Super-Oxidized Microcyn Technology in Lower-Extremity Wounds

Introduction and early experience

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When considering the spectrum of chronic limb wounds in which infection plays a clinical role, critical limb ischemia (CLI), diabetic foot ulcers (DFUs), below-knee amputations (BKA), methicillin-resistant Staphylococcus aureus (MRSA), and chronic venous insufficiency (CVI) are sure to come to mind. The role of infection in these conditions may range from minor to severe, but it likely plays a significant role in most cases. This supplement will introduce a novel, local, super-oxidized antiseptic solution, Microcyn® Technology (Oculus Innovative Sciences, Petaluma, Calif), and review the science surrounding its unique mechanism of action and the early clinical experiences from centers in Italy, Mexico, and the United States. The clinical and economical impact of acute and chronic infections in lower-extremity wounds is certainly substantial, but this impact is dwarfed when considering the overall clinical and economical global healthcare impact of infection across the entire spectrum of acute to chronic skin wounds (eg, pressure ulcers, burns, trauma, surgical infections, acn) and acute and chronic respiratory infections (eg, sinusitis, bronchitis, pneumonitis, bird flu).

The Reality of Infection and Limb Loss

Between 220,000 and 240,000 lower-extremity amputations are performed in the United States and Europe yearly for arterial insufficiency, diabetes, and CLI.1–5 In the United States, the amputation rate has increased from 19 to 30 per 100,000 persons/years over the last 2 decades, primarily due to an increase in diabetes and advancing age.6,7 In patients over 85 years of age, an amputation rate of 140 per 100,000 persons/year has been reported with primary amputation (PA) still carrying an excessively high mortality rate of 13–17%.7,8 In the highest risk patients,10 30-day periprocedural mortality after amputation can range from 4–30% and morbidity from 20–37%, because many end-stage CLI patients will suffer from infection, sepsis, and progressive renal insufficiency. Successful rehabilitation after

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BKA is achieved in less than two-thirds of patients; after above-the-knee amputations, that fraction is less than one-half of patients. Overall, less than 50% of all patients requiring amputation ever achieve full mobility.11–15 Multiple reports have documented the poor overall prognosis for the CLI patient with mortality rates greater than 50% after 3 years and twice the mortality rate after BKA versus limb salvage.10,16 Clearly, the clinical impact of CLI and amputations is staggering, and the overall role of infection in limb loss is poorly understood and certainly under appreciated.

Taking the Economical Standpoint

The total cost of treating CLI in the United States is estimated at $10–20 billion per year.2 It is estimated that just a 25%
reduction of amputations could save $2.9–3.0 billion in US healthcare expenditures. Further economic data supporting limb salvage include the known higher costs of amputations and related periprocedural rehabilitation as compared to limb salvage. Additionally, the annual cost of follow-up or long-term care and treatment for an amputee has been estimated at approximately $49,000 if he or she remains at home and $90,000–100,000 if he or she becomes nursing-home bound (15–20% of total amputees) versus $600 after limb salvage.3,10,16–18

More than 5 million patients suffer from chronic wounds in the US each year at a total cost of greater than $20 billion a year.19,20 The costs of treating pressure ulcers alone are greater than $1 billion yearly, and 1.5 to 3 million US adults in long-term care settings yearly require treatment.21 Infection unquestionably plays a large clinical and economical role in chronic wound care, and antibiotics have associated complications, side effects, and significant economical costs.

The national daily hospital cost per Medicare patient averages $2,360; therefore, any strategy to rapidly sterilize wounds, decrease IV and oral antibiotic use, decrease hospitalizations, and facilitate time to wound healing would have a significant clinical and economical impact.22 It is likely that the overall costs of infection in the global healthcare picture are greater than $100 billion yearly. The initial data and experiences would suggest wound treatment with Dermacyn (formulated with Microcyn Technology) might favorably impact wound care, especially in achieving more rapid wound sterilization therefore facilitating healing. However, prospective,

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**Figure 1.** Infected chronic venous insufficiency ulcer of 1-year duration (A). Noninfected healthy wound bed after Dermacyn wound sterilization 3 times daily and minor debridement (B). Multiple bilayered cell therapy applied as adjuvant treatment (C). Complete healing at 2 months (D).
randomized, multicenter evidence-based data will be necessary to scientifically assess the merits of this promising emerging therapy in wound care.

The author’s early safety and feasibility experience [4 months] with Dermacyn has been favorable in treating a variety of complex extremity wounds with infection (n = 40) including CLI (n = 28), CVI (n = 6), trauma (n = 2), and surgical dehiscence (n = 4). Despite the limitations of this nonrandomized, retrospective, small series analysis, there were no Dermacyn-related complications. Limb salvage rate was 100%. All wounds healed (mean = 23 days), and several adjuvant therapies were utilized including bioengineered skin (Apligraf, Organogenesis, Inc., Canton, Mass, n = 8), negative pressure wound therapy (VAC Therapy, Kinetic Concepts, Inc., San Antonio, Tex, n = 4), and local extremity oxygen replacement (LEXOR, n = 4). Dermacyn treatment was found to be safe, simple, and well accepted by patients. Rapid clinical sterilization of all wounds facilitated overall wound healing and wound preparation for more definitive adjuvant wound therapies including Apligraf (Figure 1). Active infection is a known contraindication to utilization for Apligraf and VAC. Other clinical findings in this series included a decrease in antibiotic (IV and oral) administration and decrease in hospitalizations for wound treatment.

A Review of What’s to Come

In this supplement, which is a reproduction of a wound care symposium presented at the October 2005 New Cardiovascular Horizons and Management of the Diabetic Foot Conference in Miami, Fla, several noted physicians will present their early experience with superoxidized Microcyn Technology in a variety of clinical scenarios including DFUs, CVI ulcers, complex traumatic wounds, and burns. There are more than 18 million US patients suffering from diabetes, which is now the sixth leading cause of death and major contributor in more than 50% of all amputations. 23 Approximately 80–85% of all amputations are preceded by an ulcer (eg, ischemic, DFU, CVI, mixed), and deep infections and osteomyelitis undoubtedly play a significant role in many amputations. 24

Dr. Andrés Gutiérrez will discuss the science and mechanism of action of Microcyn Technology in achieving rapid wound sterilization without apparent harm to normal cells. He will also present interesting and impressive data from Mexico in treating a wide variety of acute and chronic wounds and discuss plans for further randomized, perspective data collection and analysis.

Dr. Tom Wolvos, a general surgeon and wound care specialist, will present his experience with Dermacyn Wound Care in a variety of complex, advanced wounds including a unique experience in combining Dermacyn with negative pressure wound therapy with the VAC and the VAC InStill, which allows the instillation of fluids into the wound. Advanced wounds reported by Dr. Wolvos will include large decubitus ulcers, large post-op wound dehiscence with exposed abdominal wall mesh, and complex traumatic and post-op surgical wounds.

Dr. Luca Dalla Paola, an endocrinologist and wound care specialist, will present his experience with Dermacyn from the Albano Terme Hospital in Albano Terme, Italy. Dr. Paola will present data in advanced CLI patients who required complex revascularization, surgical debridement, and control of infection and diabetes to achieve limb salvage (in 218 patients). The Dermacyn-treated group experienced less major surgical procedures and amputations with shorter times to healing (45 days vs. 58 days) than the control group. The control group experienced 16% adverse skin reactions, while the Dermacyn group had no adverse skin reactions.

Thermal injury presents a special, atypical, acute wound that carries significant clinical and societal impact, especially in the pediatric patient population. Dr. Ariel Miranda Altamirano, a plastic surgeon at the University of Guadalajara and Chief of the Hospital Civil Pediatric Burn Unit, presents that facility’s impressive results utilizing Oculus Microcyn60 in a wide variety of pediatric burn patients.

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Other Issues to Consider

Antibiotic resistance has become a major healthcare problem in treating many hospitalized and outpatient individuals. It is particularly problematic in DFUs. Specifically, MRSA
pathogens have been associated with a significantly increasing incidence, increased hospital stay and costs, and poorer clinical outcomes with higher amputation rates and higher mortality rates.25,26 Vancomycin is increasingly less effective against MRSA, resulting in the emergence of new antibiotics that are expensive and have significant risks. Clearly, any local topical solution that would have excellent efficacy versus MRSA and other bacterial and nonbacterial pathogens with minimal complications would offer a potential significant improvement over the current treatments for wound infection and wound healing.

References

The provided information contains a discussion of off-label use or uses that have not been evaluated by the Food and Drug Administration. Oculus Innovative Sciences is not aware of any significant risks or safety concerns that are not discussed in the publication. This study was funded in part or fully funded by Oculus Innovative Sciences.
Indications for Use

510(k) Number (if known):

Device Name: Dermacyn™ Wound Cleanser

Indications for Use: Dermacyn Wound Cleanser is intended for moistening and debriding acute and chronic dermal lesions, such as Stage I-IV pressure ulcers, statis ulcers, diabetic ulcers, post-surgical wounds, first and second degree burns, abrasions and minor irritations of the skin.

Prescription Use ❌ AND/OR Over-The-Counter Use ✔
(Part 21 CFR 801 Subpart D) (21 CFR 801 Subpart C)

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Concurrence of CDRH, Office of Device Evaluation (ODE)

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