Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Coating flow of non-Newtonian anti-HIV microbicide vehicles SU CHAN PARK, ANDREW SZERI, STÉPHANE VERGUET, UC Berkeley, DAVID KATZ, Duke University, AARON WEISS, UC Berkeley — Elastohydrodynamic lubrication over soft substrates is of importance for the drug delivery functions of vehicles for anti-HIV topical microbicides. These are intended to inhibit transmission into vulnerable mucosa, e.g. in the vagina. First generation prototype microbicides have gel vehicles, which spread after insertion and coat luminal surfaces. Effectiveness derives from potency of the active ingredients and completeness and durability of coating. Delivery vehicle rheology, luminal biomechanical properties and the force due to gravity influence the coating mechanics. We develop a framework for understanding the relative importance of boundary squeezing and body forces on the extent and speed of the coating that results. In the case of a shear-thinning fluid, the Carreau number also plays a role. Numerical solutions are developed for a range of conditions and materials. Results are interpreted with respect to tradeoffs between wall elasticity, longitudinal forces, bolus viscosity and bolus volume. These provide initial insights of practical value for formulators of non-Newtonian gel delivery vehicles for anti-HIV microbicidal formulations.

Andrew Szeri
UC Berkeley

Date submitted: 06 Aug 2008 Electronic form version 1.4