Group #31

Vaginal Benchtop Model to Mimic Physiological Conditions for Intravaginal Drug Delivery

Team Members: Kaitlyn Srihavong
Mentor: Dr. Erika L. Cyphert
Co-Mentors: Yumie Lee

Abstract

Current in vitro vaginal models often lack the physiological accuracy in geometry and environmental control needed to reliably predict the in vivo behavior of drug formulations. This project developed a standardized benchtop model that replicates key physiological conditions, including an enlarged 1.5x macroscale geometry for enhanced visualization and a regulated thermal environment of 37 ± 0.5 °C. The system utilizes a modular 3D-printed assembly to cast an anatomically representative canal from EcoFlex™ 30 silicone, mimicking natural tissue compliance. To simulate dynamic physiological variables, the platform integrates a closed-loop resistive heating element with thermistor feedback, a moisture application system for simulated vaginal fluid, and controlled anatomical rotation. Preliminary assessments indicate the model provides a reproducible platform for evaluating drug deposition and retention, offering a cost-effective alternative to animal models for early-stage testing of therapeutics.