MAR07-2007-020533

Abstract for an Invited Paper
for the MAR07 Meeting of
the American Physical Society

Structural dynamics of myosin V: characterization of the one-head bound intermediate

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Myosin V transports cargo along actin filaments by walking hand over hand. Although this basic model is supported by numerous studies, little is known about the intermediate that occurs when only one of the two heads is bound to actin. Here we use submillisecond darkfield imaging of gold nanoparticle labeled myosin V to directly observe the free head as it releases from the actin filament, diffuses forward, and rebinds. The released head rotates freely about the lever arm junction, a trait which likely facilitates travel through crowded actin meshworks. Free head rebinding occurs more rapidly when one of the six calmodulins bound to the lever arm is replaced with the light chain LC1sa. Our data suggest that strong rebinding and phosphate release occur rapidly, but that the lever arm swing is thwarted by intramolecular strain. The effect of light chain composition on free head rebinding kinetics suggests a potentially elegant means of modulating filament switching and processivity in a tissue-specific manner.