Evaluating the Antibacterial Efficacy of Margatoxin Against Ciprofloxacin-Resistant *Pseudomonas aeruginosa* Clinical Isolates

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Abstract

Pseudomonas aeruginosa is a gram-negative opportunistic pathogen and a major multidrug-resistant organism due to its high adaptability and ability to withstand various classes of antibiotics. Ciprofloxacin resistance strains, in particular, have become a significant clinical concern. . This study evaluated the antibacterial activity of margatoxin (MgTX), a scorpion-derived peptide, against ciprofloxacin-resistant *P. aeruginosa* clinical isolates. Twenty clinical isolates of *P. aeruginosa* was obtained from hospital bacteriology laboratories. Antimicrobial susceptibility to piperacillin (100 μg), imipenem (10 μg), ceftazidime (30 μg), amikacin (30 μg), and ciprofloxacin (5 μg) was determined using the Kirby–Bauer disk diffusion method. Biofilm formation was assessed using the microtiter plate assay. The synergistic interaction between MgTX with ciprofloxacin was evaluated using the checkerboard method. All isolates exhibited ≥90% resistance to the tested antibiotics. Ciprofloxacin resistance levels ranged from 128 to 1024 μg/mL. against ciprofloxacin. All isolates were capable of forming biofilms, displaying weak to strong biofilm phenotypes. Checkerboard analysis demonstrated a synergistic interaction between MgTX and ciprofloxacin. resulting in dose-dependent inhibition growth. The findings indicate that margatoxin may serve as a potential alternative or adjunct therapeutic agent for managing ciprofloxacin-resistant *Pseudomonas aeruginosa* infections. Its antibacterial activity likely involves interaction with specific bacterial targets and induction of cell death, possibly through membrane disruption. However, further research—including toxicity assessment, mechanism-of-

action studies, and in vivo evaluations—is required before determining its suitability for clinical application.

Keywords: Margatoxin**,** Fe_3O_4@SiPr, *Pseudomonas aeruginosa,* silibinin

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