



Engineering the Female Reproductive Tract

Joanna Burdette¹, Jonathan Coppeta², Brett Isenberg², Jeffrey T. Borenstein², Shuo Xiao³, Jie Zhu³, Alexandra Rashedi³, Julie Kim³, Susan Olalekan³, Spiro Getsios³, Kelly McKinnon³, Mary Ellen Pavone³, Saurabh Malpani³, Elizabeth C. Sefton³, Teresa K. Woodruff³

¹*Department of Medicinal Chemistry and Pharmacognosy, University of Illinois at Chicago, USA*

²*The Charles Stark Draper Laboratory, Cambridge, USA*

³*Department of Obstetrics and Gynecology; Department of Dermatology, Feinberg School of Medicine, Northwestern University, USA*

Introduction and Objective: The objective of the FemKUBE Program is to develop an integrated microphysiological model of the female reproductive tract that can be used for reproductive toxicology and therapeutic discovery.

Materials and Methods: This model consists of 3D cultures of ovarian follicles, fallopian tube epithelium, endometrial and myometrial co-cultures, and cervix connected by recirculating flow of cell culture media using a precision-controlled microfluidic culture system. Follicles cultured using microfluidics recapitulates the human 28 days menstrual cycle hormone expression patterns.

Results: During the follicular phase (day 1-14), follicles develop from primary stage to antral stage. During the luteal phase (day 15-28), follicles undergo luteinization. A transwell culture was optimized for fallopian tube epithelium in communication with the maturing ovarian follicle. In the fallopian and follicle co-culture system, the corpus luteum maintained function longer and secreted significantly higher levels of progesterone compared with the follicle cultured alone. Two distinct 3D culture systems of endometrial and myometrial cells were established using polystyrene scaffolds and decellularized matrix. Human ectocervical cells were grown on polystyrene scaffolds and the morphologic and hormonal responses of cultured cells were confirmed.

Conclusions: Future studies will use these systems to study new therapies and reproductive toxicology.

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Joanna Burdette