THE SURVIVIN-LIKE *C. ELEGANS* PROTEIN BIR-1 ACTS WITH THE AURORA-LIKE KINASE AIR-2 TO MEDIATE CHROMOSOME BEHAVIOR AND SPINDLE MIDZONE FORMATION

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Baculoviral IAP repeat proteins (BIRPs) have been proposed to affect cell death, cell division, and signal transduction. How BIRPs function in these processes remains unclear. To learn more about BIRP function we characterized the *C. elegans* BIRP BIR-1.

BIR-1 localizes to chromosomes and to the spindle midzone, a tubulin structure that forms between segregating homologues and sister chromatids and that may play a role in cytokinesis. *bir-1*(RNAi) embryos have defects in chromosome condensation, alignment, and segregation as well as in spindle midzone formation and cytokinesis. The localization of BIR-1 is identical to that of the Aurora-like kinase AIR-2 [1]. *air-2*(RNAi) and *bir-1*(RNAi) embryos are phenotypically indistinguishable. Both BIR-1 and AIR-2 are required for histone H3 phosphorylation, which is necessary for chromosome condensation and for localization of the kinetochore component HCP-1, which may be necessary for chromosome alignment and segregation. BIR-1 is required to localize AIR-2 to chromosomes, but AIR-2 is not required to localize BIR-1.

We propose that BIR-1 localizes AIR-2 to chromosomes and to the spindle midzone, where AIR-2 phosphorylates proteins that control chromosome behavior and spindle midzone organization. Other known *C. elegans* proteins that function in cell division have localization patterns and loss-of-function phenotypes distinct from those of BIR-1 and AIR-2. Therefore, *bir-1* and *air-2* define a new class of *C. elegans* cell division genes.

BIR-1 is most similar in size and structure to the human BIRP survivin. Survivin, which is upregulated in tumors and can prevent programmed cell death when overexpressed, partially rescued the cytokinesis defect of *bir-1*(RNAi) embryos. This defect was not rescued by blocking programmed cell death, suggesting that BIR-1 and survivin share an evolutionarily conserved function separate from preventing cell death. Human Aurora homologs localize to the same structures as does survivin. We propose that survivin may contribute to tumorigenesis by promoting aneuploidy via an evolutionarily conserved mechanism that includes interaction with an Aurora-like kinase.

1. Schumacher *et al*., (1998). J. Cell. Biol. *143*, 1635-46.