# STARCH-BASED MICROPARTICLES AS CARRIERS FOR THE DELIVERY OF PLATELET-DERIVED GROWTH FACTOR AIMED TO STIMULATE THE PROLIFERATION OF OSTEOBLASTIC-LIKE CELLS

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We have previously shown that starch-based microparticles are bioactive [1], serve as substrates for the culture of osteoblast-like cells [2], and are suitable for controlled release applications [3]. In this way, we postulate that if we combine these different properties we could generate hybrid constructs with enhanced properties. Hence, we describe herein the encapsulation and release of Platelet-Derived Growth Factor (PDGF), as well as its mitogenic effect over osteoblast-like cells.

PDGF was encapsulated into starch-based microparticles composed of a blend of 50:50 (wt/wt) starch with polylactic acid (SPLA). The loaded microparticles were tested for released PDGF up to 8 weeks and the released PDGF was quantified using ELISA specific for this growth factor. Bioactivity of released PDGF was assessed using a mouse calvaria cell line (MC3T3-E1) possessing a pre-osteoblastic phenotype.

PDGF could be effectively encapsulated into SPLA microparticles. The release profile of PDGF shows there is a burst release in the first hours, and then a reduction in the released levels, with a steady release after 7 days. The release was quantified up to 8 weeks, with reduced, steady-level amounts being released. This release profile is typical for hydrophilic, biodegradable polymers, where the water uptake controls the first release stages, where the encapsulated agent is released by diffusion. In this particular application this behavior is desirable, since PDGF mitogenic effect over osteoblasts is only observed with an intermittent, higher-level supplementation, followed by a low-level, continuous one. The released PDGF bioactivity, evaluated by the response of MC3T3-E1 cells to culture medium supplemented with a defined dosage of either exogenous or released PDGF, reveals that PDGF encapsulated and released from SPLA microparticles is capable of stimulating the proliferation of MC3T3-E1 cells in levels comparable to those of exogenous PDGF. Both conditions significantly enhance the proliferation of osteoblastic cells, as compared to control conditions.

In conclusion, we clearly demonstrate the potential of starch-based microparticles to be used as carriers for growth factors. These systems encapsulate, release and maintain the bioactivity of the entrapped growth factor. PDGF was effectively released in a defined profile compatible with the final goal of stimulating the proliferation of cells within a hybrid construct aimed to be used in tissue engineering applications.

**References**

[1] G.A. Silva et al., 2004, J Biomed Mater Res, 70A [2] G.A. Silva et al., 2005, in preparation. [3] G.A. Silva et al., 2005, J Biomed Mater Res 73A.

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