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Abstract

Poly-p-dioxanone as a new scaffold material for 3D printing in tissue engineering

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Abstract:

In this study, poly-p-dioxanone (PDO) (Resomer® X, Evonik Industries AG, Germany), a material already used as surgical suture with elastic and biocompatible properties1, was characterized for processing in 3D printing and for potential application as biodegradable scaffold for tissue engineering. PDO as a heat sensitive polymer2 was characterized using 3D printed specimen in tensile testing (n=5). Heat processing showed no effect on elongation at break but a decrease in Young's modulus of 18,9 ± 4,0% and tensile strength of 31,8 ± 12,1%, likely due to inhomogeneity. The biocompability of PDO was investigated using a Cell Titer Blue® Assay (n=3) according to DIN ISO 10993 and revealed a viability of above 85% for human umbilical venous endothelial cells (HUVECs) or adipose tissue derived mesenchymal stem cells. Microstructured PDO scaffolds were generated using extrusion based 3D printing with a resolution of up to 100µm (strand diameter). Printing parameters were optimized to allow printing slightly above the melting temperature of PDO (~110 °C) to minimize heat degradation while accomplishing high resolution and precision. Cells seeded on fibrin-coated PDO scaffolds showed a good cell adhesion with preserved physiological properties in terms of cell migration and cell growth. Establishing the process of 3D printing of PDO scaffolds opens the possibility, to manufacture individually designed scaffolds to meet the need for patient-adapted soft tissue engineered products in the near future. Prospectively, combined techniques such as the integration of melt electro spinning writing (MESW) to create scaffolds with enhanced properties to tissue formation are envisioned.

Biography:

Sebastian Loewner has completed his Master of Science at the age of 26 years from the Leibniz University Hannover. He is now working as a PhD Student in the group of Prof.

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