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Mimicking the anti-biofilm activity of hydrogen peroxide in industrial water systems

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Statement of the Problem: One of the challenging issues in the pharmaceutical industry is facing with the biofilms in water systems. Biofilms are an organized community of microorganisms that bind to and grow onto biotic or non-biotic surfaces. If a biofilm develops then an out-of-control situation is likely to emerge. In this study, the effects of two disinfectants of peracetic acid and hydrogen peroxide at contact times and temperatures combinations on biofilm.

Method: *in vitro* production of biofilms was performed by highly reproducible 96 well microtiter-based method using E. coli bacterial strain isolated from deionizer of a pharmaceutical plant water system at 37°C up to 96 hours. The anti-biofilm activity of hydrogen peroxide was investigated at concentrations of 2-8% for contact time of 10-40 minutes at 20°C to 60°C.

Results: Optimum biofilm formation was observed at 37°C, 96 hours incubation and interestingly in the absence of albumin equal to 1,635 OD of biomass. Also, the best biofilm growth at 37°C in presence of albumin was produced after 96 hours incubation (1.416 OD). The anti-biofilm effect of hydrogen peroxide was observed at concentrations of 6% and up at 25-40°C and at 40-60 min; and the optimum condition was selected as 40°C/40min of 8% to be applied in the factory's water system in deionizer section.

Conclusion: According to the results obtained in this study, the best concentration of hydrogen peroxide for anti-biofilm activity using factory's common bacterial strain was practically shown to be at concentrations above 6%, temperature of 40°C and a minimum of 40 minutes of incubation. In-house validation and periodical changing of the sanitization policy is of great importance in biofilm control of water systems in pharmaceutical plants.

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