An evaluation of Wound Healing Efficacy of a Polymer-integrated Amnion Membrane Film Dressing

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Statement of Purpose: A film dressing is an easy and common wound management, which is flexible to cover many types of superficial injuries and provides a protected environment during wound healing. In a recent study, we developed a scaffold from poly (1,8-octanediolco-citrate) incorporated decellularized amnion membrane (DAM-POC). The DAM-POC scaffold was biocompatible and could enhance soft and hard tissue regeneration when applied to repair the large cleft palate in rat. The efficacy of DAM-POC scaffold in oral repair has led us to hypothesize that the DAM-POC scaffold can be employed extensively in the medical field as a wound dressing. Therefore, the aim of this study is to investigate the feasibility and efficacy of the DAM-POC scaffold as a flexible film dressing in accelerating wound healing when applied in multiple tissue wounds.

Methods: As described before [1], the human amnion membrane (AM) was dissected from the center of the placenta, trimmed into square pieces (~1.5 cm ×1.5 cm), decellularized with 1% Triton X-100 and 0.1% Sodium dodecyl sulfate (SDS), and completely washed with water to prepare the decellularized amnion membrane (DAM). POC was synthesized by dissolving equimolar ratios of citric acid and 1,8-octanediol in absolute ethanol to make a 1% (w/v) POC solution [2]. The two-layer DAM dressing was totally immersed in the 1% POC solution for 4 days at 45°C and thoroughly washed with PBS solution for 3 days to remove unbound POC pre-polymers following with lyophilization overnight at -80 °C (Cole-Parmer, Vernon Hills, IL) to prepare the DAM-POC dressing (Fig. 1).

The DAM-POC graft had been used as a film dressing for direct wound covering in different types of tissue injuries in adult Sprague-Dawley (SD) rats, including abdominal wall, back muscle, tibia bone, and liver, and compared to the wound healing with the DAM graft covering and no-dressing covering.

Results: Our results demonstrated that both the DAM and DAM-POC dressings are safe, well-tolerated, easily handled, biocompatible, and anti-adhesive without causing severe foreign body reactions when covering multiple tissue wounds including abdominal wall, back muscle, tibia bone, and liver. In addition, the DAM-POC dressing is superior to the DAM membrane in reducing inflammation, preventing fibrosis, healing wounds, and regenerating tissues.

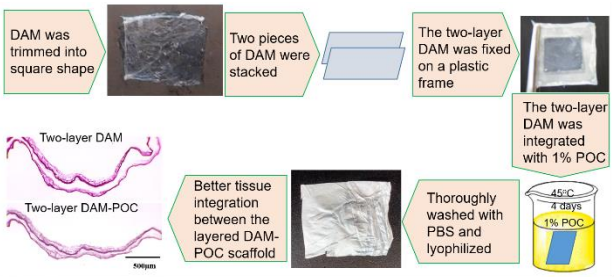

Figure 1: *Basic procedure of preparing the 2-layer DAM-POC film dressing.*

Conclusion: In accordance with the findings in this study, we assert that both the DAM and DAM-POC dressings are easy-to-use, well-tolerated by animals, tissue adhesive, and able to prevent tissue adhesion and inflammation and assist undisturbed wound healing. In addition, the DAM-POC dressing is superior to the DAM dressing in reducing inflammation, preventing fibrosis, healing wounds, and regenerating tissues. Thus, the DAM-POC may potentially be used as a film dressing in a wide range of therapeutic applications to protect the injured tissues from the external environment and prevent infections.

References:

1. Li, W., et al., *Investigating the Potential of Amnion-Based Scaffolds as a Barrier Membrane for Guided Bone Regeneration.* Langmuir, 2015. **31**(31): p. 8642-53.
2. Yang, J., et al., *Novel biphasic elastomeric scaffold for small-diameter blood vessel tissue engineering.* Tissue Eng, 2005. **11**(11-12): p. 1876-86.