Antimicrobial potential of routine disinfectants agents used in health care units against opportunistic pathogenic bacterial species


Abstract
Biofilms are surface attached, matrix embedded micro-organisms. Biofilms are difficult to eradicate since Biofilm structure prevents the penetration of chemical agents and makes more resistant to antimicrobials. This research evaluate the efficacy routine chemical agents in removing bacterial biofilms. Agar well diffusion, MIC and MBC evaluate the efficacy against planktonic bacteria. Post-exposure biofilm biomass was quantified using CV assay. All disinfectants tested effectively eradicate biofilms and planktonic bacteria, whereas 2% chlorhexidine diglucogonate and 2% sodium hypochlorite demonstrate highest efficacy.

Key words: HAI, Disinfectants, biofilms

Introduction
Hospital acquired infections are common health care facility associated problem which cause serious health issues annually. Different precautions are taken to prevent and control HAI, including surface decontamination using synthetic chemicals. Biofilms are complex ecosystem; consist of surface attached microbial cells embedded in exo-polymers substances derived from cells and their environment. Biofilms are more resistant to external physical and chemical stresses due to their extracellular matrix. Therefore, the efficacy of disinfectants use in health care facilities in Piracicaba/SP is necessary to be researched in order to control the occurrence of HAI. This study determines the efficacy of 77% ethyl alcohol, 1% and 2% chlorhexidine diglucogonate and 2% sodium hypochlorite against hospital acquired infection causing bacterial species by using in vitro biofilm models on 96-well sterile flat bottomed microtiter plates.

Results and Discussion
Synthetic chemical agents, namely, 77% ethanol, 2% sodium hypochlorite, 1% chlorhexidine diglucogonate and 2% chlorhexidine diglucogonate were used to evaluate the antimicrobial effect on Proteus mirabilis (ATCC 25933), Pseudomonas aeroginosa (ATCC 25619), Salmonella enterica (ATCC 14028), Escherichia coli (ATCC 43845), Klebsiella pneumoniae (ATCC 13883), Staphylococcus aureus (ATCC 29213), Staphylococcus epidermidis (ATCC 12228), Bacillus cereus (ATCC 11778), Enterococcus faecalis (ATCC 29212), Micrococcus luteus (ATCC 14452) sessile and biofilm cells. Agar well diffusion was performed to determine the effectiveness against planktonic cells. Minimum inhibitory and minimum bactericidal concentrations were determined using CLSI M-27A broth microdilution method with modifications. Post exposure biomass reduction was determined using crystal violet assay on 24h mature in vitro bacterial biofilms. All test strains in planktonic state exhibited sensitivity for all chemical agents. MIC and MBC values were significantly smaller than working concentrations of chemicals.

Conclusions
77% ethanol, sodium hypochlorite, 1% chlorhexidine diglucogonate and 2% chlorhexidine diglucogonate are effective for surface decontamination while 2% chlorhexidine and 2% sodium hypochlorite exhibits highest potency.

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