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Xenologous acellular scaffold-free biomaterial for cartilage defect repair: freeze-dry study

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In this study a xenologous decellularized biomaterial with hyaline cartilaginous character was developed. The effect of freeze-dry on the material is studied. The biomaterial is secreted by chondrocytes encapsulated in alginate to form a 3D culture environment. The harvested chondrocytes are proliferated and subsequently collected and co-suspended with gelatin microspheres in alginate solution. The microspheres are fabricated by double emulsion method and functioned as porogens in the system. The cells have more tendency to grow on the edges of the alginate hydrogel and the pores generated by the microspheres. Finally, the cell clones for connection between each other and the secreted extra-cellular matrix is strong enough to hold together the whole graft. After 35 days of proliferation, the alginate is removed and a scaffold-free graft is generated. After another 10 days of maturation, the cells are removed by decellularization method combining physical, chemical and biological methods. After decellularization, the graft became a scaffold-free acellular xenologous biomaterial. It has been implanted repair cartilage damage in New Zealand white rabbits. It leads to full thickness recover from the cartilage layer to subchondral bone layer. Decellularization reduces immune reaction of xenografts. Hence, decell xeno grafts can enlarge the cell source and prepare the graft for commercialization. Transportation is an important segment to be considered for commercialization, where, freeze-dry is a useful technique. Thus, its impact on the xeno-biomaterial is exmined. Based on histology and biochemical analysis it is found that the extracellular matrix and its corresponding chemical content is largely conserved after freeze-dry and rehydration. It further prepares the acellular scaffold-free xenologous biomaterial for industrialization.

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