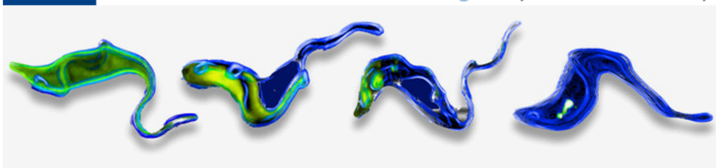

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# Flow structures around a microswimmer at fluid-fluid interface

Living organisms such as bacteria and algae often form biofilms at air-liquid and/or liquid-liquid interfaces. Therefore, it is important to understand the hydrodynamic interaction between the fluid-fluid interface and microorganisms. In this study, the flow field structures around a symmetrically trapped spherical microswimmer at an interface separating two fluids with different viscosities are investigated using lattice Boltzmann (LB) simulations. In these simulations, Reynolds (Re) and Capillary (Ca) numbers are very small, and hence the contribution of inertia and interface deformations are neglected. Simulations of different types of microswimmers (pusher, puller, and neutral) are achieved by varying the squirmer parameter ($\beta$). It is observed that the flow structure and vorticity distribution around the microswimmers are strongly influenced by the squirmer parameter ($\beta$) and viscosity contrast ($\lambda$). Furthermore, the interplay between force-dipole and source-dipole along with viscosity contrast leads to a range of flow structures such as symmetric four-lobe, and asymmetric quadrupolar flow fields. Flow structure asymmetry is quantified for swimmer with different steady state orientations. Finally, the hydrodynamic interaction between microswimmer and passive tracer particles are presented in terms of trajectories.

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