

DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Introduction of antibiotics for the treatment of bacterial infections in humans and animals have resulted in abandonment of research on alternative ways to combat pathogenic bacteria. Nowadays, when antibiotic resistance is reaching a crisis situation, non-antibiotic therapies to treat bacterial infections are an absolute necessity.

One exciting alternative to antibiotics in the fight against antibiotic-resistant bacterial infections are bacteriophages (phages), i.e. viruses infecting bacterial cells. Another option is the use of nanoparticles of metals and of metal oxides (gold, silver, platinum, zinc oxide, copper oxide or titanium oxide) that display antimicrobial properties. Nanoparticles are particles having a diameter of less than 100 nm. Both of the above mentioned alternatives certainly have advantages and disadvantages for the use in therapy. However, until now, there have been no scientific or clinical reports of the use of these agents (nanoparticles and phages) together as a combined new therapy against pathogenic bacteria.

The aim of the project is to explore the potential for development of an innovative therapy based on the use of both phages and nanoparticles. This new therapy will employ modified phages that are able to specifically bind nanoparticles displaying antimicrobial properties. Bacteriophages equipped with nanoparticles - we propose to call them *nano-phages* - would operate as couriers and deliver nanoparticles to specific bacterial cells.

In addition to advancing the field of research on new therapeutic agents, the results of the project will expand basic knowledge in the field of bionanomaterials and their uses in medicine. The project will be carried out by an interdisciplinary research team of molecular biologists, microbiologists, chemists and pharmacists. Interdisciplinary approach will enable detailed physico-chemical analysis of the nano-phages, exploration of molecular interactions between bacteriophages and nanoparticles and may lay the groundwork for developing a new effective weapon in the fight against antibiotic-resistant bacterial infections. Additionally, the obtained results will also have an impact on the development of other economy sectors such as construction of new bionanomaterials.