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MEIOSIS

A kinesin on foreign tracks

> the newly described kinesin NabKin and KIF14 coordinate the interaction between microtubules and F-actin

Before maturation into fertilizable eggs, *Xenopus laevis* oocytes grow to a gigantic size compared with somatic cells, stockpiling lipids, proteins and RNA. Their nuclei become so large that an intranuclear F-actin scaffold is required to ensure mechanical stability. So far, the structural organization and the involvement of canonical F-actin filaments in this scaffold have been debated.

To biochemically isolate the components of the F-actin network in *X. laevis* oocyte nuclei, Samwer, Görlich and colleagues have now developed a phalloidin-based affinity matrix that allows a highly selective purification of actin complexes. Starting with manually isolated *X. laevis* oocyte nuclei, they identified several prominent nuclear F-actin binders, including proteins involved in filament nucleation, severing and crosslinking. Interestingly, the most abundant F-actin interactor was a previously undescribed kinesin, which the authors named NabKin (nuclear and meiotic actin-bundling kinesin). The finding was rather surprising, because canonical kinesins are cytoplasmic proteins that 'walk' along microtubules and that do not interact with F-actin.

PHOTOALTO

NabKin colocalized with bundled F-actin in the oocyte nucleus, however, sequence analysis revealed that NabKin lacks a canonical actin-binding domain. So, the authors tested whether the amino-terminal extension (NTE) of NabKin confers its interaction with actin. Indeed, the NabKin NTE co-sedimented with F-actin *in vitro* and promoted F-actin bundling.

The meiotic prophase can last for several months and is used by the oocyte to grow. During this time, NabKin resides in the tubulin-depleted nuclei and has little chance to encounter microtubules. This situation changes suddenly, however, when the nuclear envelope breaks down and the oocyte progresses through meiotic maturation. The authors observed that NabKin then localizes to typical meiotic microtubule structures, such as the transient microtubule array (which collects the very widely scattered chromosomes) and the first and second meiotic spindles. In addition, NabKin binds meiotic actin structures, such as the F-actin-rich cortical cap, the contractile actomyosin ring that mediates cytokinesis and the two polar bodies (PBs; which are small cells that result from two asymmetric meiotic cell divisions). This suggests that NabKin has a role in meiotic processes and cytokinesis. Supporting this notion, the authors show that interrupting the NabKin–actin interaction results in the failure of PB extrusion and thus polyploidy. NabKin is not expressed in normal somatic cells, however, it has a somatic paralogue named KIF14. The authors found that KIF14 also possesses an actin-binding domain and localizes not only to the mitotic spindle but also to the contractile actomyosin ring in somatic cells.

Taken together, the results suggest that the newly described kinesin NabKin and KIF14 coordinate the interaction between microtubules and F-actin to ensure a faithful cytokinesis.

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ORIGINAL RESEARCH PAPER Samwer, M. *et al.* The nuclear F-actin interactome of *Xenopus* oocytes reveals an actin-bundling kinesin that is essential for meiotic cytokinesis. *EMBO J.* 30 May 2013 (doi:10.1038/emboj.2013.108)