

Abstract

To improve the regeneration of soft tissues, wound dressings were developed, containing nanofibers, different in composition and functional features. The work concentrates on chitosan and composite scaffolds containing chitosan. Porous nanofibre materials based on chitosan are very promising for the regeneration of soft tissues. Chitosan exhibits pH-sensitive behavior due to the large number of amino groups on its chains, which makes chitosan nanofibres promising carriers for the delivery of drugs. In this work, the examples of different modifications of nanofibres are shown. To increase the efficiency and accelerate the regeneration of soft tissues, nanofibres are functionalized with bioactive substances of various types: antimicrobial, analgesic, growth factors, etc. To stabilize nanofibres and to improve the physical characteristics, treatments using glutaraldehyde, glyoxal, genipin or heat treatment were used.

Chitosan is used to inhibit fibroplasia during wound healing and to promote cell growth and differentiation. The efficiency of antibacterial activity of chitin-glucan complex with nanofibres for wound healing was shown. Reconstruction of deeper wounds, in which skin and soft tissues are damaged, requires measures for spatial reconstruction and stimulation of regeneration processes in the volume of the defect. In this case, the use of platelets, cellular components and cell secretion products is useful. As a new strategy for nanofibre functionalization, the drug delivery system using nanovesicles (liposomes and niosomes) in combination with nanofibres for regenerative medicine is promising.

In the work, nanofibres from different materials (besides chitosan) such as: polyvinyl alcohol, polycaprolactone or hyaluronic acid, which are tested for the regeneration of soft tissues, and could be used for the preparation of composites with chitosan or its functionalization, are mentioned.

Keywords: regeneration, functionalization, nanofibres, chitosan, wound healing, nanovesicles, niosomes, regenerative medicine.