Nanostructured Natural-based Polyelectrolyte Multilayers to Agglomerate Chitosan Particles into Scaffolds for Tissue Engineering
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Introduction
The Layer-by-Layer (LbL) methodology, presented in the 1990s, allows the electrostatic self-assembly of a polyelectrolyte multilayer (PEM) film onto the surface of a substrate in order to change its surface properties (1). Natural based polymers have been used (2), aiming to improve substrate’s biocompatibility and functionality. In this work, the influence of the number of multilayers and terminal layer in cell viability and proliferation onto planar substrates was studied. Moreover, it is envisaged the use of LbL methodology to particles agglomeration in order to prepare porous structures to be used as tissue engineering scaffolds.

Materials and Methods
Alginate (ALG) and chitosan (CHI) have been used for the preparation of polyelectrolyte multilayers with 10, 10½, 20 and 20½ double-layers of (CHI/ALG), by alternate immersion in ALG and CHI solutions, with washing steps in between.
Chitosan particles were prepared by droplet precipitation in alkaline bath and further cross-linked with genipin. Particle agglomeration was carried out by LbL assembly of 10 and 20 (CHI/ALG) double-layers (dL).
Cell viability and proliferation in both cases (2D and 3D substrates), using ATDC5 cells, was assessed with MTS test, DNA quantification and SEM analysis.

Results
Particle agglomeration with polyelectrolyte multilayers assembled by LbL methodology was successfully achieved, as illustrated in Figure 1. Cell proliferation and viability for ATDC5 cell line decreased with the increasing number of layers, due to an increase in surface roughness.

Discussion and Conclusions
The LbL technique can be used as a single methodology to prepare scaffolds by particle agglomeration. These scaffolds could support attachment and proliferation of ATDC5 cells, which are influenced by the number of layers and the nature of the terminal layer.

References

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