BIOCHEMISTRY

Integrated metal nanoclusters in biopolymers
supervisor: prof. Ing. Marián Antalík, DrSc.
study form: full time
Annotation: In the previous years a lot of attention has been paid on the preparation of nanoscaled materials depending on the development of new fabrication techniques. Surface modification is often required for many functional applications in biological systems. There are several different approaches for the surface modification of nanomaterials, which are often material-specific. Common methods include the covalent attachment of small molecules, adsorption of hydrophilic polymers, and the formation of shell/layers on the surface of particles. Goal of this PhD. thesis will be on the preparation, characterization and application of metal nanoclusters with sulfur bridged peptides and proteins on the surface.

The study of di- and trisubstituted acridine and derivatives of antracene with biopolymers
supervisor: doc. RNDr. Mária Kožurková, CSc.
consultant: RNDr. Ladislav Janovec, PhD.
study form: full time
Annotation: In the thesis, we will deal with an interaction of novel derivatives of acridine/antracene (di- and trisubstituted) with biogenic ligands. The spectroscopic characteristics, hydrophibicity, stability in water solution and reactivity of the newly synthesized compounds will be studied.
We will determine the mode of interaction; calculate binding constants and neighbour exclusion parameters. Inhibition effects of these compounds on topoisomerase I and II will be examined. The potential antitumor effects of these compounds will be tested against both human and mice leukaemia cell lines and HeLa cell. The effect of substances on cells will be studied using flow cytometry analysis and the mode of cellular death will be determined. The localization of derivatives in cells will also be analysed using confocal microscopy.

The biological role of non-canonic DNA structural motifs
supervisor: doc. RNDr. Viktor Víglaský, PhD.
study form: full time
Annotation: The occurrence and location of non-canonic structural motifs in nucleic acids, e.g. DNA hairpins, triplexes and G-quadruplexes, are non-random. These motifs, and not mutation in structural genes, are crucial control elements influencing various biological processes including a gene expression of regulating proteins. There are responsible for example for the loss of cell proliferation control, induction of neoplasms formation, inefficiency in DNA repair and recombination, unexpected cell differentiation and senescence. The main task will be to determine condition of non-canonic motifs formation and their potential impact to cell viability.