

Abstract Submitted
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Concentrating bacterial cells using a ratchet system: a lattice Monte Carlo simulation study YUGUO TAO, GARY SLATER, Department of Physics, University of Ottawa — Rectification of motile *E. coli* bacteria has been observed in the presence of funnel-like channels. We present a lattice Monte Carlo model which takes into account both the size and the mechanical and thermodynamic properties of autonomous bacterial cells. The motion of the cells is composed of alternating run and tumble periods. We show that the rectification effect of the funnels is strongly dependent upon the effective random walk step length of the run/tumble cycle as well as the size of the funnel's aperture. Our results agree with experimental observations, and also confirm some conclusions from a previous simulation model of point-like bacteria. We also explore series of funnels as a means to pump and concentrate cells. We observe deviations from theoretical predictions when the size of the cells is comparable to that of the aperture of the funnel. The current model can be extended to study cells with different shapes, e.g. cigar-shape bacteria.

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