Objective of the project: The scientific problem aimed to be solved by the proposed project is examination of the contribution of ferritin operon genes i.e. *lmo0944*, *lmo0945*, *lmo0946* and *lhrC5* to the virulence, antibiotic resistance and adaptation of *Listeria monocytogenes* to different stress conditions, investigation of the importance of posttranscriptional regulation of expression of these genes by three small antisense RNAs encoded within the analyzed operon, and assessing the effect of the studied genes on the global gene expression of *L. monocytogenes* in conditions related to pathogenesis process.

The basic research to be carried out: Ferritin is a protein which plays an important role in the virulence, resistance to β-lactams antibiotics and adaptation to various stress conditions of human pathogen *L. monocytogenes*. This protein is encoded by the first gene of the operon in which four other genes are located whose physiological function and role in the adaptation to stress remain hitherto unknown. In the project we intend to investigate the role and mechanism of action of these unknown genes of the ferritin operon through the use of conventional molecular biology, classical microbiological and high-throughput methods as well as studies on the tissue cultures and animal model. The study will start from construction of the single point mutant strains of *L. monocytogenes* in genes of the ferritin operon as well as genes encoding small antisense RNAs. The obtained mutant strains will be then used to performe a wide-ranging, physiological analysis, during which the properties of the mutant strains will be compared with the properties of wild-type strain of *L. monocytogenes*. These studies will include assessment of the ability to grow and survive in various stress conditions (cold, heat, starvation, ethanol, acidic, osmotic and oxidative stress), examination of the ability to grow on different iron sources as well as in iron limitation, susceptibility to antibiotics, estimation of capability of the mutants to invade, survive, multiplication and spread from cell to cell in cultured cell lines and determination of the effect of individual mutations on virulence of *L. monocytogenes* in mouse model of infection. Research will also include comparative transcriptomic analysis of mutant strains and the wild type strain, which will be performed by total RNA sequencing and qRT-PCR method. The results of our preliminary studies indicate that, the most likely, the ferritin operon genes encode previously unidentified factors involved in virulence, antibiotic resistance and adaptation to stress conditions. Carrying out the planned studies allow confirm this hypothesis, and thus provide new and important information about the physiology of pathogenic bacterium *L. monocytogenes*. The proposed research provides also new data on the posttranscriptional control of expression of the genes responsible for the adaptation of bacteria to stress conditions with the participation of small RNAs. In this way we broaden our understanding on the mechanisms and strategies used by pathogenic bacteria to survive in adverse environmental conditions.

Reasons for choosing the research topic: *L. monocytogenes* is a foodborne Gram-positive opportunistic pathogen that can adapt to survival and growth in a wide range of environmental conditions. *L. monocytogenes* can cause disease of humans and animals. The most common symptoms of listeriosis include meningitis, septicemia and perinatal infections.This bacterium is widely distributed in the environment, and consequently, it is often also present in the raw materials used in the food industry. *L. monocytogenes* is also well equipped to survive food processing technologies i.e. well tolerate high salt concentrations and low pH values, and is able to multiply in refrigerated temperatures and survive in frozen products. Cases of listeriosis, an infection with a mortality rate up to 30 % despite undertaken antibiotic therapy, are associated with the consumption of food contaminated with this microorganism. In an effort to decrease the significant human and economic costs associated with listeriosis, it is crucial to develop of methodologies to prevent the survival and growth of *L. monocytogenes* in the clinical and non-clinical settings. In the respect, one of the primary goals should be identification and characterization of the unknown factors which contribute to virulence of *L. monocytogenes*, as well as enable to survive this bacterium in adverse environmental conditions including low temperature, high concentrations of salt, relatively low pHs, and antibiotic pressure. Understanding of the mechanisms underlying these phenomena may in the future help to develop new treatment strategies for this important human pathogen.