# A dynamic microfluidic culture model of the female reproductive tract

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The Fallopian tube epithelium plays a critical role in human fertility by facilitating gamete transport, fertilization, and early embryo development[1]. The cooperative activity of ciliated and secretory epithelial cells is essential for maintaining luminal homeostasis[2]. This balance is dynamically regulated by both mechanical and hormonal cues[3]. However, the role of the dynamic tubal flow environment in regulating epithelial cell behaviour, and the mechanotransduction pathways underlying their responses, remain largely undefined. Here, we present a microfluidic model that mimics the native flow microenvironment of the Fallopian tube to examine how physiological shear regulates epithelial differentiation. Primary epithelial cells were cultured in a dual-channel PDMS device under static and dynamic flow conditions mimicking *in vivo* shear rates. Cellular responses were evaluated for ciliogenesis (acetylated α-tubulin, FOXJ1) and secretory activity (OVGP1). Our findings demonstrate that fluid shear promotes cilia formation by up to 3-fold and enhances OVGP1 secretion, suggesting shear-induced functional maturation of both ciliated and secretory epithelial cells. This dynamic microfluidic culture model offers a valuable platform for advancing our understanding of reproductive tract biology.

**References:**

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