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Coating flow of an anti-HIV microbicide gel: boundary dilution and yield stress[1] ANDREW J. SZERI, SAVAS TASOGLU, SU CHAN PARK, UC, Berkeley, DAVID F. KATZ, Duke University — A recent study has confirmed, for the first time, that a vaginal gel formulation of the antiretroviral drug Tenofovir, when topically applied, significantly inhibits sexual HIV transmission to women [1]. However, the gel for this drug, and anti-HIV microbicide gels in general, have not been designed using an understanding of how gel spreading govern successful drug delivery. Elastohydrodynamic lubrication theory can be applied to model spreading of microbicide gels [2]. Here, we extend our initial analysis: we incorporate a yield stress, and we model the effects of gel dilution due to contact with vaginal fluid produced at the gel-tissue interface. Our model developed in [2] is supplemented with a convective-diffusive transport equation to characterize dilution, and solved using a multi-step scheme in a moving domain. The association between local dilution of gel and rheological properties is obtained experimentally. To model the common yield stress property of gels, we proceed by scaling analysis first. This establishes the conditions for validity of lubrication theory of a shear thinning yield stress fluid. This involves further development of the model in [2], incorporating a biviscosity model.

[1] Karim, et al., Science, 2010.
[2] Szeri, et al., Phy. of Fluids, 2008.

[1]NIH U19 AI 077289

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