Bacterial resistance to conventional antibiotics is serious health issue that are spreading globally. It can affect anyone, in any time and in any country. In recent years, an excessive and groundless intake of antibiotics causes rapid development of multi-drug resistant to conventional antibacterial drugs. A systematically increasing number of such dangerous pathogenic species coupled with antibiotic development waning is one of the most serious global health care issue, leading to antibiotic crisis and era without effective antimicrobial agents. Therefore, undoubtedly, research on design and synthesis of new, effective broad spectrum antimicrobial agentsis of a paramount significance to public health care system and modern medicine.

It was observed that also cancer cells can develop resistance to available metal based drugs. Used all over the world chemotherapy based on metallodrug cisplatin is becoming less and less effective and cause many server side effects. Therefore, to overcome resistance to Pt based metallodrugs and minimalize side effect, new metal complexes should be evaluated in terms of anticancer properties.

Thus, in this project I will design, synthesize and characterize novel, light stable and water soluble silver(I) coordination compounds and their composites materials that upon solvation and ultrasound irradiation kill bacteria, viruses, fungus as well as exhibit cytotoxic activity against specific cancer cells and tune their bio-functionality and physicochemical characteristic. The new silver(I) compounds will be driven by different water-soluble N,P-aminophosphines such as 1,3,5-triaza-7-phosphaadamantane (PTA) and its derivatives, and various ancillary ligand such sulfonamides, propionic and phenylacetic acids, nonsteroidal anti-inflammatory drug, modified antibiotics and vitamin B3 derivatives.

I will directly modulate ancillary ligands type in order to modify molecular architectures as well as investigate the influence of ligand structural factors on the formation and antimicrobial/anticancer efficiency of the obtained Ag-polymeric networks. Such fabricated coordination networks will be further deposit on polymeric or gel matrix in order to enhance their functional properties as well as broaden their application as advanced tailor-made multifunctional antimicrobial materials. The targeted benefit of these actions will potentially include simply low-cost synthesis, improvement of bioavailability, desired stability, tailorable water solubility, efficient antimicrobial activity coupled with other therapeutic effect such analgesic or anti-inflammatory action of obtained PTA based materials, that can serve as leads for discovering innovative therapeutic agents and antimicrobial ion release plastics and materials.