In This Issue

Escorting STAT5A

ome transcription factors take a chaperone to the nuclear dance. On page 469, Williams et al. show that STAT5A gets this escort from the ERBB4 receptor tyrosine kinase.

ERBB4 becomes an escort upon activation by growth factors such as heregulin (HRG). The activated receptor is known to recruit and phosphorylate STAT5A and get cleaved, thus releasing ERBB4’s intracellular domain (4ICD). Williams et al. show that 4ICD remains associated with STAT5A in the cytoplasm. And rather than simply turning on a signal transduction pathway, 4ICD also physically transports STAT5A all the way to the nucleus. Mutation of the 4ICD nuclear localization signal blocked both 4ICD and STAT5A nuclear entry.

In the nucleus, the two remained associated at the promoter of β-casein, a STAT5A-regulated milk protein gene. β-Casein transcription was not stimulated unless both 4ICD and STAT5 were nuclear.

Late in pregnancy, ERBB4 replaces the prolactin receptor as the major STAT5A activator. The authors hypothesize that this switch, and STAT5A’s resulting interaction with 4ICD, may subtly alter STAT5A-mediated gene expression to bring about terminal differentiation of breast cells. Whether ERBB4 directly transactivates gene expression or can recruit other proteins to the regulated promoters, however, has not been formally tested. JCB

Expanded inclusions

ike the better-known polyglutamine expansions, lengthy stretches of alanines create inclusion bodies that lead to death, as shown on page 411 by Nasrallah et al. Alanine expansions are found in several transcription factors that are associated with multiple disorders; thus, these maladies may all be rooted in inclusion body formation.

One alanine repeat–associated disorder, which causes neurological defects in infants, is caused by mutations in the ARX transcription factor. The new results show that 50% expansion of one of ARX’s alanine stretches leads to inclusion body formation in neurons. As with glutamine repeat–induced inclusions, the insoluble clumps of mutant ARX are tagged with ubiquitin, as though the cell is trying, yet failing, to degrade the misfolded proteins. Overexpressed Hsp70 chaperone cleared the inclusions.

In cell culture, expression of the mutant ARX increased cell death. Arrasate et al. (Nature. 431:805–810) recently reported that inclusion body formation was an effective coping mechanism by which polyglutamine-expanded proteins are kept from doing harm. But ARX inclusions may cause extra problems by removing both ARX and its interacting partners from the functional pool, thus disrupting transcription, altering cell physiology, and causing cell death. To confirm this theory, the authors plan to identify ARX’s gene targets and examine their expression levels in normal and inclusion-containing cells. JCB

Patches ride cables

n page 519, Huckaba et al. show that endosomes ride an actin-based conveyor belt from bud to mother cell in yeast. This passive mode of transport may replenish membrane fusion components needed for polarized secretion.

Lots of polarized secretion is needed to build a new bud. Secretory vesicles are brought into the bud via active transport along actin cables. These cables are actin bundles that are lengthened by the addition of new actin at the bud site, which thereby produces a rearward flow of actin into the mother cell. This rearward flow is now shown to carry another actin structure, called an actin patch, into the mother cell. Using an endocytosed label, the authors demonstrate that patches are the actin-rich coats of endosomes. After budding off the membrane at secretion sites, where actin patches are enriched, many endosomes latched onto actin cables and rode them into the mother cell at the rate of the cables’ rearward actin flow. Retrograde actin flow is common among higher eukaryotes, where it may also drive vesicle movement.

The patches disassembled when the vesicles met, and presumably fused with, endosomal sorting compartments, from which SNAREs and other secretion proteins can be recycled. Some endosomes avoided cables and remained in the bud. Perhaps the ability to latch onto cables is only present in vesicles containing certain cargoes. JCB