Efficacy and Tissue Toxicity of Antiseptics

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Purpose: Antiseptics are used before and during surgery to prevent bacterial infection and may be useful for eradication of infections with established biofilm. However, a concern regarding the use of antiseptics is whether they adversely affect host tissues in addition to bacteria, resulting in delayed wound healing. The purpose of this study was to analyze the effects of clinically used antiseptics at various concentrations on cell viability and wound healing using in vitro techniques.

Methods: Fibroblasts (NIH-3T3), osteoblasts (MG-63), and chondrocytes (C20A4) were cultured and used to perform scratch wound (Incucyte ZOOM) and cell viability (CCK-8) assays after exposure to various antiseptic concentrations, including acetic acid, hydrogen peroxide, chlorhexidine gluconate, or povidone iodine. Additionally, the efficacy of these antiseptic solutions against staphylococcus aureus biofilm formation was assessed by counting colony-forming units (CFUs).

Results: Cell viability and mobility were not affected by the lowest concentrations of each antiseptic; however, they were decreased at middle and higher concentrations for all antiseptics, other than acetic acid 0.05%. Conversely, acetic acid 3% was the least efficacious against biofilm formation at the respective high concentrations (hydrogen peroxide 3%, povidone iodine 0.13%, chlorhexidine gluconate 0.05%). Similar results were obtained at both 5 and 15 minutes of treatments.

Conclusion: While antiseptics may be efficacious in treating Staphylococcus aureus biofilms, the concentrations of antiseptics needed to achieve significant reduction in CFUs also led to decreased cell viability and mobility for fibroblasts, osteoblasts, and chondrocytes. Surgeons may wish to consider patient comorbidities and additional risk factors for delayed healing when using antiseptics in aseptic or infection procedures.