L929 response on polycaprolactone films with tailored crystallinity

D Kolbuk, P Denis, O Urbanek
Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw, PL

Influence of the crystallinity of the substrate on cell proliferation during in-vitro study was highlighted in few articles [1-3]. Methods of forming 3-D scaffolds usually do not take into account crystallinity optimisation. The aim of proposed presentation is to investigate an influence of polycaprolactone (PCL) crystallinity on cells spreading, their activity and proliferation.

PCL M_n45k and M_n80k g/mol were used. As a solvents: HFIP (H) and Acetic Acid (AA) were used. Two methods of foil preparation were analysed:
-forming from melt (PCL45, PCL80)
-forming from 10%wt solution (e.g. PH45, PAA45)

Samples were analyzed using interfered-polarization microscopy (MIP) which allows to describe the morphology of spherolites (crystalline and amorphous phase). Degree of crystallinity was analysed by differential scanning calorimetry (DSC) and wide angle X-ray scattering (WAXS). Selected samples surfaces were O_2 plasma treated to decrease hydrophobic properties of PCL. L929 cells adhesion and morphology were analyzed by immunohistochemical staining for actin and nuclei. Cell activity and proliferation were analyzed.

Morphology of spherolites was analyses using interfered-polarization microscopy (MIP). Analyses indicate changes in spherolites shape, size and also crystalline/ amorphous phase amount. Differences of crystallinity for PCL using different molecular weight were analysed by DSC and WAXS measurements. Decrease of contact angle was observed for O_2 plasma treated samples. All PCL films were found as nontoxic for L929 cells. Differences in cells spreading, activity and proliferation degree were found.

Modification of Mn, solvent and concentration of PCL enable film formation in wide range of crystallinity. L929 during in-vitro study interact with the PCL film. Crystallinity as part of the supermolecular structure influence on cells morphology.

*1 A. Park and L.G. Cima (1996) J Biomed Mater Res **31**:117-130.*
*2 D. Hanein, H. Sabanay, L. Addadi and B. Geiger (1993) J Cell Sci **104** 275-288.*
*3 G. Balasundaram, M. Sato, T.J. Webster 2006 Biomat **27**: 2798-805*