

## Scientific-research laboratory of Biophysics of Subcellular Structures

Since its establishment the laboratory has carried out investigations on peculiarities of DNA-ligand interaction. In particular, it was shown that the mechanism of ethidium bromide (EB) binding with DNA depends upon ionic strength: intercalative mechanism prevails under lower ionic strength meanwhile the binding is semi-intercalating under greater ionic strength. The study of melting of DNA-Hoechst 33258 complexes carried out at various ionic strengths of a solution revealed that this ligand with DNA may bind at least by two ways – strong and weak. It is revealed that the stabilizing influence of Hoechst 33258 on double-stranded structure of DNA depends on ionic strengths of a solution. The specificity of Hoechst 33258 to AT-sequences of DNA is shown at ionic strengths  $1 \cdot 10^{-2}$  M Na<sup>+</sup>, while at  $1 \cdot 10^{-2}$  M Na<sup>+</sup> such a specificity does not observed. The laboratory has also studied the peculiarities of joint and individual impact of ligands binding with DNA through various mechanisms. In particular, it was shown that the mechanism of joint interaction of EtBr and Hoechst 33258 (an agent that binds with minor groove of DNA) on DNA qualitatively differs from their individual interaction with DNA.

The laboratory also investigates the phospholipid composition of chromatin, soluble nuclei fraction and nuclei membrane of wheat germinating seedlings. Investigations are also being carried out to identify the influence of extremely high frequency electro-magnetic irradiation on the growth and development of wheat germinating seedlings. The resonance nature of the response of the biological system to that impact makes the basis of many important reactions that play crucial role in the cell.

The laboratory also carries out essential investigations aimed at identification of the role of natural and artificial anti-oxidants on various biologically active substances including in the presence of drugs. These data will help in understanding the mechanisms of free radical processes and their peculiarities.

Transport of proton, potassium and other ions across membranes and their regulation, and transformation of energy (ATPase activity and proton gradient: membrane potential and pH difference) at different growth conditions, particularly in different values of pH during fermentation of different carbon sources (glucose, glycerol and some organic acids) in chemotroph and phototroph bacteria, especially *E. coli*, *E. hirae*, lactic acid bacteria, and photosynthetic purple bacteria isolated from Arzni and Jermuk mineral springs in Armenia, are investigated. The effects and possible mechanisms of electromagnetic irradiation (EMI) of extremely high frequencies (various waves) on bacterial growth and survival and dependence on different conditions and factors as well as action mechanisms are studied. And hydrogenases mechanisms of hydrogen gas production by these bacteria, their interactions and regulation pathways are also investigated.

The laboratory investigates the changes of individual components of phosphatidylinositide and sphingomyelin signal system in nuclei and intra-nuclei structures under the impact of various hormones. The influence of hydrocortisone and insulin in chromatin packaging in thymus and liver nuclei also is being investigated. The impact of the same hormones on the activity of one of key enzymes of re-modeling the chromatin – poly-ADP-polymerase is being investigated as well.