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The efficiency of natural wound healing and bacterial biofilm inhibition of *Aloe vera* and Sodium Chloride toothpaste preparation

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Abstract

Background: Prevention is a preliminary focus of periodontitis treatment. Rather than giving complicated treatment to a periodontitis patient, a variety of toothpastes have been suggested to prevent periodontal disease progression. Herbal toothpastes containing natural plant components for maintaining or increasing healing might be a treatment modality for improving oral hygiene. *Aloe vera* is a medicinal plant with active ingredients that have antioxidant and anti-inflammatory effects. Additionally, increased sodium in the environment inhibits microorganism growth. A toothpaste containing salt and aloe vera may be an option to provide good oral hygiene.

Aim: To assess the in vitro cell migration of human gingival fibroblasts and antimicrobial effects of an herbal toothpaste containing *A. vera* and Sodium chloride.

Methods: The cytotoxicity of 0.02% or 0.2% toothpaste solution on human gingival fibroblast cell line was evaluated using a 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-2H-tetrazolium bromide (MTT) assay. The cell migration after treatment with 0.2% (v/v) toothpaste was determined using a Boyden Chamber assay. The effect of the toothpaste on inhibiting *Porphyromonas gingivalis* planktonic and biofilm growth was compared with Chlorhexidine (CHX) using a Disk Diffusion and Biofilm susceptibility test, respectively. The results of the cytotoxicity assay, inhibition zone and percentage of live cells in the biofilm were statistically analyzed with One-way analysis of variance. Cell migration and biofilm inhibition were evaluated using the independent sample t-test and multiple t-test, respectively ($p = 0.05$).

Results: Neither test concentration of the toothpaste solution was toxic to the target cells. The 0.2% concentration was selected for the cell migration experiment. The herbal toothpaste formulation significantly increased cell migration compared with the control group (culture medium) ($p = .02$). The antimicrobial effect of this formulation on the *P. gingivalis* planktonic form was lower compared with 0.12% CHX (positive control group), however, it demonstrated greater *P. gingivalis* biofilm formation inhibition compared with the 0.12% CHX group.

Conclusions: The alternative use of an herbal toothpaste instead of a non-herbal toothpaste formulation should be considered for promoting oral health care. However, further clinical studies are necessary before it can be considered for patient use.

Keywords: *A. vera*, Bacterial biofilm inhibition, Sodium chloride, Toothpaste, Wound healing

Background

Bacteria are the major cause of infection of the tooth structure and periodontal tissues in the oral cavity [1]. Dental caries and periodontal diseases affect a patient's

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