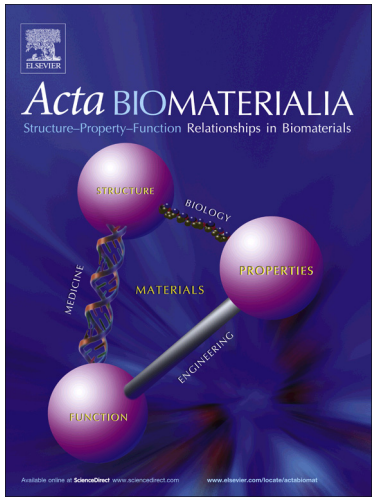

Review article

Breath figures in tissue engineering and drug delivery: state-of-the-art and future perspectives

Maria Teresa Calejo, Tanja Ilmarinen, Heli Skottman, Minna Kellomäki

PII: S1742-7061(17)30736-5
DOI: https://doi.org/10.1016/j.actbio.2017.11.043
Reference: ACTBIO 5196

To appear in: *Acta Biomaterialia*

Received Date: 29 June 2017
Revised Date: 9 November 2017
Accepted Date: 22 November 2017

Please cite this article as: Calejo, M.T., Ilmarinen, T., Skottman, H., Kellomäki, M., Breath figures in tissue engineering and drug delivery: state-of-the-art and future perspectives, *Acta Biomaterialia* (2017), doi: https://doi.org/10.1016/j.actbio.2017.11.043

Breath figures in tissue engineering and drug delivery: state-of-the-art and future perspectives

Maria Teresa Calejo[a*], Tanja Ilmarinen[b], Heli Skottman[b], Minna Kellomäki[a, b]

[a]BioMediTech Institute and Faculty of Biomedical Sciences and Engineering, Tampere University of Technology, Tampere, Finland

[b]BioMediTech Institute and Faculty of Medicine and Life Sciences, University of Tampere, Tampere, Finland

* Corresponding author. E-mail: teresa.calejo@tut.fi; Tel: +358 50 301 4048 (M. T. Calejo)

Abstract

The breath figure (BF) method is an easy, low-cost method to prepare films with a highly organized honeycomb-like porous surface. The particular surface topography and porous nature of these materials makes them valuable substrates for studying the complex effects of topography on cell fate, and to produce biomimetic materials with high performance in tissue engineering. Numerous researchers over the last two decades have studied the effects of the honeycomb topography on a variety of primary and immortalized cell lines, and drew important conclusions that can be translated to the construction of optimal biomaterials for cell culture. The literature also encouragingly shows the potential of honeycomb films to induce differentiation of stem cells down a specific lineage without the need for biochemical stimuli.

Here, we review the main studies where BF honeycomb films are used as substrates for tissue engineering applications. Furthermore, we highlight the numerous advantages of the porous nature of the films, such as the enhanced, spatially controlled adsorption of proteins, the topographical cues influencing cellular behavior, and the enhanced permeability which is essential both *in vitro* and *in vivo*. Finally, this review highlights the elegant use of honeycomb films as drug-eluting biomaterials or as reservoirs for distinct drug delivery systems.