

Bladder cancer (BC) is the tenth most common form of cancer worldwide and second most common cancer of the urinary tract after prostate cancer, taking into account both incidence and prevalence. Globally, in 2018, 549 thousand new cases of bladder cancer were diagnosed. In terms of incidence, it is the sixth most common cancer in men, the seventeenth in women and the tenth most frequent cancer in both sexes.

The current standards for BC diagnosis, monitoring of recurrence and progression includes imaging (abdominopelvic ultrasound, CT-urography), cystoscopy and voided urine cytology. Cystoscopic examination of bladder remains the gold standard for bladder cancer diagnosis but it is invasive, associated with discomfort, sometimes painful and costly. This examination depends largely on the experience of the examining physician and the quality of the used equipment. It is estimated that 4-27% of tumors are omitted during the examination. This value increases to 32%-77% in the case of carcinoma *in situ*.

In recent years, numerous urine based bladder cancer biomarkers have been evaluated but currently there is no reliable diagnostic and prognostic BC biomarker that has been accepted for diagnosis and follow-up in routine practice or clinical guidelines and which could be an alternative to cystoscopy. Therefore, the discovery of the novel BC biomarkers is desired to offer a non-invasive and less expensive method for diagnosis and surveillance of this cancer.

The aim of this project is to find new low molecular weight biomarkers of bladder cancer and to examine their structure in detail using advanced instrumental methods such as mass spectrometry (MS), nuclear magnetic resonance (NMR) spectroscopy and others. Tests will include analysis of tissue (healthy and cancerous), urine and blood plasma of 100 patients with bladder cancer. In addition, analysis of metabolic pathways containing potential biomarkers will be carried out.

The most important results of research will be published in recognized, international scientific journals. In case of selected results, patenting will also be considered. Potential, future applications: after finishing this project, it will probably be possible to prepare new set of methods focused on our biomarker data for fast MS analysis of tissue/urine/plasma. This kind of diagnostic test will be possible for every hospital having MALDI-type apparatus or alternatively, for hospital working in cooperation with local scientific faculties. The long-term aim of this research will be to prepare simple tests for BC biomarkers. Additionally, potential application of results may also facilitate evaluation of surgical margins and clinical decision making during surgery for large renal masses.