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RESEARCH ARTICLE

Influence of the mesenchymal cell source on oral epithelial development

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Abstract

The extent of the influence of mesenchymal tissue on epithelial development is still debated, and elucidation of epithelial–mesenchymal interactions should be of relevance for controlling normal as well as pathological growth and development. The aim of the present study was to elucidate the influence of the mesenchymal cell type on oral mucosa epithelial development *in vitro*, using tissue-engineering principles, by including three different sources for mesenchymal cell type, viz. oral mucosa, skin and cornea, each of them presenting a distinct type of epithelium *in situ*. We investigated epithelial–mesenchymal interactions, considering both morphological criteria and protein expression (filaggrin, keratin 10, keratin 12, keratin 13 and laminin 5). The results of the histology, immunohistochemistry and transmission electron microscopy of the three types of tissue-engineered constructs composed of mesenchymal cells of different sources (oral, dermal and corneal fibroblasts) and of the same oral epithelial cells showed that the mesenchymal cell source had a significant influence on the thickness and ultrastructure of the epithelium, but not on the differentiation of oral epithelial cells, which might be an intrinsic property of these cells due to their genetic programming. Copyright © 2011 John Wiley & Sons, Ltd.

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1. Introduction

Different types of epithelium have evolved to provide the optimal form of protection for their specific location. For example, epidermis is dry, constantly exposed to changing humidity and great variability of temperatures, mainly $<37\,^{\circ}C$, whereas oral epithelium is exposed to heavy abrasion, 100% humidity and mainly a temperature of $37\,^{\circ}C$ (Gibbs and Ponec, 2000). On the other hand, the corneal surface must be extremely smooth and corneal epithelium must have a high degree of transparency in order to allow the formation of a sharp image on the retina (Dohlman, 1971).

The oral cavity has distinct regions; some require more strength, e.g. hard palate and gingiva, and some require more elasticity, such as cheek, lips and the floor of the mouth. According to the function of the region in the oral cavity, the epithelium of the oral mucosa can be orthokeratinized as in hard palate, parakeratinized as in gingiva or non-keratinized as in buccal mucosa (Chinnathambi *et al*., 2003). Since keratinized and non-keratinized epithelia of the oral mucosa, which represent the extremes of differentiation of stratified squamous epithelia, are derived from the same germ layer, they provide a unique material to study epithelial differentiation (Clausen *et al*., 1986).

Mesenchymal tissue, composed of cells, extracellular matrix and soluble factors, is known to influence the morphogenesis, proliferation and differentiation of a variety of embryonic epithelia (Sharpe and Ferguson, 1988). The potential of epithelial development is gradually restricted as a consequence of influence from inductive tissues and other environmental factors, as the developmental fate is progressively determined (Cunha *et al*., 1983). On the other hand, whether the commitment to a particular epithelial differentiation is an irreversible process or not is

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