Cell Traction Force Mapping in MG63 and HaCaTs

Chin Fhong Soon1*, M. A. Genedy2, M. Yousefi2, Morgan C. T. Denyer2

1Biosensor and Bioengineering Laboratory, Microelectronics and Nanotechnology-Shamsuddin Research Center (MiNT-SRC), Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, Malaysia.
2School of Life Sciences, University of Bradford, BD7 1DP, Bradford, UK.
*e-mail: soon@uthm.edu.my

Abstract

The ability of a cell to adhere and transmit traction forces to a surface reveals the cytoskeleton integrity of a cell. Shear sensitive liquid crystals were discovered with new function in sensing cell traction force recently. This liquid crystal has been previously shown to be non-toxic, linear viscoelastic and sensitive to localized exerted forces. This paper reports the possibility of extending the application of the proposed liquid crystal based cell force sensor in sensing traction forces of MG63 osteoblast-like cell lines and human keratinocyte cell lines (HaCaTs). Incorporated with cell force measurement software, force distributions of both cell types were represented in force maps. For these lowly contractile cells, chondrocytes expressed regular forces (10 – 90 nN, N = 200) around the circular cell body whereas HaCaTs projected forces (0 – 200 nN, N = 200) around the perimeter of poly-hedral shaped body. These forces are associated with the organisation of the focal adhesion expressions and stiffness of the LC substrate. From the results, liquid crystal based cell force sensor system is shown to be feasible in detecting forces of both MG63 and HaCaTs.

Keywords: MG63, HaCaTs, liquid crystal, cell force sensor