

**From selective detection of cellular oxidants and small molecule signaling agents towards better understanding of their biological chemistry**

Polish scientists from the Institute of Applied Radiation Chemistry (Lodz University of Technology) in collaboration with researchers from the Medical College of Wisconsin (USA) and Aix-Marseille Université (France), are developing innovative molecular probes, designed for the selective detection of important cellular oxidants, called reactive oxygen species (**ROS**), and small molecule signaling agents.

Those cellular oxidants, produced under pathophysiological conditions associated with the development of several serious diseases (including cardiovascular and neurodegenerative diseases), react with the components of cells, causing damage.

Understanding of the specific role of various **ROS** in biological systems needs the development of reliable tools allowing for their selective detection and quantitation. Although a substantial progress in this field has been made in the recent years, the satisfactory selectivity and sensitivity of detection methods still remains a challenge. Due to the high reactivity of **ROS**, their direct detection is simply impossible. The most common approach for the detection of those species is the use of designed spectroscopic probes. Over the recent years, the profluorescent probes for **ROS** have become important tools in the studies on chemical biology of those species, but their proper use requires a complete understanding of the mechanism of their action.

The first part of the project is dedicated to the synthesis and characterization of new probes, including probes for the detection of reactive oxygen species within the mitochondria, that produce the energy for cells.

The aim of the project is to develop a method for the simultaneous detection of several biological oxidants, with the use of a set of sensitive and specific probes. The developed method will be further used in the studies on several important biological systems producing reactive oxygen metabolites. They will be also used in the studies on the cytotoxicity of certain drugs used in the cancer therapy.

The other part of the project is the development and characterization of probes for the detection of small signaling molecule, **HNO**. Recently, there is a great interest in the biological chemistry and chemical biology of that species, due to the significant and important pharmacological effects associated with the use of its donors.

The field of chemical biology and biological chemistry of **HNO** is still partially unexplored area. The endogenous production of **HNO** in mammalian systems has not been shown to occur. The most challenging task is the development of the methodology allowing detection of **HNO** in vivo, to answer the question if **HNO** can be produced in cells, when and in what quantity.