Description for the general public of the project
„*Ultra-sensitive tools for detection antibiotics as a new strategy to control treatment and withdrawal period after cattle antibiotic therapy*"

Currently, bovine mastitis has become a multifactorial disease characterized by high clinical and economic significance. Economic losses caused by mastitis include reduced milk production and changes of its composition, loss of output due to antimicrobial resistance and veterinary costs. The different treatment methods in particular European countries has caused the resistance of selected bacteria to antimicrobial agents. Studies show that excessive antibiotic treatment has resulted in the greater resistance of mastitis pathogens. So, the development of technologies for detection of antibiotics able to use to on-site in the field diagnostics of bovine mastitis are very desirable and would permit for rapid intervention to stop and prevent mastitis. Therefore, it is very important to develop a **very sensitive**, **simple**, **cheap**, and **selective** antibiotic detection tool applicable for therapy effects in order to perform a large amount of analyses in a short time. Electrochemical biosensors which we plan to use for this purpose meet such requirements.

To date, several systems have been developed for the electrochemical detection of antibiotics. However, simultaneous detection of many antibiotics during one measurement cycle, on single working electrode using redox markers is a big challenge and has not been presented so far. The most important features of such tests are low cost, labour and convenience. This subject is timely and extremely important, not only from a scientific point of view, but also has a deep social significance. Thus, in the frame of this project, we undertake to solve these interesting issues. We are going to develop electrochemical systems allowing detection of at least two antibiotics on a single measurement electrode. For the construction of these systems, we will use aptamers as the receptor elements, which will be attached in a stable and oriented manner on the nanoparticles surface. The analytical signal will be generated by redox active labels attached to the nanoparticles or encapsulated into protein nanocages. Antibiotics concentrations will be tested using developed systems in samples of milk, blood, muscle and fat tissue from cattle in the course and after bovine mastitis antibiotic therapy done by experienced veterinarians In the frame of the project, physiologically based pharmacokinetic model for antibiotic residue will be proposed The model will allow the user to change the initial level of chosen used antibiotic and simulate the antibiotic level over any time frame in the chosen tissues (blood, milk, fat, muscle).This research will be carried out using electrochemical and optical techniques available at home institute. We have suitable knowledge, a research workshop and experimental experience, which allows us to believe that the results obtained will have an impact on the development of basic knowledge in this topic. Additionally, systems designed may in the future find practical application in the cattle antibiotic therapy.