STUDIA UNIVERSITATIS BABEŞ-BOLYAI BIOLOGIA, 66, 1, 2021 (p. 9-10)

Influence of PDMS microtopographies on cells morphology

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Abstract

The cellular adhesion and morphology influence direct cell development in the tissue engineering mechanisms (Hashemzadeh *et al*., 2020; Yeh *et al*., 2017). Our work aims at knowing the impact of substrate properties by manufacturing biocompatible microstructured in polydimethylsiloxane (PDMS). Using various roughness and topography (lines, points, or unpatterned), we systematically analyze in vitro response of the cells. Initially, we characterized the physical characteristics of the PDMS samples such as contact angle, surface free energy, roughness, and SEM images. Besides, we show how plasma can turn the PDMS surface to hydrophilic after only 5 minutes exposure. Furthermore, bioassays were performed to investigate the viability, adhesion, and morphology of the cells. In vitro biocompatibility was evaluated by visualizing the actin filaments that provide mechanical support, determine cell shape, and allow movement of the cell surface, thereby enabling cells to migrate. The wettability property has been determined to be improved for plasma-treated PDMS. Morphological observations revealed good biocompatibility with the PDMS samples, cell cytoskeleton is not affected by the substrates. Finally, we showed a correlation between roughness, surface free energy, and cell adhesion. Our results suggest that PDMS microtopographies have a very high potential for cell behavior studies and future therapies.

Keywords: cells morphology, microtopographies, PDMS, wettability.

Acknowledgements. This work was supported by PN-III-P4-ID-PCE2020-2375.

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