rat hepatocytes on single-walled CNT-coated surfaces. Although the hydrophobic characteristics of CNT-coated surfaces increased with increasing CNT density, hepatocyte adhesion decreased, indicating that the interaction between hepatocytes and CNTs is weak. The hepatocytes on a CNT-coated surface gradually gathered together and formed spheroids (spherical multi-cellular aggregates). In contrast, collagen treatment in conjunction with the CNT-coated surface improved hepatocyte adhesion, and the cells maintained a monolayer configuration throughout the culture period. The albumin secretion and ammonia removal activities of hepatocyte spheroids were maintained at elevated levels for at least 15 days of culturing as compared with hepatocyte monolayer. Furthermore, connexin-32 expression was higher in the spheroid than in the monolayer, indicating that the spheroids develop cell–cell communication. These results indicate that CNTs can be used for the formation and long-term culture of hepatocyte spheroids.

59.P05
Monitoring microconstructs: cell and nanosensor encapsulation in alginate micro-beads

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Monitoring and controlling the microenvironment of cell cultures is an ongoing challenge for many researchers. Much research has been conducted characterising individual aspects such as 3D architecture, mechanical properties, biochemicals, etc. The biggest deficits in existing models for monitoring analytes within the cellular environment is the lack of appropriate means for non invasive, real-time and integrated monitoring of the cellular responses. Nanosensors can overcome these issues: they are porous polymeric nanoparticles that are sensitive to a range of analytes including pH and O_2. Microfabrication techniques are innovative tools to obtain controlled microstructures with a defined 3D architecture. In this work uniform sized 3D micro-scaled hydrogel constructs of approximately 300–400 μm diameter were fabricated. Through dual incorporation of cells and nanosensors within these constructs we aim to have a real-time, non invasive method to measure microenvironmental pH value and O_2 content. Ratiometric fluorescent output from the microenvironment is used to monitor O_2 and pH during cell culture. Measurements show that 3D micro-scaled constructs are suitable for cell growth and proliferation. Moreover O_2 content and pH within hydrogel cellularised microspheres are shown to have physiological values which enable the maintenance of the hepatic phenotype.

59.P06
Nano-reinforced poly(hydroxyethyl acrylate) hydrogels

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The application of hydrogels as scaffolding material in tissue engineering is sometimes prevented by their excessive compliance and lack of sufficient mechanical resistance. Different hybrid polymer composites containing an inorganic nano-reinforcement have been proposed in the literature to improve mechanical properties of hydrogels. Amazing properties can be obtained by precise organization of the organic and inorganic phases in the composite. The strategy proposed in this work to obtain a double micro and nano-reinforcement of a hydrogel matrix consists in a two-step synthesis being the polymer network formation the first step. Polymeric microstructure drives the absorption of a silica precursor solution and the further distribution of the inorganic phase which is formed 'in situ'. Poly(hydroxyethyl acrylate) micro / nano-composites were obtained with silica content up to 60% by weight. Silica phase is continuous, samples maintain their integrity after eliminating the organic phase by pyrolisis. Water absorbed in the gel is able to crystallize, at least in part, when the silica content is below 30% by weight, interestingly for higher silica content the glass transition of the polymer phase is suppressed as well. Increase of the elastic modulus with silica content is continuous. Improvement of bioactivity of the material in simulated body fluid was also assessed. The synthetic route proposed allows obtaining a family of composite hydrogels with adjustable properties.

59.P07
Hyaluronic acid/poly(amidoamine) dendrimer nanoparticles for central nervous system applications: In vitro and in vivo studies

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Central nervous system (CNS) disorders are among the diseases with less efficiency in treatment. In order to reach its target and exert its effect within the brain parenchyma, drugs must overcome the blood brain barrier (BBB) and the blood-cerebrospinal fluid-brain (BCSFB). The aim of this work was to develop a novel nano-based dendrimer which could serve as a nanocarrier with the ability to cross these barriers. Hyaluronic acid/poly(amidoamine) dendrimer nanoparticles (HA/PAMAM NPs) were synthesized and a detailed physicochemical characterization was performed. Results from DLS analysis showed that these HA/PAMAM NPs possessed a mean diameter of 61.23 nm. The HA/PAMAM NPs were negatively charged and had a low polydispersity factor, which indicates a narrow size distribution. Moreover it was also possible to bind them to fluorochromes, such FITC, in order to trace them in biological environments. In vitro biological assays revealed that HA/PAMAM NPs did not cause any cytotoxic effect on the viability and proliferation of neuronal and glial primary cell cultures. It was also possible to observe that the fluorescent-labeled NPs could be in vitro internalized by glial, neuronal and endothelial cells. Finally, in vivo assays revealed that these nanoparticles could be found in the brain parenchyma upon intrathecal injections. Further studies will focus on testing these systems in relevant models of CNS injury and degeneration.

59.P08
Characterization of polymer surfaces to optimize cell behavior

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Polymeric nano-surfaces can imitate the extracellular matrix, whose topography interacts in vivo with cells and regulates their activity and morphology. The possibility to optimize such tools for tissue engineer-