POSTER 381

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Development of a sophisticated endometriosis human-based in vitro microphysiological system mimicking hormonal cycle to evaluate organ invasion

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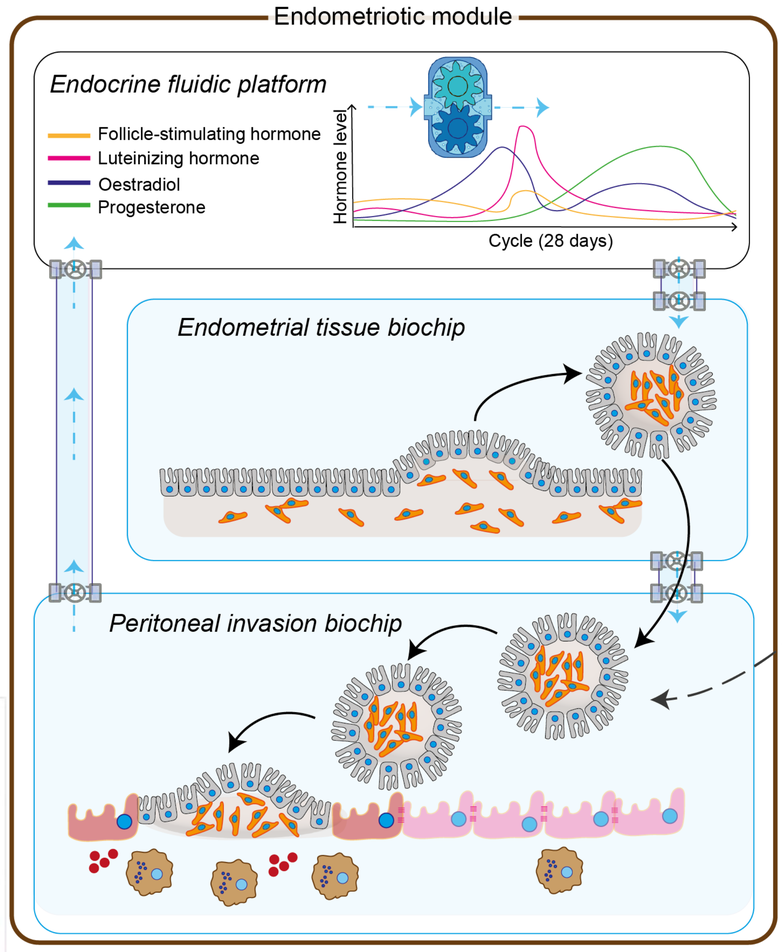
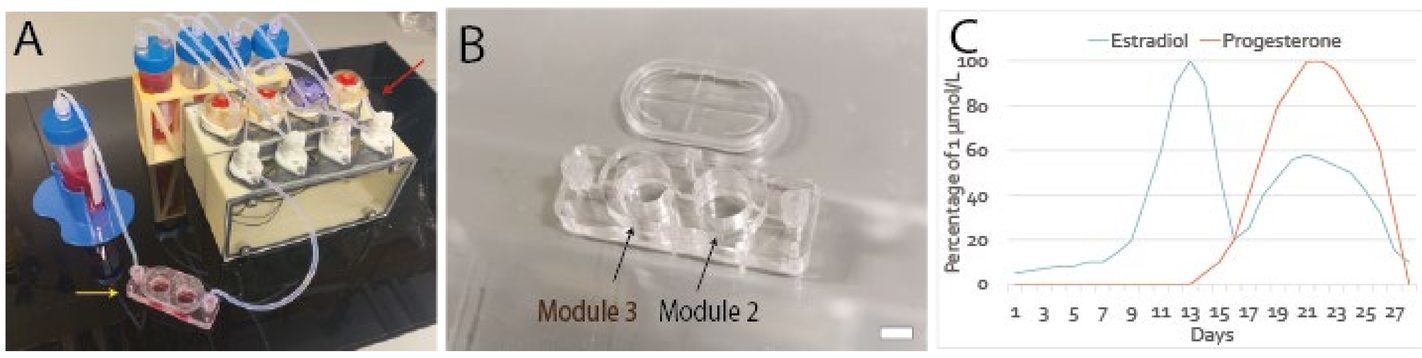
Endometriosis is a chronic and debilitating condition that affects approximately 10% of reproductive aged women worldwide. It occurs when the endometrium, which lines the inside of the uterus, grows in areas outside of the uterus, such as the peritoneum, ovaries and fallopian tubes. The misplaced tissue can cause severe pain, infertility and other morbidities.

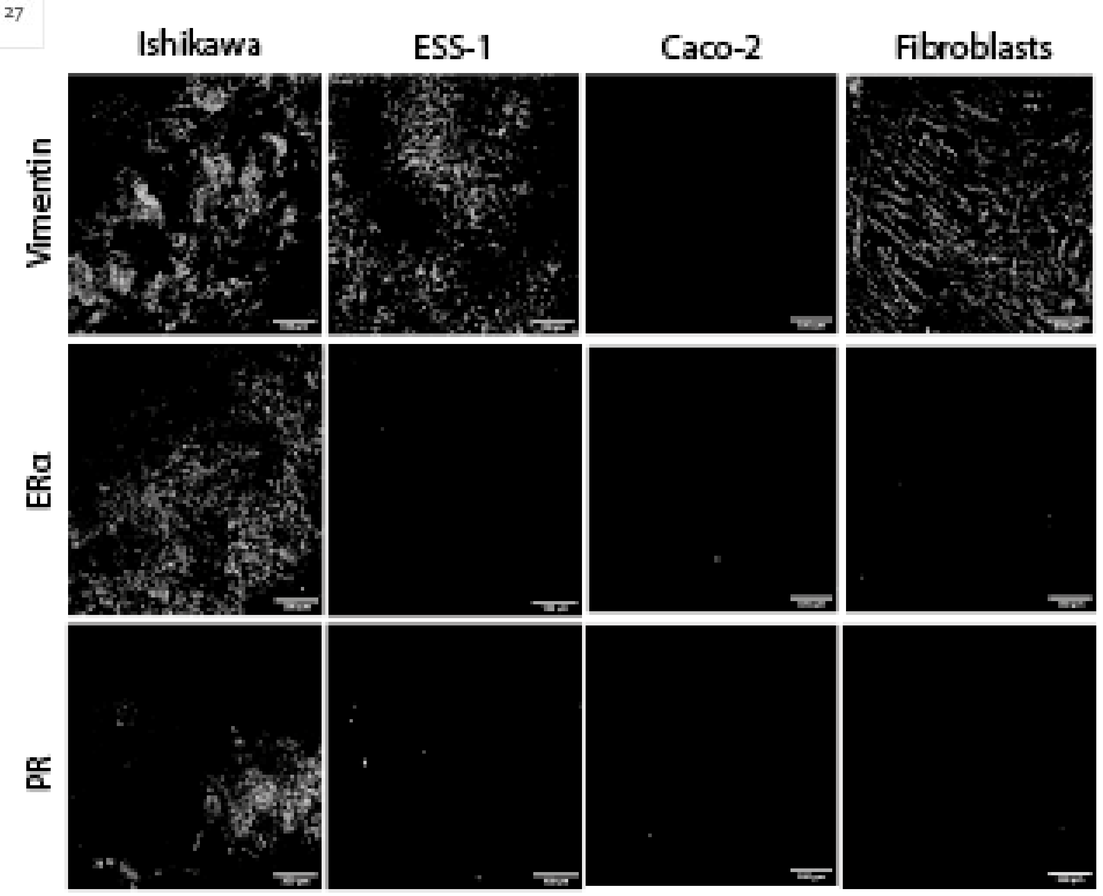
The development of endometriosis remains poorly understood. Historically, the most biologically relevant models of endometriosis are in menstruating non-human primates and in rodents. These carry significant costs and ethical concerns as well as limitations of translation to the clinic.

To answer these challenges, we have developed a more accurate and effective in vitro model to study endometriosis.

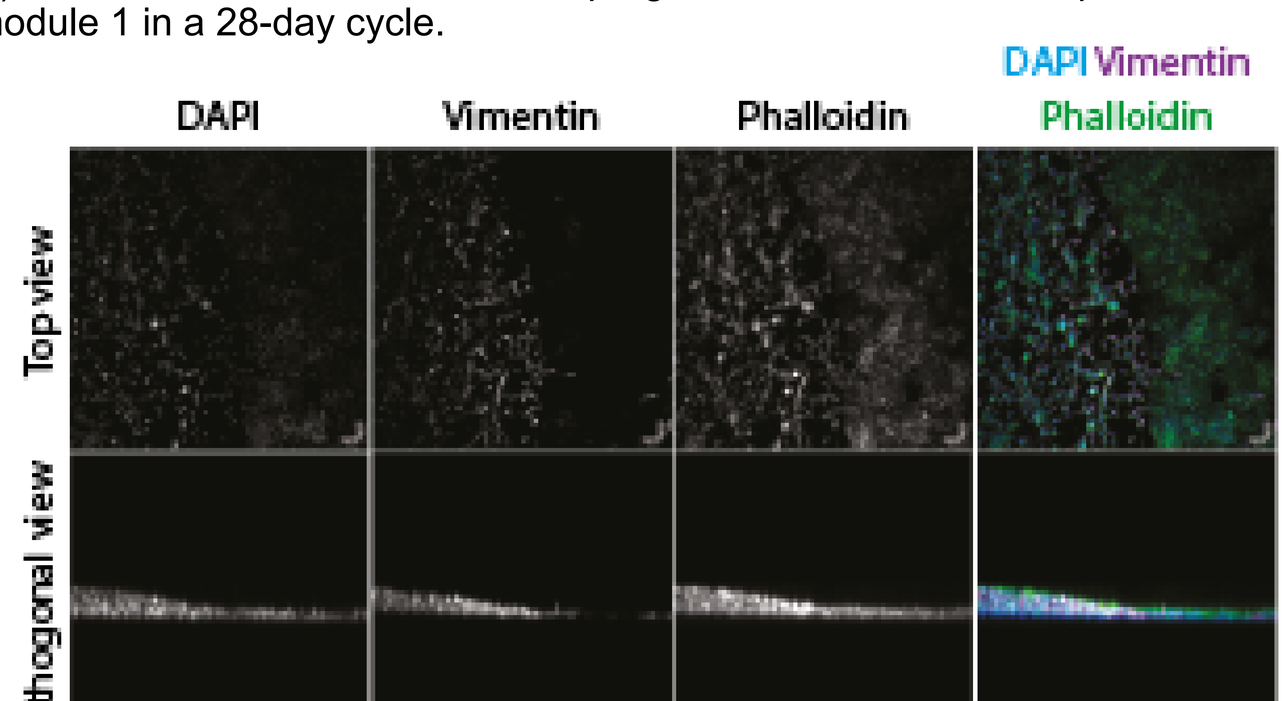




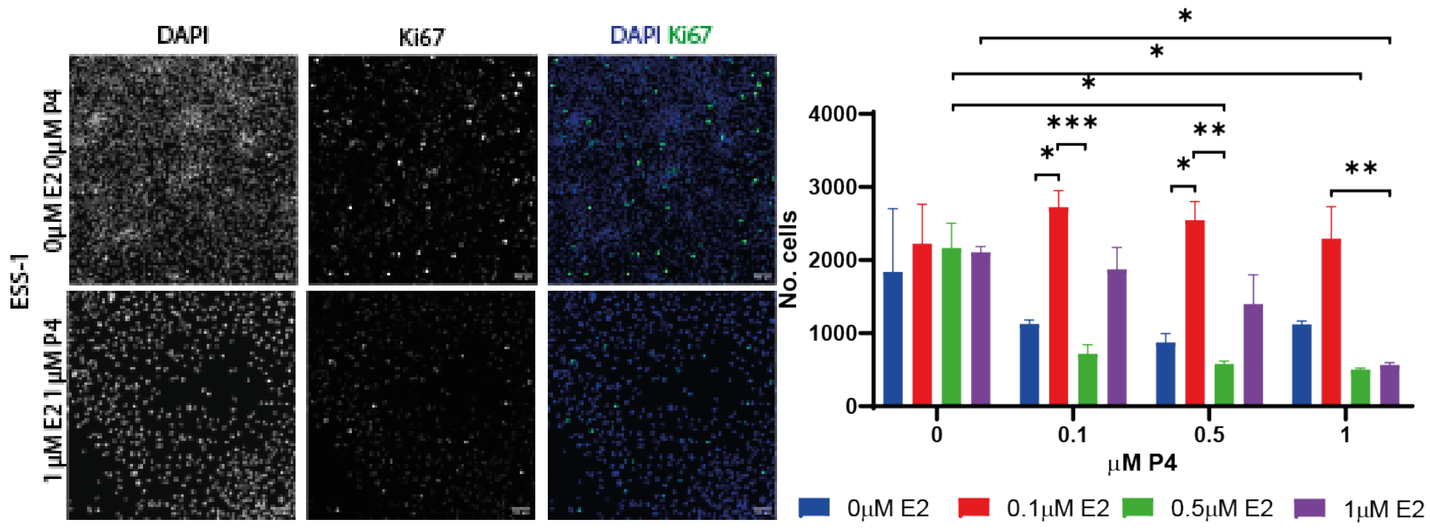
Technology A) MPS with 3 modules. Red arrow points out the fluidic unit. Yellow arrow points out Tissue-on-chip. B) Tissue-on-chip. C) Concentrations of estradiol and progesterone that can be reproduced with module 1 in a 28-day cycle.



Cells from endometrium express hormone receptors. Immunofluorescence images showing expression of Vimentin, Oestrogen Receptor alpha (Erα) and Progesterone Receptor (PR) on Ishikawa, ESS-1, Caco-2 and Fibroblasts cells. Scale bars: 100 µm.



Endometrium thickness can be monitored by confocal imaging. Immunofluorescence images of 3D model of endometrium. Field of view shows around 50% of the construct.



Number of cells is impacted by hormone concentration. ESS-1 cells labelled with DAPI and Ki67. Plots show number of cell nuclei in each conditions (ordinary 2-way ANOVA, Bonferroni method)

No. seeded cells	Counted (N ± SD)	Max integration	Integration efficacy
0	0 ± 0	0	-
10	0 ± 0.6	0	-
100	2 ± 1	2	100 ± 50 %
1000	13 ± 5.6	18	72.2 ± 31.1 %

Epithelial cells from endometrium can invade other tissue. Integration of Ishikawa cells on intestinal cell constructs.

3D co-culture models of human endometrium epithelial and stromal cell lines recapitulate features of human menstruation when exposed to different concentrations of oestrogen and progesterone. Preliminary data suggests that intestinal cell constructs can be invaded by endometrial cells. This showcases the feasibility of building a biologically relevant non-animal method for the study of endometriosis that can foster research of new drug targets and biomarkers in pharmaceutical, biotech and academic institutions.

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