Description for the general public of the project entitled: ”**Studies of the role of toxin-antitoxin systems in antibiotic resistance in staphylococci**”.

Staphylococci are bacteria which constitute the natural microflora of the skin and mucous membranes of humans and warm-blooded animals. On the other hand, they are dangerous opportunistic pathogens that can cause a number of diseases in their hosts. This threat is further strengthen by the increasing drug resistance of bacteria which causes serious difficulties in the treatment of staphylococcal infections.

Toxin-antitoxin systems (TA) are ubiquitous in bacteria but not present in eukaryotes. They consist of ‘toxin’, an intracellular protein often having enzymatic properties, and ‘antitoxin’ which is its specific inhibitor. Activation of the system as the consequence of the release of toxin leads to the “poisoning” of the cell resulting in, among others, growth inhibition or even its death. Although the role of the TA systems in bacterial physiology is still the subject of a heated discussion, it is known that these systems are involved in the stabilization of genetic material and the response to stress caused among others by antibiotics. Preliminary studies have shown that TA systems’ genes in staphylococci often occur together with genes for antibiotic resistance.

In the frame of the project we plan to explore the correlation between the presence of TA systems in staphylococci and their antibiotic resistance. The research will seek for the explanation whether and how TA systems influence the acquisition and stabilization of genetic material coding for antibiotic resistance. In addition, we intend to examine how the activation leading to the release of the enzymatic activity of the toxin (RNase) controls the degree of susceptibility of *Staphylococcus* to selected antibiotics.

Implementation of the project requires a number of techniques from the field of bacteriology, molecular biology and biochemistry. Among others, databases will be searched with the use of specialized software. For the functional characterization of the newly discovered TA systems chromatographic and electrophoretic techniques will be applied. Using specialized equipment the impact of TA systems on the action of antibiotics towards bacteria will be examined as well.

The study of the effect of TA systems on drug resistance of staphylococci are in concordance with the latest trends in the research in the field of modern bacteriology. This is particularly important in the case of bacteria from *Staphylococcus* genus, opportunistic pathogens,as these bacteria are the cause of many serious infections in humans and animals leading to a number of diseases that pose a serious public health hazard, and entail substantial losses in animal farming. Studies of relations and mechanisms linking TA systems to resistance of bacteria to antibiotics undoubtedly expand our knowledge in the field of the modern bacteriology with future implications for medical practice and veterinary medicine. Moreover, the planned research addresses the burning issue of the growing drug resistance in bacteria, for solving of which national and international institutions and organizations call insistently.