Calcium signals from outside

Calcium just got a promotion. Findings by Caroppo et al. (page 111) reveal that in addition to its many roles inside the cell, Ca$^{2+}$ has a distinct extracellular purpose: it acts via a Ca$^{2+}$ receptor (CaR) to regulate the function of gastric epithelial cells.

It has been known for some time that extracellular Ca$^{2+}$ can be sensed by the CaR. The team noted that a Ca$^{2+}$ gradient was generated outside gastric cells after cholinergic stimulation with carbachol, which mimics a signal received during digestion processes. Ca$^{2+}$ levels increased on the apical side and decreased on the basolateral side, and prompted secretion of pepsinogen. Proteolytic cleavage of pepsinogen yields the digestive enzyme pepsin.

Perhaps cells economize by using a single messenger, calcium, both inside and outside of the cell. In this way, the authors speculate, cells can use the raised Ca$^{2+}$ levels that are present outside cells during intracellular Ca$^{2+}$ signaling events to control necessary functions.

Orbit(ing) the furrow

Two distinct populations of spindle microtubules provide signals that initiate and complete cytokinesis, according to a proposition from Inoue et al. (page 49).

During interphase, microtubules radiate from centrosomes in all directions. But after chromosome segregation a structure called the central spindle forms. It provides the signals that place the actin-based cytokinetic furrow in the right place and then orchestrates its actions.

The authors take a close look at the central spindle in living fly spermatoocytes and find that this structure, previously thought to be uniform, is composed of two populations of microtubules. These peripheral and interior microtubules were both graphically and biochemically distinct, with only the interior microtubules associated with the Orbit/Mast protein.

In mutants with reduced levels of Orbit protein, formation of the interior bundle of central spindle microtubules was defective. As in wild-type cells, peripheral microtubules still probed the actin-rich cortex leading to cleavage furrow initiation, but the furrows in mutants eventually snapped back. This failure in cleavage was accompanied by the mislocalization of several proteins thought to be involved in generating the cytokinesis signal.

Orbit helps to stabilize microtubule plus ends. This stabilization may not be favorable for the highly dynamic peripheral microtubules but may be essential for the maintenance of the more stable interior microtubules. As is clear from mutants with less Orbit, a full description of cytokinesis may have to account for the coordination not only of the actin and microtubule systems but also of two distinct microtubule populations.