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SUMOYLATION

Wrestling with filaments

How intermediate filaments polymerize and assemble *in vivo* is largely unknown. Now, a study reveals that this assembly is regulated by sumoylation of the cytoplasmic intermediate filament protein B-1A (IFB-1A).

Using a proteomic screen in *Caenorhabditis elegans*, Kaminsky *et al.* identified a group of intermediate filament proteins as putative targets of the small ubiquitin-related modifier (SUMO), SMO-1. To investigate this possible link between sumoylation and filament assembly, the authors focused on IFB-1A, which links the apical and basal hemidesmosome-like structures of the epidermis and is essential for embryonic elongation and maintenance of muscle attachment to the cuticle.

> “sumoylation of IFB-1A occurs at the C terminus and regulates the assembly of IFB-1A into epidermal filaments”

The authors found that the localization of IFB-1A — normally found in circumferential stripes at the basal and apical epidermal membranes — was disrupted in worms lacking SMO-1. They also observed ectopic filaments and cytoplasmic inclusions in which IFB-1A accumulated, and saw a decreased exchange rate between the soluble cytoplasmic and filament-incorporated IFB-1A forms. Furthermore, expression analysis of green fluorescent protein (GFP)-tagged IFB-1A after an RNA interference-feeding approach to deplete SMO-1 from embryos during their epidermal elongation phase showed that the soluble IFB-1A pool was eliminated, resulting in aberrant and ectopic IFB-1A polymerization.

In vitro sumoylation assays of IFB-1A with site-directed Lys mutations identified Lys460, located in the carboxy-terminal immunoglobulin-fold domain, as the primary sumoylation site. This was confirmed *in vivo* using His-tagged IFB-1A with a mutation of Lys460 to Arg. Lys460Arg IFB-1A was also tagged with GFP, and expression analysis of this sumoylation-deficient fusion protein showed that it had a reduced soluble pool and a slower exchange rate between its soluble and filament-incorporated forms. In larvae expressing Lys460Arg IFB-1A, the structure of the epidermal attachment sites was impaired and resembled the aberrant structures in the worms lacking SMO-1. Moreover, the elongation defects of IFB-1A-mutant embryos could not be rescued by Lys460Arg IFB-1A.

So, sumoylation of IFB-1A occurs at the C terminus and regulates the assembly of IFB-1A into epidermal filaments, probably by sequestering IFB-1A to maintain an unpolymerized cytoplasmic pool. This study provides insight into the regulation of intermediate filament assembly and will enable the roles of SUMO in the cytoskeletal organization of multicellular organisms to be further investigated.

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ORIGINAL RESEARCH PAPER Kaminsky, R. *et al.* SUMO regulates the assembly and function of a cytoplasmic intermediate filament protein in *C. elegans*. *Dev. Cell* **17**, 724–735 (2009)
FURTHER READING Geiss-Friedlander, R. & Melchior, F. Concepts in sumoylation: a decade on. *Nature Rev. Mol. Cell Biol.* **8**, 947–956 (2007)