Taking tea with actin and microtubules

Microtubule plus ends may control sites of cell polarity and cytokinesis in both animal and yeast cells, but the mechanisms behind this have remained obscure. Now Fred Chang and colleagues at Columbia University, New York, NY, have detected a protein complex in Schizosaccharomyces pombe that links the actin- and microtubule-based cytoskeletal systems. Its existence also suggests that microtubule plus ends polarize cells by targeting cell-polarity factors to the cell surface.

The two proteins that coimmunoprecipitate are the microtubule-associated Tea1 protein and the actin-associated Bud6 protein. Tea1p is constantly deposited at cell tips by the plus ends of microtubules. The cell end that has grown before does not need Tea1p to continue growing, but delivery of Tea1p to the new end is apparently necessary for both the initiation of new growth and, according to Chang, the maintenance of Bud6p at this site. The two proteins are found in large multiprotein complexes that may drive the formation of actin-based structures necessary for growth.

Reference: Glynn, J.M., et al. 2001. Curr. Biol. 11:836–845.

Microtubules concentrate

Two centrosomal proteins help restrict the bulk of microtubule polymerization to the spindle, according to two papers from Fiona Cullen and Hiroyuki Ohkura (University of Edinburgh, Edinburgh, UK) and Jordan Raff (Wellcome/CRC Institute, Cambridge, UK) and colleagues.

The two Drosophila proteins, Mini-spindles (Mps) and D-TACC, have previously been shown to localize to centrosomes. Here both groups show that the two proteins physically interact. At least in female fly meiotic cells, the microtubule motor Ncd helps with the localization of Mps to spindle poles, and this localization is stabilized by the interaction with D-TACC at either conventional centrosomal spindle poles (Raff) or the acentrosomal poles that form during female fly meiosis (Cullen and Ohkura). Mps and D-TACC are the first proteins that have been localized to these unusual acentrosomal poles.

Lack of Mps leads to tripolar meiotic spindles, and overexpression of D-TACC (and subsequent recruitment of Mps to aggregates of D-TACC) results in the formation of extra microtubule asters in syncitia embryos. Given the fact that Mps promotes microtubule polymerization, both groups suggest that the localization of Mps to spindle poles is essential to focus and restrict microtubule growth to a bipolar spindle.

References: Cullen, C.F., and H. Ohkura. 2001. Nat. Cell Biol. 3:637–642
Lee, M.J., et al. 2001. Nat. Cell Biol. 3:643–649.