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in kemijsko tehnologijo

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**VABILO NA PREDAVANJE
V OKVIRU DOKTORSKEGA ŠTUDIJA
KEMIJSKE ZNANOSTI**

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z naslovom:

**Metal induced genes:
an engineering aspect of life**

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Vljudno vabljeni!

Abstract

Metals and metalloids in their ionic forms have various roles in living organisms. Some such ions' functions stem from their capability of taking more than one oxidation state. These elements take part in wide varieties of redox reactions from cyclic electron storage in photosynthesis to being terminal electron acceptors in respiration, among others. Some other functions are results of their ionizing forces, electronegativity and other physico-chemical properties being different from those of the macroelements that build up the living material, hence these metal ions are indispensable parts in establishing subtle microenvironments of the active centers of certain enzymes.

However, when they are present in too high concentration in the environment metal and metalloid ions may be harmful or even toxic to living organisms. Beyond their toxic effects via bonding to sulphhydryl groups of proteins and similar reactions, excessive amount of these ions may lead to oxidative stress, a state where increased formation of reactive oxygen species (ROS) overwhelms antioxidant protection and subsequently induces DNA damage, lipid peroxidation, protein modification and other effects. This way the complex biochemical pathway systems of the cells are perturbed. In higher organisms these may lead to numerous diseases, involving cancer, cardiovascular disease, diabetes, atherosclerosis, neurological disorders (Alzheimer's disease, Parkinson's disease), chronic inflammation and others¹.

To maintain homeostasis within the cells, that is, the right concentrations of each ion species, several specific intracellular processes work together in an ion-concentration dependent manner. In these processes, therefore, metal and metalloid ions function as regulators, which alter the syntheses as well as the activities of the involved proteins. This regulation can occur on various levels ranging from gene expression to allosteric modification of the matured protein complexes.

In the lecture we will focus on the direct and indirect effects of metal and metalloid ions on gene expression as regulators of biochemical processes, some of which, in return, regulate the intracellular concentration of these ions. Beyond the health hazard mentioned above, these regulatory features of metal ions can also be utilized in scientific research and in developing new technologies. The biotechnological applicability² of such systems will also be covered.

- 1) Jomova K., Valko M. Advances in metal-induced oxidative stress and human disease; (2011) *Toxicology* 283:65-87
- 2) Peca et al., Construction of bioluminescent cyanobacterial reporter strains for detection of nickel, cobalt and zinc; (2008) *FEMS Microbiol. Lett.* 289:258–264