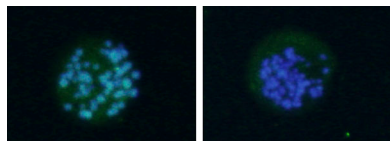


## Mps1 sends condensin II off to work



More CAP-H2 (green) attaches to chromatin (blue) in a control cell (left) than in a cell depleted of Mps1 (right).

The condensin I and condensin II complexes prompt diffuse chromatin to scrunch up into mitotic chromosomes. Condensin II gets a head start on its partner, but researchers still aren't sure which enzymes switch on condensin II at the start of mitosis.

One of them, Kagami et al. found, is Mps1. This protein's multiple obligations during mitosis include spurring spindle microtubules to connect to kinetochores, helping chromosomes

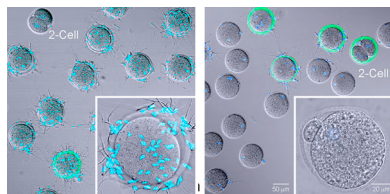
**T**he kinase Mps1 has a long to-do list during mitosis, and Kagami et al. identify yet another responsibility: promoting chromosome condensation.

align, and fostering accurate chromosome separation. The researchers searched for proteins that partner with Mps1 and found that the kinase associated with SMC2, a component of both condensin complexes. Condensin I remains in the cytoplasm until the nuclear envelope breaks down, whereas condensin II resides in the nucleus. The team used this difference to show that Mps1 interacts specifically with condensin II.

The researchers then asked how Mps1 influences condensin II's function. They found that Mps1 phosphorylates the CAP-H2 subunit of condensin II. Less of this subunit appeared on the chromosomes in cells lacking Mps1, suggesting that the protein directs the complex to the chromosomes. Reducing Mps1 levels also cut the amount of chromosome condensation during prophase, indicating that the kinase spurs the early stages of chromosome compaction by stimulating condensin II.

Kagami, Y., et al. 2014. *J. Cell Biol.* <http://dx.doi.org/10.1083/jcb.201308172>.

## How sperm get into the zona



Sperm (blue) latch onto an egg that has ZP2 (left) but not to an egg lacking it (right).

The zona pellucida protects the egg and the early embryo before implantation. Its structure seems simple—in humans it contains four kinds of glycoproteins, and in mice it only holds three. But researchers haven't been able to identify the sperm's binding partner in the layer, although their suspicions have fallen on two of the glycoproteins, ZP2 and ZP3.

**B**efore fertilization can occur, a sperm has to bind to and bore through the zona pellucida layer that encloses the egg. Avella et al. identify the glycoprotein in the zona pellucida that sperm latch onto.

Avella et al. engineered mice to produce various combinations of human and mouse zona pellucida glycoproteins. Mouse sperm didn't bind to the zona pellucida if it was missing ZP2, and female mice lacking the protein were sterile. The researchers also found that sperm couldn't latch onto eggs if ZP2 was missing part of its N terminus. This result jibes with a previous finding that fertilization triggers the release of an enzyme that cleaves ZP2, thus preventing additional sperm from attaching to the zona pellucida. That cut occurs in ZP2's N terminus and presumably disrupts the binding site.

The team also tested the binding of human sperm to mouse eggs surrounded by a zona pellucida harboring human glycoproteins. Human sperm adhered to the mouse zona pellucida if it contained human ZP2 but not if it carried human ZP3. An unanswered question is which protein sperm use to grip ZP2.

Avella, M.A., et al. 2014. *J. Cell Biol.* <http://dx.doi.org/10.1083/jcb.201404025>.

## SPP pulls an inside job

**A** protease helps cells dispose of certain ER proteins by cleaving them within the organelle's membrane, Boname et al. reveal.

Cells send damaged or unneeded ER proteins back to the cytosol for destruction by the proteasome. A key step in this process is ubiquitylation of the doomed protein by ubiquitin ligases such as TRC8. TRC8 interacts with an enzyme known as signal peptide peptidase (SPP), whose best-known job is cutting signal peptides in their transmembrane domain, allowing them to escape from the ER. But SPP's interaction with TRC8 suggested that it also participates in the removal of ER proteins.

Boname et al. performed a proteomics screen to identify ER membrane proteins that build up in cells lacking SPP. Their analysis suggested that heme oxygenase-1 (HO-1), an enzyme that breaks down heme, is one of SPP's targets. The team tested that possibility by steeping the cells in hemin, which spurs HO-1 production.

After hemin's removal, HO-1 levels fell more slowly in cells lacking SPP than in controls.

HO-1 is a tail-anchored protein, embedded in the ER membrane with only the nub of its C terminus protruding into the lumen. SPP cut HO-1 in its transmembrane domain, after which TRC8 stepped in to ubiquitylate the severed protein. The researchers determined that SPP cleaved three other tail-anchored proteins in their transmembrane domains and promoted their subsequent degradation. However, SPP didn't attack another tail-anchored ER protein the team tested.

SPP and TRC8 might collaborate to extract target proteins from the ER membrane so that they can meet their fate in the proteasome. Whether SPP helps cells rid themselves of the majority of tail-anchored proteins, which constitute up to 5% of membrane proteins, remains to be seen.

Boname, J.M., et al. 2014. *J. Cell Biol.* <http://dx.doi.org/10.1083/jcb.201312009>.