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**Fibrous flagellar hairs of Chlamydomonas reinhardtii do not enhance swimming** GUILLERMO AMADOR, DA WEI, MARIE-EVE AUBIN-TAM, DANIEL TAM, Delft University of Technology — The flagella of Chlamydomonas reinhardtii possess fibrous ultrastructures of nanometer-scale thickness known as mastigonemes. While these structures are hypothesized to enhance flagellar thrust, detailed hydrodynamic evidence supporting this claim is lacking. In this study, we present a comprehensive investigation into the hydrodynamic effects of mastigonemes using genetically modified mutants lacking the fibrous structures. Through high speed observations of freely swimming cells, we found the average and maximum swimming speeds to be unaffected by the presence of mastigonemes. In addition to swimming speeds, no significant difference was found for flagellar gait kinematics. Following our observations of swimming kinematics, we present direct measurements of the hydrodynamic forces generated by flagella with and without mastigonemes. These measurements were conducted using optical tweezers, which enabled high temporal and spatial resolution of hydrodynamic forces. Through our measurements, we found no significant difference in propulsive flows due to the presence of mastigonemes. Direct comparison between experimental measurements and numerical simulations revealed that swimming hydrodynamics were accurately captured without including mastigonemes on the modeled swimmer's flagella. Therefore, mastigonemes do not appear to increase the flagella's effective area while swimming, as previously thought. Our results refute the claim that mastigonemes enhance flagellar thrust in C. reinhardtii, and so their function still remains enigmatic.

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