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PLANT-EXPRESSED PYOCINS AS ANTIBIOTIC ALTERNATIVES AGAINST PSEUDOMONAS AERUGINOSA

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P*seudomonas aeruginosa* is a gram-negative bacterium, a common pathogen in healthcare-associated infections. This opportunistic microorganism establishes itself in vulnerable patients, such as those with cystic fibrosis or hospitalized in intensive care units. *P. aeruginosa* is one of ESKAPE pathogens (*Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa* and *Enterobacter* spp.) causing hospital infections, which readily develops resistance to antibiotics. Various *P. aeruginosa* strains rival with each other by secreting various activity spectrum antibacterial proteins called pyocins: deoxyribonucleases, ribonucleases, pore-forming proteins, peptidoglycan synthesis-blocking proteins, lectin-like proteins, and bacteriophage tail-like protein complexes. We successfully expressed pyocins of several different types in *Nicotiana benthamiana* - TMV (Tobacco Mosaic Virus) transient expression system and purified them to homogeneity. We demonstrated that plant-expressed pyocins effectively reduce *P. aeruginosa* CFU (colony forming unit) counts in liquid culture and biofilm assays and rescue *Galleria mellonella* larvae from lethal *P. aeruginosa* infection in challenge assays. Since pyocins tend to be strain specific, we evaluated the spectrum of their activity with a collection of one hundred clinical strains. By using only three

pyocins (S5, PaeM and PaeM4), we were able to target as much as 68% of tested clinical strains, including multidrug resistant isolates. In conclusion, plant-expressed pyocins may have potential use as antimicrobial agents.

Recent Publications

1. Starkevič U et al. (2015) High-yield production of a functional bacteriophage lysin with antipneumococcal activity using a plant virus-based expression system. *Journal of Biotechnology*. 200:10-16.
2. Paškevičius Š (2017) Plant expressed pyocins for control of *Pseudomonas aeruginosa*. *PLoS ONE* 12(10):e0185782.

Biography

Urtė Starkevič is a PhD student of Chemical Engineering at Vilnius University, Lithuania and a Research Worker in UAB Nomads company. She is currently focusing on synthesis of antimicrobial proteins using a plant virus-based expression system.

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