In vitro Cytotoxicity Testing of PEEK Biomaterials on Mesenchymal Stromal Cells

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Polyether ether ketone (PEEK) is polyaromatic semi-crystalline thermoplastic polymer with mechanical properties favorable for bio-medical applications. The aim of our study was to investigate if PEEK biomaterials have toxic impact on mesenchymal stromal cells (MSCs). We evaluated how PEEK biomaterials influence the amount, viability, morphology and cytoskeleton of MSCs after co-cultivations. After indirect co-cultivation with MSCs we did not find significant differences dependent on PEEK filaments. The highest amount of MSCs was obtained after co-cultivation with PEEK No. 1 (1,99x105) compared to the negative control (2,04x105). No big differences were found in the viability of MSCs co-cultivated with all PEEK biomaterials, viability in all groups was around 95±5%. Morphology of MSCs in direct contact with all of PEEK biomaterials after crystal violet staining was similar to the negative control. Cytoskeleton of MSCs was not influenced by any of PEEK filaments. Proliferation assay of MSCs seeded on 3D PEEK samples proved that PEEK biomaterials have no adverse effect on viability of MSCs. After 3 and 7 days of cultivation no differences in proliferation of MSCs were observed, just small increase in proliferation of MSCs on porous PEEK material on the 7th day. Adherence of MSCs on 3D PEEK material was observed by scanning electron microscopy. After 3 days of cultivation we found only few areas of MSCs adhered on the surface of PEEK material. All of the tests, including direct and indirect co-cultivation proved that none of the PEEK filaments, nor 3D printed PEEK cubes have cytotoxic impact on MSCs.

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