HealSuture: A Suture That Deposits a Tissue Regenerative Medicine to Prevent Scarring During Wound Healing

Lead Lankenau Institute for Medical Research Investigator

Ellen Heber-Katz, PhD

Unmet Need

Scars are an inescapable consequence of surgical wound healing, because of normal processes of repair in mammals. For functional and cosmetic reasons, there is great interest in developing tools for non-scarring regeneration of normal tissue after a surgical procedure. While considerable effort has been dedicated to improving suturing and wound healing strategies that reduce scarring, more effective approaches are still needed.

Basic research into the regenerative capabilities of amphibians and the MRL mouse strain that can regenerate lost appendages, where scars do not develop at the injury site as a result of epimorphic healing, has now led to the development of a novel suture formulation that limits scarring. This clinical device – referred to as *HealSuture* due to its deposition of a compound LIMR scientists have determined can promote epimorphic regenerative healing – offers an off-the-shelf modality to reprogram the capabilities of a tissue microenvironment, limiting the formation of scar tissue during the healing of surgical wounds.

Opportunity

HealSuture is conceptualized in two forms for different surgical uses. The first is a dissolvable suture infused with an active compound. The second is a compound-coated silk suture with similar properties. In essence, these sutures locally re-activate a latent fetal program of stem cell-based regenerative healing that avoids fibrotic deposition (scar tissue).

Using the suture as a time-release depot, an active compound that inhibits prolyl 4-hydrolases is released continuously into the local tissue over a ~2 week period as the suture dissolves or before the silk suture is removed. Varying doses released by different dissolvable suture preparations are envisioned to tailor treatments to maximize non-scarring healing of various types or locations of surgical wounds. This technology does not interfere with other methodologies that may be applied by surgeons to improve wound healing, including to limit scar formation, infection risk or other factors that influence optimal wound healing in a patient.

In summary, *HealSuture* offers an off-the-shelf clinical device to capture a latent capability for epimorphic healing, a non-scarring process of tissue regeneration suppressed in mammals after fetal development that can locally re-activated by this technology.

Unique Attributes

To our knowledge, there is no suture technology that re-activates the natural latent process of epimorphic regenerative healing at a surgical wound site that is characteristic of fetal tissue (which does not scar). Unlike other technologies, an active compound deposited by the suture acts to reprogram local inflammatory and stem cell functions in the wound. This technology has been characterized for its ability to promote regeneration in a variety of tissue types damaged by trauma, surgical resection, infection and age-related degeneration. Accordingly, *HealSuture* may have special utility to promote optimal healing of many types of surgical wounds.

Continued on back

Clinical Applications

HealSuture applications are based on preclinical studies suggesting that deposition of the active compound can promote regeneration of normal cartilage, nerve, bone, vasculature, muscle, and organ tissues while limiting the formation of fibrotic tissue, the major constituent of wound scars. Thus, the technology is expected to be suitable for repairing not only surgical wounds, but also wounds caused by trauma, infection, tissue degeneration or other causes requiring suturing, e.g. heart surgery. Accordingly, we envision broad general applications in diverse tissues where clinical proof of concept is testable.

Stage of Development

Preclinical genetic and therapeutic proof of concept in mice for tissue regeneration by drug-hydrogel formulations has been published. Suture formulations of the regenerating drug are at the stage of preclinical proof of concept, with ongoing investigations focusing on drug deposition efficiency, time course and clearance after suturing wounds with dissolvable polymer and silk-based forms of *HealSuture*.

Intellectual Property

US Patent Application published June 2022. “Scar Reducing Wound Closure Materials.”

Collaboration Opportunity

LIMR seeks partners to license and advance IND-enabling studies of the *HealSuture* as a unique clinical device for non-scarring regenerative healing of surgical wounds.

References and Publications

- Zhang Y, Strehin I, Bedelbaeva K, Gourevitch D, Clark L, Leferovich J, Messersmith PB and Heber-Katz E. (2015). Drug-induced regeneration in adult mice. Sci Transl Med. 7: 290ra92.
- Heber-Katz E. (2017). Oxygen, metabolism and regeneration – lessons from mice. Trends Molec Med. 23:1024-1036.
- Cheng J, Amin D, Latona J, Heber-Katz E and Messerschmidt PB. (2019). Supramolecular polymer hydrogels for drug-induced tissue regeneration. ACS Nano. 13: 5493-5501.
- Hagai K, Ideguchi H, Kajikawa T, Li X, Chavakis T, Cheng J, Messersmith PB, Heber-Katz E and Hajishengallis G. (2020). An injectable hydrogel-formated inhibitor of prolyl-4-hydroxylase promotes T regulatory cell recruitment and enhances alveolar bone regeneration during resolution of experimental periodontitis. FASEB J. 34: 13726-13740.

INSTITUTIONAL CONTACT

George C. Prendergast, PhD
+1 484.476.8475
prendergast@limr.org

L2C PARTNERS CONTACT

Merle Gilmore
+1 610.662.0940
gilmore@l2cpartners.com