Abstract Submitted
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Changes in the flagellar bundling time account for variations in swimming behavior of flagellated bacteria in viscous media[1] ZIJIE QU, Brown University, FATMA TEMEL, Harvard University, RENE HENDERIKX, Eindhoven University of Technology, KENNETH BREUER, Brown University — The motility of bacteria E.coli in viscous fluids has been widely studied, although conflicting results on the effect of viscosity on swimming speed abound. The swimming mode of wild-type E.coli is idealized as a run-and-tumble sequence in which periods of straight swimming at a constant speed are randomly interrupted by a tumble, defined as a sudden change of direction with a very low speed. Using a tracking microscope, we follow cells for extended time and find that the swimming behavior of a single cell can exhibit a variety of behaviors including run-and-tumble and "slow-random-walk" in which the cells move at relatively low speed without the characteristic run. Although the characteristic swimming speed varies between individuals and in different polymer solutions, we find that the skewness of the speed distribution is solely a function of viscosity, and uniquely determines the ratio of the average speed to the characteristic run speed. Using Resistive Force Theory and the cell-specific measured characteristic run speed, we show that differences in the swimming behavior observed in solutions of different viscosity are due to changes in the flagellar bundling time, which increases as the viscosity rises, due to lower rotation rate of the flagellar motor.

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Zijie Qu
Brown University

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