Chitosan membranes for spatially controlled cell adhesion and specific cell recruitment

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We propose a concept of biomaterials that are able to fix specific cell types onto their surface when in contact with a mix population of cells.

Adipose tissue has shown to be an interesting source of stem cells with therapeutic potential. However only a small amount of the heterogeneous mixture of the cells extracted from lipoaspirates are stem cells, and within stem cells there are different populations with different capabilities to differentiate through a lineage.

We studied the ability of immobilized antibodies on chitosan surfaces to capture specific types of cells with a spatial micrometer resolution.

Antibodies were covalently immobilized onto chitosan membranes using bis[sulfosuccinimidyl] suberate (BS3). X-ray photoelectron spectroscopy (XPS) was used to chemically characterize the surface and quartz crystal microbalance (QCM) to calculate the amount of adsorbed and/or immobilized antibody.

Data shown greater immobilization when BS3 was used compared to simple adsorption. Specific antibodies covalently immobilized in a surface, kept their bioactivity and controlled the type of cell that attached on the chitosan surface. Microcontact printing permitted to covalently immobilize antibodies in patterns allowing a spatial control in cell attachment. Cell sorting experiments performed using a mixture of adipose stem cells and osteoblast like cells shown that chitosan surfaces were able to capture a specific phenotype depending on the immobilized antibody.

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