Tissue-Engineered Oral Mucosa as Preclinical Model for Oral Wound Care Products

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Introduction

In vitro biological evaluation of biomaterials and wound care products is critical before moving to animal studies. Most studies use a two-dimensional (2D) culture of cells to evaluate biomaterials' biocompatibility. However, in the clinical situation, materials are in contact with the extracellular matrix. This study aimed to simulate the *in vivo* situation, providing 3D *in vitro* models of oral mucosa comparing collagen and Gelatin-methacryloyl (GelMA) hydrogels as carriers for fibroblasts and connective tissue substrates for seeding oral epithelial cells.

Methods

The viability of fibroblasts in the hydrogels was investigated after one and three days of cultivation using the PrestoBlue assay. Following the addition and culture of oral keratinocytes onto the connective tissue constructs, the tissue-engineered oral mucosa was assessed histologically.

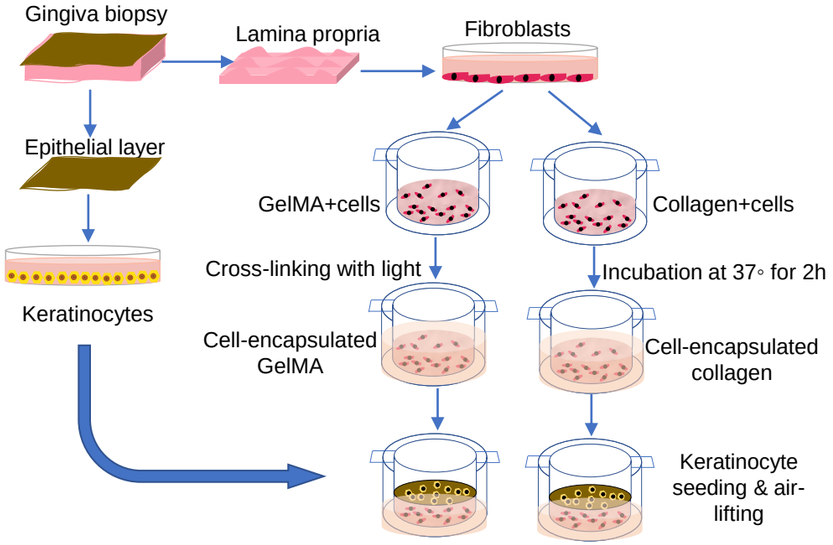


Figure 1. Workflow chart showing the different steps of isolation of cells, cell encapsulation in collagen and GelMA hydrogels, and keratinocyte seeding.

Results

Figure 2. Morphology of the isolated (a) fibroblasts and (b) keratinocytes, and the viability of fibroblasts encapsulated into collagen or GelMA analyzed by PrestoBlue assay after one day and three days of cultivation (c) *p < 0.05.

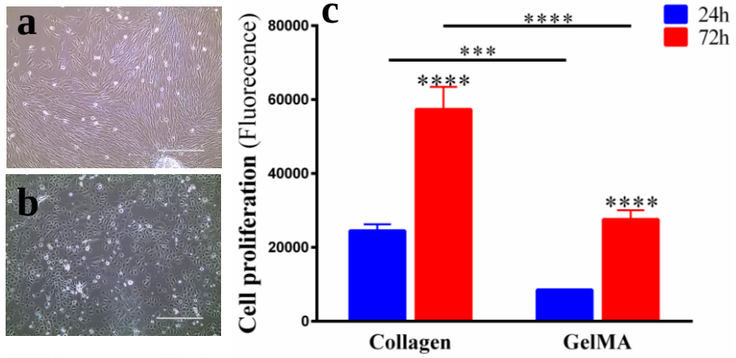
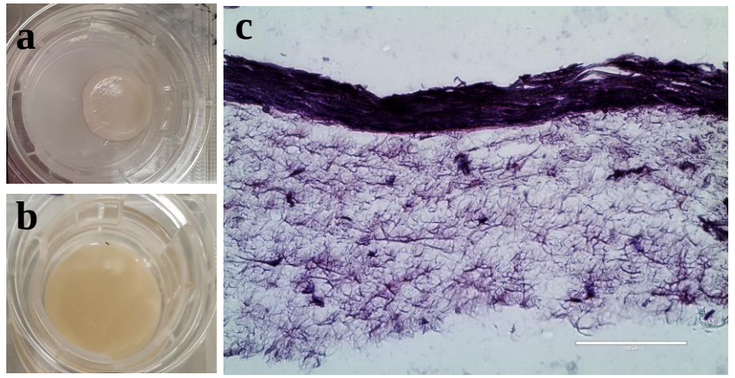
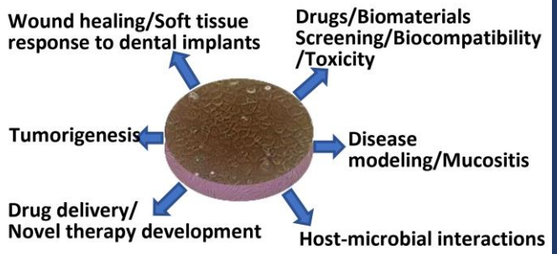


Figure 3. Images of (a) contracted cell-laden collagen gel and (b) GelMA hydrogel containing fibroblasts after 4 days of cultivation. (c) H&E-stained histological section of tissue-engineered oral mucosa based on collagen hydrogel.



Conclusion

Collagen-based scaffold offers superior biological properties compared to GelMA hydrogel for providing oral mucosa models.



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