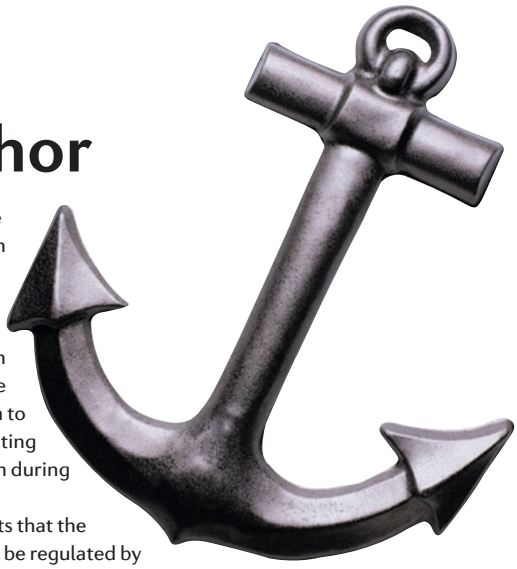
Nature Reviews Molecular Cell Biology | AOP, published online 18 January 2012; doi:10.1038/nrm3276

POST-TRANSLATIONAL MODIFICATION

A monoubiquitylation pore anchor



The nuclear pore complex (NPC), which consists of ~30 nucleoporins (NUPs), has additional roles beyond its core function in nuclear transport. Post-translational modification of NUPs by ubiquitylation and phosphorylation can affect NUP turnover and pore disassembly, respectively, and may offer the opportunity for fine-tuning NUP functions beyond transport. Here, Dargemont and colleagues reveal that much of the NPC can be ubiquitylated and, in the case of yeast Nup159, this is crucial for normal cell division.

Dargemont and colleagues analysed a library of tagged NUPs for conjugation by ubiquitin and found that approximately half of the NUPs are targets of this modification. Although ubiquitylation was not observed on transmembrane NUPs, there was not a strong correlation between NUPs that were modified and their localization elsewhere within the NPC.

The ubiquitylation profiles observed were varied, suggesting that this modification might affect NUP functions beyond 'housekeeping' roles. To test this, the authors focused on Nup159, which resides on the cytoplasmic face of the NPC and mediates the interaction of dynein light chain 2 (Dyn2) with the NPC. They showed that Nup159 is monoubiquitylated at Lys897 by the E2 enzyme Cdc34 and the E3 ligase SCF^{Grr1} (Skp1–Cdc53–F box bound to the adaptor subunit Grr1) and that this modification is not important for Nup159 localization at the NPC or for Nup159 turnover. It also did not affect either nuclear transport or the overall organization of the NPC.

Instead, Nup159 monoubiquitylation was required for the anchoring of Dyn2 at the NPC; as a consequence, dynein-mediated nuclear migration and spindle positioning was impaired in cells in which the monoubiquitylation of Nup159 was disrupted. Thus, Nup159 monoubiquitylation has an essential role in recruiting dynein to the pore and mediating nuclear segregation during division.

This study suggests that the capacity of NUPs to be regulated by ubiquitylation is more prevalent than may have been anticipated and that dissection of these modifications may provide new insights into the functions of NUPs beyond nuclear transport.

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ORIGINAL RESEARCH PAPER Hayakawa, A. *et al.* Ubiquitylation of the nuclear pore complex controls nuclear migration during mitosis in *S. cerevisiae*. *J. Cell Biol.* 2 Jan 2012 (doi:10.1083/jcb.201108124)