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1. Philchenkov A.A.

Apoptosis-reactivating agents for targeted anticancer therapy.

The current knowledge on molecular mechanisms of apoptosis is presented focusing on the key elements of the extrinsic death receptor pathway as well as the intrinsic mitochondrial pathway. Disregulation of apoptotic pathways is considered as a key factor in the survival of cancer cells in response to conventional chemotherapeutic drugs or radiation therapy. Substances that selectively reactivate apoptosis in malignant cells are the promising candidate anticancer drugs, which have now entered various phases of clinical trials. The up-to-date techniques allowing for non-invasive in vivo visualization of apoptotic cells with special reference to therapy-induced cell death are briefly surveyed.

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2. Maltsev A.V., Dovidchenko N.V., Uteshev V.K., Sokolik V.V., Shtang O.M., Yakushin M.A., Sokolova N.M., Surin A.K., Galzitskaya O.V.

Intensive protein synthesis in neurons and phosphorylation of beta-amyloid precursor protein and tau-protein are triggering factors of neuronal amyloidosis and Alzheimer's disease.

Recently the studies of Alzheimerâ€™s disease have become particularly actual and have attracted scientists from all over the world to this problem as a result of dissemination of this dangerous disorder. The reason for such pathogenesis is not known, but the final image, for the first time obtained on microscopic brain sections from patients with this disease more than a hundred years ago, is well known to clinicists. This is the deposition of Ab amyloid in the brain tissue of senile plaques and fibrils. Many authors suppose that the deposition of beta-amyloid provokes secondary neuronal changes which are the reason of neuron death. Other authors associate the death of neurons with hyperphosphorylation of tau-proteins which form neurofibrillar coils inside nerve cells and lead to their death. For creation of methods of preclinical diagnostics and effective treatment of Alzheimerâ€™s disease novel knowledge is required on the nature of triggering factors of sporadic isoforms of Alzheimerâ€™s disease, on cause-effect relationships of phosphorylation of amyloid precursor protein with formation of pathogenic beta-amyloids, on the relationship with these factors of hyperphosphorylation of tau-protein and neuron death. In this review we analyze the papers describing the increasing of intensity of biosynthesis in neurons in normal conditions and under the stress, the possibility of development of energetic unbalanced neurons and activation of their protective systems. Phosphorylation and hyperphosphorylation of tau-proteins is also tightly connected with protective mechanisms of cells and with processes of evacuation of phosphates, adenosine mono-phosphates and pyrophosphates from the region of protein synthesis. Upon long and high intensity of protein synthesis the protective mechanisms are overloaded and the complementarity of metabolitic processes is disturbed. This results in dysfunction of neurons, transport collapse, and neuron death.

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3. Ivanov A.S., Ershov P.V., Mezentsev Yu.V., Poverennaya E.V., Lisitsa A.V., Archakov A.I.

Protocols of proteins interactomics: molecular fishing on optical chips and magnetic nanoparticles.

Now it is absolutely clear, that the majority of proteins in living systems function due to interaction with each other in stable or dynamic proteins complexes. Therefore necessity of deeper studies of proteins functions causes expansion of protein-protein interaction research. In the present review the brief description and comparative estimation of experimental methods and protocols of protein interactomics, based on technology of molecular fishing on an optical chips and paramagnetic nanoparticles is given.

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4. Cherkasova O.P., Selyatitskaya V.G.

Adrenocortical and renin-angiotensin systems in dynamics of experimental diabetes.

Components of the adrenocortical system (adrenal and blood corticosteroid hormones and hepatic and renal 11b-hydroxysteroid dehydrogenase activity) and also activity of the most important enzyme of the renin-angiotensin system, tissue and blood angiotensin converting enzyme (ACE) have been investigated in dynamics of alloxan diabetes. The study has shown that the initial period of diabetes is characterized by activation of synthesis and secretion of adrenocortical hormones into blood. High blood glucose and glucocorticoid hormones increase activity of the renin-angiotensin system in lungs and decrease ACE secretion into blood. This is accompanied by a decrease of activity of the renin-angiotensin system in kidneys. Subsequent progression of diabetes resulted in impairments of physiologically determined correlations between the components of these systems. Development of experimental diabetes for 30 days was accompanied by sign of a decrease of the adrenal glucocorticoid function regardless of stable impairments of carbohydrate metabolism. Under these conditions increased adrenal and hepatic 11b-hydroxysteroid dehydrogenase activity may be responsible for maintenance of elevated levels of the main glucocorticoid in blood and tissues. Factor analysis revealed impairments in intersystem relationships between the adrenocortical and renin-angiotensin systems in experimental diabetes thus suggesting disintegration of regulatory systems.

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5. Pokrovskaya M.V., Pokrovskiy V.S., Aleksandrova S.S., Anisimova N.Yu., Andrianov R.M., Treschalina E.M., Ponomarev G.V., Sokolov N.N.

Recombinant intracellular Rhodospirillum rubrum L-asparaginase with low L-glutaminase activity and antiproliferative effect.

The recombinant producer of Rhodospirillum rubrum L-asparaginase (RrA) was received and purification procedure of RrA was developed. It was shown

that RrA has following biochemical and catalytic characteristics: K for L-asn 0,22 Đ¼M, pH optimum 9,2; temperature optimum 54Â°Đ¡; pI=5,1Â±0,3; L-gln activity seems to be low-to-negligible. Đš562, DU145 and MDA-MB-231 cellular lines displayed significant sensitivity towards the enzyme (IC50=1,80; 9,19 and 34,62 ME/ml, respectively. In comparison with L-asparaginases from E . coli II type (EcA) and Erwinia carotovora (EwA) cytotoxicity of RrA seems to be higher than EwA, but lower than EcA. 10-fold i.p. RrA administration (4000 ME/kg per day) in L5178y bearing mice showed Đ¢/Đ¡=172%. The received results show that RrA belongs to I type cellular L-asparaginases with low L-gln activity and the high antiproliferative effect.
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6. Shumyantseva V.V., Bulko T.V., Suprun E.V., Archakov A.I.

Electrochemical sensor systems based on one dimensional (1D) nanostructures for analysis of bioaffinity interactions.

It was shown that modification of screen printed graphite electrodes with gold nanoparticles (AuNPs) decorated Pb nanowires (PbNWs) demonstrates the enhancement of sensorâ€™s analytical characteristics such as effective surface area, electro catalytic properties and heterogeneous electron transfer kinetics. The reason for such improvement may be the synergistic effect of AuNPs and PbNWs. Nanowires ensembles on electrode surface were employed for the detection of hemeproteins cytochrome P450 2B4, cytochrome c , and cardiac myoglobin in human plasma. Composite materials based on nanoparticles with different dimentions (3D three dimensional gold nanoparticles and 1D one dimensional Pb nanowires make it possible to construct biosensors with low detection limit of proteins.
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7. Falko O.V., Zemlianskykh N.G., Lipina O.V., Procopyuk O.S.

Modification of placenta blood serum proteins under low temperature effect.

Changes in environmental physical and chemical factors upon freeze-thawing and low temperature storage of biological samples can result in impairments of protein structures. This work specifies spontaneous and diamide-induced protein aggregations of placenta blood serum stored at -20Â° and -196Â°C during 2 years with SDS-PAGE. It was shown that storage of placenta blood serum at low temperatures did not cause any quantitative and qualitative changes in fraction distribution of proteins denatured with SDS in comparison to the native samples which were not frozen. Application of b-mercaptoethanol revealed that placenta blood serum proteins upon freeze-thawing did not form spontaneous aggregates linked by disulphide bridges. Oxidation of amino acid sulfhydryl groups induced by diamide and accompanied by high molecular aggregate formation proved to be a quite effective way for indirect estimation of structural changes in protein upon low temperature effects. In samples thawed after low temperature storage the protein aggregation with 4 mM diamide was significantly higher than in native serum. These discrepancies between native and frozen-thawed samples are stipulated by impairments of protein structure under low temperature and increased in accessibility of reactive SH-groups of proteins for oxidation with diamide. Structural changes in placenta blood serum proteins, which caused by low temperatures and revealed by elevated sensibility to diamide-induced aggregate formation, did not depend on temperature (-20Â° Đ¸ -196Â°C) and storage terms (2 years and 3 weeks). They reflect protein reaction to freeze-thawing processes and could be sequence of ice crystal formation which takes place in unprotected media.
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