

Benzyl alcohol and ethanol can enhance the pathogenic potential of clinical *Staphylococcus epidermidis* strains

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Abstract

Background: *Staphylococcus epidermidis* is the most frequent cause of health care-associated infections, particularly in neonates and patients with indwelling catheters. The pathogenesis of infections caused by this organism is associated with its ability to form biofilms. We hypothesized that alcohol used in skin disinfectants, as well as preservative in solutions administered through catheters, can enhance biofilm formation by *S epidermidis*.

Methods: We performed polymerase chain reaction (PCR) analysis to investigate the prevalence of *ica* locus in a collection of 169 commensal and clinical *S epidermidis* strains. Using a microtiter plate assay, we examined the effect of ethanol and benzyl alcohol on biofilm production. Quantitative real-time reverse transcriptase PCR analysis evaluated quantitative changes in gene expression.

Results: We found that *ica*-positive but biofilm-negative or low-grade biofilm-positive *S epidermidis* strains displayed induction or increase in biofilm production after incubation in media supplemented with both ethanol and benzyl alcohol. The expression of the *icaADBC* operon was up-regulated in the presence of alcohol.

Conclusion: Our results suggest that biofilm production and, therefore, the pathogen potential of *S epidermidis* can be induced by alcohol. Considering the routine use of alcohol-based skin disinfectants and benzyl alcohol-containing solutions in hospitals, the alcohol-inducible biofilm phenotype of *S epidermidis* has potentially profound clinical ramifications.