

Characterization of the selected honeybee products based on omic techniques

„Let the food be thy medicine and medicine be thy food”

Hippocrates

Apitherapy is a field of medicine in which honeybee products (HBP) are used. Because of their nutritional, profilactic and therapeutic properties, they have been used since ancient times. Commonly known examples are the use of bee honey for prevention and treatment of infectious diseases or propolis as the antibacterial, antifungal and antiviral agent. Currently a multitude of preparations (drugs, dietary supplements and cosmetics) based on natural products (including HBP) is available and they have indications for use in a variety of diseases. This is due to increased consumer interest in natural products perceived as healthy, safe and not causing side effects. In the case of drugs, their action related to the presence of active components must be confirmed by i.a. appropriate clinical studies involving patients, whereas that condition does not have to be met by neither dietary supplements nor cosmetics. **Consequently, a number of the offered preparations with unconfirmed biological properties and questionable quality is growing, which is a threat to the health of people using those preparations.**

The composition of honeybee products and their biological activity remains not fully investigated. **Therefore the proposed project aims at searching for novel biologically active compounds derived from selected HBP (honeybee venom, pollen, propolis and royal jelly) based on a modern, advanced omics model.** The term „omics” refers to all fields of science aimed at complete and holistic understanding of the processes occurring in living organisms. Those fields include i.a. proteomics, that deals with the studying of the structure and function of proteins, and metabolomics, that focuses on the study of all metabolites present in a given organism, tissue or cell. Such innovatory and multidisciplinary approach has never been proposed in HBP studies before. **In the proposed project we intend to focus on:**

- proteomic and metabolomic characterization of HBP with special emphasis on looking for novel biologically active substances, assessment of variability in HBP composition (that may influence HBP activity) and finding and depicting factors influencing variability, such as: bee strain, place of origin, year and season of HBP collection;
- toxicological insight into HBP and into influence of toxic compounds on HBP quality in order to provide the reliable data regarding the influence of environmental pollution on HBP;
- biological effects of HBP and their constituents based on the study using organs and tissues of model insects.

HBP samples for the project will be collected from 4 apiaries located in various areas of Poland. **The project will be realized by the application of proteomics and metabolomics that use a set of the up to date molecular methods based on mass spectrometry.** Mass spectrometry is a modern analytical technique applicable i.a. in identifying and defining the structure of chemical compounds. **For evaluation of biological activity of new substances insects will be used, because of the similarity of physiological functions of their tissues and organs to respective structures in human organism.** The data obtained and archived in the biorepository (designed to provide secure storage of HBP samples and data gathered on them) will be subjected to statistical analyses. It will allow to **assess the variability in HBP composition** and factors responsible for that variability, as well as to characterize the correlations between environmental pollution and HBP quality. It will influence on **establishment of standardization norms of HBP.** This will improve the quality and safety of using products based on HBP (drugs and dietary supplements) in prevention and treatment. The realization of the project will also lead to the **discovery of new biologically active compounds which potentially can be used in medicine.** This may positively affect healthcare. Moreover, **unique methodologies based on most-recent analytical techniques will be developed.** They may be used in the study of HBP and other natural products. Such methods may be subsequently implemented by analytical laboratories around the world, which has great importance for development of science. **The unique value of the project will be the creation of open access database of HBP** and their components including their biological, pharmacologic and toxicological properties. It will allow to collect and disseminate of the results of the studies conducted within this project as well as the results obtained by other research teams, both now and in the future.