A NEW BIOACTIVE DERMAL SUBSTITUTE FOR WOUND HEALING AND SKIN REGENERATION

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Aim:

Rabbit skin is an abundant agri-food by-product with interesting properties to be up-cycled into a xenogeneic dermal substrate for skin and regeneration. When decellularized, rabbit dermis preserves collagen–elastin components that can guide cell behavior [1]. However, decellularization conditions can also influence the preservation of tissue architecture and may introduce immunogenic triggers such as damage-associated molecular patterns (DAMPs)[2]. This work aimed to develop low-immunogenicity decellularized dermal matrices (dDMs) using rabbit skin as by-product.

Method:

dDMs were generated using optimized chemical decellularization protocols and evaluated for structural and biochemical integrity using SEM, tensile testing, FTIR, proteomics, and DNA, GAGs, collagen, and elastin quantification. Immunogenicity was assessed throughendotoxin analysis and by exposing human peripheral blood mononuclear cells (PBMCs) to the matrices to measure complement activation, ROS, apoptosis, activation markers, and cytokine release. The ability of dDMs to support human dermal fibroblasts (hDFs) and keratinocytes (HaCaTs) was examined over 14 days using Alamar Blue, BrdU, SEM, and DAPI/phalloidin staining.

Results/Discussion:

dRDMs preserved native collagen–elastin architecture, and GAG levels were comparable to human dermis. Residual DNA confirmed effective decellularization. No significant immune activation occurred: ROS and apoptosis were absent, and PBMC activation matched controls with only mild monocyte and B-cell responses. Cytokine release indicated modest inflammatory signaling

induction. Interestingly, matrices with lower DNA content triggered stronger immune responses, suggesting biocompatibility is influenced more by processing-related factors (detergent residues or DAMPs) than by DNA levels. hDF and HaCaT adhesion, viability, and proliferation were maintained for 14 days.

Conclusion:
dRDMs showed favorable structural, biochemical, and immunological profiles and supported dermo-epidermal cell growth, demonstrating potential as bioactive dermal substitutes for skin regeneration.

References
[1]Rosadas et al., Front. Biomaterials, 2024.
[2]Kasravi et al., Biomaterials Research, 2023.

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