Nonquaternary diallylammonium polymers with different amine structure and their biocidal effect on *M. tuberculosis and M. smegmatis*

Larisa M. Timofeeva
RC Biotechnology TIPS RAS, Russia

Statement of the Problem: Mycobacteria, especially *M. tuberculosis* is one of the most dangerous types of microorganisms to cause diseases and mortality. While specific resistance of *M. tuberculosis* to drug therapy is thought to be caused by antibiotics action, the general resistance is due to the known distinctive structure of mycobacterial cell wall (CW). Owing to the CW structure, mycobacteria are protected from the penetration of overwhelming number of soluble substances including majority of antibiotics and common chemical disinfectants and biocides. Methodology & Theoretical Orientation: In the presented work, protonated polydiallylamines (PDAAs) based on trifluoroacetic salts of the secondary and tertiary (with Me/Et N-substituents) diallylamines have been synthesized that may be defined as the representatives of a novel family of synthetic water-soluble cationic polyelectrolytes. The in vitro antimicrobial activity of PDAAs against *M. tuberculosis* and *M. smegmatis* including "nonculturable" dormant *M. tuberculosis* cells has been evaluated, as well of quaternary counterpart poly(diallyldimethylammonium chloride) (q-PDADMAC) and current antibiotics rifampicin and ciprofloxacin as control systems to compare activities at the similar conditions. Examination of *M. smegmatis* cells in presence of PDAAs/(rifampicin, isoniazid) under an optical microscope in the epifluorescence modes has been performed. Studies on electrophoretic mobility of *M. smegmatis* cells and some model liposomes have revealed a small negative charge of the cells outer surface and recharge in the presence of cationic PDAAs. Conclusion & Significance: The PDAAs possess high mycobactericidal activity including dormant *M. tuberculosis* cells at a variable time treatment (1.5-72 h) and cells concentration (105-107 CFU mL-1), unlike q-PDADMAC and the antibiotics which are significantly less efficient or inactive at all (at a maximal tested concentration of 500 □g mL-1). To all appearances, PDAAs' impact does not target specific metabolic processes, unlike antibiotics, and is related to disturbance of the integrity of mycobacterial outer bilayer followed by fatal damage of the inner membrane permeability of mycobacterial cells.

Speaker Biography

Larisa Timofeeva is an expert in the field of processes for preparing novel cationic polymers, including mechanism and kinetics of polymerization reactions in solutions and theory of monomers reactivity, as well as novel polyamines with antimicrobial activity. She has years of experience in scientific research work in Topchiev Institute of Petrochemical Synthesis of RAS. Last 15 years, her research activity was aimed at solving the known problem of polymerization of diallylammonium monomers. She has developed an approach which allowed to obtain protonated polyamines of poly(diallylammonium) series with relatively high molecular weight. It has been discovered that polymers of this novel family exert strong biocidal action on multiple clinically relevant pathogens including rare activity against mycobacteria *M. tuberculosis*.

e: timofeeva@ips.ac.ru

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