A simple and robust method for pre-wetting poly (lactic-co-glycolic) acid microspheres

Abstract

Poly (lactic-co-glycolic) acid microspheres are amenable to a number of biomedical procedures that support delivery of cells, drugs, peptides or genes. Hydrophilisation or wetting of poly (lactic-co-glycolic) acid are an important pre-requisites for attachment of cells and can be achieved via exposure to plasma oxygen or nitrogen, surface hydrolysis with NaOH or chloric acid, immersion in ethanol and water, or prolonged incubation in phosphate buffered saline or cell culture medium. The aim of this study is to develop a simple method for wetting poly (lactic-co-glycolic) acid microspheres for cell delivery applications. A one-step ethanol immersion process that involved addition of serum-supplemented medium and ethanol to PLGA microspheres over 30 min–24 h is described in the present study. This protocol presents a more efficient methodology than conventional two-step wetting procedures. Attachment of human skeletal myoblasts to poly (lactic-co-glycolic) acid microspheres was dependent on extent of wetting, changes in surface topography mediated by ethanol pre-wetting and serum protein adsorption. Ethanol, at 70% (v/v) and 100%, facilitated similar levels of wetting. Wetting with 35% (v/v) ethanol was only achieved after 24 h. Pre-wetting (over 3 h) with 70% (v/v) ethanol allowed significantly greater ($p \leq 0.01$) serum protein adsorption to microspheres than wetting with 35% (v/v) ethanol. On serum protein-loaded microspheres, greater numbers of myoblasts attached to constructs wetted with 70% ethanol than those partially wetted with 35% (v/v) ethanol. Microspheres treated with 70% (v/v) ethanol presented a more rugose surface than those treated with 35% (v/v) ethanol, indicating that more efficient myoblast adhesion to the former may be at least partially attributed to differences in surface structure. We conclude that our novel protocol for pre-wetting poly (lactic-co-glycolic) acid microspheres that

incorporates biochemical and structural features into this biomaterial can facilitate myoblast delivery for use in clinical settings.