

A Novel Degradable Dressing Composed of Gelatin, Poly- γ -Glutamic Acid, and Shengii Herb for Wound Healing: *in Vitro* and *in Vivo* Studies

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Abstract

The injury to the skin initiates a cascade of events including tissue liquid secreting, inflammation, and tissue remodeling. Therefore, an ideal wound dressing should efficiently absorb tissue liquid, and prevent bacterial infection, then reducing tissue inflammation occurrence. To accomplish ideal wound healing dressing, wound dressings should be changed from traditional passive materials to active and functional materials. As a hydrophilic and natural compound, poly(γ -glutamic acid) (γ -PGA) is a variety of *Bacillus* strains obtained by microbial fermentation, according to previous reports that γ -PGA can prevent the shrinkage of the membrane and enables it to act as an appropriate barrier at the wound site. Although some broad spectrum antibiotics have been used in the selection of these pathogens, however, the antibiotic-resistant organism is one of the most important multidrug-resistant pathogens around the world. To overcome the problem of resistance, alternatives to antibiotics should be used to manage wound infection. The Chinese herbal medicine shengii herb with *Glycyrrhiza uralensis* Fisch; *Daemonorops draco* Blume; *Angelica Sinensis*; *Arnebia euchroma* and *Angelica dahuica*) was reported that it had been used long time for anti-inflammatory effect and prevent from bacterial infection in wound healing process. Therefore, in our study, we prepared hydrogel membranes composed of biomaterials (γ -PGA and gelatin), encapsulating shengii herb as an ideal wound dressing system for fabricate a novel wound dressing, is proposed for wound healing and skin tissue regeneration. First, we had used electro spray ionization–mass spectrometer to assay shengii herbal medicine chemical compounds and identify their constituents of *Glycyrrhiza uralensis* Fisch; *Daemonorops draco* Blume; *Angelica Sinensis*; *Arnebia euchroma* and *Angelica dahuica*. Second, we prepared genipin–crosslinked γ -PGA/gelatin membranes, encapsulating shengii extracted liquid to exam its bio-characteristic property in vitro study, and we found that they had fine antimicrobial and cell viability property, and could induce human umbilical vein endothelial cells to promote cell angiogenesis and tube formation. Finally, *in vivo* study, we could observe the prepared shengii extracts-loaded γ -PGA/gelatin membranes wound healing effect on rat skin wound tissue was better than alginate wound dressing (Sorbagon[®], HARTMANN) or sterile gauze and hence its potential clinical usefulness.

Keywords: poly- γ -glutamic acid, shengii herb, tissue regeneration, wound dressing