Accelerating Effects of the Acemannan Extract on Wound Healing of Rat Palatal Mucosa

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Keywords: Acemannan, Aloe vera, Immunohistochemistry, Oral mucosa, PCNA

Introduction
The several cause of oral wound included stress, immune deficiency, trauma caused by dentistry (dental devices and surgery), radiation of head and neck and some medication. In severe case, pain and wound can result in poor quality of life (1). In small animal practice, most dogs suffering from gingival tartar might be useful for the acceleration of gingival healing after tartar removal. Such the acceleration of oral healing topical agent might be important for treatment in both human beings and animals. Acemannan extract from forks medicinal plant (Aloe vera barbadensis Miller) that was safety and can accelerate wound healing of skin. There were a few studies of oral topical preparation (2). The purpose of this study was to investigate the effect of the acemannan extract oral paste on the oral wound healing in the rat model.

Materials and Methods
A total of 80 Sprague-Dawley rats were made a 12.57 mm² circular wound on mid-palatal surfaces by using a 4-mm. biopsy punch under anesthesia (3). The animal were divided into 5 groups which were topically applied as 1) distilled water as a negative control 2) carbopol polymer as the base of acemannan 3) 0.5% acemannan 4) 2% acemannan and 5) 0.1% triamcinolone acetonide (Kenalog™, Bristol-Mayer Squibb, USA). Each groups were topically applied once daily at the wound. Four animals of each groups were sacrificed, necropsied and took a photo of the wound at 3, 5, 7 and 14 day post-wounding (dpw). The hard palate was fixed in 10% buffered formalin and histopathologically examined by hematoxylin and eosin stain. The immunohistochemistry (IHC) using antibody against proliferating cell nuclear antigen (PCNA) and Dako REAL™ Envision™ Detection System Peroxidase/DAB method was done. The wound size was calculated by Scion Image version alpha 4.0.3.2 software and statistic analysis by SPSS v.11 software. The number of the PCNA-positive cells in the lamina propria and epithelium was counted.

Results and Discussion
On the 5 and 7 dpw, the wound size of acemannan groups decreased better than others but it wasn’t statistically different among the groups (p>0.05) (Fig. 1). On the 14 dpw, most of all had completely wound healing (Fig. 2).

Histopathology of wound as not differed among the groups at all dpw. The pronounced inflammation as severe subacute (70%) form at 3 dpw. Moreover, there were a large number of fibroblasts and endothelial cells migrated into the rim of wound. At 5 dpw, the inflammation shifted to moderate subacute form (55%) and increasing of fibroblasts at the rim of wound than of 3 dpw. At 7 and 14 dpw, fibroblasts initiated to re-arrange as parallel fiber within the wound and the inflammation shifted to mild subacute or mild chronic form (70%). Immunohistochemistry showed strongly PCNA-positive cells in lamina propria and epithelium layer, which were fibroblasts, mononuclear cells and endothelial cells and basal epithelial cells, respectively. At 3 dpw, the 0.5% acemannan group had the highest number of PCNA-positive cells in both of lamina propria and epithelium. At 5 dpw, the PCNA-positive cells of 0.5% acemannan group peak in epithelium while decreasing in lamina propria (Fig. 3a, b). At 7 dpw, the PCNA-positive cells of the control and triamcinolone acetonide groups were higher than others in both layers.

This study showed that the acemannan extract could accelerated oral wound healing, especially the 0.5% acemannan because of the wound size tend to decrease faster than others at 5 and 7 dpw. However, the statistical difference wasn’t significant. The 0.5% acemannan group had the highest number of PCNA-positive cells of both layers at 3 and 5 dpw. It suggested that the cell proliferation might be induced earlier occur by acemannan and the wound contraction followed up at 5 and 7 dpw. In addition, the control and other groups were not dramatically increase the cell proliferation at the early dpw, but the higher number of positive cells will occur at 7 and 14 dpw. Previous studies shown that the acemannan promotes wound healing by stimulating macrophage and fibroblast activity (4, 5). This study confirmed that the application of the 0.5% acemannan enhance the cell proliferation of the rat oral mucosa wound. The acemannan might be used as a topical oral wound treatment.
References

Fig. 1 The average of wound size at 3, 5, 7 and 14 dpw.

Fig. 2 The wound size at 3 (a, b) and 14 dpw (c, d); a & c: control, b & d: 0.5%acemannan.

Fig. 3 The average number of PCNA positive-cells at 3, 5, 7 and 14 dpw. a) lamina propria, b) epithelium.