

ABSTRACT

Charles University in Prague, Faculty of Pharmacy in Hradec Kralove

Department of Biological and Medical Sciences

Author: Bc. Hana Straková

Supervisor: PharmDr. Miroslav Kovařík, PhD.

Consultant: PharmDr. Jan Marek, PhD.

Title: Planktonic and biofilm form of pathogenic microorganisms - effectiveness of disinfectants

Diploma thesis

Study program: Bioanalytical laboratory diagnostics in healthcare

Introduction: Quaternary ammonium salts are widely used in the field of disinfection and antiseptics. Commonly used compounds on this basis include, for example: Benzoxonium chloride (Orofar), Didecyldimethylammonium chloride (Sanytol), Carbethopendecinium bromide (Septonex) and many other substances.

Objectives: The aim of this diploma thesis was to test 10 substances of the quaternary ammonium salt type, divided into two groups using the microdilution broth method on selected bacterial strains and compare it with the standards used in practice. Furthermore, the selected compounds were evaluated for the ability to inhibit the growth of planktonic and biofilm form of the *Staphylococcus aureus* strain.

Methods: The antimicrobial activity of 10 novel compounds divided into two groups according to the structure on eight bacterial strains was measured by the microdilution broth method: *Staphylococcus aureus*, methicillin-resistant *Staphylococcus aureus*, *Staphylococcus epidermidis*, Vancomycin-resistant *Enterococcus*, *Escherichia coli*, *Klebsiella pneumoniae*, *Klebsiella pneumoniae* Extended spectrum β -lactamases (ESBL) positive and multi-resistant *Pseudomonas aeruginosa*. Furthermore, the efficacy against bacterial biofilm was evaluated using crystal violet and triphenyl tetrazolium chloride.

Results: Gram-positive strains were generally more sensitive to evaluated compounds than gram-negative ones. In the overall evaluation, none of the substances exceeded the efficacy of the standard substances. When compared for individual strains, some tested substances were even better than the standards. By determining the minimum biofilm inhibitory concentration, the test substances were able to suppress biofilm growth.

Conclusion: The efficacy of newly synthesized compounds, especially on gram-positive bacteria, was observed. Furthermore, the comparison to inhibit the growth of planktonic and biofilm form of the *Staphylococcus aureus* strain were established.

Key words: Biofilm, quaternary ammonium salts, antimicrobial efficacy testing, microdilution broth method, minimum inhibitory concentration, minimum bactericidal concentration, minimum biofilm inhibitory concentration