

COMPANION ANIMAL EDITION | JANUARY 2024

INSIGHT



NEW YEAR

NEW IDEAS TO KEEP EXISTING CLIENTS

CROSS-TRAIN FOR EFFICIENCY

BETTER FLOW, BETTER BALANCE

Rapid Wound Healing

BETTER PET HEALTH OUTCOMES

NOW TRENDING

NEW PRODUCTS AND PROMOTIONS

Vet Tech Contest

HEAR FROM OUR WINNERS

COMMUNITY CONNECTION

PATTERSON FOUNDATION SUPPORTS SERVICE DOGS

TRUSTED EXPERTISE. UNRIVALED SUPPORT.™


PATTERSON®
VETERINARY

RESTORE
BY NOXSANO

Innovative Veterinary Wound Care

NEW AND IMPROVED!

Same delivery of powerful nitric oxide in a softer and more durable pad. Our redesigned pad is softer for increased comfort and more durable to enable longer change intervals.

Accelerates wound healing



- Clinically proven to drive **40% faster healing**
- Delivers a steady, continuous supply of nitric oxide directly to the wound bed
- Promotes blood flow, angiogenesis, granulation, and epithelialization

Reduces workload and costs



- Fewer changes and office visits **saves time and money** for the veterinarian and pet owner
- Can be left in place up to 7 days
- No special equipment or training required

Controls and prevents infection



- Provides **infection control** and remediation of biofilm and resistant bacteria
- Reduces the need for broad spectrum antibiotics



Available in boxes of 5 individually packaged 5 x 7 cm or 5 x 12 cm wound pads or 5 packs of 5 mL wound gels.



IMPROVING OUTCOMES IN WOUND MANAGEMENT

HOW NITRIC OXIDE PROMOTES RAPID HEALING

BY JACOB ADAMS, PHD, CHIEF SCIENTIFIC OFFICER, NOXSANO

Ranging from simple scrapes, surgical incisions and dermatologic issues to serious life and limb threatening traumas, wounds are common in veterinary medicine. The body begins work immediately upon insult to the skin to repair damaged tissue and restore the functional barrier properties of the skin.

Wound management presents many problems for the practicing veterinarian.¹ Frequent bandage changes place a time burden on the clinic and a financial burden on the pet owner. Extended healing times decrease owner compliance and increase the risk of reinjury or reopening of wounds.

Microbial contamination and biofilm growth are common and can prevent healing. Tensional forces on the wound can lead to wound expansion. The

challenges are exacerbated in the case of distal limb wounds, which contract and re-epithelialize more slowly than truncal wounds. Slow healing and chronic inflammation can lead to weak and poorly perfused tissue.

An ideal wound healing product would promote rapid healing, mitigate the above issues and not require specialized regimens, training or equipment – and be affordable to pet owners. Therapeutic application of nitric oxide is one such candidate that has garnered significant attention due to its diverse and critical functions throughout each post-coagulation phase of the wound healing cascade (Image 1). Utilization of nitric oxide in veterinary medicine has long been anticipated² but practical applications have not previously been developed.

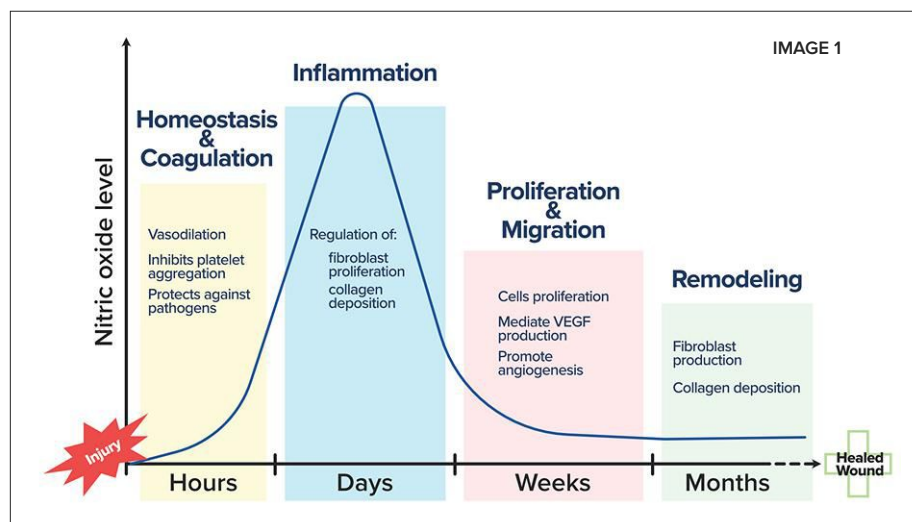
NITRIC OXIDE: A KEY REGULATOR OF THE NATURAL HEALING PROCESS

Nitric oxide is an endogenous gas that serves as a biologic messenger in many physiologic processes, most notably, wound healing.³ Nitric oxide is produced by enzymes acting upon the amino acid L-arginine. Nitric oxide as a topical treatment has shown tremendous promise across species in everything from human and companion animal to equine and exotic applications.⁴

FUNCTION ACROSS ALL PHASES OF WOUND HEALING

Inflammatory phase Nitric oxide acts as a signaling molecule that promotes the growth and activity of immune cells and the biochemical reactions which are used to defend against bacteria, fungi, viruses and parasites. Additionally, nitric oxide induces broad-spectrum damage to pathogens caused by nitrosative and oxidative reactions. Nitric oxide also controls immune cell signaling and the biochemical reactions which are used to defend against bacteria, fungi, viruses and parasites. Further, nitric oxide controls macrophage polarization, helping wounds transition from the inflammatory phase.

Continued



Nitric oxide has been shown to stimulate the proliferation of endothelial cells, protect endothelial cells from apoptosis and mediate vascular endothelial growth factor (VEGF) production.

Proliferative phase Nitric oxide drives increased blood flow, angiogenesis, proliferation and epithelialization, resulting in rapid wound closure, reduced proud flesh and stronger tissue. Nitric oxide upregulates expression of endogenous collagenase, which autolytically debrides the wound to further promote the healing process.

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vascular endothelial growth factor (VEGF) production. These effects of nitric oxide on endothelial cells guide angiogenesis, the formation of new blood vessels. The resulting increased blood flow boosts the transport of proteins into the wound bed, facilitating wound healing.

Remodeling phase Low levels of nitric oxide increase keratinocyte proliferation. Nitric oxide coordinates increased collagen synthesis and deposition in the final phases of wound healing. Treatment with nitric oxide donors has been shown to increase collagen formation from fibroblasts.

Feline TECA case study

A cat who was previously seen for a total ear canal ablation surgery developed complications post-surgery, developing a 1/2-inch-deep pus-filled hole at the site of treatment. At this stage, the treating veterinarian debrided the wound bed and began treating the wound with Restore Gel. After only a few days of treating with Restore Gel, the wound was filled with granulation tissue and continued healing without further complication. The treating veterinarian said, "I was shocked at how fast the depth filled in and the wound contracted. The gel worked great for the irregular wound shape and difficult area to cover."



DELIVERING NITRIC OXIDE

Multiple nitric oxide delivery systems for wound care have been developed. Despite the success of nitric oxide delivery systems in treating laboratory models of wounds and infection, practical use in the field has been hampered by high complexity and costs.

Canine burn case study

A four-year-old female Labrador retriever jumped onto a stove, spilling a pan of hot oil, sustaining burns to the right PL foot and chest. She sustained severe degloving of the wounds along the dorsal aspect of the digits and infection. She was treated with debridement and regular bandage changes using Restore Wound Pads initially and then Restore Gel.



A new electrochemical system has been introduced that overcomes the complexity and cost challenges. These products are activated by the addition of water. Once activated, nitric oxide is produced over multiple days.

The first practical wound dressings to utilize this approach have recently been released by Noxsano as the Restore product line. The products, available as pads and gel, are optimized to deliver nitric oxide at a level that drives increased blood flow, angiogenesis, proliferation and epithelialization, resulting in improved wound healing. Independent clinical studies of Restore show 40% faster wound healing. Restore delivers faster granulation, reduction in total wound area and increased percent contraction.⁵

IMPACT ON WOUNDS

Several factors such as low perfusion (hypoxia) due to poor blood flow, lack of nutrition at the wound site related to the poor blood

Within one week of injury, there was healthy granulation tissue formation and control of infection. She was able to heal all her wounds by second intention within one month. The treating veterinarian said, "In this case, Restore alleviated the need for any surgical intervention. We were able to provide outpatient care which was a significant cost savings to the client."

DAY 14



DAY 24



DAY 37



Canine flaps and grafts case study

A seven-year-old golden retriever with a soft tissue sarcoma was presented to the veterinarian. The veterinarian removed the sarcoma and treated the area with grafting. Post-surgery, the wound was covered with a Restore Wound Pad. Dressings were changed biweekly. In just 30 days the dog required no further veterinary follow-up. According to the treating veterinarian, this degree of healing isn't normally observed until 60 or even 90 days post-surgery.

PRE-SURGERY



POST-SURGERY



DAY 30



flow and infection/biofilm formation are common sources of delayed wound healing. These factors are believed to result in the wound becoming stalled in the inflammatory phase. Nitric oxide delivered therapeutically will promote blood flow to the wound through dilation and angiogenesis, eliminate biofilm/infection and polarize macrophages from pro- to anti-inflammatory to transition out of the inflammatory phase. The result is promotion of healthy wound healing. ■

Independent clinical studies of Restore show 40% faster wound healing.

References

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