Graphene oxide application in cell microencapsulation for bioartificial organ development

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Abstract
Cell microencapsulation represents a great promise for the development of new long-term drug delivery systems. However, several challenges need to be overcome before it can be translated extensively into the clinic. For instance, the long term cell survival inside the microcapsules. On this regard, graphene oxide has shown to promote the proliferation of different cell types both in two and three dimension cultures. Therefore, we planned to combine the use of graphene oxide together with the cell microencapsulation technology and analyze the biocompatibility of this chemical compound with cells within alginate-poly-L-lysine (APA) microcapsules. We have been able to produce 200 µm-diameter APA microcapsules with increasing concentrations of graphene oxide in their inside and prove that the physical chemical parameters of the traditional microcapsules were no modified. Moreover, microcapsules containing graphene oxide enhanced the viability of the encapsulated cells, providing another step for the future pre-clinical application of graphene oxide in combination with cell microencapsulation.

References

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Figures

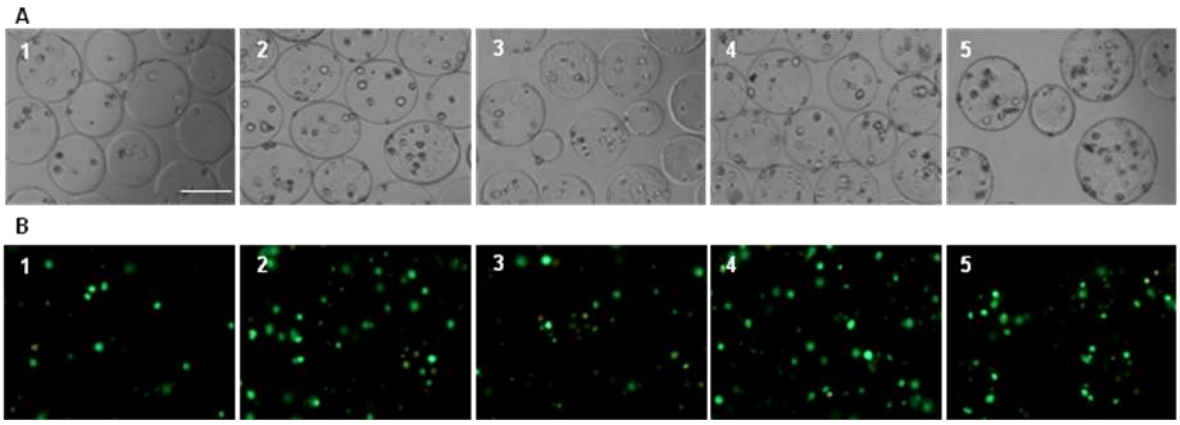

Figure 1.- Microscopy images of bright field (A) and fluorescence after calcein ethidium staining (B) from microcapsules containing graphene oxide [1) without oxide graphene, 2) 10 µg/ml, 3) 25 µg/ml, 4) 50 µg/ml and 5) 100 µg/ml] and C_2C_{12} myoblasts 4 days after encapsulation. Scale bar 100 µm.

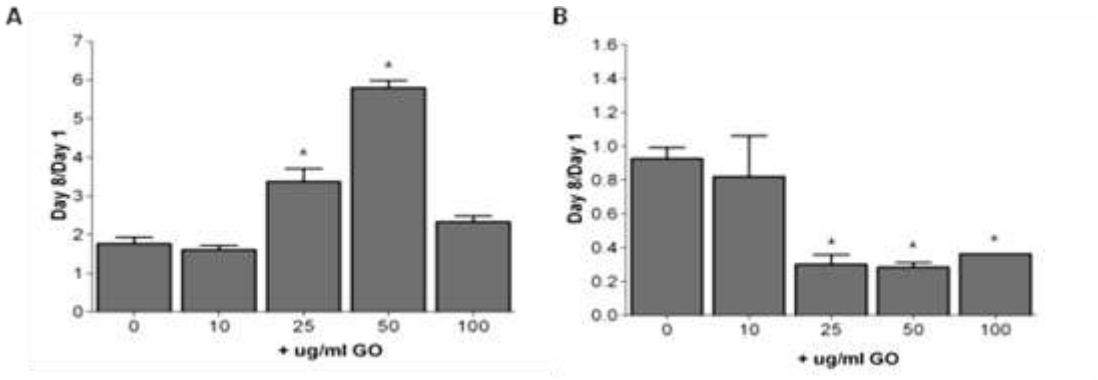

Figure 2.- Viability of encapsulated C_2C_{12} myoblasts in alginate microcapsules containing different concentrations of graphene oxide [0-100 µg/ml]. A) Metabolic activity measured in the cell counting kit 8 (CCK8) assay and B) Membrane integrity measured by the lactate dehydrogenase activity (LDH) assay, both expressed as the ratio between day 8 and 1 after microencapsulation.