Motto: “Make Progress, Face Challenges, Get Solutions”

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based coatings was homogeneous throughout the surface; whereas the surface morphology of TCP coated magnesium samples contained some irregularities that may be due to a wide size distribution of initial powder. The measured Ca/P ratio values were 1.96±0.09 and 1.98±0.12 for initial HA and TCP powders, respectively. The measured Ca/P ratio values for powders were found to be greater as compared with those specified in literature for stoichiometric HA (1.67) and TCP (1.50); they correspond to the Ca/P ratio value of tetra-calcium phosphate (TTCP – 2.00). On the other hand, the Ca/P ratio values for the coatings ZrO2/HA “mixture”, ZrO2/HA “sandwich”, HA and TCP were calculated as 1.83±0.21, 1.76±0.10, 1.84±0.22 and 1.67±0.07, respectively. In conclusion, the developed and utilized GDD method is highly promising to obtain bioactive coatings on magnesium to control its degradation.
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Contribution ID: 795
15. Biomaterials, Cellular and Tissue Engineering, Artificial Organs
15.02. Artificial skin, bones, joints, teeth and related biomaterials

Fabrication of electrospun fiber mats with defined geometry and load profile

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The general feasibility to manufacture a model-based implant for the muscle-tendon transition at the rotator cuff is focused in this research. The idea to replace the native tendon with an electrospun fiber mat based is based on biodegradable polycaprolactone (PCL). The fiber mats will exhibit graded mechanical and geometric properties as well as a defined load profile. The detailed aim is to mimic the mechanical properties of the collagen structure of the native tendon.
Therefore two different fiber morphologies are needed. On the one hand aligned fibers who assimilate the full mechanical load. On the other hand non-aligned fibers are needed to act as scaffold for cell migration. The main task is to combine aligned and not aligned fiber mats within one fiber mat.
Commonly used dynamic rotation drum collectors generate increased alignment in dependence of increased circumferential speed. However, with this technique, it is merely possible to either get aligned or non-aligned fibers. In contrast, the gap spinning effect combines both in a static setup. To quantify these results, the orientation degree was measured. The lower the range, the higher the orientation. The gap spinning shows highly aligned fibers (<15°) between two collectors and non-aligned fibers (~100°) at the surface of the collector.
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Contribution ID: 803
15. Biomaterials, Cellular and Tissue Engineering, Artificial Organs
15.02. Artificial skin, bones, joints, teeth and related biomaterials

Cross-linked alginate structures for engineering of scaffolds for neural tissue engineering

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In neural tissue engineering polymers are being investigated as potential scaffolds for supporting nerve regeneration processes. Electrospun piezoelectric scaffolds from polyvinylidene-fluoride (PVDF) with introduction of alginate encapsulated cells and growth factors are very promising to stimulate and accelerate nerve cells ingrowth. In previous studies, the biocompatibility of the scaffolds has been proved and their morphological, mechanical and electric properties have been investigated. This study reports developing a 3D-printing strategy for generation adjustable cross-linked alginate structures for engineering of PVDF-scaffolds.
A hand-made 3D-printer and a coaxial nozzle have been designed and constructed to produce cross-linked alginate structures. Alginate (1.5%, w/v) was pumped at different flow rates through the needle (outer diameter 0.4 mm). The printing speed (0.5-4.5 mm/s) was controlled using developed software. The size of generated structures was analyzed using a Zeiss SteREO Discovery.V12 microscope. The amnion multipotent stromal cells (3×106 cells/ml) were used to print alginate structures with encapsulated cells. The viability of cells was analysed using Calcein AM/EthD-1 live-dead viability and visualized using a fluorescent microscope Zeis Axiovert 200M.
Preliminary experiments using the hand-made 3D-printer have shown that size of cross-linked alginate structures can be precisely controlled (100-1000 μm) by a range of process parameters, such as printing speed, alginate flow rate as well as nozzle diameter. As expected, the viability of cells entrapped into printed alginate structures analysed using a Calcein AM / Ethidium Homodimer live-dead viability assay was not significantly lower (87.3 ± 3.2%) as compared to initially viable cells (90.1 ± 2.4%).
Taken together, the experiments prove a great potential of a 3D-printing strategy to develop multistructural tissue-engineered PVDF scaffolds with an application of alginate encapsulated cells and growth factors to develop an effective method for replacement and regeneration of damaged nerves of a peripheral nervous system (PNS).

Contribution ID: 807
15. Biomaterials, Cellular and Tissue Engineering, Artificial Organs
15.02. Artificial skin, bones, joints, teeth and related biomaterials

μCT based characterization of biomaterial scaffold microstructure under compression

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In this study, two scaffolds (PLCL and collagen) were subjected to deformation under uniaxial compression. The corresponding changes in the scaffold bulk characteristics were observed through micro computed tomographic imaging. Calculated parameters for both samples were porosities, material thickness and pore thickness of analysed volumes. The results show an expected decrease in porosity with increasing deformation. Especially in sandwich constructs of collagen-PLA it was evident that different materials can be affected differently which may be of significance in certain applications. The results of this study are a step towards understanding the changes in the structure of these scaffolds under expected operation.

Contribution ID: 845
15. Biomaterials, Cellular and Tissue Engineering, Artificial Organs
15.02. Artificial skin, bones, joints, teeth and related biomaterials

Fabrication of a multi-layered human breast cancer tissue model for clinical evaluation of photothermal therapy

Ki-Hwan Nam

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