Preparation of PDMS Substrates with Desired Physical Surface Features for Cell Culture Practice

Mojdeh Mohseni[a], Farshad H- Shirazi[a]

Abstract: surface properties in tissue engineering can be considered as novel approach. In this research diverse substrate with different physical parameters are designed according to specific cellular functions.

Introduction: In the context of tissue engineering, surface features can be considered as important design parameters. In this regard, chemical and physical cues in synthesized substrate modulate biological reactions. Therefore to obtain desirable cellular functions, optimized features of surface substrate were necessary. Roughness and stiffness are physical characteristics which affect cellular fate.

Methods and Results: SYLGARD 184 (silicone elastomer kit) was purchased from Dow Corning, Tokyo, Japan. To achieve diverse stiffness in PDMS (poly- dimethyl sulfoxide) three compositions of precursor and curing agent were mixed and samples of S1, S2, and S3 with the proportion of 1.6, 5 and 16 bases to curing agent were prepared, respectively. In the procedure of PDMS fabrication, after through mechanical stirring, each sample was degassed under vacuum for 20 minutes and the mixture was poured into the mold and cured at 75 °C for 24 hours. To gain assorted roughness in PDMS substrates, SDBD plasma (Iran) was applied. The proportion of base to curing agent for plasma treatment was set 10:1 and the plasma power and electrode distances were 30 W and 2 mm, respectively. Different roughness in PDMS surface was accomplished by different processing durations of 30, 90 and 180 seconds (R2, R3, and R4) with a template without any plasma exposure as the control (R1). Atomic force microscopy (AFM) and bulk elasticity were measured by tensile test. AFM images of various surface substrates in which exposure plasma times were altered, quantitative root mean square roughness of R2, R3 and R4 were assigned as 174.92, 189.22 and 326.7 nm, respectively. Hence, surface topography has changed with changes in plasma radiation times on the surface.

Conclusions: This study showed that by changing in plasma time exposure and proportion of base to curing agent in PDMS, roughness and stiffness can be optimized base on specific cellular reactions. So, synthesized substrates with distinctive physical properties can be appropriated for particular cellular function.

Key words: PDMS, physical properties, surface features, cell culture

Authors' Affiliations:
[a] Department Department of pharmacology and toxicology, school of pharmacy, Shahid Beheshti University of Medical Science, Tehran, Iran;

Abstract Presener:
Mojdeh Mohseni; PhD student;Department of pharmacology and toxicology, school of pharmacy, Shahid Beheshti University of Medical Science, Tehran, Iran;, E-mail: mohsenimojdeh90@gmail.com

****Correspondance:***
Farshad H.Shirazi; PhD; Department of pharmacology and toxicology, school of pharmacy, Shahid Beheshti University of Medical Science, Tehran, Iran; E-mail:Fshirazi@sbmu.ac.ir