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KlpA is a Novel Processive Kinesin-14 Motor with Tunable Directionality

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ABSTRACT

Kinesins are naturally occurring protein-based motor proteins that can use chemical energy to drive directional movement and generate forces inside the cells. Kinesin-14s are a distinct subset of kinesin motors that typically contain an N-terminal nonmotor microtubule-binding tail and a C-terminal microtubule-binding motor domain. Extensive studies suggest that kinesin-14 are commonly considered to be nonprocessive minus end-directed motors. However, our recent study shows that KlpA – a kinesin-14 from the filamentous fungus Aspergillus nidulans – is a context-dependent bidirectional motor: between a pair of microtubules, it behaves similarly to other kinesin-14s to exhibit canonical minus end-directed motility, but on a single microtubule, it surprisingly moves processively toward the plus end on a single microtubule. We further show that the N-terminal nonmotor microtubule-binding tail of KlpA is required for it to achieve processive plus end-directed motility on single microtubules. By shortening the N-terminal tail of KlpA or inserting a flexible linker between the tail and the motor domain, we have now engineered two new KlpA variants that both exhibit processive minus end-directed motility on single microtubules. Collectively, these results show that KlpA is a novel processive kinesin-14 motor with tunable directionality.

BIO:

Dr. Weihong Qiu received his B.S. and M.S. in Applied Physcs both from Nankai Univeristy (Tianjin, China) and his Ph.D. in Biophysics from The Ohio State University (Columbus, OH). Dr. Qiu did his postdoctoral training in the Department of Cell Biology at Harvard Medical School before joining the Department of Physics as an Assistant Professor at Oregon State University. Research in the Qiu lab is focused on understanding the evolution, mechanism and regulation of protein-based molecular motors using an interdisciplinary approach that integrates molecular biology, protein biochemistry, cell biology and single-molecule imaging. Current research in the Qiu lab is funded by the National Science Foundation.