In This Issue

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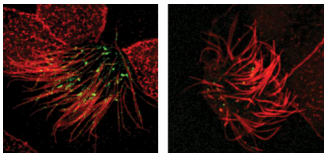
The Fuzzy logistics of intraflagellar transport



IFT43 (green) localizes to the cilia of wild-type cells (left) but not cells lacking Fuz (right).

The planar cell polarity protein Fuzzy (Fuz) promotes ciliogenesis by delivering intraflagellar transport (IFT) proteins to the basal bodies of primary cilia, Brooks and Wallingford report.

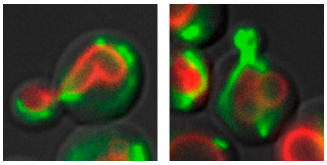
Fuz is required for cilia assembly in frogs and mice, but how it supports ciliogenesis is unknown. The protein has no obvious functional domains, though bioinformatic analyses point to a possible role in vesicle trafficking. Brooks and Wallingford found that multiciliated frog cells lacking Fuz failed to transport several proteins to the distal ends of their cilia, suggesting that Fuz might regulate the movements of IFT particles, protein complexes that shuttle cargo back and forth along the cilium's microtubules.

The researchers imaged the dynamics of IFT complexes in multiciliated cells and found that the particles stalled in the absence of Fuz. The arrested particles lacked IFT43, a component of the IFT-A complex that recycles proteins back from cilia tips. IFT particles are assembled at the basal bodies of primary cilia, but IFT43 wasn't recruited to these structures in Fuz-deficient cells. The particles lacking IFT43 can probably move to cilia tips but fail to complete the return journey, eventually blocking traffic in both directions and disrupting cilia assembly.

It remains to be seen how Fuz brings IFT43 to basal bodies. Senior author John Wallingford now wants to investigate exactly where in the cell Fuz operates and to identify binding partners that aid its trafficking function.

Brooks, E.R., and J.B. Wallingford. 2012. *J. Cell Biol.* http://dx.doi.org/10.1083/jcb.201204072.

Organelles compete for their inheritance



Compared with wild-type cells (left), yeast overexpressing Mmr1 (right) transport more mitochondria (green) and fewer vacuoles (red) into the bud.

Competition for the motor protein Myo2 helps coordinate the inheritance of budding yeast organelles, Eves et al. reveal.

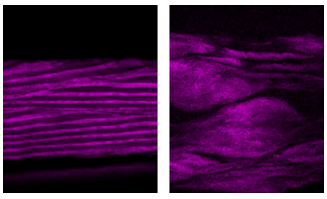
Myo2 transports numerous organelles from the mother cell into the bud. The different organelles associate with Myo2 via specific cargo adaptors that bind to a cargo-binding domain in the motor protein's C terminus. Eves et al. found that Mmr1 and Vac17, the adaptors for mitochondria and vacuoles, respectively, bound to overlapping sites on Myo2 and competed for access to the motor protein in vitro.

Mitochondria and vacuoles might take turns binding Myo2, but Eves et al. found that both organelles enter the bud at the same stage of the cell cycle. The researchers selectively inhibited the inheritance of mitochondria or vacuoles by expressing Myo2 mutants unable to bind either Mmr1 or Vac17. When Myo2's interaction with Mmr1 was abolished, fewer mitochondria and more vacuoles were delivered into the bud. Inhibiting Myo2's association with Vac17 had the opposite effect. On the other hand, overexpressing either of the cargo adaptors boosted the inheritance of its associated organelle at the expense of the other.

Changes in the quantities of organelles persisted in the daughter cells, indicating that inheritance—and competition for Myo2—is a key regulator of organelle volume. Moreover, Eves et al. found that six other cargo adaptors, including the adaptors for peroxisomes and secretory vesicles, all bound to a second site on Myo2, suggesting that competition may be a common mechanism of coordinating inheritance. Senior author Lois Weisman now wants to investigate whether the two adaptor-binding sites on Myo2 can modulate each other's function.

Eves, P.T., et al. 2012. *J. Cell Biol.* http://dx.doi.org/10.1083/jcb.201201024.

Formin' muscle sarcomeres



Actin filaments (magenta) show a striated pattern in wild-type body wall muscle cells (left) but are disorganized in cells lacking CYK-1 (right).

Mi-Mi et al. describe two actin-nucleating proteins that assemble actin filaments into the sarcomeres of worm muscle cells.

Formin family proteins stimulate actin polymerization in vitro, but the functions of individual family members in vivo remain unclear. Mi-Mi et al. found that a formin called FHOD-1 was strongly expressed in the body wall muscle cells of *C. elegans* larvae. These cells contract to help worms swim and crawl, and, just like vertebrate skeletal muscle, they appear striated due to the regular arrangement of actin and myosin filaments into repeating units called sarcomeres.

FHOD-1 localized around each sarcomere's Z lines, the sites where actin filaments are anchored. Worms lacking FHOD-1 had relatively normal muscles, however, so Mi-Mi et al. looked for additional formins that might help organize sarcomeric actin. The formin CYK-1 also localized to Z lines, and, although CYK-1 mutant worms also had a mild muscle phenotype, worms lacking CYK-1 and FHOD-1 developed very small body wall muscles with only a few sarcomeres in each cell.

FHOD-1 expression was switched off in adult worms, leaving CYK-1 in sole charge of maintaining the sarcomeric actin network. Adult worms lacking CYK-1 developed increasingly disorganized contractile lattices. Senior author David Pruyne says it's unclear why nematodes need two formins to build muscle sarcomeres; one possibility is that FHOD-1 and CYK-1 generate two distinct sets of actin filaments at slightly different sites in the contractile network. Pruyne now wants to investigate how the formins are recruited to developing sarcomeres and to determine how their activity is regulated.

Mi-Mi, L., et al. 2012. *J. Cell Biol.* http://dx.doi.org/10.1083/jcb.201202053.