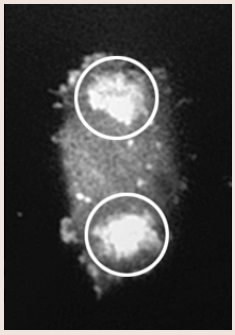
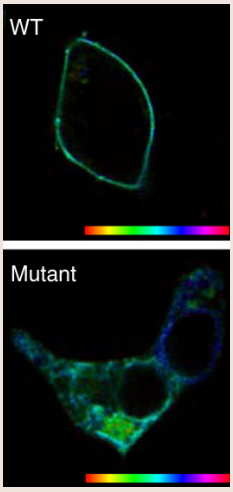
In this issue



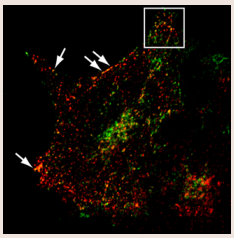
Cytokinesis: the MiDAS touch

Dictyostelium form a myosin-containing contractile ring to divide daughter cells during mitosis. Mutants that lack myosin motors do not undergo mitosis in suspension, but can still divide if attached to a substrate. Although substratum attachment is thought to allow daughter cells to generate traction force for pushing away from one another, the way in which force might be exerted remains obscure. Go Itoh and Shigehiko Yumura (p. 4302) now describe the formation of novel actin structures (termed MiDASes) during mitosis in myosin-null and wild-type *Dictyostelium*, which might help generate traction. Using total internal reflection fluorescence (TIRF) microscopy of GFP-actin, they show that MiDASes localise to the ventral surface of the cell, under the nucleus, and migrate with daughter nuclei. Importantly, MiDASes are points for attachment of cells to the substrate, implying that they can generate traction for the cell. The authors demonstrate that MiDAS formation may play a role in forcing daughter cells apart.



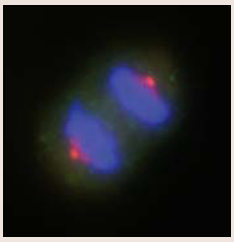
Munc18-1 sets a SNARE

SNARE proteins control the fusion of vesicles with target membranes. During exocytosis, fusion occurs when the vesicular SNARE synaptobrevin forms a ternary complex with the plasma membrane SNAREs syntaxin and SNAP25. The sites of SNARE-complex formation must be closely regulated to avoid inappropriate membrane fusion. Although several accessory proteins that modulate membrane trafficking are known, many questions about how they confer specificity remain. On page 4407, Rory Duncan and colleagues investigate the role of one such protein: munc18-1. The authors show that, in neuroendocrine cells, munc18-1 binds to syntaxin and promotes its trafficking to the plasma membrane. Using fluorescence lifetime imaging microscopy (FLIM), they go on to demonstrate that syntaxin and SNAP25 readily interact at the Golgi complex in the absence of munc18-1, forming stable SNARE complexes that trap the proteins and prevent their trafficking to the plasma membrane. Munc18-1 blocks the syntaxin-SNAP25 interaction. These findings indicate that a major role of munc18-1 is to avoid formation of a complex of SNAP25 and syntaxin before either protein reaches the plasma membrane.



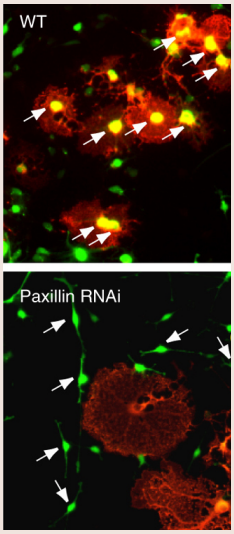
Myosin VI: an ERCsome motor

Myosin VI is unique among myosin motors because it travels 'backwards' (towards the minus end) along actin filaments. Perhaps because of this unusual property, myosin VI plays a role in diverse membrane trafficking processes, including early endocytosis and exocytic trafficking from the Golgi. On page 4278, Folma Buss and colleagues identify a new role for myosin VI in the delivery of cargo from early endosomes to the endosomal recycling compartment (ERC), as well as a new myosin-VI-binding partner, LMTK2, that acts in the same pathway. The authors have mapped the interacting regions of myosin VI and LMTK2 by using yeast and mammalian two-hybrid screens and co-immunoprecipitation. Moreover, they show that the two proteins colocalise. Importantly, knocking down either myosin VI or LMTK2 by RNAi leads to swollen early endosomes and impedes the normal transfer of transferrin from early endosomes to the ERC, demonstrating a role for both proteins in endosomal recycling.



The trials of centrosome separation

Centrosome duplication is necessary for cell division. This occurs at S phase, but the new centrosomes do not split from each other until prophase. What holds them together after duplication, until they separate to enable mitotic spindle formation? A proteinaceous linker is thought to maintain this association, but details of its makeup remain unclear. On page 4321 of this issue, Erich Nigg and co-workers identify two new components in the linker: Cep68 and Cep215. In an RNAi screen of 38 putative centrosomal proteins, they find that knocking down of Cep68 and Cep215, and three previously identified candidates, abolishes centrosome cohesion. Immunogold electron microscopy shows that both proteins lie adjacent to centrioles. The authors use further RNAi studies to show that Cep68 and other proteins, such rootletin, have interdependent roles in centrosome cohesion. Their work yields a clearer picture of the mechanisms of centrosomal duplication and splitting, suggesting a key role for Cep68 in forming the proteinaceous linker, and an accessory function for Cep215.



New tricks: Cdk5 and paxillin in OPC maturation

In the vertebrate nervous system, oligodendrocytes coat axons with multiple layers of myelin, forming a sheath that provides electrical insulation and enables the efficient transmission of action potentials. Before myelin can be produced, oligodendrocyte precursor cells (OPCs) must mature into oligodendrocytes, but the details of this process remain unclear. Now Yuki Miyamoto, Junji Yamauchi and colleagues (p. 4355) demonstrate that cyclin-dependent kinase 5 (Cdk5) and the focal adhesion-associated adaptor protein paxillin are necessary for OPC maturation. Using short hairpin RNAs directed against Cdk5 and paxillin, the authors demonstrate that primary rat OPCs fail to differentiate into oligodendrocytes in the absence of either protein. By co-immunoprecipitation, they show that Cdk5 and paxillin form a complex. Moreover, Cdk5 is shown to phosphorylate paxillin at serine 244 in vitro and within cells, and OPC maturation is inhibited by the overexpression of a mutant form of paxillin that cannot be phosphorylated at residue 244. Together, these results indicate that the phosphorylation of paxillin by Cdk5 is a key event in OPC maturation.

Development in press

Membrane recycling: not an ARFterthought

During cytokinesis, the central spindle microtubules and the actomysin contractile ring drive dramatic changes in cell shape. These shape changes also involve a rapid increase in the surface area of the plasma membrane but how is this achieved? In a paper published in *Development*, Dyer and colleagues propose that the endosomal trafficking component ARF6 promotes rapid membrane addition during spermatocyte cytokinesis in *Drosophila*. The researchers show that cytokinesis fails in most meiotic divisions in *arf6*-null spermatocytes. They use time-lapse microscopy to show that the rapid addition of membrane to the plasma membrane is defective in these spermatocytes and causes furrow regression. In normal spermatocytes, they report, ARF6 is enriched on recycling endosomes at the central spindle and binds to the centralspindlin component Pavarotti. However, ARF6 is not required for central spindle or actomysin-contractile-ring assembly or for targeting of recycling endosomes to the spindle. They propose, therefore, that ARF6 promotes the rapid recycling of endosomal membrane stores during cytokinesis, thus coordinating membrane recycling with central spindle formation.

Dyer, N., Rebollo, E., Domínguez, P., Elkhatib, N., Chavrier, P., Daviet, L., González, C. and González-Gaitán, M. (2007). Spermatocyte cytokinesis requires rapid membrane addition mediated by ARF6 on central spindle recycling endosomes. *Development* **134**, 4437-4447.