

# Wound Healing

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**T**his July 2015 issue of JDD highlights the broad and diverse world of wound healing/care. The manuscripts here in display the breadth of research, management options, and limitations in the current landscape.

Wound healing is an exceedingly complex process, involving a multitude of signaling pathways, effector molecules, response phases, as well as a moderated balance between all these components. In both old age and common disease states, such as diabetes and malnutrition, this delicate balance is disturbed and wound healing can be delayed, resulting in non-healing wound sites and therefore profound morbidity. In the U.S. alone, it is estimated that 6.5 million people suffer from chronic skin ulcers and 1.25 million from burns each year,<sup>1</sup> consuming over \$25 billion dollars of health care spending.<sup>2</sup> Furthermore, this chronic barrier disruption serves as a point of entry for pathogens, further impeding wound closure and quality of life. At its worst, chronic wound infections can result in grave complications including amputation, sepsis and death.<sup>3,4</sup>

There is ample evidence that utilizing the expertise of a multidisciplinary wound healing team improves outcomes.<sup>3</sup> No question, as masters of the integument, dermatologists should be at the center of said team, though often we are not invited to the party. Why is this? To probe this question further, Stamell Ruiz et al surveyed U.S. residents regarding their readiness to manage acute and chronic wounds, and by doing so identified gaps in training that both offer some insight into this discrepancy and highlight the need for action. This gap is further underscored by Musaev et al's single center chart review, which found that dermatologists are likely not considered first line responders for wound care, in this case, burn wound care, as this presenting complaint was infrequent over a several year period between multiple dermatologists. If we are not capturing these patients in our practices, how can dermatologists be expected to manage wounds appropriately without ample exposure and opportunity to become familiar with the breadth of devices and therapeutics?

To provide a small taste of the innovative research in the wound healing space, this edition shares examples from both the pre-clinical and clinical research world. Using an innovative nanotechnology, Landriscina and Musaev et al demonstrated the important role of nitrosothiols in burn wound healing using a mouse model of thermal burn injury. The utilization of nanomaterials in wound healing has been growing exponentially as a means to both deliver active agents in a controlled and sustained manner as well as provide scaffolding or a provisional matrix for cell migrations during wound repair.<sup>4</sup>

In the wound healing clinical research arena, one of the greatest challenges is identifying a reliable, consistent wound model, especially when attempting to follow controlled trial methodology. Herein Vivas et al propose a practical, easy, and reproducible human acute wound model where partial thickness wounds are induced by cryosurgery, overcoming challenges some of the challenges with incisional or suction induced wounds.

Lastly, to help ease the confusion and burden of picking the right wound dressing, Landriscina and Rosen et al provide a simple, clinical image correlated algorithm to matching specific wound types with the appropriate device.

No doubt, a thorough understanding of the underpinning of wound healing, the current status of research, and the landscape of available technologies is necessary for proper clinical decision making. The manuscripts presented highlight that importance of disseminating the current state of the science to allow scientists and physicians to develop better models and treatments to enable our ability to modulate healing, ultimately improving outcomes. It is with this mindset that the wound healing special edition was crafted. Enjoy!

## Disclosure

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## References

1. Ho WS, Chan HH, Ying SY, Cheng HS, Wong CS. Skin care in burn patients: a team approach. *Burns*. 2001;27(5):489-491.
2. Archana D, Dutta J, Dutta PK. Evaluation of chitosan nano dressing for wound healing: characterization, in vitro and in vivo studies. *Int J Biol Macromol*. 2013;57:193-203.
3. Ghaffari A, Jalili R, Ghaffari M, Miller C, Ghahary A. Efficacy of gaseous nitric oxide in the treatment of skin and soft tissue infections. *Wound Repair Regen*. 2007;15(3):368-377.
4. Ghaffari A, Miller C, McMullin B, Ghahary A. Potential application of gaseous nitric oxide as a topical antimicrobial agent. *Nitric Oxide* 2006;14(1):21-29.
5. Blecher K, Martinez LR, Tuckman-Vernon C, et al. Nitric oxide-releasing nanoparticles accelerate wound healing in NOD-SCID mice. *Nanomedicine: Nanotechnology, Biology, and Medicine*. Mar 6 2012.
6. Parkinson LG, Rea SM, Stevenson AW, Wood FM, Fear MW. The effect of nano-scale topography on keratinocyte phenotype and wound healing following burn injury. *Tissue Eng. Part A*. 2012;18(7-8):703-714.
7. Friedman A. Wound healing: from basic science to clinical practice and beyond. *J Drugs Dermatol*. 2011;10(4):427-433.
8. Norling LV, Spite M, Yang R, Flower RJ, Perretti M, Serhan CN. Cutting edge: Humanized nano-proresolving medicines mimic inflammation-resolution and enhance wound healing. *J Immunol*. 2011;186(10):5543-5547.

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