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Diffusion nearby elastic cell membranes ABDALLAH DADDI-MOUSSA-IDER, ACHIM GUCKENBERGER, STEPHAN GEKLE, Biofluid Simulation and Modeling, Universität Bayreuth, Universitätsstra30, 95440, Germany —
The physical approach of a small particle to the cell membrane represents the crucial step before active internalization and is governed by Brownian diffusion. Using a fully analytical theory, we show that the stretching and bending of cell membranes induces a long-lived subdiffusive behavior on the nearby particle (1,2). Such behavior is qualitatively different from the normal diffusion in a bulk fluid or near a hard-wall. the scaling exponent of the mean-square displacement can go as low as 0.87 in the perpendicular and 0.92 in the parallel direction. Moreover, we investigate the hydrodynamic interaction between two particles finding that the steady motion of two particles towards an elastic membrane possessing only shearing resistance leads to attractive interaction in contrast to the hard-wall case where the interaction is known to be repulsive. Our analytical predictions are compared with boundary-integral simulations where an excellent agreement is obtained (3).

References
(1) Daddi-Moussa-Ider, A., Guckenberger, A. and Gekle, S., Phys. Rev. E 93, 012612 (2016)
(2) Daddi-Moussa-Ider, A., Guckenberger, A. and Gekle, S., Phys. Fluids 28, 071903 (2016)
(3) Daddi-Moussa-Ider, A. and Gekle, S., J. Chem. Phys., 145, 014905 (2016)

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