Light-activated linkage of biomolecules to tissues.

Published date: May 23, 2019

Technology description

The wound healing response is limited or impaired in many conditions, such as in diabetic ulcers, burns, chemical exposure injuries, neurotropic keratopathy, and nerve damage. There is, therefore, a need in the art for ways to stimulate a regenerative response in order to foster wound healing and restore anatomy and, in turn, tissue functions such as epithelial barrier effects and neural transmission. Cell based therapies such as stem cell transplantation typically provide only cells without the required matrix upon which to grow, or without the stimulatory factors to which respond to by migration, proliferation, and/or differentiation. Topical approaches to wound healing have been reported, such as topical epidermal growth factor, thymosin beta 4, nerve growth factor, Substance P and Insulin-like Growth Factor, and Fibronectin. However, a clinically proven biopharmacologic therapy has not yet been successfully developed. This invention improves upon prior work on applying topical agents by enabling their immobilization and concentration at the surface of the damaged tissue, thus increasing their residence time, as well as enabling the synergistic combination of multiple proteins to work together in a biomimetic, "matrikine-like" fashion.
Researchers at Stanford have developed methods of immobilizing and concentrating therapeutic factors on a tissue to improve wound healing in challenging situations. Tissue regeneration is a complex process involving the temporal and spatial interplay between cells and their extracellular milieu. Often therapeutic approaches to tissue regeneration do not reconstitute this interaction and thus wound healing is limited or impaired. Previous attempts to improve wound healing by topically applying therapeutic factors and biomolecules are limited as these factors are easily removed or washed away. Thus, there is a need for better methods to stimulate the regenerative process and foster wound healing. To help meet this need the inventors have developed this method which enables topical agents and biomolecules to be immobilized and concentrated on the surface of the damaged tissue. This increases the residence time of therapeutic factors and enables synergistic combinations of multiple proteins to work together. This method promotes faster, more effective wound healing especially in challenging situations.

Application area

Wound healing for: neurotrophic corneas, diabetic ulcers, burns and nerve injury

Advantages

Method provides spatial-temporal control over the regenerative process Does not require frequent re-administration of active ingredients Mimics the action of naturally occurring matrikines Enables synergistic combination of therapeutic agents and biomolecules to work together

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