Zones and rings in wound healing

Cells sustain rips and tears during processes such as migration. The plasma membrane is repaired within milliseconds, but rescaling of the underlying actomyosin cortex can take several minutes. On page 785, Mandato and Bement investigate this process in frog oocytes and find that a polymerization zone and a contractile ring work together to close wounds.

Mandato and Bement find that the structure surrounding a wound is clearly contractile—square wounds round up, elongated wounds shorten fastest along their long axis, and rewounding causes nearby areas to spring open further. But contractility seems to be restricted to a narrow ring, whereas actin and myosin accumulate in a broader zone around this ring. Actin filaments can be tracked as they flow and accelerate into this zone, thus depleting the surrounding area. This process of cortical flow should create a positive feedback loop, as incoming actin increases contractility, thus increasing flow.

Flow is probably not, however, how things get started. In the absence of actin, several proteins implicated in actin polymerization accumulate around a wound. De novo polymerization triggered by these proteins would normally provide the initial signal that sets up a zone of actin and myosin accumulation. Mandato and Bement show that the zone can be established in the absence of any flow, although the zone is unstable without contraction and does not move to heal the wound. Presumably the zone normally triggers enough contraction to initiate flow, and the flow then results in the formation of a contractile ring and healing.

Making virus in the axon

Reactivated herpes viruses make their way from the nerve cell body to the axon terminal, where they are either shed or transferred across the synapse to another neuron. Tomishima and Enquist report on page 741 that, during this process, viral membrane proteins are transported into the axon independently of viral capsids, suggesting that viral assembly must occur at or near the synapse.

Viral assembly was thought to occur only in the cell body, with subsequent transport of fully assembled virions to axon terminals for release. Indeed, a pseudorabies virus mutant for Us9 appeared to be defective only in the second step, as it still makes infectious viral particles in the cell body but is defective for viral shedding from axons. But Tomishima and Enquist find that in the Us9 mutant some of the viral capsids are transported into the axon, leaving the viral membrane proteins behind in the cell body.

Us9 has motifs suggesting that it could interact with a neuron-specific adaptor, thus creating an axonal transport vesicle for viral membrane proteins. Segregating viral membrane proteins from viral capsids during axonal transport may ensure that virus components can reach the axon terminal without prematurely uniting and being shed as assembled virus. Perhaps when the components reach the synapse they encounter a synapse-specific protein that finally allows them to join together to form infectious particles.

Compartmentalized insulin signaling

On page 829, Watson et al. find that the small GTP-binding protein TC10 must be in a lipid raft compartment to impact insulin signaling. Such spatial control may be one way in which cells create a distinct response from activation of a common set of signal transduction proteins.

Insulin acts on the insulin receptor to trigger translocation of the GLUT4 transporter to the plasma membrane, resulting in increased glucose uptake. In previous studies, activation of both PI 3-kinase and TC10 were implicated in transducing a signal from activated receptor to GLUT4.

Now Watson et al. show that TC10 localizes to lipid raft domains, and that inhibition of this localization (using a dominant-interfering caveolin mutant) prevents TC10 activation by insulin. Although the current authors and others have worked out a complex series of links from the activated receptor to TC10, it seems that these links can only be set up productively when the relevant proteins are concentrated in a specific domain.