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Macroporous thin membranes for cell transplant in regenerative medicine

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ABSTRACT

The aim of this paper is to present a method to produce macroporous thin membranes made of poly (ethyl acrylate-co-hydroxyethyl acrylate) copolymer network with varying cross-linking density for cell transplantation and prosthesis fabrication. The manufacture process is based on template techniques and anisotropic pore collapse. Pore collapse was produced by swelling the membrane in acetone and subsequently drying and changing the solvent by water to produce 100 microns thick porous membranes. These very thin membranes are porous enough to hold cells to be transplanted to the organism or to be colonized by ingrowth from neighboring tissues in the organism, and they present sufficient tearing stress to be sutured with surgical thread. The obtained pore morphology was observed by Scanning Electron Microscope, and confocal laser microscopy. Mechanical properties were characterized by stress-strain experiments in tension and tearing strength measurements. Morphology and mechanical properties were related to the different initial thickness of the scaffold and the cross-linking density of the polymer network. Seeding efficiency and proliferation of mesenchymal stem cells inside the pore structure were determined at 2 hours, 1, 7, 14 and 21 days from seeding.