Cancer is one of the main death causes in the world. Although there has been a major improvement in diagnosis and treatment, therapies currently used have their drawbacks. Most of them are cytotoxic for healthy cells, thus there is a need for new medicines, effective against tumor cells but at the same time safe for normal cells. Approximately 80% of antimicrobial, immunosuppressive and anticancer drugs are of plant origin. Lichens are symbiotic organisms known as a rich source of bioactive compounds. One of them is usnic acid which is known to inhibit cancer cell proliferation and induce cell death both, *in vitro* and *in vivo*. The mechanisms underlying its activity are not fully elucidated. Moreover, the hepatotoxicity and the low water solubility restrict its practical use in therapy.

The aim of this project is to synthesize new derivatives of usnic acid in order to improve their physico-chemical and biological properties. The molecular mechanisms of their activity and anticancer effectiveness *in vivo* will be investigated.

To investigate anticancer potential of usnic acid derivatives we will use cancer cell lines of different origin (liver, prostate, lungs, breast, ovaries, cervix). We will test the impact of usnic acid derivatives on viability, cell cycle and death of cells. Our preliminary data indicate that usnic acid and its derivatives induce vacuolization in cancer cells. Therefore, will study the nature of this process and its importance for potential cancer therapy. The main research methods used in the project will be microarrays, supplemented by quantitative real-time PCR (qRT-PCR), flow cytometry, fluorescent and electron microscopy, as well as immunofluorescence and immunoblotting techniques. The most promising derivatives will be tested for their toxicity and subsequently - antitumor activity on a mouse model.

The results of our study will broaden our knowledge on the mechanism of activity of usnic acid derivatives, which can contribute to the development of new, effective anticancer drugs.