Hemidesmosome-like Adhesion Mimicked through Nanopatterning of Laminin-332

Sadegh Ghorbani[1], Ali Shahrokhtash[1], Duncan Sutherland[1]

[1] *Interdisciplinary Nanoscience Center (iNANO) and CellPAT Center, Aarhus University, Aarhus C, Denmark*

Hemidesmosomes (HD) are multiprotein-complexes that firmly anchor cells to the basement membrane through the interconnection of the cytoplasmic intermediate filaments, keratin, with extracellular laminin-332 (Ln-332) [1]. This type of cell-matrix adhesion is of fundamental importance in the integrity and normal function of multiple tissues and act as signaling centers, their failure can result in various diseases [2]. Considerably less attention has been paid to HDs compared to focal adhesions in single-cell structures due to the lack of suitable in vitro model systems.

In this work, nanopatterns of Ln-332 are created to direct and study the formation of HD assemblies in adherent Hacat cells, mimicking the cell-matrix interface. Protein nanopatterns of size 100, 300, 500, and 1000 nm were fabricated and used to study cell adhesion, showing that Hacat cells adhere and form hemidesmosome-like adhesions after 3 hr. Hemidesmosome-like junctions formed on larger patterns were more well-defined, imaged by colocalization of α6 integrin with Col 17 or Pan cytokeratin. While cells on flat surfaces and 100 nm patterns expressed a higher level of vinculin protein which suggests the formation of more mature focal adhesion structures compared to HDs. The results also show that the size of nanopatterned could altered cell spread area but not attached cell numbers.

[1] L. Borradori, and A. Sonnenberg, Journal of investigative dermatology 112, no. 4 (1999): 411-418.

[2] D. Tsuruta, et al., Journal of dermatological science 62.1 (2011): 1-7.