

Tracking the Idiosyncratic Steps of Kinesin Family Members With Optical Tweezers

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We have been using optical tweezers in various geometries to measure the motions of kinesin motor proteins from different motor families in single-molecule assays. Dimeric Kinesin 1 motors are processive and can be well tracked with “single-bead assays” which involve trapping a micron-sized bead with one individual motor protein attached to it. One can deduce step size, motor speed and stall forces from these assays. Kinesin 5 motors are tetrameric with motor heads on both ends of a stalk. The one we studied, Eg5, is also processive, but shows intriguing regulation features. The C-terminal Kinesin 14 motors have the opposite directionality from all other kinesins and are not processive. For these motors we have set up a “three-bead assay”, suspending a microtubule with two optical traps over a third bead carrying the motor. In this way one can observe individual power strokes of the motor.