Cannabidiol as a modulator of radiological response in the therapy of peripheral nervous system tumors - lipidomics from the spectroscopic perspective

Cannabidiol (CBD) is a non-psychoactive compound extracted from cannabis plants that modulates lipid homeostasis in mammalian cells. Because lipids play essential roles in the human body, unfortunately they also participate in the cancer development, undergo transformations which disturbed lipid metabolism. In order to investigate the modifications occurring in lipids during cancerous process, analytical techniques such as chromatography, mass spectrometry (MS) and nuclear magnetic resonance (NMR) are used. They enable the qualitative and quantitative assessment of lipids in a field of research called lipidomics. Although these techniques provide very precise information about the type and amount of lipids in the investigates sample, they not allow to determine their spatial distribution, which is important because it is often related to the biological function of lipids.

The novelty of this project is the use of hyperspectral imaging to examine changes occurring in lipids, using deuterated lipid probes. Currently, vibrational spectroscopy imaging techniques, such as Raman spectroscopy (RS) and Fourier transform infrared absorption spectroscopy (FT-IR), allows for the simultaneously determination of the spatial distribution and semi-quantitative information about the molecules present in the sample, including lipids, with micrometric spatial resolution. The unique AFM-IR system, in which atomic force microscopy is combined with IR spectroscopy, enables such studies at the nanoscale. Due to the presence of deuterated lipid chains, spectra will display bands associated with –C-D vibrations. These bands occur in a "silent" spectral region, where no bands related to cells are present. Therefore, such lipid probes will be easily distinguishable from other molecules present in the sample.

The use of deuterium probes will allow for active tracking of lipid metabolism using spectroscopic techniques in an *in vitro* model of malignant peripheral nerve sheath tumor (MPNST). The choice of this tumor was dictated by the fact that only a few papers discussed the critical role of impaired lipid metabolism in its development and resistance to radiotherapy. Therefore, the use of CBD during radiotherapy may influence the lipid fraction of MPNST and modulate its radiological response. It is extremely important to broaden the knowledge about the behavior of lipids under the influence of CBD and radiotherapy for MPNST. The obtained spectroscopic results will be correlated with the results of biological analyses, towards the development of multi-parameter characteristics for targeted lipid analysis, such as lipidomics, but in a spectroscopic approach.

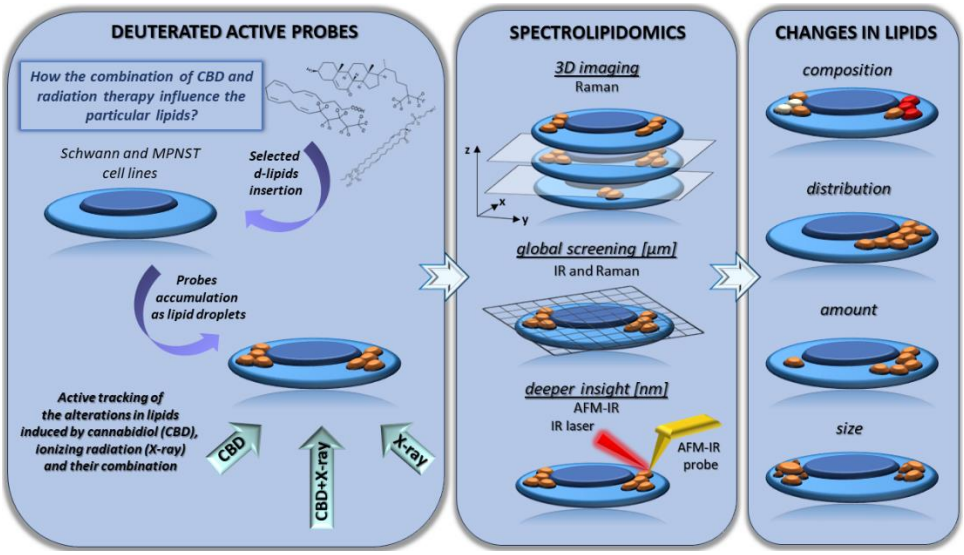

Figure 1. Conceptual scheme of the project.