(P 196) Hydrostatic Pressure Culture System for Human Chondrocyte Cultivation and Stimulation in Gellan Gum Hydrogel Disks

C. Correia[1,2], A.J. Pedro[1,2], J.T. Oliveira[1,2], R.A. Sousa[1,2], R.L. Reis[1,2]

[1]3B's Research Group—Biomaterials, Biodegradables and Biomimetics, University of Minho, Campus de Gualtar, 4710-057 Braga, Portugal.
[2]IBB—Institute for Biotechnology and Bioengineering, Braga, Portugal.

Cartilage tissue loss, resulting from injury or disease, is a major health problem worldwide. Tissue Engineering (TE) has a great potential for the treatment of vast number of pathologies. In this regard, bioreactor systems are used as frameworks for studying fundamental aspects of cell response and tissue development, as well as scale–up platforms for industrial application. It has been

shown that mechanotransduction mechanisms modulate cell functioning, including cell differentiation, proliferation and extracellular matrix (ECM) deposition, and that chondrocytes are mechano–sensitive cells. Hydrogels are often used in TE to encapsulate chondrocytes and engineer cartilage–like constructs, which are incompatible with flow perfusion bioreactors. In this work, hydrostatic pressure (HP) was used as an alternative to mechanically signal human chondrocytes encapsulated in gellan gum hydrogel discs, as it has a profound effect on cartilage metabolism in normal and pathological conditions. HP was applied in both static and dynamic regimens. Dynamic conditions were used in order to mimic the non–continuous *in vivo* loading of articular cartilage and induce the production of cartilage–like ECM. The effects of HP over chondrocytes was assessed by morphological and histological characterization of the constructs: detection of Sulphated glycosaminoglycans (GAGs), collagen type I and II; evaluation of mRNA expression by real time RT–PCR analysis, and visualization of the chondrocytes inside the produced matrix by bright–field microscopy. HP was shown to affect the synthetic capacity and viability of chondrocytes, depending on the mode, duration and magnitude of pressure. The properties of the hydrogel were also shown to depend of HP conditions.