

Rapid intraoperative diagnostics continuously gains popularity in recent years because of the increasing number of patients potentially suffering from cancer. In such patients rapid diagnosis would increase a chance for immediate implementation of appropriate treatment and successful fight against the disease. Assessment of the margins during surgery as well as rapid identification of biomarkers is important. For these purposes high technologies, e.g. mass spectrometry can be used. It is possible to analyze biological sample without prior sample preparation which allows time saving. However, lack of proper sample clean-up compromise quality of the results. Introduction of the technology, which allows to combine the speed of direct analysis with method of sample preparation which does not require exhaustive procedure would enable to obtain reproducible results in short time.

The goal of the project is to assess the applicability of Coated Blade Spray (CBS), a technology enabling fast determination of small molecules in complex matrices, to biochemically characterize brain tumors and to propose specific biomarkers which would enable their fast identification intraoperatively. It is known that changes in genome have impact on tumor biology therefore the selection of biomarkers genetic tests will be also performed. These results will be compared with lipidomic and metabolomics data obtained from other study.

This project consists of two parts. First one is connected with analytical chemistry and optimization of Coated Blade Spray as a new fast method. This technique was developed at the University of Waterloo in Canada. The thin blade in the shape of the sword is coated with a special sorbent. Biological compounds from the sample interact with the coating and their subsequent "withdrawal" from the sample. In the next step, the blade is installed in a special holder beside the mass spectrometer. Drop of the organic solvent is added on coated surface and then high voltage is applied. Studied compound is travelling in the mass spectrometer and they can be identified. The proposed method allows to analyze many compounds in just a few minutes. It is also possible to use CBS blade for transport and storage of biological samples (similarly to dried blood spot samples).

The second part of this project refer do medical application. Meningiomas were chosen for the studies as the most common non-malignant tumors of central nervous system (CNS). The neurosurgery usually is the best option of treatment and prognosis for patients are usually good. However, there are cases of meningiomas with a high level of malignancy. It was observed that these changes are sometimes associated with genetic mutations, however genetic tests are not performed routinely because of the high cost. Therefore, in the first stage of research, it was proposed to perform genetic tests and then compare them with the previously obtained results of brain tumor profiling (analysis of lipids and other compounds associated with cellular metabolism in a selected group of meningiomas). This analysis should allow selection of potential biomarkers which will be measured with CBS as fast (intraoperative) and more cost-effective diagnostic solution. These substances should be characteristic for processes occurring in a specific group of tumors. The optimization of CBS method and analysis of group of tumors will be performed for selected compounds.