Comparative Healing Effect with Diverse Nanosilver Concentration Hydrocolloids on Three Types of Wound Model

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Introduction
Silver has been known to have antimicrobial, anti-inflammatory, antioxidant properties. Free silver cations have a potent antimicrobial effect which destroys microorganisms by disrupting the function of bacterial cell membranes and denaturing the bacterial DNA and RNA. On the other way, silver has a distinct negative effect on cell level. This study suggests a comprehensive approach to support optimal nanosilver contents of hydrocolloid dressing in wound healing process.

Materials and Methods
We divided the Sprague-Dawley rats into three categories by types of wound model: fresh surgical wound, infectious wound which was inoculated with units of S. aureus, and 3rd degree burn wound. Four round (diameter 2cm) wounds were made on the dorsal aspect of trunk and were divided into four groups of hydrocolloid dressing materials. Group A: Nanosilver 0wt%, Group B: Nanosilver 1.5wt%, Group C: Nanosilver 2.5wt%, Group D: Nanosilver 3.5wt%. We compared each group with gross findings by tracing the remained wound, histological and biomolecular test on each time period.

Results
In fresh surgical wound and burn wound, Group A, B, and C showed statistically higher percentage of wound healing. Histologically, Group B and C showed less inflammatory cell infiltration, Group A and B showed faster and more prominent angiogenesis. In infectious wound, Group B and C showed statistically better wound healing process and wound contraction than the other groups. Histologically, Group B and C showed better finding than other groups (Fig.1). In biomolecular analysis, using by Western blot test including fibronectin, TGF-β, Laminin α3, Group B showed higher expression than other groups (Table 1).

Discussion and Conclusions
This study demonstrates that the nanosilver level between 1.5wt% and 2.5wt% in hydrocolloid have optimal effective results. Hydrocolloid with excessive nanosilver takes adverse effects on cells in decreasing cell viability and cell proliferation.

References