

BDRC Seminar Series: Organoid systems to study human pregnancy in vitro

Dr Margherita Turco

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Keywords

pregnancy, placenta, endometrium organoids, maternal-fetal interactions

Abstract

The key to a successful pregnancy is the fascinating yet ill-understood dialogue between the maternal endometrium and the fetal placental cells. In contrast to other organs, the uterus undergoes monthly cyclical growth and shedding of its mucosal lining, the endometrium, under the control of ovarian hormones. The biology of the normal endometrium is important to understand because distressing conditions such as infertility and pregnancy disorders are due to altered behaviour of the endometrium and its interactions with the placenta. Recently we have established 3D organoid systems of both the human endometrium and placenta. They both recapitulate the morphology, transcriptomics and function of their tissue of origin providing invaluable tools to study these two tissues in physiology and disease. We are using these in vitro models to investigate the signals that control the cyclical changes of the healthy endometrium and how this may be altered in women with early pregnancy loss. To study the fetal contribution to this, we are also using our organoid cultures of the human placenta. By deepening our understanding of the basic biology of maternal-fetal interactions, we aim to inform the development of treatments for the preparation of an optimal endometrium to improve implantation and pregnancy outcome.

Bio

Margherita is a Royal Society Dorothy Hodgkin Research Fellow and a Group Leader at the Department of Pathology, University of Cambridge. The research focus of her lab is to understand how the human placenta develops and how this process is influenced by its interactions with the maternal uterine environment. Her interest in the cell fate decisions and embryonic development began during her studies in Biotechnology at the University of Bologna, where she investigated the role of endogenous cannabinoid signalling in pre-implantation embryos. During her PhD in Molecular Medicine at the University of Milano, she continued to explore the role of adaptor molecules in development and cancer using several stem cell models. Margherita then joined the Centre for Trophoblast Research at the University of Cambridge as a research associate under the supervision of Prof. Graham Burton, Dr. Myriam Hemberger and Prof. Ashley Moffett. She was awarded an Intra-European Marie-Curie fellowship during which she established organoid models of the human placenta and uterus. With the support of the Royal Society and an ERC Starting Grant, her lab is using these culture systems combined with gene editing, single cell technologies and bioengineering approaches to address the key questions surrounding the establishment of pregnancy in humans.