Short communication

Investigating the effect of cell substrate on cancer cell stiffness by optical tweezers

Muhammad Sulaiman Yousafzai, Giovanna Coceano, Serena Bonin, Joseph Niemela, Giacinto Scoles, Dan Cojoc

PII: S0021-9290(17)30353-6
DOI: http://dx.doi.org/10.1016/j.jbiomech.2017.06.043
Reference: BM 8282

To appear in: *Journal of Biomechanics*

Received Date: 19 January 2017
Revised Date: 20 June 2017
Accepted Date: 29 June 2017

Please cite this article as: M. Sulaiman Yousafzai, G. Coceano, S. Bonin, J. Niemela, G. Scoles, D. Cojoc, Investigating the effect of cell substrate on cancer cell stiffness by optical tweezers, *Journal of Biomechanics* (2017), doi: http://dx.doi.org/10.1016/j.jbiomech.2017.06.043

Investigating the effect of cell substrate on cancer cell stiffness by optical tweezers

Muhammad Sulaiman Yousafzai[a,b], Giovanna Coceano[c], Serena Bonin[d], Joseph Niemela [b], Giacinto Scoles[e] and Dan Cojoc[a]*

[a]*Institute of Materials (IOM-CNR), Area Science Park, Basovizza, S.S. 14, Km 163.5, 34149 Trieste, Italy*

[b]*The Abdus Salam International Centre for Theoretical Physics (ICTP), 34149 Trieste, Italy*

[c]*Department of Applied Physics, KTH Royal Institute of Technology, Stockholm, Sweden*

[d]*Department of Medical Sciences (DSM), University of Trieste, 34149, Italy*

[c]*Department of Biological and Medical Science, University of Udine, Santa Maria della Misericordia Hospital, 33100 Udine, Italy*

*Corresponding Author: cojoc@iom.cnr.it

ABSTRACT

The mechanical properties of cells are influenced by their microenvironment. Here we report cell stiffness alteration by changing the cell substrate stiffness for isolated cells and cells in contact with other cells. Polydimethylsiloxane (PDMS) is used to prepare soft substrates with three different stiffness values (173, 88 and 17 kPa respectively). Breast cancer cells lines, namely HBL-100, MCF-7 and MDA-MB-231 with different level of aggressiveness are cultured on these substrates and their local elasticity is investigated by vertical indentation of the cell membrane. Our preliminary results show an unforeseen behavior of the MDA-MB-231 cells. When cultured on glass substrate as isolated cells, they are less stiff than the other two types of cells, in agreement with the general statement that more aggressive and metastatic cells are softer. However, when connected to other cells the stiffness of MDA-MB-231 cells becomes similar to the other two cell lines. Moreover, the stiffness of MDA-MB-231 cells cultured on soft PDMS substrates is significantly higher than the stiffness of the other cell types, demonstrating thus the strong influence of the environmental conditions on the mechanical properties of the cells.