Therapeutic Delivery of Nitric Oxide and Carbon Monoxide to Tissue for Accelerated Wound Healing

### Background
Researchers at Ohio University have created a device used to deliver therapeutic concentrations of NO and CO gases to wound tissue to aid in vasodilation and vascular regeneration providing therapeutic angiogenesis. The result of this metered delivery to compromised tissue is accelerated wound and burn healing for critical patients.

The concerted rise in both mean age and type II diabetes has resulted in an exponential increase in the expression of chronic wounds present in these populations. Treatment of chronic wounds and to a smaller extent, burn and trauma, has escalated both time and costs for healthcare.

The delivery of NO and CO gases to wound tissue provides a route to accelerating a critical pathway in wound healing through directly impacting new blood vessel formation or angiogenesis. This cellular pathway provides the underpinning for wound maturation and subsequent healing. NO is the small molecule responsible for multiple vascular and ancillary therapies including cardiac drugs and erectile dysfunction. The research outlined in the intellectual property for this development demonstrates that accelerated wound healing is possible with this device/therapeutic combination.

### Potential/Commercial Applications
- Device with delivery of NO and CO gas to wound surface as a prescription combination product for accelerated wound healing
- Tailored delivery rates for NO and CO gases optimized for specific types of wounds such as venous ulcers or diabetic foot ulcers
- Application of system without physical contact to critical burn trauma with local delivery of gases instrumental in vasodilation

### Benefits of Technology
- Allows determination and optimization of NO and CO gas delivery for maximum therapeutic effect in specific wound types
- Local delivery of gases prevents degradation of NO with short half life in tissue while combination with CO decreases degradation pathway
- Device design impacts only periphery of wound tissue limiting damage, irritation and maceration.

### Reference Number
OU10001

### Inventors
Tadeusz Malinski, Ph.D.

### Field
- Wound healing
- Angiogenesis
- Vasodilation
- Tissue Regeneration

### Technology
Topical gas delivery system that utilizes of NO and CO gases, or a combination thereof, to accelerate wound healing

### Stage of Development
- Lab tested proof of concept developed
- Preclinical animal models show successful wound healing acceleration using device
- Literature evidence shows strong correlation between NO and vascular angiogenesis in human clinical research.

### Business Opportunity
- Available for licensing
- Seeking development and commercialization partner

### IP Status
U.S. and EPC Applications Filed: WO/2011/082375 A2
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**Figure 1**: Schematic diagram of gas delivery system.
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**Researcher**

Tadeusz Malinski holds the Distinguished Marvin and Ann Dilley White Professor Chair of Chemistry and is the Chair of the Department of Chemistry and Biochemistry at Ohio University.

Dr. Malinski and his research group focus on Nanomedicine, Nanobiotechnology, and Nanosensors for Medical Applications. His team has produced multiple highly-referenced publications on the role of Nitric Oxide and Carbon Monoxide in cellular pathways. His use of nanosensors in combination with NO and CO gas delivery to tissue allowed the understanding of critical cellular pathways in tissue regeneration and the subsequent development of therapeutic doses in delivery of these gases to tissue.