Docket #: S20-412

Gene Editing and Delivery of Myeloid cells To Promote Wound Healing

Stanford inventors have developed a method of using CRISPR/Cas9 or similar gene editing technologies to genetically edit an individual's own myeloid cells for specific gene targets, which are critical to wound repair, and applying these edited cells in a hydrogel to promote rapid healing of skin wounds in diabetic and non-diabetic conditions.

Current clinical treatments for skin wounds have limitations, including low specificity, donor site morbidity, immune rejection, or foreign body reactions. Conventional surgical approaches are not only invasive, but also ineffective in treating complex wounds in diabetes or peripheral vascular disease.

This invention brings several advantages over the current treatment options. It is minimally invasive without the need of invasive injections or surgeries. It uses pro-angiogenic and pro-regenerative myeloid cells that are readily available from a patient's own blood, and this autologous introduction of modified cells minimizes immune reactions. More importantly, the inventors have demonstrated that this approach significantly accelerates wound healing rates, not only in wild-type but also in diabetic animal models, which is promising for future clinical translation of this technique, especially for patients with chronic wounds that are refractive to standard treatment options.

Stage of development
Pre-clinical

Applications

- Uncomplicated skin wounds
- Chronic-non-healing skin wounds
- Complex skin wounds in diabetes or peripheral vascular disease

Advantages

- Minimally invasive
- Effective
- Use of autologous cells that are easy to harvest from the peripheral blood
- Significantly accelerates wound healing
- Significantly promotes angiogenesis and blood vessel formation in the wound

Publications

- Henn, D., Zhao, D., Sivaraj, D. et al. Cas9-mediated knockout of Ndrg2 enhances the regenerative potential of dendritic cells for wound healing. *Nat Commun* 14, 4729 (2023). https://doi.org/10.1038/s41467-023-40519-z
- Henn, Dominic, et al. Cas9-Mediated Knockout of Ndrg2 Enhances the Regenerative Potential of Dendritic Cells for Wound Healing. *bioRxiv* (2022).

Patents

- Published Application: WO2023147291
- Published Application: 20250114498

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