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Minimal Mechanochemical Model for the Processivity of Myosin VI YUBO YANG, IAN LOWE, RIINA TEHVER, Denison University — Myosin VI is an ATPase responsible for force generation in cells. It dimerizes upon actin binding, and is proposed to walk along the actin filament. Single headed reaction mechanism of myosin VI is well understood but much of its walking mechanism remains unclear. We aim to construct a minimum model for the myosin VI walking mechanism and explore the minimal requirements for processivity. We constructed a kinetic model for the stepping mechanism of Myosin VI using minimum assumptions. The kinetics of the myosin VI dimer is modeled as a three state linear reaction network with reaction rates extracted from relevant experiments. The time limiting step in in-vitro experiments (low APT concentration) is the diffusion of detached head. In this process the myosin dimer is modeled as a tethered polymer with a flexible joint at the dimerization site. The relevance of this polymer model is checked with coarse-grained simulation. We found that the motor maintains processivity for a wide range of kinetic parameters, however long persistence length for the lever arm is crucial for processivity especially under resistive load.

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