Abstract for general public

Bacterial resistance is one of the biggest threats in human global health. The increased use of antibiotics in the medicine and food industry led to the crisis of antibiotic-resistance in bacteria. *Staphylococcus aureus* is considered one of the most threatening pathogens in humans. This bacterium has a high propensity to develop multi-drug resistance. In the past, it was associated with nosocomial infections, but now it has emerged in community-acquired infections and it spreads rapidly among healthy individuals. The major issue in the development of new therapies against *S. aureus* infections is the decline of conventional antibiotic therapy efficiency.

Non-antibiotics antibacterials are proposed to expand the drug repertoire, to complement conventional antibiotic treatment, and to combat antibiotic-resistant bacterial strains. These proteins can be found in natural sources, including a wide range of microorganisms, and they currently are of a great interest to medicine, pharmacology, and veterinary. New antimicrobials should both exhibit novel modes of action as well as affect different cellular targets in comparison to the existing drugs, to escape cross-resistance. Many antibacterial proteins (e.g. lysozyme, autolysins) demonstrate antimicrobial activities against various bacteria, and they are proposed as model proteins to develop new potent antibacterial agents with broader specificity and without cross-resistance induced by antibiotics.

The expected impact of this project relates directly to the problem of infections caused by drug-resistant bacterial strains. This project addresses this challenge by proposing a new possible antibacterial agent: protein orf096, derived from bacteriophages (antibacterial agents). Phage derived bacteriolytic proteins, are products or structural elements of phages naturally existing in our bodies, and importantly, they do not exert harmful effects on human and animal bodies or cells. Bacteriophage derived lytic proteins (e.g. endolysins) have been proposed as promising and potent candidates for antibacterial agents. In-depth understanding of active antibacterial phage proteins is the key for their wide use in medicine and veterinary in the future. Phage studies are an area of scientific investigation that expands rapidly. Here we propose a project focused on a new antibacterial agent, which can potentially be applied in treatment of *S. aureus* infections, including methicillin-resistant *Staphylococcus aureus (*MRSA). Hitherto unknown structure and complex specificity characterization, as well as biological properties of the studied protein will be studied and described in this project. The objective of the project is to recognize antibacterial potential of phage-derived protein orf096 active against *Staphylococcus aureus*. This project involves identification of molecular mechanisms and kinetics of antibacterial action. The study covers the effect of orf096 protein on *Staphylococcus aureus* isolates, including MRSA.