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Flexible polymers suppress wobbling and tumbling of *E. coli* cells

ALISON KOSER, PAULO ARRATIA, University of Pennsylvania — The run-and-tumble dynamics of swimming *E. coli* has been extensively studied. In this talk, we experimentally investigate the role of polymer concentration on the swimming dynamics of *E. coli* using tracking methods. We find that the addition of small amount of polymer to water drastically changes the run-and-tumble behavior of *E. coli* cells, enhancing translation while hindering rotational diffusion. Here, the cells are suspended in dilute solutions of carboxy-methyl cellulose (CMC) and imaged in a liquid film away from surfaces. The addition of polymer molecules to the fluid (water) leads to cell trajectories that are highly correlated in time; cells move in nearly straight lines and rotational diffusion is greatly reduced. By varying the polymer molecular weight, we show that trajectories are a result of two mechanisms: (1) suppression of cell wobbling due to elasticity and (2) enhancement of run times due to viscosity. Our experiments show that this combination of increased speed and suppressed reorientation dramatically changes overall cell dynamics in the presence of polymers.

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