Giving neural precursors the finger

Epithelial cells communicate amongst themselves using finger-like projections, according to Cyrille de Joussineau, Daniel Alexandre, and colleagues (Université Montpellier II, Montpellier, France). The filopodia help individual fly neural precursors to create an island of nonneural cells around themselves, thus allowing the formation of discrete structures such as bristles at regular intervals.

The filopodia only become visible when single cells are labeled. Their inhibitory action is mediated by Delta attached to the filopodia, which contacts membrane-bound Notch on the surrounding, inhibited cells. The extent of visible filopodia roughly matched the range of inhibition. And overexpression of Delta increased the range of the filopodia, so Delta actually promotes formation of its own means of transport.

Inhibition of filopodial outgrowth did not prevent local Delta–Notch signaling, but did shut down longer range inhibition. The result was an increased density of neural cells and more of the associated structures such as microchaetes. Thus, epithelial cells can communicate at long distances without resorting to either diffusible mediators or cell relay mechanisms.

Reference: de Joussineau, C., et al. 2003. Nature. 426:555–559.

Oxidation makes a germline

Food and sex go hand in hand, according to Yukimasa Shibata, Siegfried Hekimi, and colleagues (McGill University, Montreal, Canada). They find that worms that have less oxidation of certain lipoprotein particles—possibly an indicator of a slowed metabolism—have slowed development of their germline. Only when food is abundant and metabolism active would the germline get the stimulus to develop to maturity.

The proteins in question are vitellogenins: analogues of vertebrate apoB, a component of low-density lipoprotein (LDL). In the clk-1 worm mutant, an increase in the levels of an antioxidant results in less oxidation of lipoprotein. The result is a slowing in germline development.

The slowed development is reversed by blocking the production of lipoproteins, or by reestablishing a more normal level of oxidation by reactive oxygen species (ROS). “The degree of oxidation is a measure of general metabolism,” says Hekimi. “The germline may want to know that the worm is running fast. It could be sensing the general quality of metabolism.” ROS effects on signaling have been seen before in vitro, but the new results are the most dramatic to be detected in vivo.

The effects of lipoproteins on germline development go through a receptor-associated kinase called ARK-1. Although ARK-1 is known to work downstream of an EGF-like receptor, it is not clear whether this or another type of receptor is a mediator for the lipoprotein signal, or which lipoprotein species (oxidized or nonoxidized) is doing the signaling.

Reference: Shibata, Y., et al. 2003. Science. 302:1779–1782.