The skin, as the largest organ of the human body, serves a crucial protecting role against external environment, therefore its integrity and rapid regeneration are essential for overall physiological balance. Damages within tissue, such as extensive burns or chronic, non-healing wounds, especially in the course of chronic diseases or as a result of pressure ulcers, poses a serious threat to patients' health. Open wounds create an ideal conditions not only for environmental pathogens but also for microorganisms considered as a healthy skin microbiota. While superficial bacterial infections are well studied, research analyzing the microbial composition from infected wounds revealed the presence of fungal strains belonging to the *Candida* genus, particularly *C. albicans*, *C. parapsilosis*, and *C. tropicalis,* known opportunistic pathogens. Importantly, such infections are often underdiagnosed or inadequately treated, leading to delayed wound healing, and in some cases, fungal infection is identified postmortem. This highlights the need for the effective therapeutic strategies with identification of opportunistic yeast infections. It is worth to underline, that the location of the infection also plays vital role, as fungi from the *Malassezia* genus preferentially colonize sebaceous areas, therefore their involvement in surface infections cannot be ruled out.

During ongoing antimicrobial resistance crisis, it is critical to harness natural defense mechanisms, such as microbial competition. Many probiotic produce substances that inhibit the growth of pathogens, including fungi. In recent years, extracellular vesicles (EVs), nanoscale particles, secreted by both prokaryotic and eukaryotic cells, have attracted growing attention. Due to their small size (100–300 nm), diverse molecular content, and intercellular signaling potential, EVs are considered an important elements of cellular communication that can influence various biological processes.

The aim of this project is to evaluate the potential of EVs, secreted by bacterial strains associated with the skin microbiome for innovative therapy development, which would combine the enhancement of the wound healing with antifungal effects, critical during treatment of chronic inflammation coinfected by yeast cells. EVs application is a promising strategy due to their biocompatibility and the fact that fungal microorganisms are unable to develop resistance against those particles. Moreover, previous studies have demonstrated that the composition of EVs can be altered in response to stress conditions, with these alterations varying depending on the organism. Therefore, an additional goal of the project is to assess the feasibility of a natural cellulose biopolymer wound dressing, targeted against specific pathogenic strains. The study will include a detailed characterization of the isolated vesicles and in vitro evaluation of their effects on human keratinocytes. In subsequent phases, a three-dimensional skin model will be employed to assess both wound healing efficiency and the progression of fungal infection. The final stage will involve the application of the developed covering in vivo, using the alternative animal model *Galleria mellonella* larvae, which will serve to evaluate therapeutic efficacy in the context of burn wounds.