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Mitosis. Microtubule detyrosination guides chromosomes during mitosis.

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Abstract

Before chromosomes segregate into daughter cells, they align at the mitotic spindle equator, a process known as chromosome congression. Centromere-associated protein E (CENP-E)/Kinesin-7 is a microtubule plus-end-directed kinetochore motor required for congression of pole-proximal chromosomes. Because the plus-ends of many astral microtubules in the spindle point to the cell cortex, it remains unknown how CENP-E guides pole-proximal chromosomes specifically toward the equator. We found that congression of pole-proximal chromosomes depended on specific posttranslational detyrosination of spindle microtubules that point to the equator. In vitro reconstitution experiments demonstrated that CENP-E-dependent transport was strongly enhanced on detyrosinated microtubules. Blocking tubulin tyrosination in cells caused ubiquitous detyrosination of spindle microtubules, and CENP-E transported chromosomes away from spindle poles in random directions. Thus, CENP-E-driven chromosome congression is guided by microtubule detyrosination.

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