ABSTRACT

Modification of nanofibers is an actual trend in tissue engineering. Polyvinylacohol (PVA) is nontoxic and biodegradable polymer suitable for preparation of submicron fibers by electrospinning. Main disadvantage of PVA fibers is rapid degradation in aqueous environment. On the other hand surface of fibers contains free hydroxyl group that could be chemically modified. In recent work, chemical modification of PVA nanofibers prepared by needleless electrospinning was investigated. Polyethylenglykol (PEG) linker was introduced to the fiber surface by acylation (PVA-PEG) and further modified by biotin (PVA-PEG-b) as a function agent. Process of chemical modification does not affected fibrous morphology of samples. Interestingly, linkage of PEG-b linker promoted stability of PVA in aqueous environment. PVA-PEG-b sample was stable for 41 days. Stability of samples was strongly dependent on amount of introduced PEG-b linker, thus proposed method of modification allows to prepare nanofibers of different solubility. Additionally, biocompatibility of chemically modified nanofibers with both mesenchymal stem cells (MSC) and chondrocytes was determined. Proliferation of both cell types was not sufficient and number of cells decreased in time, probably because of high hydrophility of modified PVA scaffold. To eliminate this disadvantage, blend PVA-chitosan nanofibers were prepared and modified by PEG-b linker. Such modifications also promoted stability of PVA nanofibers in water and improved cell adhesion and proliferation. Finally, binding of avidin conjugated anti-CD29 antibody to PVA-PEG-b was confirmed by confocal microscopy. In conclusion, introduced chemical modification enables preparation of nanofibrous scaffolds controlled solubility and surface functionalization using biotin – avidin system. Such system supports selective binding of different proteins like antibodies, growth and differentation factors.