Bioengineering and characterization of autologous human laryngeal mucosa transplants

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Introduction

Human vocal fold mucosa possesses an unique multilayered structure and has to withstand extreme mechanical strain enabling undisturbed oscillation [1]. Voice discorders are the most common communication disorders across lifespan where treatment options such as speech therapy as well as phonosurgical methods are still far from satisfying [2]. That is why newer therapeutic approaches focus to restore function on a cellular basis. Laryngeal mucosa transplants are a comprising option for treatment of vocal fold scars.

Methods

Our study comprises to collect healthy human laryngeal and oral mucosa to isolate and cultivate fibroblasts and epithelial cells from either location *in vitro*. These cells are used to bio-engineer constructs under 3D-organotypic conditions that will be evaluated against native laryngeal mucosa by histological analyses and proteomics.

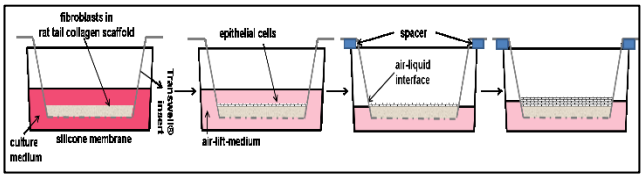

Figure 1: Schematic illustration of the co-cultivation procedure of isolated cells

Results

Fibroblasts from human vocal folds and epithelial cells from oral mucosa were isolated, cultivated and characterized with q-PCR using cell-type specific marker genes.

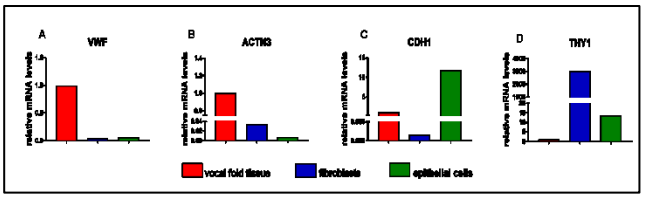

Figure 2. Relative mRNA levels of cell-type specific marker genes of native vocal fold tissue, vocal fold fibroblasts and oral mucosal epithelial cells- Von Willebrand factor (A), actinin alpha 3 (B), cadherin 1 (C) and Thy-1 cell surface antigen (D).

The successful assembly of a multi-layered structure of constructs could be confirmed through histological and immunohistochemical analyses and evaluated against native laryngeal mucosa samples.

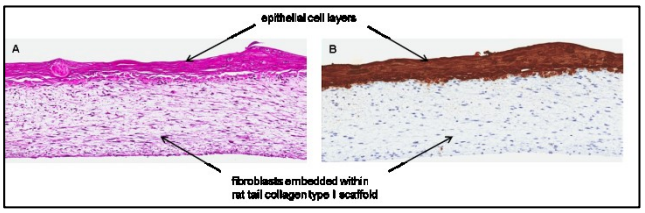

Figure 3: Representative H&E staining (A) and immunohistochemical staining for Cytokeratin 5/6 (B) of formalin-fixed, paraffin-embedded sections of 3D constructs (both 10x magnification)

Discussion

Established isolation procedures of cells will give the opportunity to generate 3D constructs being highly comparable to native vocal fold tissue in histological and proteomic features [3,4]. Besides their implementation as option for treatment of vocal fold scars, constructs will contribute substantially to a deeper understanding of vocal fold micro-physiology and may provide a possible *in vitro* platform for drug testing

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