Microorganisms have been accompanying human since the dawn of history. Although they are invisible to the naked eye, the effects of their activity are known to everyone. In this large and extremely diverse group we can distinguish strains that are beneficial to humans, neutral or pathogenic. Pathogenic organisms have always been a challenge for medicine (humanity). In the second decade of the twentieth century, Scottish researcher Alexander Fleming discovered , as a result of accidental bacterial culture media contamination by *Penicillium notatum*, the presence of fungi inhibits the growth of bacterial colonies. This discovery allowed to isolate a penicillin, a biologically active compound with antibacterial properties. However, such a spectacular discovery did not stop the development of bacterial diseases, because bacteria have learned to "ignore" the drug by producing enzymes that break down or modify an antibiotic activity. The widespread use of antibiotics has led to the emergence of drug-resistant strains that are responsible for the deaths of millions of people each year. Therefore, in the fight against drug resistance more effectively, it is necessary to synthesize new substances that microorganisms will not be able to generate feedback mechanisms.

The aim of research project is to develop innovative technologies for the production of metal composites based on milk and whey proteins and the synthesis of metal and metal oxide nanoparticles performed by probiotic strains of lactic acid bacteria. In order to obtain biologically active proteins and probiotic bacterial strains will be used cow's milk and whey referred to as "forgotten treasure". During the project realization, the nature of metal binding to protein and the physicochemical phenomena leading to the synthesis of Me/MeO nanoparticles by lactic acid bacteria will be investigated. For this purpose, state-of-the-art research instruments such as matrix-assisted laser desorption/ionization approach and tools of quantum chemistry such as molecular modeling and quantum-mechanical calculations will be used. It is expected to obtain active metal-protein composites and nanoparticles of the metal and metal oxide combine with e.g. lactic acid metabolite with high-potential bactericidal, bacteriostatic, antifungal and antitumor properties. The obtained milk and whey protein-based metallocomposites and biologically synthetized nanoparticles of metals and their oxides will provide a viable alternative to commonly used formulas for the e.g. treatment of bedsores, which are a serious problem in the care of the lay person.