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Mechanical insights into the physiological functions of intercellular adhesion proteins

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Summary

The structural integrity as well as the regulation of paracellular diffusion of solutes across epithelial monolayers is critically regulated by the intercellular adhesion complex. The intercellular adhesion complex consists of a variety of proteins that perform different physiological functions. While proteins localizing at adherens junctions (nectins and e-cadherins) are important for initiating and stabilizing cell adhesion, proteins localizing at the tight junctions (occludin, claudins and junctional adhesion molecules) act as gates to regulate the diffusion of solutes across the epithelial monolayer. Despite significant advancement in the understanding of the biological roles of these cell adhesion proteins in regulating various cellular processes, the biophysical aspects of their adhesion remain poorly characterized. Using atomic force microscopy, we have characterized the adhesion kinetics of some of these important intercellular adhesion molecules at the molecular level. Results show that adhesion mediated by adherens junction proteins are kinetically stable while those mediated by tight junction proteins are dynamic in nature. The results of our single molecule force spectroscopy experiments provide a better insight into how the adhesion kinetics of proteins bears a direct correlation to their physiological functions.

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