

The main aims of this project are basis research devoted to healthy food and healthy nutrition, in particular the improvement of ways of deactivation and quenching free radicals in food. The main goal will be realized through:

- (1) examination of the impact of 16 metals on changing the antioxidant properties of phenolic compounds (monomers and polymers, including curcumin) present in foods of plant origin,
- (2) examination the relationship between the molecular structure of the ligands (plant phenolic compounds) and their antioxidant capacity causing the deactivation of free radicals in the bodies of humans and animals,
- (3) Research on the improving of the activity, effectiveness and bioavailability of natural antioxidants in food.

The test results available in the world literature clearly show that the human nutrition has a huge impact on his health condition. A number of diseases (including cancer) are caused by an excess of free radicals in the body. The proper diet rich in natural compounds with antioxidant properties has a huge impact on the health condition of the population. Study of the effect of various factors on the ability of antioxidant compounds of natural origin (including different metal complexes) will allow to improve the biological properties of the compounds and facilitate the search for new compounds (food supplements) with beneficial effect on the body, as well as to seek new, safer and more efficient food preservatives.

Our project, based on basic research, may bring significant knowledge in the field of healthy food and healthy nutrition, in particular, ways of improving the deactivation and leaching of free radicals from food. One of the most important tasks of modern science of food technology and human nutrition is to produce a diet devoid of free radicals. This obvious truth is formed on Polish and world congresses, in numerous national and international journals devoted to food and nutrition. As it is known, an excess of free radicals in food causes numerous diseases, in particular tumors.

A clear element of novelty and innovative methodology of this project (as opposed to the work of other centers and our previous work) consists of:

1. Complete and systematic examination of the role of the metal and metal complexes in the inactivation and leaching of the excess of free radicals. We assume that the complexation of the antioxidant compounds will effect on the electronic charge distribution of ligands and change their redox properties and the ability to inactivate free radicals. Our preliminary (unpublished) research indicates such dependence. We will examine the impact of 16 metals (chosen in a logical series) in the processes of generation or quenching radicals in model systems with a few selected ligands of natural origin, mainly phenolic acids having importance in food and nutrition.

2. Determination of what metal parameters (e.g. ionic potential, magnetic properties, electronegativity and other parameters listed in the project) and which metals affect to the greatest extent the generation or extinction radicals in food. Extensive experimental material (choice of 16 metals and ligands 4 model makes it possible to explore a range of complexes and salt) will enable the study of the relationship between the general antioxidant properties and the properties of metals.

3. Choosing the metals in a logical series will allow the use of systematic, fully novel and innovative methodologies. In the world literature one can find a number of papers describing mainly the role of individual metals in the generation or extinction of free radicals in food. So far, such a comprehensive approach described above was not presented in the literature.

In summary, we can say the this project can significantly contribute to a better understanding the mechanisms of action of various metals in the processes of decaying or generating radicals in model systems and food. This will be realized through a systematic approach gained by years of experience and proven by obtained so far experimental results published in the international papers. As we know, the battle for healthy food, devoid of excess free radicals or harmful preservatives, except tumor processes, it is imperative today.

Thus, the project may have a significant impact on the development of a scientific discipline. It fits very well into "Fundamentals of Applied Life Sciences NZ9", in particular the "Scientific Foundations of Nutrition and Food Research -NZ9-7". Interest in our project and cooperation with specialists from: (a) Warsaw University of Life Science - SGGW, (b) Institute of Plant Protection in Białystok (c) National Medicines Institute (d) Jagiellonian University, (e) Medical University of Warsaw, (f) Anticancer Center of the University of the Texas in Houston (USA) confirms our conclusion.