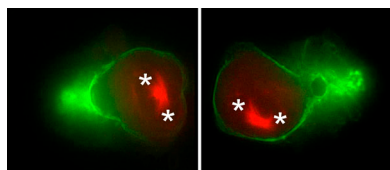


Long asters rock the spindle



In the absence of MCAK, the mitotic spindle (red) rocks back and forth as myosin (green) contracts opposing cell poles.

Mitotic cells regulate the lengths of their astral microtubules to keep the spindle steady during cytokinesis, Rankin and Wordeman report.

Astral microtubules emanate from the spindle poles toward the cell cortex and help to position the cleavage furrow at the end of mitosis by confining actomyosin contraction to the cell equator: when microtubules are shortened with depolymerizing drugs, contraction occurs all around the cell cortex. Rankin and Wordeman took the opposite approach to studying astral microtubules—lengthening them by depleting the depolymerizing motor protein MCAK or treating cells with the stabilizing drug taxol.

Cytokinetic furrows formed correctly but mitotic spindles oscillated wildly between would-be daughter cells. Spindle rocking correlated with the formation of membrane blebs—protrusions at the cell poles where cortical actomyosin was disrupted. Mitotic spindles were sucked into the blebs before actin and myosin reassembled to squeeze the membrane back into shape, pushing the spindle into blebs on the opposing side. Inhibiting myosin activity stopped spindle rocking in MCAK-depleted cells.

Rankin and Wordeman suggest that membrane blebs form during cytokinesis because the polar cortical cytoskeleton is weakened as actin and myosin relocate to the growing cleavage furrow. Blebbing occurs in wild-type cells too, but is particularly hazardous in the absence of MCAK because the cells' extended astral microtubules widen the blebs to a size large enough to initiate spindle oscillations. Aster size must therefore be tightly regulated to position the cleavage furrow without exacerbating membrane blebs. Rankin, K.E., and L. Wordeman. 2010. *J. Cell Biol.* doi:10.1083/jcb.201004017.

SPSB2 sets NO limits

The SOCS box protein SPSB2 targets inducible nitric oxide synthase (iNOS) for degradation to prevent the enzyme from damaging tissues following pathogen infection, Kuang et al. say.

SOCS box proteins recruit E3 ubiquitin ligases to modify specific proteins and target them for destruction by the proteasome. SPSB2 is part of a subfamily of SOCS box proteins whose physiological substrates are largely unknown. Kuang et al. found that one of SPSB2's targets is iNOS, the enzyme that generates nitric oxide (NO) and other reactive nitrogen species to fight invading pathogens such as *Leishmania major*.

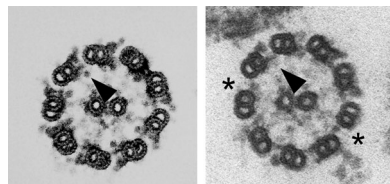
NO is cytotoxic, so iNOS must be removed once an infection has been resolved. SPSB2 bound to iNOS and induced its ubiquitination. The enzyme was rapidly turned over by macrophages

overexpressing SPSB2, whereas macrophages lacking SPSB2 degraded iNOS slowly. But the lack of SPSB2 has an upside: iNOS and NO levels were higher in SPSB2-deficient macrophages, allowing the cells to kill invading *Leishmania* with greater efficiency.

SPSB2 expression is suppressed by the same stimuli that induce iNOS production, so the SOCS box protein only downregulates iNOS once an infection has passed. But authors Sandra Nicholson and Ray Norton think that inhibiting the SPSB2–iNOS interaction could help treat chronic diseases like tuberculosis, prolonging iNOS's lifetime to kill off persistent, low-level infections. They also want to investigate whether other members of the SPSB family target iNOS for degradation as well.

Kuang, Z., et al. 2010. *J. Cell Biol.* doi:10.1083/jcb.200912087.

PIH proteins give dynein arms a hand



Some inner arm dyneins (arrowhead) are missing from the flagella of algae lacking the co-chaperone MOT48 (right).

A family of co-chaperones helps preassemble dynein motor complexes in the cytoplasm before they move into cilia and flagella, Yamamoto et al. report.

Cilia movements are powered by dynein arms that connect neighboring outer microtubule doublets in the organelle's axoneme. Rather than separately transporting individual dynein subunits into the flagellum, each motor complex is preassembled in the cytoplasm before moving into position. The flagella of *Chlamydomonas* contain eight different dynein arms, some of which are preassembled with the help of a co-chaperone called PF13. Yamamoto et al. found that a related protein, MOT48, is mutated in a

Chlamydomonas strain with motility defects and reduced levels of axonemal dyneins.

Inner arm dyneins b, c, and d were particularly decreased in MOT48's absence, a distinct but overlapping set of dyneins compared to those affected by the loss of PF13. Dynein protein levels were decreased in the cytoplasm as well as the flagella of mutant algae—the co-chaperones may help dynein heavy chains fold and stabilize the subunits as they assemble into a transport-ready complex.

Both PF13 and MOT48 contain a PIH domain, originally described in a budding yeast protein that interacts with the chaperone Hsp90. Yamamoto et al. identified a third PIH protein in *Chlamydomonas* called TWI1, whose homologue in zebrafish is also required for cilia motility. Senior author Ritsu Kamiya now plans to investigate whether TWI1 assembles the flagellar dyneins not covered by either PF13 or MOT48. He also wants to explore whether—like PF13—MOT48 helps build axonemal dyneins in higher eukaryotes as well.

Yamamoto, R., et al. 2010. *J. Cell Biol.* doi:10.1083/jcb.201002081.