Abstract Submitted
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Flow caused by the stalk contraction of Vorticella[1] SANGJIN RYU, EUN-GUL CHUNG, DAVID ADMIRAAL, University of Nebraska-Lincoln — Vorticella is a stalked protozoan, and its ultrafast stalk contraction moves the spherically-shrunken cell body (zooid) and thus causes surrounding water to flow. Because the fluid dynamics of this water flow is important for understanding the motility of Vorticella, we investigated the flow based on various fluid dynamics approaches. To find why Vorticella contracts its stalk, we propose a hypothesis that the protist utilizes the contraction-induced water flow to augment transport of food particles. This hypothesis was investigated using a computational fluid dynamics (CFD) model, which was validated with an experimental scale model of Vorticella. The CFD model enabled calculating the motion of particles around Vorticella and thus quantifying the transport effect of the stalk contraction. Also, we have developed a hydrodynamic drag model for easier estimation of Vorticella's contractility without using the CFD model. Because the contractile force of the stalk equals the drag on the moving zooid, the model enabled evaluating the contractile force and energetics of Vorticella based on its contraction speed. Analyses using the drag model show that the stalk contractility of Vorticella depends on the stalk length.

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