In This Issue

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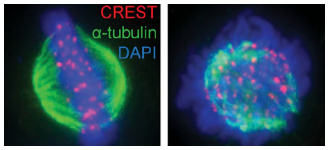
Aurora B is no Ska fan



Unlike control cells (left), cells that carry a Ska version that can't be phosphorylated by Aurora B (right) can't fix incorrect attachments between microtubules (green) and kinetochores (red).

By dislodging a microtubule-binding protein, the Aurora B kinase helps prevent sloppy connections between chromosomes and the mitotic spindle, Chan et al. suggest.

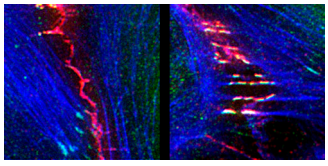
The KMN complex connects spindle microtubules to kinetochores, which is essential for chromosomes to separate during mitosis. To forge solid links between microtubules and the kinetochore, however, the KMN complex might need help from the Ska complex, but researchers aren't sure what recruits this latter group of proteins to the kinetochore.

Chan et al. found that two members of the KMN complex, Ndc80 and Mis13, bring the Ska complex to kinetochores. The mitotic kinase Aurora B inhibited this association by phosphorylating the Ska complex, thereby bumping it from kinetochores. Cells expressing a nonphosphorylatable Ska complex formed incorrect kinetochore–microtubule attachments and took longer to complete mitosis.

The researchers propose a division of labor during microtubule attachment. Early on in mitosis, microtubules promiscuously connect to and disconnect from kinetochores. If the Ska complex fastens to the KMN complex at this stage, it will land close to Aurora B and be phosphorylated, causing it to drop off. Once the KMN complex establishes a correctly oriented connection between a microtubule and a kinetochore, the Ska complex can land without being phosphorylated because tension from the spindle pulls KMN and the Ska complex away from Aurora B. Ska can then seal the kinetochore–microtubule link. Delaying the Ska complex's arrival until microtubules are correctly attached might prevent it from clamping weak attachments in place.

Chan, Y.W., et al. 2012. *J. Cell Biol.* http://dx.doi.org/10.1083/jcb.201109001.

Vinculin minds the gap



IMAGES COURTESY OF STEPHAN HUVENEERS

A stable junction (left) containing VE-cadherin (red) contrasts with a remodeling junction that is being pulled by F-actin bundles (blue) and contains vinculin (green).

The cytoskeleton protein vinculin helps prevent neighboring endothelial cells from separating too far, Huveneers et al. show.

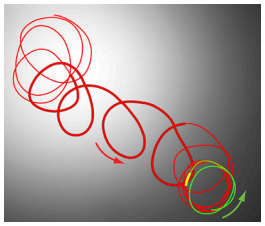
Endothelial cells that line blood vessels interlock with their neighbors to form a continuous surface. These connections can become leaky during diseases such as atherosclerosis. But intercellular junctions must temporarily loosen so that white blood cells can exit the bloodstream and new vessels can grow from existing ones. Molecules such as vascular endothelial growth factor (VEGF), tumor necrosis factor α (TNFα), and thrombin spur such junctional rearrangements.

Huveneers et al. discovered that there are two kinds of junctions between endothelial cells: "mature" or stable junctions, which remain sealed; and focal adherens junctions (FAJs), which partially unzip. The two kinds of junctions show several structural differences, such as in the orientation of their associated actin fibers. VEGF, TNFα, and thrombin prompted stable junctions to convert to FAJs, a process that required the actin cytoskeleton to pull on FAJs.

Unlike stable junctions, FAJs contain the actin-binding protein vinculin. To probe its function, the researchers furnished cells with a modified version of one of vinculin's binding partners, α-catenin, thus preventing vinculin from reaching the junctions. In these cells, FAJs formed, but they opened farther than normal and took longer to reseal. Thus, vinculin's job is to limit how far cellular junctions open. Researchers might be able to harness vinculin's ability to treat conditions such as pulmonary edema, when fluid builds up in the lungs.

Huveneers, S., et al. 2012. *J. Cell Biol.* http://dx.doi.org/10.1083/jcb.201108120.

As the sperm turns



The swimming path of a sperm before (green), during (yellow), and after (red) release of an attractant.

Sperm are the original guided missiles. Alvarez et al. show that changing calcium concentrations within the flagellum help direct a sperm to its target.

A sperm's path to the egg typically includes straight-ahead runs alternating with curves and even loops. The sperm's flagellum guides the journey by sensing the egg's come-hither molecules and adjusting its beating pattern to steer in the right direction. The attractants released by the egg cause calcium spikes in the flagellum. Early studies suggested that the concentration of calcium ions determines the flagellum's beating pattern, with high calcium levels spurring the sperm to turn. But recent research has called these findings into question.

Alvarez et al. provided sea urchin sperm with a caged version of cyclic GMP, which they could liberate with a pulse of UV light in order to trigger a calcium surge in the flagellum. The researchers found that sperm continued on a straight course even when calcium was abundant. Instead, sperm respond to a change in calcium level—in mathematical terms, its time derivative. The rate of calcium increase dictates how sharply the sperm turns, whereas the path of the subsequent run depends on the steepness of the calcium decline.

The researchers found that sperm from three other kinds of invertebrates also detect changing calcium concentrations, suggesting this mechanism might be widespread, even perhaps in human sperm. A key question, the researchers say, is whether the other main type of cell-propelling filament, the cilium, also relies on the same mechanism.

Alvarez, L., et al. 2012. *J. Cell Biol.* http://dx.doi.org/10.1083/jcb.201106096.