

# Histological evidence for the therapeutic effect of chitosan nanofibrous dressing on acute skin wounds in a rat model

Mahboubeh Ghanbari<sup>1</sup>, Sayed Ahmadrza Razian<sup>1</sup>, Sara Cartwright<sup>2</sup>, Yury Salkovskiy<sup>1</sup>, Jason MacTaggart<sup>2</sup>, Mark A. Carlson<sup>2</sup>

<sup>1</sup>Department of Biomechanics, University of Nebraska at Omaha, Omaha, NE, USA

<sup>2</sup>Department of Surgery, University of Nebraska Medical Center, NE, USA

email: [mghanbari@unomaha.edu](mailto:mghanbari@unomaha.edu)

**Introduction:** Large-area skin traumas, such as thermal burns, are among the most severe health issues that decrease patients' quality of life and burden healthcare systems. The CDC estimates that there are 1.1 million burns requiring medical attention each year, with more than 20,000 cases involving at least 25% of the body surface, resulting in 4,500 deaths. In addition, about 10,000 people die from burn-related infections. A promising solution to alleviate this problem is using wound dressings based on biopolymers with inherent wound healing properties and biodegradability. One of these biopolymers is chitosan, which is derived from arthropod shells and exhibits antimicrobial activity. This study aims to assess the wound healing effects of nonwoven dressing made of chitosan nanofibers in an acute wound rat model.

**Methods:** Thirty Sprague Dawley rats (3 month old, 250-350g) were divided into three groups, and a full-thickness 2×2 cm skin wound was induced on the dorsal area of each rat, followed by splinting to reduce wound contraction. Treatments for three groups included our developed chitosan nanofibrous dressing, PriMatrix Dermal Repair Scaffold (Integra LifeSciences, positive control), Tegaderm (3M, negative control). Animals were sacrificed at three time points (days 7, 14, 21), and skin samples were used to evaluate histological parameters. Hematoxylin and eosin staining was used to measure wound closure, thickness and area of the epidermis and granulation tissue, and Masson's trichrome staining was applied to assess collagen deposition in the granulation tissue.

**Results:** Preliminary histological analysis demonstrated that wound closure rate in the rats treated with chitosan nanofibrous dressing was significantly ( $P < 0.007$ ) increased compared to PriMatrix at the day 21. We are currently analyzing other histological parameters to investigate whether our chitosan nanofibrous material has a more positive effect on the epidermis and dermis regeneration than commercial dressings.