Functional cell microcarriers- a new platform for cell separation and expansion

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The success of many stem cell applications in the biomedical field is highly dependent on the development of separation techniques for isolation and purification of cells with a very high yield and purity. Despite all the achievements made in the field over the past several years, new systems for effective cell separation are still needed. Previous work from our group demonstrated that functional chitosan films grafted with antibodies promote selective cell adhesion. [1]

Herein we developed chitosan microparticles able to capture a specific cell types based in the concept of antibody coating for cell sorting. Our goal was to create new biomaterial surfaces capable of recruit a specific cell population within a mixture, reducing cell manipulation and time-consuming allowing at the same time cell expansion. Such system acts as a microcarrier for cell expansion of a specific cell target. Microcarrier culture system offers the advantage of providing a larger surface area for the growth of anchorage-dependent cells in a suspension culture system. Chitosan was chosen due to the excellent biocompatibility, gel forming properties, chemistry surface and low cell adhesion. This allows the modification with specific biochemical cues, for a controllable cell attachment. Here we develop functional biotinylated microparticles, such system allows tailoring microparticles to a variety of functional biomolecules. Here we tested the immobilization of antibodies to target specific cell types, CD31 for endothelial cells and CD90 for adipose stem cells.

Primarily designed for an application in tissue engineering, two main challenges are accomplished with the herein presented microparticles: separation and scale-up expansion of specific cell type. The herein developed polymeric microparticles can also be used for directly deliver cells *in vivo* to repair and regenerate tissues.

1. Custodio CA, Frias AM, del Campo A, Reis RL, Mano JF. Selective cell recruitment and spatially controlled cell attachment on instructive chitosan surfaces functionalized with antibodies. Biointerphases. 2012;7:65.

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