

Walking with Myosin V

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Abstract:

Myosins comprise a superfamily of more than 30 classes which perform a diverse set of tasks within cells including the transport of cargo such as melanosomes, secretory vesicles, ER and mRNA. To accomplish the role of a transport motor, some myosins have evolved the ability to move processively along actin filaments such that a single molecule would be capable of moving the cargo. Myosin 5a is a particularly well studied cargo motor. It is generally agreed that myosin 5a:

- 1) moves processively along actin
- 2) takes 36 nm steps in doing so
- 3) moves in a “hand-over-hand” fashion in which the two heads alternate positions while moving forward
- 4) the neck region of myosin 5a serves as a rigid lever arm to amplify small scale movements within the motor domain into a large power stroke
- 5) the kinetics of the two heads are gated such that the leading head does not readily release ADP as long as the trail head is attached
- 6) One ATP molecule is consumed per step

In this talk I will present evidence accumulated over the past ten years by our lab along with our collaborators to support each of these statements. Various biophysical techniques have been used to probe the function of myosin 5a at a single molecule level including optical trapping nanometry, observation of the movement of single, fluorescently-labeled molecules using TIRF microscope, including movement tracking at near nanometer resolution and single particle electron microscopy. Combined, these techniques give a clear picture of how myosin-5a moves along actin.

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