

# Tissue engineering of oral mucosa: a shared concept with skin

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Received: 12 June 2014 / Accepted: 7 October 2014  
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**Abstract** Tissue-engineered oral mucosa, in the form of epithelial cell sheets or full-thickness oral mucosa equivalents, is a potential solution for many patients with congenital defects or with tissue loss due to diseases or tumor excision following a craniofacial cancer diagnosis. In the laboratory, it further serves as an *in vitro* model, alternative to *in vivo* testing of oral care products, and provides insight into the behavior of the oral mucosal cells in healthy and pathological tissues. This review covers the old and new generation scaffold types and materials used in oral mucosa engineering; discusses similarities and differences between oral mucosa and skin, the methods developed to reconstruct oral mucosal defects; and ends with future perspectives on oral mucosa engineering.

**Keywords** Tissue engineering · Biomaterials · Polymeric scaffold · Oral mucosa · Skin

## Introduction

Construction of oral mucosa is a relatively recent field of tissue engineering that aims to treat and fill the tissue

defects caused by facial trauma or malignant lesion surgery, as well as to provide a model to study the biology and pathology of oral mucosa. A tissue-engineered oral mucosa may further serve as a vehicle for gene therapy, and as an *in vitro* system, alternative to *in vivo* testing of oral care products [1]. It is a potential solution for many patients with congenital defects such as cleft palate or with lost tissues due to diseases such as gingivitis or tumor excision following a craniofacial cancer diagnosis. In case of skin, the “gold standard” for the treatment of wounds has been the use of split-thickness skin grafts [2]. However, for the treatment of wounds in the oral cavity, the small size of the donor oral tissue is a limitation [3]. Besides, the use of skin grafts for the treatment of oral wounds results in negligible assimilation even years after transplantation due to differences between skin and oral mucosa [4]. These led the researchers to employ tissue engineering to develop suitable oral mucosa equivalents designed and constructed according to the needs of the patient to assist in the reconstruction of oral cavity.

3D full-thickness oral mucosa equivalents and oral epithelial cell sheets are the predominant approaches in oral mucosa engineering, which aim to reconstruct oral tissue using cells with or without biodegradable scaffolds, respectively.

Any 3D oral mucosa equivalent should contain a scaffold which, when seeded with fibroblasts, would form a lamina propria equivalent. The choice of the scaffold material is a crucial one since the success of the tissue-engineered implant largely depends on it. The ideal scaffold used in oral mucosa engineering must not induce a toxic or immune response or result in excessive or prolonged inflammation. It should be slowly biodegradable, support the reconstruction of normal tissue and have similar mechanical and physical properties to the oral mucosa

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