(OP 39) Bone, Cartilage and Osteochondral Tissue Engineering Strategies Using Natural Origin Polymers and Ceramics, Growth Factors and Progenitor Cells

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Tissue engineering (TE) has emerged in the last decade of the 20th century as an alternative approach to circumvent the existent limitations in the current therapies for organ failure or replacement. The EU HIPPOCRATES project joined academic and industrial partners to develop novel products and concepts that can be used for bone, cartilage or osteochondral TE strategies. Several issues were addressed including i) the choice and study of adequate human cell cultures, (ii) the development of culture technology with which human tissues can be grown *ex vivo* in three dimensional biodegradable matrices, (iii) the development of a material technology with which polymeric matrices can be produced, being suitable for cell culture (proliferation, differentiation), (iv) to assess the *in-vivo* functionality and clinical relevance of the tissue engineering strategies. In this context, we proposed the use of a series of natural-based biomaterials, namely polysaccharides (e.g. starch, chitin derivatives, alginate, carrageenan, gellan gum) compounded, or not, with synthetic polymers and ceramics, including calcium phosphates obtained from mineralized red algae. A series of processing techniques and surface modifications were used to produce scaffolds with a wide range of porosity and porous architecture and controlled surface features. Hydrogels, including thermo-responsive injectable systems, were produced as biodegradable supports and vehicles for cells and growth factors. Complementary studies were performed to use the same kind of materials in drug release systems; such information could be integrated in tissue engineering strategies where growth factors or differentiation agents could be delivered in a controlled way to progenitor cells.