Role of alpha-catenin in the control of cell polarity

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Abstract

Cell polarity is essential for most cellular functions, such as division, differentiation and migration. The crucial role of cell polarity is also highlighted by the fact that loss of polarity is hallmark of cancer cells. Cell polarity can be defined by the morphological, structural and functional organization of a cell along the so-called polarity axis. In general, the nucleus-centrosome axis parallels the cell polarity axis. We have previously shown that the anisotropic distribution of adherens junctions promotes the front-to-rear polarization of immobile and migrating cells, by regulating both nucleus and centrosome positioning. However, the molecular mechanisms mediating cadherin-induced regulation of cell polarity remained unknown. The cadherins interact through their cytoplasmic domain with the p120-catenin and beta-catenin. Alpha-catenin interacts directly with beta-catenin and provides a major link with the cytoskeleton. It also acts as a tumor suppressor. In astrocytes, there are two members of the family of alpha-catenins; the alpha-E-catenin and the alpha-N-catenin, which have the same structural domains. Using fibronectin-coated micropatterns to control the distribution of adherens junctions and cell polarity, we have investigated the specific function of alpha-E-catenin and alpha-N-catenin in front-to-rear cell polarity. Our observations point to a model in which alpha-N-catenin specifically controls centrosome position and cell polarity downstream of adherens junctions by regulating microtubule acetylation.