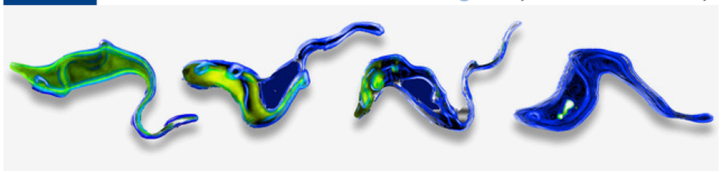

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Evolution of micro-swimmer designs in distinct microenvironments

Trypanosoma brucei, a eukaryotic parasite with a single flagellum, is transmitted by tsetse flies and thrives across a broad range of vertebrate species. These parasites cause several diseases in their hosts, exemplified by sleeping sickness in humans. Throughout their life cycle, these cells encounter diverse microenvironments with different physical attributes, such as viscosity [1]. These cells have demonstrated a notable capacity to adapt within these microenvironments. Cell morphology and propulsion are highly dependent on flagellar motion [2]. The cell movement initiates with a planar bending wave on the flagellum in the anterior end of the cell, followed by a longitudinal rotation due to the helical attachment of the flagellum to the cell body [3]. However, the details of the motion behavior and morphological cell changes remain insufficiently quantified. In this study, we acquired live cells at high temporal resolution. This allowed us to elucidate the single-cell movement of Trypanosoma brucei, particularly within different viscosities. This investigation involves quantitatively comparing cell behavior in different viscosities, revealing interesting correlations of rotational cell translocation, and frequency of flagellar beating. Further, the characterization of the environment's rheological properties is underway in order to determine how the environmental properties affect cell behavior. These prompted us to carry out experiments aimed at quantifying the mechanical properties of the cells, explaining the underlying morphological basis for changes in motility patterns.

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