1. The goal of the project

The main objective of the project is to define a biomarkers of Central Nervous System (CNS) tumors by examining the vibrational properties of *ex*- and *in-vivo* tissues and conducting research on tumorous cell lines *(in-vitro).*

2. Implemented tasks

The project involves the analysis of samples before and after collection during standard surgery to remove a tumor in the form of: (a) fragments from CNS tumors, and (b) so-called safety margin around the tumor by Raman spectroscopy. In addition, the research will be conducted on cell lines which are a model systems, which will be modulated with anti-cancer drugs (temozolomide, erlotinib) in order to understand the spectroscopic response to their effects. The proposed studies have not been carried out so far using Raman spectroscopy.

An important stage of the project will be the optimization of experimental parameters, to enable immediate assessment of the scale of a tumor growth. The Raman spectra will be collected during brain tumor resection using portable Raman spectrometer.

The obtained results for *ex*- and *in-vivo* tissues and cell lines will be analyzed using statistical methods to indicate and determine differences between Raman spectra including the estimation of the impact of the biological material preparation stages for ex-vivo testing, but above all to find specific Raman markers capable of to distinguish between neoplastic changes and the normal form.

3. Reasons for undertaking research topics

Tumors of the Central Nervous Systems are the most common in 1-16 years old children and are among the most complicated to treat. The inability to directly and precisely distinguish between CNS tumors and normal tissue during surgery prevents the complete removal of the tumor (reducing the patient’s prognosis).

The standard histopathological methods are time consuming and are multi-stage procedures. They rely on embedding fragments of tissues in paraffin blocks after fixation, dehydratation, organic solvents, embedding in paraffin, cutting, dewaxing and finally coloring and closing in balsam/resin. The process of fixation of samples causes a partial loss of chemical properties of the samples, disturbing the actual biochemical image of tissue-building cells. For proper diagnosis of cancer it is necessary to know both their biology and biochemistry.

Describing the mechanism of cancer and finding Raman markers of this process will positively influence the development of new methods of cancer detection and treatment.