

THERAPEUTIC DELIVERY OF NITRIC OXIDE AND CARBON MONOXIDE TO TISSUE FOR ACCELERATED WOUND HEALING

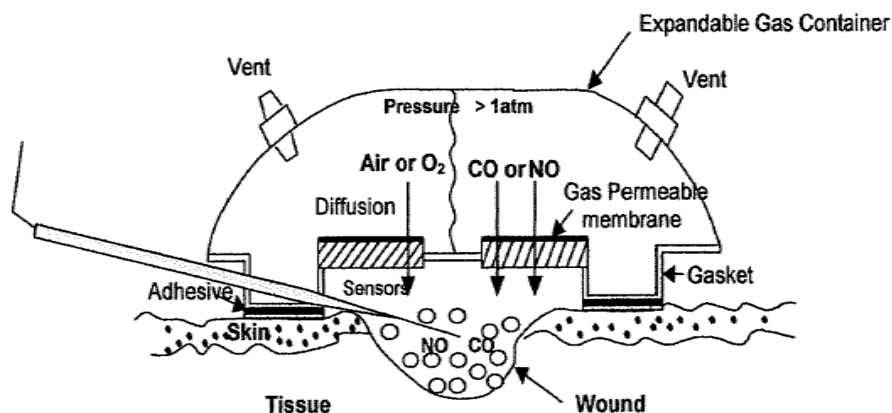
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Overview

Extensive studies of the vascular system, heart and brain have shown that after a brief period of wound ischemia, there is a massive generation of nitric oxide by two nitric oxide synthases. Shortly thereafter, nitric oxide production is diminished as result of increased superoxide production and subsequently, peroxynitrite and highly reactive radicals. As a result, the high levels of oxidative species trigger inflammation, edema, apoptosis and necrosis of wound tissue, having a negative effect on the healing process.

Preserving the function of the constitutive nitric oxide synthases can prevent the generation of oxidative species, nullify the ischemic damage in the wound, and accelerate the wound healing process. This can be accomplished by providing an exogenous supply of nitric oxide (NO) and/or carbon monoxide (CO). Data also indicate that increased levels of topically applied NO/CO can be beneficial in accelerating wound healing by promoting wound angiogenesis, collagen accumulation and expression of endothelial growth factor.

Inventors at Ohio University have developed a delivery system for optimal, efficient and controllable supply of NO and/or CO to a wound. It is based on a gas-permeable membrane attached to a flexible and expandable gas container. This new system is a safe mechanism for supplying therapeutic gases in order to promote accelerated wound healing. For additional information, please see Issued U.S. Patent 9,511,196.



Commercial Application

- 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 stimulating wound healing pathways.



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Benefits

- Allows for targeted, optimized delivery of NO and/or CO to a wound
- Delivery/release of gases can be controlled through vents in the device
- Contemplates the inclusion of nanosensors for continuous monitoring of gas concentrations
- Device design impacts only periphery of wound tissue limiting damage, irritation and maceration

About the Inventor

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.

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