



Fund “Nauka” Project № 23003 Resume – Competition-Based Session 2023:

“Investigation of the antitumor, anti-inflammatory and antibacterial effect of plant extracts and antitumor agents using lipid model systems and in vitro cell models”

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The current project is focused on the study of the antitumor, anti-inflammatory, and antibacterial action of antitumor agents and plant extracts. The antitumor agents employed are alkylphospholipids and various plant extracts such as *Petasites hybrids*, *Myrtus communis*, *Moringa oleifera*, *Curcuma longa*, and more.

The study will investigate the interactions between antitumor agents and model systems and explore the synergistic effects of combining them with plant extracts. The researchers will use spectral impedance spectroscopy, cyclic voltammetry, and spectral ellipsometry techniques.

The extracts will be characterized by Raman spectroscopy, infrared spectroscopy, fluorimetry, and X-ray diffractometry. Cytotoxicity, genotoxicity, analgesic, anti-inflammatory, antimicrobial, and antitumor activity tests will be conducted.

Electrochemical impedance spectroscopy and cyclic voltammetry results will be used for preclinical testing of a given antitumor agent or plant extract on cell lines or model lipid membranes. It will seek a relationship between the agent's interaction and the membrane's structure and composition. The present project will provide an opportunity to analyze the interaction between the membrane structure and the antitumor agent or extract, which is closely related to their future potential application in various aspects of medicine and pharmacy. The researchers will report the research at international scientific conferences and present it as scientific publications in top-quartile journals.

The interdisciplinary team of scientists and researchers working on the realization of the project expects that the major result of their work will be the antibacterial, analgesic, and/or anti-inflammatory activity of the developed compositions from plant extracts (aqueous or essential oils). These results could then be used to develop a pharmaceutical product with colleagues from dosage form technology and grow into a new scientific research project.

The following **results** are expected:

1. Obtaining data on dry plant extracts' chemical composition and mineral content.
2. Obtaining data on fatty acid composition, tocopherol, and sterol content of oil extracts (essential oils).

3. Antioxidant activity of the indicated extracts and antioxidant activity on breast cancer cell cultures of the above extracts.
4. Obtaining results from X-ray structural analysis and Raman spectroscopy, providing information on the extracts' structure and degree of amorphousness or crystallinity.
5. Obtaining data from infrared spectroscopy and fluorescence measurements, providing information on the optical properties and the presence of functional groups in the studied extracts.
6. Obtaining information from the microbiological analysis about the action of the extracts individually and in combination with different strains of bacteria.
7. Cytotoxicity and genotoxicity test results for the tested extracts.
8. Study of analgesic and anti-inflammatory activity.
9. Exploring the interaction of extracts and alkylphospholipids with model systems using ellipsometric studies.
10. Obtaining the electrochemical characteristics of the studied substances and model systems.

The staff of the research team, including specialists from various fields (physicists, biophysicists, microbiologists, chemists, biologists) is a guarantee for conducting wide-ranging and in-depth complex research and for the successful and efficient implementation of the project.