A ribonuclease helps the ER get in shape

Schwarz and Blower reveal that a calcium-regulated ribonuclease promotes the formation of tubular ER networks.

By triggering a wave of intracellular calcium, fertilization induces dramatic changes in the internal organization and protein expression pattern of oocytes. Schwarz and Blower discovered that increased calcium levels activate a ribonuclease called XendoU in Xenopus egg extracts. XendoU doesn’t appear to degrade any specific RNAs in response to calcium. Instead, the researchers found that depleting the ribonuclease delayed nuclear envelope assembly and restricted the formation of tubular ER networks as the extracts exited meiosis. These membrane organization defects could be rescued by the addition of wild-type XendoU but not by catalytically dead versions of the enzyme.

ER membranes are covered with RNAs and associated ribosomes. Schwarz and Blower determined that a portion of XendoU localized to the ER, where it promoted the release of RNA and ribosomal proteins into the cytosol. This activity stimulated the fusion of ER membranes into a dense, tubular network, possibly by giving the membrane fusion machinery a clear space in which to operate.

Knocking down the human homologues of XendoU also altered ER morphology in HeLa cells. Senior author Michael Blower now wants to investigate the ribonuclease’s function in vivo, particularly in tissues where calcium signaling plays a major role, such as in muscles and neurons.

Schwarz, D.S., and M.D. Blower. 2014. J. Cell Biol. http://dx.doi.org/10.1083/jcb.201406037.

Bem1p directs vesicular traffic

The polarity protein Bem1p recruits the exocyst subunit Exo70p to the site of polarized exocytosis, Liu and Novick reveal.

Budding yeast direct secretory vesicles to the sites of polarized bud growth, where they are tethered to the cell cortex by an actin-meromeric complex called the exocyst. The exocyst assembles on vesicles as they move along actin cables into the bud, but two of its subunits—Exo70p and Sec3p—are also recruited directly to the sites of exocytosis by an actin-independent mechanism. Sec3p is recruited by members of the Rhö GTPase family, including the polarity determinant Cdc42p, and the phospholipid PI(4,5)P₂. Although Exo70p also binds to PI(4,5)P₂, the mechanism underlying its recruitment to exocytic sites remains unclear.

Liu, D., and P. Novick. 2014. J. Cell Biol. http://dx.doi.org/10.1083/jcb.201404122.

Chibby’s function in the dock

Burke et al. describe how the coiled-coil protein Chibby promotes the formation of a membranous cap that helps centrioles dock with the plasma membrane during ciliogenesis.

Centrioles, also known as basal bodies, dock with the plasma membrane to nucleate the axonemal microtubules of both primary and motile cilia. Mice lacking the centriolar protein Chibby suffer chronic respiratory infections because their airway epithelial cells fail to form enough motile cilia to clear the respiratory tract of mucus and debris. The cells’ centrioles are unable to efficiently dock with the apical plasma membrane during ciliogenesis, but Chibby’s precise role in the process is unclear.

Burke, M.C., et al. 2014. J. Cell Biol. http://dx.doi.org/10.1083/jcb.201406140.