**Layered dermal reconstitution through epigallocatechin 3-gallate loaded chitosan nanoparticle within enzymatically crosslinked polyvinyl alcohol/collagen fibrous mat**

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**Abstract**

Biocompatible electrospun fiber comprising bioactive substrates has potential to implant into the wound site as a reliable therapeutic approach in tissue regeneration. Here, electrospun polyvinyl alcohol conjugated tyramine (PVA-Tyr) and collagen (Col) fibrous mat containing chitosan nanoparticle loaded with epigallocatechin 3-gallate (NCs-EGCG) developed and the composite was applied to evaluate in vivo wound healing ability of fabricated wound patch. The synthesized PVA-Tyr and Col were electrospun and crosslinked through peroxidase reaction in presence of vaporized H2O2 as an electron donor which covalently proceeded conjugation of phenolic groups and could develop hybrid fibrous mat in stable structure and uniform shapes. The EGCG as anti-oxidative/inflammatory substrate was encapsulated efficiently in NCs and released in a sustained manner. The hybrid fibers seeded with adipose-derived stem cells presented appropriate biocompatibility from biophysical and biochemical viewpoints and in following wound healing ability in a full-thickness excisional animal model. Fourier transform infrared spectroscopy (FTIR) confirmed all typical absorption characteristics of PVA-Tyr and Col as well as NCs and EGCG. The results showed the perfect hydrophilic/hydrophobic ratio and good mechanical and structural characteristics including shape uniformity and porosity. Interestingly, cellular attachment and proliferation on the PVA-Tyr/Col fibers containing NCs-EGCG were higher than control samples. The histological analysis of hybrid fibrous patch could be suggested the applicability of this structure as suitable skin substitutes to repair injured skin.

**Keywords**

[Polyvinyl alcohol/ collagen fiber](https://journals.sagepub.com/keyword/Polyvinyl%2BAlcohol/%2BCollagen%2BFiber), [Horseradish peroxidase-mediated crosslinking](https://journals.sagepub.com/keyword/Horseradish%2BPeroxidase-mediated%2BCrosslinking), [Epigallocatechin 3-gallate loaded chitosan nanoparticle](https://journals.sagepub.com/keyword/Epigallocatechin%2B3-gallate%2BLoaded%2BChitosan%2BNanoparticle), [Wound healing](https://journals.sagepub.com/keyword/Wound%2BHealing)