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Evaluation of antibacterial activity of five biocides and the synergistic effect of biocide/EDTA combinations on biofilm-producing and non-producing *Stenotrophomonas maltophilia* strains isolated from clinical specimens in Iran

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Abstract

Background: The overuse of biocides in healthcare-facilities poses risk for emergence and spread of antibiotic resistance among nosocomial pathogens. Hospital-acquired infections due to *S. maltophilia* have been increased in the recent years and with its various resistance mechanisms contribute to patient morbidity and mortality in hospitals. The current study aimed to evaluate the susceptibility of biofilm-producing and non-producing *S. maltophilia* clinical isolates to five commonly used hospital biocides, alone and in combination with EDTA to examine the synergistic effect of combining EDTA on the bactericidal activity of them by microbroth dilution method. As well as the frequency of efflux genes encoding resistance to biocides among isolates. This study also intended to assess the effect of exposure of *S. maltophilia* isolates to sub-inhibitory concentrations of sodium hypochlorite upon the antimicrobial susceptibility patterns.

Results: Based on minimum inhibitory and bactericidal concentrations of biocides sodium hypochlorite 5% (w/v) and ethyl alcohol 70% (v/v) were the strongest and weakest biocides against *S. maltophilia* isolates, respectively. The combination of EDTA with biocides significantly increased the effectiveness of the studied biocides. Exposure to sub-inhibitory concentration of sodium hypochlorite showed a significant change in the susceptibility of isolates towards ceftazidime ($p = 0.019$), ticarcillin/clavulanate ($p = 0.009$), and chloramphenicol ($p = 0.028$). As well as among the isolates examined, 94 (95%) were able to produce biofilm. The frequency of *sugE1* resistance genes was found in 90.7% of our clinical *S. maltophilia* isolates. None of the isolates carried *qacE* and *qacED1* gene.

Conclusions: The current study recommended that using the mixture of biocides with EDTA can be effective in reducing nosocomial infections. Also, this study demonstrated that exposure to sub-inhibitory concentrations of

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