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Self-care in keloid management with nanoparticles/microneedles for drug delivery

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Abstract

Keloids are proliferative fibrous growths that result from an excessive tissue response to skin trauma. They frequently persist at the site of injury, often recur after excision and always overgrow the boundaries of the original wound. Although they are benign with no malignant potential, disfigurement from keloids lead to considerable physical and psychological adverse effects. Keloids are more prevalent in young individuals (age 20-30) with darker skin pigmentation. Research from National University of Singapore also indicates that keloids are three times more common in Chinese patients than Caucasian patients.

A variety of techniques have been utilized to treat keloids. However, all treatments are administered by clinicians, which require clinic visits by the patients and increase medical cost. Most of them are invasive and are fraught with pain during the treatment. For example, the current standard treatment of keloids with intralesional corticosteroid injections requires a prolonged treatment period at regular intervals of administration by physician.

Today self-care with miniaturized and automated devices are presenting as possible options in disease treatment. Responding to this trend, the ultimate goal of this project is to realize the self-administered treatment of keloids. Specifically, we intend to revolutionize the strategy in keloid treatment, by replacing the clinician-controlled drug administration with the patient-manageable drug delivery. We have built a prototype technology, in which skin-penetrating microneedles and drug-releasing nanoparticle are used to deliver drugs in a minimally invasive way for keloid treatment. This technology prevented the growth and proliferation of keloid fibroblast in a 3D skin model.

Biography

Xu received his PhD from Brown University in 2009, focusing on biomedical applications of novel platforms of magnetic nanoparticles. From 2009-2012, he was a research associate at Harvard-MIT HST in the field of stem cell engineering and drug delivery. Dr. Xu's main field of research is the biomedical application of functional nanoparticles. More specifically, he is interested in realizing the early detection, diagnosis, and cost-effective treatment of major diseases at Asia with nanoparticle-related nanotechnology and. He has published 32 papers and filed 2 patents so far with 2400 citations and H-index of 18.