

Despite the continuous development of medicine, the many commercially available drugs and possible therapies, we still have great difficulties in treating some conditions, such as cancer and infections caused by drug-resistant bacteria or fungi. For this reason, there is a need to search for new sources of therapeutic compounds, especially substances with an anticancer activity that show toxicity only towards to cancer cells and antimicrobial compounds as alternatives to currently used antibiotics. Such compounds can be obtained from plants that are abundant in bioactive substances. These include medicinal plants broadly used in traditional herbal medicine to alleviate various ailments.

Medicinal plants and herbs have been used for centuries as a source of a wide range of biologically active (bioactive) compounds. Nowadays, they are also an object of research interest, as plant material and the pure compounds extracted from it have the potential to be widely used in the treatment of various ailments and represent an important source of substances with therapeutic potential. Plant-derived compounds exhibit a broad spectrum of bioactivity, such as anticancer, anti-inflammatory, antioxidant, antibacterial or antifungal activities. The study of the biological properties of extracts and the search for new sources of substances with therapeutic potential that do not show undesirable side effects is an important issue. Before such a substance can be considered as an ingredient for a drug or functional food, it must first undergo a series of primary investigations to confirm its efficacy, safety of use and mechanism of action.

The aim of this project is to determine the anticancer, antimicrobial and antifungal potential of plant extracts derived from: tansy, common chamomile, wild garlic, peppermint, common nettle, St. John's wort, dandelion, red clover, wormwood, watercress, ground-ivy, yarrow, garden angelica, elcampane and valerian. For the study we selected plants commonly found in Poland and used in traditional herbal medicine. Previous studies indicate that some plant-derived substances show biological activity useful in the prevention and treatment of cancer and bacterial and fungal infections. Unfortunately, in some cases, they may also exhibit some side effects. As there is a lack of comprehensive studies confirming the efficacy and safety of some medicinal plants, we have decided to address this issue in this project and carry out thorough analyses of the properties of the plant extracts selected for investigation.

We want to perform screening studies to select plants whose extracts negatively affect the viability and proliferation of cancer cells or inhibit the growth of bacteria or fungi. Those plant extracts with the highest biological activity will be subjected to further analyses to confirm their safety. This will be investigated by excluding negative effects of the extracts on the proliferation or viability of normal human cells and on the viability of beneficial intestinal bacteria.

We will also determine the stability of bioactive compounds in extracts subjected to *in vitro* digestion, which is crucial to confirm whether the extracts will remain active after digestion in the human gastrointestinal tract. We will also assay the antioxidant properties of the extracts. In addition, we will determine the mechanism of action of selected plant extracts on cancer cells and attempt to identify compounds contained in the plant extracts that exhibit the desired biological activities, with the aim of selecting compounds that contribute to the obtained biological effect.

Our proposed research regarding plant extracts will allow to trace the path from detection of their activity to potential application. The results of this project will contribute to understanding the spectrum of activity of a wide range of polish medicinal plants and give a broader picture of their properties. It will address many aspects important to understand the efficacy of the tested extracts and the safety of their potential use. The methods used and the scope of the research guarantee publication of the results in prestigious, high-impact scientific journals.