

Abstract Submitted  
for the DFD20 Meeting of  
The American Physical Society

**Fluid Elasticity enhances Mammalian Sperm Cells propulsion speed** QUENTIN BROSSEAU, PAULO ARRATIA, University of Pennsylvania — While much is known about swimming of mammalian sperm cells in Newtonian fluids, there is still much to be learned about the effects of fluid elasticity on the swimming behavior of sperm cells. Here, we discuss results from a systematic experimental investigation of sperm cells swimming in polymeric fluids with different levels of elasticity; results are compared to Newtonian fluids of similar viscosities. We find that in general sperm cells swimming speed decreases as fluids viscosity increases for both viscoelastic and Newtonian fluids. However, as the viscosity increases, the decay in swimming speed in polymeric solutions is much less pronounced than in Newtonian solutions; that is, the swimming speed asymptotes to a larger value for viscoelastic than for Newtonian fluids at high viscosities. We also find that sperm swimming speed increases as fluid elasticity (or Deborah number) increases. We quantify changes in kinematics and swimming gait and show how they can account for the significant enhancement in sperm motility in non-Newtonian fluids. Overall, our results show sperm cells can swim faster in viscoelastic than in Newtonian fluids of same viscosity, suggesting that viscoelasticity may enhance sperm swimming speed.

Quentin Brosseau  
University of Pennsylvania

Date submitted: 10 Aug 2020

Electronic form version 1.4