APPLICATION OF VOLTAMMETRY AND GRAVIMETRY FOR SIMULTANEOUS DETECTION OF MATRIX METALLOPROTEINASES -1, -2 AND -9 IN HUMAN LUNG CANCER

One of the major challenges of medicine is currently effective combating civilization threats, including cancer diseases, which rank second on the list of causes of mortality caused by non-infectious diseases. According to data from the World Health Organization, about 75% of all patients with different types of cancer die each year. Many patients who survive the disease do not regain full fitness. Despite the huge technological and scientific progress, there is still no effective method of combating cancer. The difficulty of the problem of cancer treatment consists of many factors, including not fully understood, multithreaded causes of tumorigenesis, significant biochemical similarity of cancerous cells to normal tissues and the resulting low selectivity of therapy. The complexity of the cytotoxic mechanisms of the known therapeutic agents must be added.

Early detection of disturbances in homeostasis by controlling the level of selected proteins in body fluids is as important as the effectiveness of the therapeutic process. In the process of tumorigenesis, growth and metastasis of malignant tumors, it is necessary to digest components of the extracellular matrix (ECM). The extracellular matrix metalloproteinases (MMPs) play a key role in its degradation. It has been proven that the expression of metalloproteinases is elevated in many types of malignant tumors. The level of MMPs on the one hand is a prognostic factor, on the other hand, it is a factor allowing to monitor the course and effectiveness of therapy. Therefore, fast, selective and ultra-sensitive tools for determining these biomarkers at trace levels in body fluids, including blood samples, are intensively sought for.

The aim of the project is to develop procedures for the determination of matrix metalloproteinases important in the diagnosis of various types of human lung cancer. Research conducted as part of this research project will aim at: (1) constructing voltammetric and gravimetric sensors (nanobiosensors) for the simultaneous detection of MMP-1, MMP-2 and MMP-9 extracellular matrix metalloproteinases in various cellular media and body fluids, including blood samples, (2) investigating the activity of selected MMPs and (3) assessing their levels depending on the type of human lung cancer.