Background

- In full-thickness skin wound healing, dermal reconstruction is fundamental to optimize the functional and aesthetic outcome.
- Usually, full-thickness skin graft or flaps are used to reconstruct the dermis. But in large wounds as in burns the conventional methods are not enough.
- An alternative is the use of artificial dermal substitutes, dermal substitutes are scaffolds composed of extracellular matrix components: collagen and glycosaminoglycan or hyaluronic acid.
- Collagen-based wound dressings are common in wound care yet the mechanism of action of specific dressings remain unknown.

Methods

- **Study design**: Design of experiment (n=5 mice). SEM (p<0.05).
- **SEM**: Scanning electron microscope.
- **Immunohistochemistry (IHC)** and H&E staining. Paraffin sections were collected from the wound area on d4 and stained with Immunostaining of k14.
- **Herovici staining for collagen identification.**
- **Statistical analyses**: Significance between the Architect and the control group was tested using Student's t-test (two-tailed). A p value p < 0.05 was considered statistically significant.

Results

**Macrophage recruitment to the wound site post (sPCM) application**

- PVA (polyvinyl alcohol) sponges were implanted subcutaneously in the back of C57Bl6 mice. Polycarbonate membrane served as a control to the sPCM. Cells were harvested on d3 post-implantation.
- A SEM image of the harvested sPCM shows more macrophage recruitment at d3 than control.
- B. Increased recruitment of macrophage (4/80 is a macrophage marker) at d3 and rapid resolution by d7 as evident from flow cytometry analysis. Data are represented as means SEM. *p<0.05, n=5.

**sPCM bolsters host immune defenses to inhibit biofilm formation**

- HaCaT cells grown on sPCM for 24 h showed upregulation of Antimicrobial peptides (AMPs). S100A9 and beta defensin are two such AMPs with broad spectrum antimicrobial activity against bacteria, viruses, and fungi.
- SEM image of HaCaT cells grown on a control surface (glass) and on sPCM showing distinct morphological difference in sPCM.
- B. S100A9 and beta defensin. Data are represented as means SEM. *p<0.05, n=5.

**Wound closure following (sPCM) application**

- A. Images of b6 mice at d14 showing complete closure of the wound in sPCM s (Right side) in comparison to the left control side. B. Wound closure area showing significant wound closure in sPCM treated side. Data represents mean ± SD (n=5). *P<0.05 C. H&E images showing full epithelialization and closure of sPCM treated wound at d14. Wound edges are indicated by red arrows in the upper panel skin scale bar=200um and the epidermis indented in the lower panel zoomed images by red dotted line skin scale bar=50 um.

Hypothesis

Study the mechanism of action of a biologically stabilized, acellular, equine pericardial collagen matrix (sPCM). Collagen-based wound dressing is capable of presenting scaffold functionality during wound healing, induces endogenous antimicrobial defense systems and supports the wound healing process.

Conclusion

sPCM is a single application collagen-based wound dressing that is capable of presenting scaffold functionality during wound healing, potently induces endogenous antimicrobial defense systems and supports the healing process through accelerated epithelialization, improved collagen deposition and enhanced immune responses.

**STABILIZED COLLAGEN MATRIX DRESSING IMPROVES MACROPHAGE RECRUITMENT AND WOUND EPITHELIZATION**

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