00404 Advanced Prototype Wound Dressings for the Management of Non-infected and Bacteria-infected Burns

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Aims: To investigate the antimicrobial and wound healing properties of prototype wound dressings prepared by bio-inspired crosslinking in vitro and in vivo.

Methodology: Electrospun gelatin nanofibers containing epsilon-poly-L-lysine (εPL) and dopamine was prepared and crosslinked by ammonium carbonate diffusion method, reported previously. The prototype wound dressing was labeled as ePL_Gel_pDA mats. Antimicrobial properties and durability were investigated against panels of bacteria and yeast strains. Mammalian cell biocompatibility and cell proliferative properties were determined for primary human dermal fibroblasts (hDFs) keratinocytes (HaCaT) cell lines. *In vivo* wound healing of the mats were examined in both non-infected and *Staphylococcus aureus*/*Pseudomonas aeruginosa* infected porcine model of partial thickness burns. Digital status of the wounds after treatment and placebo were assessed in terms of clinical examination (Bates-Jensen Wound Assessment Tool, BWAT), relative wound closure (SigmaScan Pro5), bacterial enumeration from swab culture (for infected burns) and Hematoxylin and Eosin (H & E) /Masson Trichrome staining.

Result: εPL_Gel_pDA mats displayed potent antimicrobial properties against common wound pathogens. The mats displayed excellent biocompatibility and cell proliferative properties for both the mammalian cells. When compared to Aquacel®Ag, εPL_Gel_pDA mats required less frequency of dressing changes and higher wound closure in non-infected burns. In bacteria-infected burns, εPL_Gel _PDA mats decreased the bacterial bioburden (>4$\log_{10}$ reduction), lower BWAT score, increased wound closure, higher keratinization and faster re-epithelialization when compared to placebo and Aquacel®Ag.

Conclusion: This study identified the combined utility of bio-inspired crosslinker, biocompatible antiseptic polymer and hydrogel nanofibers as Advanced Prototype Wound Dressings and established its superiority over commercial silver-based dressings. These prototype wound dressings could reduce the frequency of dressing changes and nursing costs and is a potentially valuable approach for treating life-threatening burn injuries and burnrelated infections.