The increasing number of bacteria resistant to many, and sometimes all, known antibiotics is a serious threat for public health. This leads to danger of failure of possible therapies and spreading of super-pathogenic strains. Therefore, the effort are undertaken to obtain new sources of antimicrobial agents, by synthesis of novel compounds and taking advantage of chemicals naturally present in nature. Especially, plants are a rich source of secondary metabolites and essential oils with potential health benefits, including antibacterial effects. Some of them have been used as antiseptic, medicinal and food preservation agents for thousands of years. Thus, plant-derived compounds can be considered as prospective antimicrobial factors for new therapeutic strategies to combat pathogen infections. Nevertheless, establishing and registering of new therapeutic compounds have to be preceded by systematic studies of their mechanisms of action and, importantly, their safety doses for humans.

Among phytoncides exhibiting antimicrobial potential are those obtained from plant species of the genus *Cinnamomum,* where the main component of essential oils is *trans*-cinnamaldehyde (CNMA). The aim of our study is to elucidate the mechanism of the antibacterial effect of this compound against pathogenic strain of enterohaemorrhagic *Escherichia coli* (EHEC). The EHEC infection, besides the typical bloody diarrhea, may cause serious life threatening complications such as hemolytic uremic syndrome, hemolytic colitis and acute renal failure. The outbreaks of EHEC, as a result of food poisoning, happen worldwide, also in developed countries. The lack of effective and safe therapy constitutes EHEC infection a serious health danger. The virulence of this strain is associated with the production of Shiga toxin. The genes encoding toxins are located in the semi-independent genetic system - bacteriophages genome integrated within host bacterial chromosome. Thus, the problem necessary to solve while designing the novel therapy is how to stop bacterial growth without inducing toxin production.

Our previous studies showed that some of the plant-derived compounds, isothiocyanates, can exhibit antimicrobial effects simultaneously blocking the dangerous Shiga toxin synthesis, via inducing a specific bacterial stress response. The preliminary results of our laboratory suggest that antimicrobial properties of CNMA could be based on triggering similar way of stress control. Therefore, we plan to assess the molecular mechanism of this effect. Moreover, we plan to extend our studies towards the silver-based nanoparticles synthesized with CNMA. Nanotechnology is currently one of the leading topics in biomedicine and physics, and nanoparticles (NP) is widely used in textiles, electronic and in medicine, where they are often employed as antibacterial agents. We have developed novel environmental friendly method of synthesis of AgNP using CNMA. After thorough physical and chemical analysis of this compound we will study its antimicrobial potential and mechanism of action. Our aim is also to determine the safety of CNMA and CNMA-AGNPs for eukaryotic cells and animals (both insects and mouse). The results of these experiments will lead us to answer the question whether CNMA and CNMA-AGNPs could be efficiently used to combat EHEC infections which will be studied on the animal model.

Therefore, our studies are anticipated to provide comprehensive set of data on the mechanisms of action of plant-derived compound, CNMA and its silver nanoparticle against pathogenic bacteria. It will be a basis for further studies on possible therapeutic strategy for serious and difficult to eradicate infections such as these caused by enterohaemorrhagic *Escherichia coli*.