status was assessed in each of the study subjects by measuring RBC levels of $\text{D}\cdot\text{D}\ddot{\text{z}}$, organic hydroperoxides, glutathione (GSH) and glutathione disulfide (GSSG), activities of superoxide dismutase, catalase, glutathione peroxidase, glutathione reductase, glutathione S-transferase, and glucose-6-phosphate dehydrogenase. In both aging and dementia, oxidative stress in RBC was shown to increase and to be expressed in elevated concentrations of H₂O₂ and organic hydroperoxides, decreased the GSH/GSSG ratio and glutathione S-transferase activity. Decreased glutathione peroxidase activity in RBC may be considered as a new peripheral marker for Alzheimer's disease while alterations of other parameters of oxidative stress reflect age-related events.

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8. Panchenko L.F., Davydov B.V., Terebilina N.N., Baronets V.Yu., Zhuravleva A.S.

Oxidative stress in the of alcoholic liver disease.

Parameters reflecting oxidative stress (OS) have been studied in 37 patients with alcoholic liver disease (ALD) during admission to the hospital and 2 weeks after the beginning of therapy. The patients were divided into 3 groups: alcoholic hepatitis (AH), alcoholic cirrhosis with hepatic insufficiency (the group C with Child-Paquet) and terminal stage patients (they subsequently died). All patients were characterized by a significant increase in plasma products of lipid peroxidation (conjugated diene and malondialdehyde) and decrease of the ceruloplasmin level. The coefficient K OS significantly exceeded normal values both on admission and after the 2-week course of traditional treatment. This suggests an important role of the OS with ALD.

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9. Gracheva E.V., Samoilova N.N., Golovanova N.K., Piksina G.F., Shishkina V.S., Prokazova N.V.

Activation of ganglioside GM3 biosynthesis in human blood mononuclear cells in atherosclerosis.

Using blood monocytes and lymphocytes from atherosclerotic patients and healthy subjects we have investigated activity of GM3 synthase, cellular levels of ganglioside GM3 and its role in monocyte adhesion to cultured human umbilical vein endothelial cells (HUVEC). The results showed that activity of GM3 synthase and cellular levels of ganglioside GM3 in blood mononuclear cells from atherosclerotic patients were several-fold higher than those from healthy subjects. In monocytes the activity of GM3 synthase was one an order of magnitude higher than in lymphocytes from both groups studied; this suggests the major contribution of monocytes to enhanced biosynthesis and levels of GM3 in mononuclear cells in atherosclerosis. Enrichment of monocytes from healthy subjects with ganglioside GM3 by incubation in medium containing this ganglioside increased adherence of these monocytes to HUVEC up to the values typical for monocytes from atherosclerotic patients. In addition, an increase in CD11b integrin expression was observed that was comparable to that seen in lipopolysaccharide-activated monocytes. It is suggested that in atherosclerosis the enhanced cellular levels of GM3 in monocytes and lymphocytes may be an important element of cell activation that facilitates their adhesion to endothelial cells and penetration into intima.

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10. Titarenko O.T., Dyakova M.E., Esmedlyaeva D.S., Manicheva O.A., Alekseeva N.P., Dogonadze M.Z., Perova T.L.

The dependence of the inflammatory reaction on the properties of mycobacterium tuberculosis and the course of specific pulmonary process.

The systemic analysis of the inflammatory process in untreated patients with newly diagnosed infiltrative-destructive tuberculosis has been performed in the context of host mycobacterium interaction. Variability of acute phase proteins (APP) reflecting mobilization of nonspecific protective systems of the body did not depend on cytotoxicity of Mycobacterium tuberculosis (MBT). In 87.5% of patients the dependence between effectiveness of antitubercular chemotherapy (for three months) and combination of MBT characteristics and initial APP levels was found. Patients with effectiveness of therapy, which was inadequate to MBT cytotoxicity, were characterized by its dependence on the APP level and MBT sensitivity to antitubercular agents. Results of multifactorial analysis of parameters reflecting intensity of the inflammatory response, pathological process in the lungs, and characteristics of MBT suggest that the overall result of the host-pathogen interactions primarily depend on adequateness of protective systems of the body

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