

3rd International Conference on
Infection, Disease Control and Prevention
&
2nd International Conference on
Microbial Pathogenesis & Infectious Diseases
June 25-26, 2018 | Vancouver, Canada

Synthesis, antimicrobial efficacy and structure-activity relationships of three series of benzalkonium salts

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Three series of N-alkylammonium salts (7a-c, 8a-b, 9a-b) based on quaternary ammonium compounds with a different length and type of carbon chain (C_{12} , C_{14} , C_{16}) were synthesized, characterized (EA, HRMS, NMR) and tested *in vitro* for antimicrobial (antibacterial, antifungal and antialgal) activity. Furthermore, the critical micelle concentration (CMC), capacity factors k and cytotoxicity were likewise measured to elucidate possible structure-activity relationships. The antimicrobial activity of the prepared compounds has been evaluated and compared. All compounds being tested proved high efficacy against both Gram-positive and Gram-negative bacterial strains, excluding the activity against multi-resistant *Pseudomonas aeruginosa*. Antifungal testing showed high activity of most compounds against fungal strains (yeasts and filamentous fungi) except of *Aspergillus niger*. The relationship between length of carbon chain and the efficiency has been observed. Series 7a-c proved high antialgal efficacy. Cell viability assay confirmed an expected trend that increasing carbon chain length results in higher cytotoxicity.

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