

# Amnion and collagen-based blended hydrogel improves burn healing efficacy on a rat skin wound model in the presence of wound dressing biomembrane

**Background:** A burn wound is one of the most frequent and devastating injuries for patients which requires extensive care. Early treatment of burn wounds improves healing significantly.

**Objective:** This study was designed to investigate the efficacy of amnion and collagen-based hydrogels on cutaneous burn wound healing in rats with covering membrane.

**Methods:** We prepared a novel cell free hydrogel comprising human amnion, rabbit collagen, carboxymethyl cellulose sodium salt, citric acid, methyl paraben, propyl paraben, glycerin and triethanol amine. The wound covering membrane was developed from rabbit collagen and prawn shell chitosan. Beside swelling ratio, water absorption, equilibrium water content, gel fraction and spreadability analysis, in vitro cytotoxicity and biocompatibility tests were performed for the formulated hydrogels. Following the skin irritation study, second-degree burns were created on the dorsal region of the rats and the gels were applied with/without covering membrane to study the wound contraction and re-epithelialization period.

**Results:** The formulated hydrogels were observed non-cytotoxic and compatible with human blood cells. No erythema and edema were found in skin irritation assay confirming the safety and applicability. Hydrogel consisting in a combination of amnion and collagen demonstrated significantly rapid wound healing, driven by complete re-epithelialization ( $16.75 \pm 0.96$  days) and closure by wound contraction ( $72 \pm 3.27\%$ ,  $P < 0.0000009$ ) when wound dressing membrane was used, whereas this gel alone healed about  $62.5 \pm 4.43\%$  ( $P < 0.00001$ ) and required  $18.75 \pm 0.50$  days to complete re-epithelialization. Additionally, the gel with covering membrane treated group had maximum average body weight, food and water intake.

**Conclusion:** The amnion and collagen-based blended gel offers alternative possibilities to treat skin wounds when covered with film, which could overcome the limitations associated with modern therapeutic products such as high costs, long manufacturing times, complexities, storing, and presence of living biomaterials.