Abstract

Our study contributes to the tissue engineering, mainly to the construction of appropriate scaffolds for regeneration of damaged skin. Simultaneously, it brings valuable insights for basic research in the field of molecular mechanisms of adhesion, proliferation and phenotypic maturation of cells and the control of the cell behavior through the cell extracellular matrix (ECM), represented by synthetic nanofibrous material. Nanofibrous polylactic-co-glycolic acid (PLGA) membranes were prepared by needle-less electrospinning technology. These membranes were further modified with cell adhesion-mediating biomolecules, e.g. collagen, fibronectin and fibrin in order to increase their affinity to colonizing cells. Adhesion, growth and differentiation of keratinocytes (HaCaT) and fibroblasts, i.e. major cell types of epidermis and dermis, were evaluated on these nanofibrous membranes. The results show that the membrane modification using fibrin structures improved adhesion and proliferation of human dermal fibroblasts. The collagen structure on the surface of membranes improved the adhesion and proliferation of human HaCaT keratinocytes. Furthermore, fibrin structure stimulated fibroblasts to produce collagen, which is a major component of ECM in the natural skin dermis. Fibronectin enhanced cell attachment to the membranes. Therefore, we can conclude that nanofibrous PLGA membrane covered with protein layer, fibrin or collagen appear to be a promising solution for the construction of temporary skin tissue carriers.

Kay words:

nanofibres, PLGA membrane, fibrin, collagen, modification, fibroblasts, keratinocytes HaCaT