

## Tracheostomy Stoma Care

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### **Clinical Question:**

Does normal saline influence wound healing in patients with a tracheostomy compared to the use of half strength hydrogen peroxide?

### **Summary of Key Evidence:**

Three sources of evidence were reviewed to answer the clinical question. The first source by Doughty (1994) is a literature review. The purpose was to review the events of wound healing, including the key cells that mediate this process, the significance of bacteria in the wound bed, and the impact of infection. Specific antiseptics, including providone-iodine, hydrogen peroxide, acetic acid, and Dakin's solution are reviewed, emphasizing their bactericidal potential and their cytotoxic properties" (p. 224). The findings looked at were for hydrogen peroxide only. The studies reviewed indicate that hydrogen peroxide has limited bactericidal effectiveness. The data indicates that hydrogen peroxide (3%) is cytotoxic. They also found hydrogen peroxide on cultured human fibroblasts is 100% toxic at 3% and 0.3% concentrations. The 0.03% solution remained moderately toxic, and absence of toxic effect was not demonstrated until the peroxide had been diluted 1:1000 (0.003%). "Current data indicates that hydrogen peroxide is inappropriate for use as an antiseptic. Its cytotoxicity outweighs its limited bactericidal effects" (p.230).

The second study is an experimental design by Thomas et. al (2009). The purpose was to "explore the ability of subcytotoxic levels of antiseptics to interfere with fibroblast function" (p.82). The researchers performed 3 experiments: Proliferation Assay, Wound Scratch Assay, and Gelatin Zymogram. The results found from these experiments showed that hydrogen peroxide reduces proliferation and migration of cells in wound healing and also MMP release. This data would suggest that hydrogen peroxide is a poor choice because it will potentially retard the healing process.

The third study by Wilson, Mills, Prather, and Dimitrijevic (2005) was "to determine toxicity indexes of commercially available skin, wound, and skin/wound cleansers on in vitro fibroblasts and keratinocytes" (p. 373). This is an experimental design which researchers took

twenty commercial skin, wound, and skin/wound cleansers and evaluated them. The samples included saline, hydrogen peroxide, and liquid bath soaps. These samples were used on infant dermal fibroblasts and epidermal keratinocytes. Both skin cell types were exposed to serial 10-fold dilutions of each cleanser until treated cell viability was comparable to untreated controls. The results were found by using toxicity indexes. These indexes ranged from 10-100,000. A nontoxic dilution of 1/1000 corresponded to a toxicity index of 1000. As the toxicity index becomes higher, the presence of the material becomes more detrimental to cell division. Saline was found to have a toxicity index of 0 on the viability of fibroblasts and hydrogen peroxide was found to have a toxicity index of 1000. On the viability of keratinocytes saline was found to have a toxicity index of 10 and hydrogen peroxide was found to have a toxicity index of 100,000. Hydrogen peroxide is more toxic to fibroblasts and keratinocytes when compared to normal saline according to the researchers.

**Bottom Line:**

The evidence suggests that hydrogen peroxide is more detrimental to skin tissue compared to normal saline.

**Implications for practice:**

Nurses can use this evidence when providing tracheostomy stoma care. This evidence shows that nurses should not be using hydrogen peroxide on open wounds such as a stoma. Hydrogen peroxide is cytotoxic and decreases wound healing.

**Articles:**

Doughty, D. (1994). A rational approach to the use of topical antiseptics. *Journal of Wound Ostomy and Continence Nursing*.21 (6) 224-231.

Thomas, G. W., Real, L. T., Bar-Or, R., Shimonkevitz, R., Mains, C.W., Slone, D.S, Craun, M.L., & Bar-Or, D. (2009). Mechanisms of delayed wound healing by commonly used antiseptics. *The Journal of Trauma Injury, Infection, and Critical Care*, 66(1), 82-91. doi: 10.1097/TA.0b013e31818b146d

Wilson, J.R., Mills, J.G., Prather, I. D., & Dimitrijevič, S. D. ( 2005). A toxicity index of skin and wound cleansers used on in vitro fibroblasts and keratinocytes. *Advances In Skin & Wound Care*, 18(7), 373-378.