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The deadly swimming of Cercariae: an unusual Stokesian swimmer MANU PRAKASH, DEEPAK KRISHNAMURTHY, Stanford University — Schistosomiasis, also known as Bilharzia, is a Neglected Tropical Disease (NTD) caused by a parasitic Trematode blood fluke worm. In terms of socio-economic and public health impact, Schistosomiasis is second only to Malaria as the most devastating parasitic disease in tropical countries; with roughly 200 million people infected at any time world-wide and up to 200,000 deaths every year. The infectious form of the parasite, known as Cercariae, emerge from snails into freshwater and infect humans by directly burrowing into the skin. Thus, anyone in contact with infected waters is at risk, which mostly includes children. By establishing a safe experimental means of studying the Cercariae in our lab, we report here their unusual swimming dynamics which include both head-first and tail-first swimming modes. These swimming modes are crucial for the chemotactic activity of Cercariae which allows them to seek out and burrow into human skin. By experimental and analytical means, we demonstrate that Cercariae break symmetry and achieve locomotion at small Reynolds number differently when compared to well-known methods involving traveling waves in the flagellum or chiral beating. Although they utilize the well-known drag anisotropy of a slender body in Stokes flow, the geometry and kinematics of their propulsion mechanism is novel. Based on these results, we propose a new kind of simple Stokesian swimmer (T-joint swimmer) in an attempt to explain the evolutionary advantages of this novel swimming mechanism. Using the above physical insights from a biological and global-health standpoint, we explore ways to hinder the chemotactic capabilities of this parasite.

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