Co-Encapsulation of Mesenchymal Stem Cells and Insulin for Wound Healing

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Abstract

Every year, in Europe, approximately 7 million people are diagnosed with chronic wounds. According to estimates, these wounds represents a cost of 2.8-3.5 million euros per 100,000 habitants (1). MSCs can be ideal candidates for cell-based therapy for several skin disorders and wound healing. It is believed that MSCs differentiation into epithelial cells fill the area of the wound, accelerating the recovering process (2). Growth factors, which are decreased at the wound site, are known to promote MSCs proliferation. Insulin is one of the cheapest growth factors in the market able to stimulate angiogenesis and cell migration. However, the low stability of insulin and MSCs in the wound bed are problems to overcome and the encapsulation into microparticles can be a good strategy (3). The main objective of this work is to develop a polymer-based delivery system co-encapsulating MSCs and insulin loaded into an hydrogel by droplet microfluidics for wound healing. Using an 1.2% (w/v) alginate solution flow of 0.10 µl/min and a Maisine CC oil flow of 10 µl/min, it was obtained spherical microparticles at about 1 µm. More importantly, it was obtained a delivery system able to co-encapsulate MSCs and insulin, maintaining the cells viability and the structural stability of the growth factor.

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