Reg. No: 2015/18/E/NZ6/00643; Principal Investigator: dr Agata Edyta Krawczyk-Balska

Objective of the project: The scientific problem aimed to be solved by the proposed project is to explain the mechanism of regulation of the ferritin operon genes of *Listeria monocytogenes* by RNA chaperone - protein Hfq.
The basic research to be carried out: In the project, the studies will be carried out which lead to investigate the mechanisms and strategies used by pathogenic bacteria to effectively adapt to different stressful conditions, including those related to virulence and resistance to antibiotics. 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 *Listeria monocytogenes*. This protein is encoded by the first gene of the operon in which four other genes are located which potentially play an important role in the aforementioned stress adaptation. Pathogenic bacteria use a variety of regulatory mechanisms to ensure an appropriate level of expression of genes such as ferritin operon genes , i.e. genes that enable efficient infection of the human body, the survival of antibiotics action and survival in adverse environmental conditions. The results of our preliminary studies suggest that chaperone RNA - protein Hfq is indispensible for the appropriate level of expression of ferritin operon genes of *Listeria monocytogenes*. Based on the results of our preliminary studies, we assume that Hfq-mediated regulation of expression of ferritin operon genes can have crucial role for the adaptation of *Listeria monocytogenes* to different stressful conditions, including those related to virulence and antibiotic susceptibility. In the project, through the use of molecular biology methods, genetic engineering and conventional microbiological methods, we intend to investigate the involvement of chaperone Hfq and its role in regulation of expression of ferritin operon genes in various stress conditions and to elucidate the molecular mechanism of this regulation involving Hfq. Discovery of the mechanism of regulation of the expression of ferritin operon genes by chaperone Hfq will provide new data concerning the regulation of genes playing an important role in adaptation of *Listeria monocytogenes* to different stressful conditions, including those related to virulence and antibiotic susceptibility as well as give a more comprehensive view of the regulatory networks controlling stress response in this pathogenic bacterium. In this way we broaden also our understanding on the mechanisms and strategies used by pathogenic bacteria to survive in adverse environmental conditions.
Reasons for choosing the research topic: *Listeria monocytogenes* is a foodborne Gram-positive opportunistic pathogen that can adapt to survival and growth in a wide range of environmental conditions. *Listeria 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. Listeria 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 *Listeria monocytogenes* in the clinical and non-clinical settings. In the respect, one of the primary goals should be discovery and characterization of the mechanisms which enable to survive *Listeria monocytogenes* in adverse environmental conditions including low temperature, high concentrations of salt, relatively low pHs, and antibiotic pressure, as well as which contribute to virulence of this pathogen. Understanding of the mechanisms underlying these phenomena may in the future help to develop new treatment strategies for this important human pathogen.