Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Webinar

Malaria parasites as a novel model system for chiral active matter

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Active matter refers to a collection of individuals, from animal groups to microorganisms to cytoskeletal filaments, that extract energy from their surroundings at a single particle level to generate motion and display remarkable examples of self-organization. Here we show that Plasmodium sporozoites, a crescent-shaped form of malaria parasites, provide a unique model system for active matter that combines the aspects of self-propulsion, curved shape, and mechanical flexibility into one system. We investigate the motion of sporozoites in collectives extracted from the salivary glands of mosquitoes, where they form large rotating vortices. We find that single sporozoites within the vortices are sorted, and the vortices undergo oscillatory breathing in their shape. We explain these intriguing observations using agent-based simulations where each agent is represented by an active curved polymer that mimics a motile sporozoite. In summary, we establish malaria parasites as a new active matter system and provide novel insight into the collective behaviour of chiral active particles.

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