RACE to wound healing with polylactic-acid dermal matrices

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Background

Background:

- **Lactate** is a key player in cellular homeostasis and exerts powerful pleiotropic effects on wound healing.
- These properties have been exploited a next-generation **fully synthetic guided closure matrix** to help re-establish the healing cascade and afford hard-to-heal wounds the ability to heal.
- Here, we present the acronym **RACE** to describe the lactate effects on the wound-healing cascade and comment on four patients that received this novel **poly-lactic acid (PLA)** wound closure matrix to exemplify each effect.

Methods & Results

- A literature review was performed to identify the effects of lactate on wound healing.
- **Ten main topics** were identified and integrated into the **RACE acronym**.
- The acronym consists of the following elements:

R

- **R**educe pH and inflammation [1-7]
- **R**educe ROS production [8]
- **R**edox homeostasis [8,9]
- Free **R**adical scavenger [9]

A

- **A**ngiogenesis stimulation by increasing:
  - VEGF [6,10,11]
  - Endothelial cell mobility [11,12]

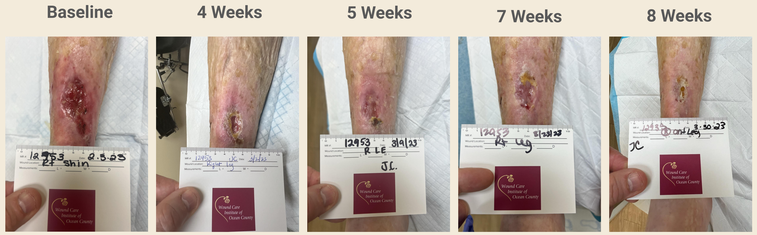
C

- **C**ollagen synthesis [13-16]
- **C**ollagen secretion [13,14,16]

E

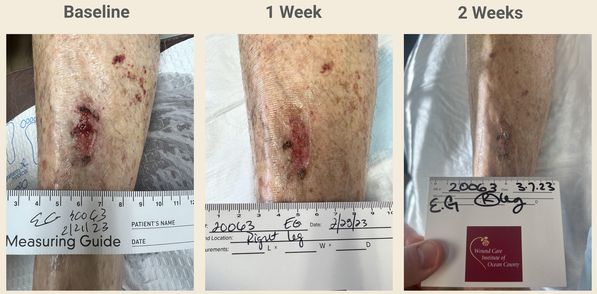
- Enhancing wound healing by reducing pH leads to:
  - MMPs activity decrease [17]
  - Tissue oxygenation increase [17,18]
  - Unsuitable environment for pathogenic bacteria [17]

Results



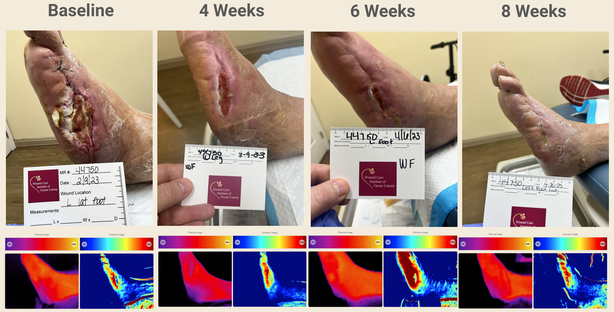
Case 1: Reduction of Inflammation in a Pyoderma Gangrenosum Ulcer

PLA matrices were weekly applied to the ulcer of a 71-year old female with a 2-year old PG ulcer. Note the significant inflammatory halo in the peri-wound area at baseline. After 4 rounds of weekly PLA applications, the ulcer size had reduced by over 80% and the inflammatory halo was greatly reduced. Complete healing was achieved at 8 weeks with minimal scarring and no signs of soft tissue residual inflammation.



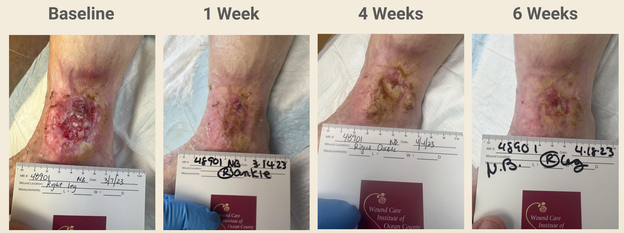
Case 3: Increasing Collagen Synthesis to Achieve Healing of Atrophic Wounds

PLA matrices were applied weekly to the skin tear of a 89-year-old frail patient. The patient had a history of frequent skin tears that were difficult to heal. The use of PLA matrices led to the complete healing of the defect in only 2 weeks with adequate restoration of the skin integrity.



Case 2: Increases in Angiogenesis in a hard-to-heal ulcer

A 66-year-old male with poorly controlled diabetes and a foot ulcer with a history of repeated infections underwent multispectral imaging after the application of PLA matrices. His images show increases in the temperature and oxygen saturation of the wound bed and peri-wound tissues. This was matched with a switch of the wound's tissue from fibrous, necrotic to granulation tissue, which resulted in increased healing rates and finally, closure of the wound.



Case 4: Enhancing Wound Healing in Contaminated Wounds

PLA matrices were applied to a 68-year-old patient with an alkaline ulcer with significant bacterial load. Within one week, the PLA matrix led to the restoration of the pH value of the wound bed, which greatly enhanced the healing cascade. Complete healing of the wound was achieved in 6 weeks.

Discussion

- Despite traditionally being regarded as a waste product of cellular metabolism, **lactate is a pleiotropic signalling molecule**.
- Its **main effects** can be summarized as:
  - Promoting a balance inflammatory environment
  - Promoting angiogenesis
  - Promoting ECM deposition
  - Promoting pH balance
- The **RACE to heal acronym** offers an easy way to remember its key effects in the healing cascade.

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