Residual Stress Patterns Affect Cell Distributions on Injection-Molded Poly-l -Lactide Substrate

楊正昌

Lee SY;Tseng H;Ou KL;Yang JC;Ho KN;Lin CT;and Huang HM

Abstract

The effects of residual intra-substrate stress distribution on cell behavior have not been systematically investigated. Thus, the objective of this research was to analyze the relationship between cell distribution and internal stress patterns. A photoelastic method was used for residual stresses identification. Poly-L-lactide (PLLA) discs were prepared using an injection molding technique. MG-63 and NIH-3T3 cells were cultured on the surface of the PLLA disc. The cell distributions for high and low-stress regions were measured and compared. There were significantly more cells in the low-stress regions relative to high-stress analogs ($p < 0.05$). Further, linear relationships were demonstrated for both MG-63 and NIH-3T3 models with high correlation coefficients of 0.80 and 0.95, respectively. These results suggest that the distribution of residual stress in substrates affect cell behavior. These findings may provide greater insight into the interaction between cells and substrates, and may serve as a useful reference in future clinical study.