

EXPLOITING NATIVE TENDON TOPOGRAPHY TO SUPPORT TENOCYTE PHENOTYPE

A.D Eren¹, A. Vasilevich¹, E.D Eren², P. Sudarsanam¹, U. Tuvshindorj¹, J.d. Boer¹, J. Foolen^{*1}

¹Institute for Complex Molecular Systems, Department of Biomedical Engineering, Eindhoven University of Technology, Eindhoven, The Netherlands

²Laboratory of Physical Chemistry, Department of Chemical Engineering and Chemistry, Eindhoven University of Technology, Eindhoven, The Netherlands.

Alterations in the tendon extracellular matrix (ECM) *in vivo* or the lack of a tendon-like niche *in vitro*, results in tenocytes to lose their shape and phenotype. In this study, a method was developed of imprinting native tendon topology onto polystyrene (PS) sheets to study the effect of tendon surface topology as an isolated feature on tenocyte shape and phenotype. Compared to flat surfaces, tendon imprints decrease cell and nuclear area, increase aspect ratio, compactness and solidity, and decrease the proliferation rate of rat tenocytes. Tendon imprints stabilized the expression of the tenogenic marker genes *Scleraxis*, *Coll1a1* and *Decorin* over 7 days, compared to flat PS surfaces. Strikingly, Scleraxis protein expression was correlated with cell shape, where cell and nuclear aspect ratio negatively and, compactness and eccentricity correlated positively with Scleraxis protein expression intensity. This research demonstrates that native tendon topology is relevant for tenogenic phenotype and sheds a light on the relation between cell shape and cell phenotype in tendon fibroblasts. Future studies can employ imprinting technology to imprint tendon topology on various natural polymers and provide new approaches for tendon tissue engineering.

¹A.D. Eren a.dede@tue.nl