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Ciclo XXVI Tutor Prof.ssa Luddi Alice

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Introduction

3D models are considered a new step to foster precision medicine and an advanced tool to study endometrial biology, endometrium associated diseases and to understand the complex mechanisms surrounding endometrium-embryo crosstalk.

Methods

My second-year focus on improving and characterize the 3D endometrial model (EM) using primary stromal and epithelial cells isolated from donor's menstrual blood as alternative to the endometrial biopsy, confirming their responsiveness to the decidualization hormonal treatments.

During my time as visitor PhD, I investigated a novel 3DEM composed of immortalized human endometrial stromal cells (ThESC), an endometrial epithelial cell line (EM42) and primary human uterine endothelial cells (HUtMECs). This model has been optimized to undergo physiological changes after decidualization treatments.

Initially generated in a static culture system, was integrated into the TissUse's Chips, biology-inspired micro-physiological systems, whose microfluidic channels were seeded with HUtMECs, and cultured for up to 10 days under circulatory pulsative flow. Viability and homeostasis were monitored by LDH release and metabolic profiling throughout the length of the assay.

Furthermore, integrity and functionality of the 3D EM were evaluated by immunofluorescence using cell-specific markers. After hormonal treatments, qPCR and ELISA were used to confirm decidualization. Characterization of endothelial cells was performed by ddPCR under basal and treatment conditions.

Results

This hormone-induced decidualization process could be partially inhibited by co-treatment with ulipristal acetate, a selective progesterone receptor modulator. Moreover, CalceinAM viability together with endothelial markers staining demonstrated that HUtMECs were viable and functional throughout the course of the chip culture. The implementation of the 3D model in the Chip allows to elucidate treatment effects on pathophysiological parameters in a complex tissue and could be used to model the window of implantation.

Abstracts:

-Endometrial Organoids From Menstrual Blood A Reliable And Non-invasive Tool For The Precision Medicine

F. Luongo, L. Governini, G. Belmonte, G. Morgante, V. De Leo, P. Piomboni, A. Luddi,
ISGE Gynecological Endocrinology 20th world congress 11-14 may 2022 Florence(IT)

- Baseline CD166 expression determines CRISPR-mediated *ALCAM* gene knockout effects on migratory phenotype in metastatic melanoma cells

Rafal Kaminski, Francesca P. Luongo, Konrad Dabrowski, Anna Bellizzi, Pietro Mancuso, M. Raza Zaidi, Johanna McMillan, Meha Patel, Tyrone Coleman, Oneida A. Arosarena.
AACR American Association for Cancer Research Annual Meeting 8-13 April 2022
Philadelphia (USA)

- SARS-CoV2 infection in human testis and sperm: in vivo and in vitro studies

A Luddi, F.P Luongo, R Ponchia, F Cecconi, F Dragoni, A Haxiu, M Zazzi, I Vicenti, P Piomboni
ESHRE European Society of Human Reproduction and Embryology 3-6 July 2022 Milan (IT)

-Human endometrial Organoids (hEOs): a non invasive powerful tool to study receptivity and a step forward precision medicine in IVF

F.P Luongo, A Luddi, E Paccagnini, G Morgante, V De Leo, P Piomboni
ESHRE European Society of Human Reproduction and Embryology 3-6 July 2022 Milan (IT)

- SARS CoV-2 infection of human ovarian cells: an *in vitro* model for the detection of the virus entry into the host cells

P Piomboni, F.P Luongo, F Dragoni, M Gentile, A Boccuto, L Boschi, G Morgante, I Vicenti, M Zazzi, A Luddi
ESHRE European Society of Human Reproduction and Embryology 3-6 July 2022 Milan (IT)

-Human endometrium-on-a-chip model of the secretory phase: a non-invasive powerful tool to study receptivity.

Francesca Paola Luongo, Katharina Schimek, Diana Karwelat, Andrea Seipp, Marian Raschke, Reyk Horland , Nicole Schmidt ,Paola Piomboni, Bianca De Leo
AIBG Associazione Italiana Biologia e Genetica 23-24 September 2022 Rome

Publications:

-Oxidative Stress Measurement in Frozen/Thawed Human Sperm: The Protective Role of an In Vitro Treatment with Myo-Inositol.

Ponchia R, Bruno A, Renzi A, Landi C, Shaba E, Luongo FP, Haxhiu A, Artini PG, Luddi A, Governini L, Piomboni P.
Antioxidants (Basel). 2021 Dec 22;11(1):10. doi:0.3390/antiox11010010. PMID: 35052514;
PMCID: PMC8773045.

- Bitter Taste Receptors Expression in Human Granulosa and Cumulus Cells: New Perspectives in Female Fertility.

Semplici B, Luongo FP, Passaponti S, Landi C, Governini L, Morgante G, De Leo V, Piomboni P, Luddi A.
Cells. 2021 Nov 11;10(11):3127. doi: 10.3390/cells10113127. PMID: 34831350; PMCID: PMC8619861.

- SARS-CoV-2 Infection of Human Ovarian Cells: A Potential Negative Impact on Female Fertility.

Luongo FP, Dragoni F, Boccutto A, Paccagnini E, Gentile M, Canosi T, Morgante G, Luddi A, Zazzi M, Vicenti I, Piomboni P.

Cells. 2022 Apr 23;11(9):1431. doi: 10.3390/cells11091431. PMID: 35563737; PMCID: PMC9105548.

-Cellular and Molecular Mechanisms of In Vivo and In Vitro SARS-CoV-2 Infection: A Lesson from Human Sperm.

Luddi A, Luongo FP, Dragoni F, Fiaschi L, Vicenti I, Lupetti P, Gentile M, Paccagnini E, Haxhiu A, Ponchia R, Governini L, Zazzi M, Piomboni P.

Cells. 2022 Aug 24;11(17):2631. doi: 10.3390/cells11172631. PMID: 36078041; PMCID: PMC9455059.

Experience Abroad

Experience in Company: from 25th of April to 27th of August

Project: Human endometrium-on-a-chip model of the secretory phase

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