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Review

Runnin' with the Dvl: Proteins That Associate with Dsh/Dvl and Their Significance to Wnt Signal Transduction ☆

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Abstract

Wnt proteins transmit myriad intercellular signals crucial for the development and homeostasis of metazoan animals from *Hydra* to human. Abnormal Wnt signaling causes a growing number of diseases, including cancer and osteoporosis. Depending on the context, a given Wnt signal may denote: cell proliferation or apoptosis; cell fate determination, differentiation, or stem cell maintenance; a variety of changes in cell behavior; and/or coordinated interactions with its neighbors. Which event(s) occur in Wnt-responsive cells depends critically on the ability of Dishevelled (Dsh)/Dvl proteins to interpret distinct types of intracellular, receptor-generated stimuli and transmit them to at least two distinct sets of effector molecules, all while apparently ignoring a third type of Wnt-generated Ca^{2+} signal. The three conserved domains present in Dsh/Dvl proteins uniquely function in each Wnt pathway, in part by association with 18 (and counting) Dsh/Dvl-associated proteins. The latest data suggest that Dsh/Dvl proteins organize dynamic, pathway-specific subcellular signaling complexes that ensure correct information routing, signal amplification, and dynamic control through feedback regulation. The biochemical and cell biological mechanisms by which Dsh/Dvl proteins accomplish these remarkable tasks remain obscure.

Keywords

Wnt; Wingless; Wg; Dishevelled; Dsh; Dvl; Frizzled; Fz; Armadillo; Arm; β-catenin; planar cell polarity; tissue polarity; convergent extension

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