(OP 72) Dependence of Cell Proliferation on the Morphology of Starch Based Scaffolds for Tissue Engineering

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In tissue engineering (TE), several biological, mechanical and geometrical design constraints need to be addressed in order to create an adequate micro-environment for cells response. In this study, the correlation between architectural features of the scaffold construct and cellular behavior was investigated for a blend of starch and polycaprolactone (SPCL). The aim was to determine the effects of scaffold parameters on mechanical properties on cell seeding efficiency and proliferation of human osteoblast-like cells (SaOs-2) of scaffolds obtained via Rapid Prototyping (Bioplotter) and fiber bonding. For fiber bonding, a L8 design of experiment approach was used to produce different scaffold morphologies and properties by systematically varying processing parameters. For rapid prototyping, processing parameters such as filament orientation, offset, and building layers were also varied to obtain different structural configurations.

Fiber bonding method produced randomly oriented fiber mesh with porosity values up to 75%, whereas rapid prototyping method produced a precise 3D architectures with similar porosity levels. Correlation between the mechanical performance and scaffold architecture was determined. Scaffold architecture was demonstrated to have a profound effect on cell seeding efficiency and cell proliferation. SEM micrographs and HE staining indicated cells' preference during seeding towards points of geometric constraint that resulted in higher seeding efficiencies for low values of porosity. Conversely, high values of porosity revealed to be an important aspect to enhance cell proliferation for longer culture periods. These results are an indication that scaffold architecture can be optimized according to a specific envisaged cellular response and period of culture.