cal structures and, after 7 days, the cells had colonized the whole scaffold. ALP/dsDNA was higher than on 2D culture plates and, in general, was not influenced by the introduction of the structures. In conclusion, the methodology proposed permits to modify the surface or add a new hierarchical structural level in scaffolds for TE that could be used to control cell adhesion, proliferation and differentiation.

34.P03
Hierarchical design of bone extracellular matrix mimetic nanofibers promote osteogenic differentiation of mesenchymal stem cells

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Native bone is comprised from a collagen-based network which is mineralized with a special type of calcium phosphate in a hierarchical manner. Both instructive signals, including small peptide sequences, growth factors, etc., on the extracellular matrix and bare hydroxyapatite were separately reported in the literature promoting mesenchymal stem cell (MSC) differentiation into osteogenic lineage. However, reconstitution of the hierarchy that imitates the native bone structure in laboratory and clinics, however, still remains as a challenge. In this study, we engineered self assembling peptide molecules bearing MSC-specific peptide signals. Onto these nanofibers, we were able to mineralize bone-like hydroxyapatite (HAP). We characterized the mineralized nanofibers using FT-IR, Raman spectroscopy, XRD, electron diffraction, and SEM. We then evaluated the differentiation of MSCs into osteogenic lineage by employing alkaline-phosphatase activity assay, qRT-PCR, immunocytochemistry, and western blot. We reveal that HAP-peptide nanofiber composites demonstrate robust performance for MSC differentiation.

34.P04
Designing functional self-assembling peptides as biomaterial-scaffolds for bone repair

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Aim of this project is to study designed functionalized oligopeptides immobilized on biomaterial scaffolds that promote cell adhesion, proliferation and differentiation. The oligopeptides consist of a core derived from the adenovirus fiber shaft protein responsible for their amyloid character. The peptides were engineered to contain the characteristic RGDS motif of fibronectin to promote integrin-mediated cell adhesion. We performed TEM for the characterization of structural features of the peptides and the fibrils and SEM for the visualization of the surfaces. We seeded MC3T3-E1 cells on glass slides and added the mature peptide solution. Either the RGDS-containing peptide, or a control peptide or fibronectin, or BMP-2 was added to the cells. On day 8 cells were harvested and counted, and gene expression of bone sialoprotein, osteocalcin and Col24a1 was performed. The oligopeptides self-assemble into a few micrometer-long fibrils at a concentration of 2 mg/ml, pH = 7.4. Preliminary experiments show a significant increase in proliferation of cells cultured in presence of the peptide with the RGDS sequence. Cells cultured in presence of fibronectin and in mixture conditions of the RGDS peptide and BMP-2 behaved similarly. Bone sialoprotein and Col24a1 were both expressed in presence of the RGDS-containing peptide and in mixture of the peptide with BMP-2. Furthermore, we investigated the osteogenic response of immobilized peptides on structured hybrid biomaterial-scaffolds.

34.P05
Characterisation and in vitro and in vivo response to self assembled peptide hydrogels

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The importance of recapitulating a 3-D environment representative of conditions in vivo, has driven the recent development of new materials designed for both in vitro cell and tissue culture and in vivo applications in regenerative medicine. Bioinspired supramolecular assembly is an attractive method for the fabrication of such materials and one class of these materials which are attracting increasing attention in biological applications are hydrogels based on peptides, as a result of their inherent structural and biochemical diversity, low cost and ease of preparation. Fabrication of such self-assembling peptide materials include the use of, for example, a pH switch or the presence of enzymes to trigger the process amongst others. Here, we demonstrate the use of both a pH switch and an enzyme induced self assembly of both capped (Fmoc) and uncapped-tripeptide systems to give ordered nanostructures which further interact to form peptide hydrogels. Our goal is the development of a suite of materials whose rheological properties and other characteristics can be tailored by the manipulation of self assembly conditions during materials fabrication. We demonstrate the use of these hydrogels for culturing specific cell types in vitro and the application of these systems in vivo.

34.P06
Sustained release of ranibizumab from self-asssembled peptide amphiphile microgels

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Ranibizumab is a recombinant VEGF antibody used in clinics for the treatment of wet form of age related macular degeneration. It is intravitreally administered to ocular compartments and it needs frequent injections. However, intravitreal administration could cause side complications as well as patient discomfort. These necessitate alternative treatment strategies based on relatively noninvasive ranibizumab delivery that is more effective and sustainable in the eye vitreous than the current clinical regimen. Herein, we developed self-assembled peptide microgels to sustainably release ranibizumab from these microgels at high local dose. Release profile of ranibizumab at different peptide concentrations was used to evaluate the release performance from the microgels for improved and modulated treatment of wet form of age related macular degeneration.

34.P07
Controlled aggregation of microstructures and hMSCs as a bottom-up approach towards cell and tissue organization

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Current methods to fabricate scaffolds for tissue engineering applications have limitations in terms of 3D structure complexity, remodeling and cellular distribution. In this study, we propose a bottom-up approach towards a cell-driven assembly of microparticles at the macroscale. We speculate this might allow the formation of more complex 3D structures prone to remodeling. We show that physical properties like size, shape and wettability of the structures modulate the circularity, branching and compaction of the cell-driven assembly. As a proof of