Dirt and the perpetual need for its regular removal accompany people since the beginning of our civilization. For millennia, the only available means of maintaining hygiene were natural products, including extracts from plants containing natural surfactants. The rapid development of the chemical industry in the nineteenth and twentieth century led to their almost complete denial and replacement by often more effective and cheaper synthetic products (synthetic surfactants). However, due to the delicate balance between the lipids forming the protective layer of the skin and those forming the unwanted dirt, the synthetic surfactants currently used in most cleansing cosmetics often cause mild and severe health problems. They result from the too effective and non-selective removal of lipophilic substances from the skin surface. Together with the dirt, the valuable barrier components of the skin, forming its protective layer are also often removed. Despite the constant improvement of the synthesis and purification methods of synthetic surfactants, the growing awareness of the threats resulting from their production and use, increasingly encourages users of cosmetics and household chemical products (dishwashing liquids, fabric rinsing agents, washing agents, glass cleaners, etc.) to return to traditional and natural products. Hence the growing interest, both among users and among researchers, in natural surfactants (biosurfactants). Previous studies indicate the unique and complex surface properties of biosurfactants, especially those belonging to the group of so-called saponins, occurring in numerous plants, including herbs (e.g. Soapwort, Gypsophila) or vegetables (e.g. soybeans, beets, spinach).

In addition to the ability to produce foam and mildly remove the dirt, one of the most interesting unique features of saponins is the ability to interact with biological membranes. Although some of them cause serious damage to the cell membrane of red blood cells (haemolysis), most of them show a mild effect of fluidizing lipids that form the cell membranes. Thanks to this property, some saponins support the action of vaccines (adjuvants), and thanks to the research carried out during the implementation of this project, in the future they could also be used as penetration enhancers for nutrients and pharmaceuticals through the skin. Such substances enable delivery of selected ingredients to the deeper layers of the skin in a controlled manner. This will improve the effectiveness of currently used skincare cosmetics, but also pharmaceuticals administered in the form of, for example, ointments for the skin.

The aim of the project is to understand the mechanism of promotion of transepidermal transport of biologically active components by saponins isolated from rupturewort, a plant widely used in herbal medicine, and currently a subject of interest of pharmaceutical industry. Great emphasis will be placed on the synergistic effects of saponin and non-saponin components, an aspect very often neglected in previous studies on model systems. The study will employ both the mono- and bilayer systems, and the model cell lines. Understanding the mechanism of transport promotion by saponins will enable to more effectively exploit the great potential of saponin-rich plant extracts in pharmacological applications in the future.