Bioanalytics in Nano Dimension

Boguslaw Buszewski[1,2]

[1]*Chair of Environmental Chemistry & Bioanalytics, Faculty of Chemistry, Nicolaus Copernicus University, 7 Gagarin, 87 100 Torun, bbusz@chem.umk.pl*
[2]*Centre for Modern Interdisciplinary Technologies, Nicolaus Copernicus University, 4 Wilenska, 87 100 Torun*

Determination of biologically active compounds from various matrices, including environmental and biological samples is a serious problem in a modern analytical chemistry. The most relevant matrices to be analyzed for this purpose are plasma or blood, due to providing a good correlation between their concentration and pharmacological effects. From a medical point of view, the routine analysis of xenoestrogens which are one of the causes of cancer, generates a lot of problems. Nowadays, interest of the analytics of this group of compounds need to be developed effective analytical methodologies where the biggest problem is the preparation and purification of biological samples such as blood or tissue. For this reason, the main objective of this project is to develop new methodologies and procedures for biological monitoring of xenoestrogens and their derivatives and determination of their biotransformation pathways in the bloodstream. Furthermore, the development of techniques for the preparation of samples based on solid phase extraction (SPE) in the form of sorbents with the imprinted molecule and its miniaturized form such as solid phase microextraction (SPME) using a fiber and new generation sorbents with nanoparticles characterized by ferromagnetic properties and *shell* structure are a good alternative for the implementation of determination by conjugated and multidimensional separation techniques (LC-Q-TOF/MS/MS or LC×LC-MALDI-TOF/MS^n). To enlarge specificity/selectivity, sorbents will be modified with appropriate chosen molecules (MIPs – Molecularly Imprinted Polymers), which will create a molecular recognition system (host – guest supra-molecular system). Fundamental research realized within the presentation, are focused on two main areas, which include macromolecular and supramolecular chemistry and research of the relationship between the structure and properties of polymers and biotechnology combined with enzymatic applied microbiology. It gives the possibility to track the impact of the enzyme-substrate or antigen-antibody complexes in biological systems. Such approach allows to reduce the limit of detection of analyzed compounds.

Acknowledgements
The work was financially supported by the National Science Centre in the frame of the project Symfonia 1 No. 2013/08/W/NZ8/701 (2013-2016), Maestro 6, No. 2014/14/A/ST4/00641 (2015-2017).