Kecheng Chen, J Biotechnol Biomater 2022, Volume 12

Fabrication of chitosan/PVP/dihydroquercetin nanocomposite film potential usage in wound healing

Kecheng Chen
The Starsky Medical Research Institute, Jilin, China

Wound healing is to restore the damaged tissue to its original state through the interaction with biomolecules and cell-matrix. It follows a well-defined, yet complex, cascade of processes that are commonly divided into four major stages: coagulation, inflammation, cell proliferation with matrix repair, and epithelialization with scar remodeling. Because wound complications involve infection, deformity, scar tissue overgrowth, and bleeding, wounds should indeed be covered with a dressing as soon as they are damaged. Traditional dressings cause the wound to become dehydrated and enhance the adhesion to the wound. It also causes the patient discomfort and pain and slows wound healing. The ideal wound dressing should have the following characteristics: a moist environment, rapid wound healing, mechanical protection, noncytotoxicity to healthy tissue, antimicrobial/antifungal effect, ease of use, and patient acceptance. In recent years, nanofiber polymer materials prepared by electrospinning have attracted great attention because of their unique properties such as high specific surface area, high porosity, and controllable structure and function. Chitosan (CS) has been proved to be biocompatible, biodegradable and antibacterial. In recent years, a variety of chitosan hemostatic dressings have been developed. For example, Ren et al., Prepared silk fibroin/chitosan/halloysite nanotube electrospinning composite medical dressings. Polyvinylpyrrolidone (PVP) is a drug polymer for preparing different dosage forms, it is a non-toxic, biocompatible, watersoluble polymer, mainly used as a dissolution accelerator for pharmaceutical preparations. Contardi et al., showed PVP-based hydrogels exhibit biocompatibility and hemocompatibility in vitro and wound healing properties in vivo. Dihydroquercetin, is a flavonoid compound extracted from larch, which has been used in various commercial preparations. Studies have shown that dihydroquercetin has the effects of antibacterial, antiinflammatory, and anti-oxidation. It has the potential to be made into wound excipients. According to reports, utilizing dihydroquercetin liposomal complex to classify burn trauma helped to stabilize the endogenous antioxidant system and reduce the area of secondary necrosis in the wound. Skin regeneration and sebaceous gland repair have also been enhanced. Previous studies have also shown that dihydroquercetin can be combined with chitosan and hyaluronic acid to prepare a multifunctional wound dressing film with antioxidant, antibacterial, and anti-inflammatory properties. In this work, we report the preparation and characterization of chitosan (CS), PVP, and dihydroquercetin (DHQ) nanofiber film used as wound excipients, as well as in vivo and in vitro evaluations, and verify that the film is effective in wounds. The results show that the prepared film has good morphology, thermal stability and hydrophilicity. In vitro studies have shown that it has antibacterial activity against S.aureus and E.coli, and the DPPH free radical scavenging rate proves that the fiber film has antioxidant activity. MTT cytotoxicity test proved that the film is non-toxic to Hacatcells. Animal experiments have proved that wounds treated with CS-PVP-DHQ nanofiber film heal faster. This article also studied the composite nanofiber film by inducing

autophagy pathway and increasing the expression of pan-keratin, vascular endothelial growth factor VEGF and CD31 to promote wound healing. Therefore, the nanofiber film herein show great potential in wound healing applications.

Biography

Kecheng Chen, graduated from the Biology Department of Shenyang Normal University in 1992. He has been employed as a visiting professor by Zhejiang Forestry University, Shenyang Normal University and Biopharmaceutical Research Institute of Liaocheng University. In 2019, he was hired as a researcher follower by the Australian Trefoil Life Research Institute. In 2020, he was hired by the Space-Time Medicine Studio of the Traditional Chinese Medicine Mining and Inheritance Innovation Center of Shanghai Jiaotong University as a member of the expert committee. He was also a co-founder of the Starsky Medical Research Institute in China.

Received: April 27, 2022; **Accepted**: April 29, 2022; **Published**: July 11, 2022