Nanomedicine & Biotherapeutic Discovery

Extended Abstract

Nano-fibers of poly (vinyl alcohol co-vinyl acetate) as novel scaffold for mammalian cell culture and controlled drug delivery

Francisca Villanueva Flores

Abstract

The development of novel materials as scaffolds for cell culture has gained attention. The current challenge is to provide a scaffold that mimics natural tissues. We have synthetized at physiological temperature a pH-responsive and biocompatible nanostructured hydrogel with three different crosslinking degrees by varying the content of Glutaraldehyde (GA). According to our data of Scanning Electron Microscopy (SEM) and FTIR, we observed that the hydrogel is conformed highly ordered nanofibers of poly (vinyl alcohol co-vinyl acetate) (nsPAcVA). By Atomic Force Microscopy (AFM), we showed that nsPAcVA has nano-pores homogeneously distributed on its surface. We have characterized the relative amount of remaining hydroxyl groups and of formed acetal bridges by FTIR and by mechanical tests; we have measured the Young???s modulus, strain stress, elastic deformation and tensile strength. nsPAcVA had swelling dynamics dependent on pH and crosslinking. By cyclic voltammetry, we showed that nsPAcVA has ionic conductivity properties inversely proportional to its crosslinking degree. Based on this, we evaluated its capability to controllably release a model molecule. Diffusion analysis through the Peppas equation showed that at lower crosslinking degrees (5 and 10% of GA content), diffusion from nsPAcVA was Fickian. Moreover, we demonstrated for the very first time that nsPAcVA is an efficient scaffold for growth of mammalian cells (embryonic mouse hypothalamic mHypoE-N1 and human lung carcinoma A-549 cells). mHypoE- grown on nsPAcVA had lower proliferation than the control, but after 108 hours of adaptation, cells proliferated at comparable growth levels than the control. No significant difference in A-549 cell growth over nsPAcVA and the control was observed. We present a very easy synthesizable, cheap, biocompatible and nanostructured scaffold for controlled drug release with promising physicochemical characteristics to be applied as a tissue engineering material that integrates abiotic and biotic Components towards a new generation of smart implants which ultimately could mimic natural tissues.

Tissue engineering needs novel good materials to sustain cell growth, tissue regeneration and in place drug unleash during a controlled mode. Cell culture is that the method by that cells are fully grown underneath controlled conditions, usually outside their natural atmosphere. once the cells of interest are isolated from living tissue, they'll afterward be maintained underneath fastidiously controlled conditions. These conditions vary for every cell sort, however usually contains an appropriate vessel with a substrate or medium that provides the essential nutrients (amino acids, carbohydrates, vitamins, minerals), growth factors, hormones, and gases (CO2, O2), and regulates the physio-chemical atmosphere (pH buffer, pressure level, temperature). Most cells need a surface or a man-made substrate (adherent or monolayer culture) whereas others is fully grown free floating in matter (suspension culture). The time period of most cells is genetically determined, however some cell culturing cells are “transformed” into immortal cells which is able to reproduce indefinitely if the best conditions are provided. In observe, the term "cell culture" currently refers to the culturing of cells derived from cellular eukaryotes, particularly animal cells, in distinction with different forms of culture that additionally grow cells, like plant part culture, fungous culture, and microbiological culture (of microbes). The laboratory technique of maintaining live cell lines (a population of cells descended from one cell and containing identical genetic makeup) separated from their original tissue supply became a lot of strong within the middle twentieth century. Cells is isolated from tissues for ex vivo culture in many ways that. Cell is simply pure from blood; but, solely the white cells are capable of growth in culture. Cells are isolated from solid tissues by digesting the animate thing matrix victimization enzymes like enzyme, trypsin, or pronase, before provoking the

Francisca Villanueva Flores
National Autonomous University of Mexico, Mexico, E-mail: fran@ibt.unam.mx

tissue to unleash the cells into suspension. Instead, items of tissue is placed in growth media, and therefore the cells that grow out are obtainable for culture. This technique is understood as explant culture. Cells that are civilised directly from an issue are referred to as primary cells. With the exception of some derived from tumors, most cell cultures have restricted time period. dye was used as a model molecule to characterize the emotional properties of the compound. Effective diffusivities were a operate of the crosslinking degree. unleash rates were proportional to temperature and were quicker at lower GA contents. other than temperature and gas mixture, the foremost unremarkably varied think about culture systems is that the cell growth medium. Recipes for growth media will vary in pH scale, aldohexose concentration, growth factors, and therefore the presence of different nutrients. the expansion factors accustomed supplement media are typically derived from the blood serum of animal blood, like craniate bovine blood serum (FBS), bovine calf blood serum, equine blood serum, and porcine blood serum.

This work is partly presented at 16th World Medical Nanotechnology Congress September 03-04, 2018 | Tokyo, Japan.

Francisca Villanueva Flores
National Autonomous University of Mexico, Mexico, E-mail: fran@ibt.unam.mx