

Abstract Submitted
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Single molecule studies reveal new mechanisms for microtubule severing¹ JENNIFER ROSS, JUAN DANIEL DIAZ-VALENCIA, MARGARET MORELLI, UMass Amherst, DONG ZHANG, DAVID SHARP, AECOM — Microtubule-severing enzymes are hexameric complexes made from monomeric enzyme subunits that remove tubulin dimers from the microtubule lattice. Severing proteins are known to remodel the cytoskeleton during interphase and mitosis, and are required in proper axon morphology and mammalian bone and cartilage development. We have performed the first single molecule imaging to determine where and how severing enzymes act to cut microtubules. We have focused on the original member of the group, katanin, and the newest member, fidgetin to compare their biophysical activities in vitro. We find that, as expected, severing proteins localize to areas of activity. Interestingly, the association is very brief: they do not stay bound nor do they bind cooperatively at active sites. The association duration changes with the nucleotide content, implying that the state in the catalytic cycle dictates binding affinity with the microtubule. We also discovered that, at lower concentrations, both katanin and fidgetin can depolymerize taxol-stabilized microtubules by removing terminal dimers. These studies reveal the physical regulation schemes to control severing activity in cells, and ultimately regulate cytoskeletal architecture.

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