CELL ADHESION

α-Catenin: static or dynamic

> “…the proposed model … challenges our static view of cadherin-mediated adhesion.”

Reporting in *Cell*, the Nelson and Weis groups now collaborate to question one of the classic models in cell biology. Previous studies have indicated that the connection between cell–cell contacts and the actin cytoskeleton is mediated by a link between actin and α-catenin of the E-cadherin–catenin complex. By challenging the present static view of cadherin-mediated adhesions, the authors propose a dynamic model in which α-catenin functions as a regulator of actin dynamics.

Cell–cell junctions are thought to be stable structures that maintain the structural integrity of tissues. The current evidence supports a model in which cadherins, which mediate homophilic adhesions, bind to cytoplasmic proteins that recruit and organize actin filaments. β-Catenin binds to the cytoplasmic tail of E-cadherin, whereas α-catenin can bind to both β-catenin and the actin filaments. It has therefore been widely accepted that α-catenin that is bound to the E-cadherin–β-catenin complex links the complex to actin, either directly, or through its interactions with many actin-binding proteins.

The Nelson and Weis groups showed that α-catenin can exist as a monomer or a homodimer, and that monomeric α-catenin preferentially binds to E-cadherin–β-catenin, whereas its dimeric form binds to actin filaments. The authors combined biochemical assays and a new assay in which cadherin–catenin complexes are assembled in isolated patches of plasma membrane. They used purified proteins to show that the ternary complex of E-cadherin–β-catenin–α-catenin does not bind to actin filaments, neither directly, nor indirectly through vinculin or α-actinin. In addition, using live-cell imaging, they showed that actin is more dynamic than the E-cadherin–catenin complex, which contradicts the existence of a stable connection.

So, if α-catenin is not the link, what is its role in adherens junctions? The Nelson and Weis groups proposed that α-catenin might function as a molecular switch that regulates actin dynamics. To test their hypothesis, they investigated whether α-catenin can influence actin polymerization. They found that addition of the α-catenin homodimer to actin suppressed the actin polymerization that occurs in the presence of the actin-related protein (Arp)2/3 complex and Wiskott–Aldrich syndrome protein (WASP). The authors also showed that α-catenin that is bound to an E-cadherin–β-catenin complex can dissociate from the complex and bind to actin, which indicated that its interaction with the E-cadherin complex is transient.

These studies provide new mechanistic insights into the local dynamics of actin that are associated with cell–cell contacts, and the proposed model — that α-catenin shuttles between an E-cadherin complex and actin — challenges the static view of E-cadherin-mediated adhesion.

Ekat Kritikou

ORIGINAL RESEARCH PAPERS Yamada, S. *et al.* Deconstructing the cadherin–catenin–actin complex. *Cell* **123**, 889–901 (2005) | Drees, F. *et al.* α-Catenin is a molecular switch that binds E-cadherin–β-catenin and regulates actin-filament assembly. *Cell* **123**, 903–915 (2005)
FURTHER READING Gates, J. & Peifer, M. Can 1000 reviews be wrong? Actin, α-catenin, and adherens junctions. *Cell* **123**, 769–772 (2005)

URLs
E-cadherin: http://us.expasy.org/uniprot/P09803
β-catenin: http://us.expasy.org/uniprot/Q02248