Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Peristaltic pumping of solid particles immersed in a viscoelastic fluid[1] JOHN CHRISPELL, LISA FAUCI, Tulane University — Peristaltic pumping of fluid is a fundamental method of transport in many biological processes. In some instances, particles of appreciable size are transported along with the fluid, such as ovum transport in the oviduct or kidney stones in the ureter. In some of these biological settings, the fluid may be viscoelastic. In such a case, a nonlinear constitutive equation to describe the evolution of the viscoelastic contribution to the stress tensor must be included in the governing equations. Here we use an immersed boundary framework to study peristaltic transport of a macroscopic solid particle in a viscoelastic fluid governed by a Navier-Stokes/Oldroyd-B model. Numerical simulations of peristaltic pumping as a function of Weissenberg number are presented. We examine the spatial and temporal evolution of the polymer stress field, and also find that the viscoelasticity of the fluid does hamper the overall transport of the particle in the direction of the wave.

[1]Research partially supported by the NSF under grant no. DMS-0652795.

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Date submitted: 05 Aug 2010 Electronic form version 1.4