siRNA mediated knock down of AQP1 weakens E-cadherin based intercellular adhesion

Darwesh M K Aladin¹, Jormay Lim², Xin Hua², Lai Lai Yap¹ and Jean Paul Thiery¹,²,³
Mechanobiology Institute, Singapore,
National University of Singapore, Singapore 117411
Institute of Molecular and Cell Biology, A*STAR, Singapore
Department of Biochemistry, National University of Singapore, Singapore

Adherens Junctions (AJs) are molecular ensembles that occur at cell–cell junctions in epithelial and endothelial tissues. Cadherins cluster during AJ formation and recruit a multitude of additional structural and regulatory proteins. The intracellular tail of cadherin binds to catenin complexes that couples cadherins with the actin cytoskeleton. Over 170 proteins have been reported to colocalize in the AJs. Our SILAC immunoprecipitation experiment aimed at identifying more proteins interacting with E-cadherin identified AQP1 as an interacting partner. AQP1 is a member of membrane water channel proteins called the Aquaporins. Silencing of AQP1 is known to dramatically affect the actin cytoskeleton organization through Lin-7/β-catenin interaction. Since actin dynamics is known to regulate E-cadherin recruitment at AJs in a mechanosensitive manner, we hypothesized that knocking down AQP1 will inhibit the adhesion strength of AJs. Using dual pipette separation force assay, we measured the force required to separate cell doublets that are formed in 18 hrs of culture and compared between the SiRNA mediated AQP1 knockdown S180 cells expressing E-cadherin and the negative SiRNA control cells. As hypothesized, the separation force of AQP1 knockdown cells was significantly lower than that of the controls. Furthermore, a micropipette aspiration assay of single cells revealed that the cortical shear modulus of the AQP1 knockdown cells was significantly lower than the control cells. These findings suggest that AQP1 plays a role in the adhesive strength of AJs possibly by controlling the dynamics of actin cytoskeleton.

Biography
Darwesh MK Aladin received his PhD in 2010 from the University of Hong Kong. His PhD work was on the multi scale structure and mechanics of intervertebral discs. He is currently pursuing his postdoctoral studies at the Mechanobiology Institute, Singapore, in which he is studying intercellular adhesion and the role of cadherin extracellular domains in particular. He has published 6 papers in reputed journals. He has presented in more than 30 conferences and has won 18 awards including an honorable mention award from the ASME Bioengineering Division.

darwesh.aladin@nus.edu.sg