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SUMOylated DNA Topoisomerase II α regulates phosphorylated histone H3 kinase Haspin at the centromere.

In many model systems, SUMOylation is required for proper mitosis, particularly chromosome segregation during anaphase. We have shown that interruption of SUMOylation through by addition of dominant negative E2 SUMO conjugating enzyme Ubc9 in mitosis causes abnormal chromosome segregation in *Xenopus laevis* egg extract cell-free assays, and identified DNA topoisomerase II α (TopoII α) is SUMOylated at K660, which is essential in regulating TopoII α activity, and multiple sites in the C-terminus domain (CTD). Through affinity isolation, we have identified, Haspin, a histone H3 threonine 3 (H3T3) kinase, as a SUMOylated CTD binding protein. We further determined that Haspin is enriched at the centromere of sister chromatid with TopoII α in a SUMO-dependent manner. Mutations in TopoII α CTD SUMOylation sites or Haspin's SUMO-interacting motif (SIM) reduced the binding interaction between TopoII α and Haspin on chromosome. We also reveal that T206 phosphorylation of Haspin regulates interaction between TopoII α and Haspin. Overall, our results suggest that Haspin's localization at centromere requires both T206 phosphorylation and SUMOylation of TopoII α CTD, and regulates centromeric H3T3ph.