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Osteogenic differentiation of MG63 cells in biodegradable scaffolds based on gelatin and genipin

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Gelatin is a denatured collagen and commercially available as a biodegradable polymer. It has been extensively utilized for pharmaceutical and medical purposes, and its biosafety has been proven through long clinical applications. It showed an high cell attachment and proliferation, thus it has been widely considered as one of the best material to be used in medicine regenerative. Scaffolds based on pure gelatin showed a low mechanical and biological stability, so that a chemical crosslinking is necessary to improve its mechanical proprieties and success in clinical application.

The aim of this study was to test the influence of a new porous composite scaffold based on gelatin/genipin composition on cell adhesion, proliferation and osteogenic potential. Genipin is a natural non toxic crosslinking agent which significantly improve the mechanical stability of the scaffold1.

Osteoblast like cell (MG63) were seeded in collagen/genipin scaffolds for 24h, 7, 14, 21 and 28 days. Cell proliferation assay, light and electron microscopy analysis were performed to evaluate cell growth and morphological changes induced by cell/scaffold interactions. Real Time PCR were carried out to evaluate the expression of the osteogenic markers such as collagen type I, osteonectin, osteopontin, ostecalcin and alkaline phosphatase proteins in MG63 seeded on gelatin/genipin scaffolds.

Our results showed that gelatin/genipin scaffold is an excellent substrate for the growth and cell proliferation. Microscopy analysis showed an high cell adhesion on scaffold surface and an deep penetration in the macropores of the sponge. The Real Time data reveal a significant difference in the expression of the ostegenic markers in MG63 grown on gelatin/genipin scaffold compared to control samples.

In conclusion, our data demonstrated that gelatin/genipin scaffold showed an high biocompatibility with human cells and an high osteogenic potential and it could be a potential tool in regenerative medicine.

References

[1] Panzavolta et al. (2009). Acta Biomat 5: 636-643.

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