

# Bio-mimetic Tissue Models for Disease Modelling and Testing New Materials

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Despite emergence of many promising new drug leads and biomaterials there is still a substantial gap between biological effects observed in *in vitro* and pre-clinical animal models and the safety and efficacy of new drugs and materials when tested and used in patients. This has substantial cost and time implications making introducing efficient and safe new drugs and medical devices an expensive and lengthy endeavour. These issues are partly due to limited physiological relevance of animal models to human and the lack of bio-mimetic human based tissue models that can be used for disease modelling and/or testing new drugs and materials for both safety and efficacy.

In this presentation we discuss our approach for developing biomimetic models of human barrier tissues with emphasis on the importance of stromal-epithelial cross-talk and the role of immune cells in investigating inflammatory responses. By simulating key aspects of structural and functional features of these tissues it would be possible to use *in vitro* models for disease modelling and testing the efficacy and safety of new drug leads or chemicals. We will discuss some examples of such applications. Furthermore, monitoring cellular responses and microenvironmental changes in 3D tissue models is not straightforward and often involves physical probing or terminating experiments to collect cells or supernatants. Here, we discuss different strategies for real-time and non-invasive monitoring of cellular responses and changes in microenvironment in 3D tissue models. This capability will enable the use of these models in repeat-dose and longer-term experiments providing higher physiological relevance and more in depth understanding of cellular responses.

## Biography

Amir Ghaemmaghmi is Professor of Immunology & Immuno-bioengineering at the Faculty of Medicine and Health Sciences, University of Nottingham, United Kingdom. He obtained his MD (1996) before studying for a PhD in Immunology (2002) at the University of Nottingham. After a period of postdoctoral training in universities of Leicester and Nottingham, in 2006 he was appointed as a Lecturer in Immunology in the Institute of Infection, Immunity and Inflammation at the Faculty of Medicine and Health Sciences, University of Nottingham followed by his promotion to Chair in Immunology & Immuno-bioengineering in 2014. Professor Ghaemmaghmi's research is focused on understanding the interaction between the immune system and environmental stimuli with an emphasis on the role of antigen presenting cells in immune regulation. His group's work in the area of innate immune recognition has led to many novel findings in the field. More recently his work has focused on developing 'immune-competent' tissue models and 'immune-instructive' biomaterials for applications in regenerative medicine, vaccinations and implantable medical devices. Professor Ghaemmaghmi is a Fellow of the Royal Society of Biologists and the UK Higher Education Academy and has served on various Editorial/Advisory Boards and international research funding panels.

