SUMMARY OF DOCTORAL DISSERTATION

The aim of the doctoral dissertation was to determine the relationship between the structure of obtained coordination compounds and their physicochemical and biological properties. On this basis, the structural and physicochemical properties of the complexes which determine the desirable antioxidant activities of polycarboxylate coordination compounds with Co^{2+}, Ni^{2+}, Cu^{2+} and VO^{2+} were drawn. To realize the aim of the doctoral dissertation the Co^{2+}, Ni^{2+}, Cu^{2+} and VO^{2+} complexes with polycarboxylate ligands – oxydiacetate and thiodicetate anions, aminopolycarboxylate ligands – iminodiacetate and N-methyliminodiacetate anions, 1,10-phenantroline, 2,2'-bipyridine and 4,4'-dimethoxy-2,2'-bipyridine were synthesized. In the next step the physicochemical and biological properties of the complexes have been investigated. The composition of the compounds was confirmed by elemental analysis. The structures of the complexes were determined by spectroscopic methods. The coordination compounds obtained as monocrystals have been studied by the X-ray diffraction analysis. The thermodynamic and kinetic stability of the complexes in a solution was determined by the following methods: potentiometric titration and spectrophotometric stopped-flow method. The reactivity of the compounds towards free radicals have been studied by cyclic voltammetry, the nitrobluetetrazolium salt test, 2,2-diphenyl-1-picrylhydrazyl and [2,2′-azinobis-(3-ethylbenzothiazoline-6-sulfonic acid)] radical cation tests. The complexes that revealed the highest radical scavenging activity were selected and subjected to biological tests. In the first step the cytotoxicity of the complexes has been investigated by MTT and LDH tests using the hippocampal mouse HT22 cell line and a human fibroblast cell line. The concentrations of the complexes that cause no cytotoxic effect and the concentration of the hydrogen peroxide causing a decrease under 50 % of cell viability have been selected to the further studies. Then, the cytoprotective properties of the complexes have been evaluated. Structural and physicochemical properties which characterize the complex compounds showing a reactivity towards the stable organic radicals and the superoxide anion radical were defined. Thus new directions for the synthesis of low molecular weight complex compounds having the desired antioxidant properties have been identified. It has been shown that the tested complexes are able to protect the mouse hippocampal and human cells (fibroblasts) against the toxic effects of H_2O_2 and that the complexes exhibit the antibacterial activity against six strains of bacteria showing an antagonistic activity to the human body.