Antimicrobial Effects of a Novel Combination Therapy Against Methicillin-Resistant Staphylococcus aureus and Pseudomonas aeruginosa in a Porcine Wound Model

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Introduction
• Chronic wound infections contain various species of bacteria, primarily among which are Staphylococcus aureus and Pseudomonas aeruginosa (PA27312)1.
• The degree of microbial growth, especially biofilm formation, has a direct impact on wound healing.2
• Therefore, limiting bacterial growth is an essential component of chronic wound care.
• A novel technology has been designed to target components of wound healing in chronic refractory wounds, regardless of pathology.
• The combination therapy consists of formulations that address wound preparation, wound therapy (OCM), and skin integrity.

Objective
• To evaluate the antimicrobial and wound healing effects of various wound care formulations against methicillin-resistant Staphylococcus aureus (MRSA) and PA27312 using a porcine wound model.

Methods
• Thirty-one deep reticular wounds (22 mm × 22 mm × 3 mm) were made across the paramedian and thoracic areas on each of 6 specific pathogen-free pigs (Looper Farms, North Carolina).
• Pathogenic strains of MRSA (USA300) or PA27312 (AEC 27312) prepared in 10^9 CFU/mL inoculum suspensions were used to inoculate all wounds within 20 minutes after wounding.
• Inoculated wounds were covered with polyurethane dressings (Tegaderm, 3M, USA) for 72 hours before being treated.
• Treatment consisted of OCM alone, OCM plus skin protectant, or Aquacel Ag Advantage (positive control) or wounds left untreated (negative control).
• Wounds treated with OCM alone were debrided before treatment and covered with polyurethane dressings (Figures 1, A-D).
• Wounds treated with Aquacel Ag Advantage were initially debrided, treated with Aquacel, and covered with polyurethane dressing (Figure 1, E-G).
• Untreated wounds were debrided then covered with polyurethane dressing.
• All treatments except wound preparation were repeated on Days 4 and 8.
• Baseline wounds were biopsied before and after debridement, and baseline counts were obtained on Day 0; treated wounds were assessed on Days 4, 8, and 12 after treatment.

Results
• On Days 4 and 12, MRSA USA300 counts were significantly lower in OCM alone-treated wounds versus all other treatments (Figure 2).
• On Day 6, 8, and 12, MRSA USA300 counts were significantly lower in wounds treated with OCM plus skin protectant versus those treated with the positive and negative controls (Figure 2, all comparisons; Figure 3).
• On Days 6, 8, 12, and PA27312 counts were significantly lower in wounds treated with OCM alone or OCM plus skin protectant versus baseline and before debridement (Figures 4 and 5).
• Day 12 PA27312 counts were significantly lower with OCM alone versus all other treatments and with OCM plus skin protectant versus Aquacel and untreated control (P0.05, all comparisons; Figures 4 and 5).
• Among all treatments at all time points, the lowest MRSA USA300 and PA27312 counts occurred on Day 12 in wounds treated with OCM alone (Figures 2 and 3).
• On Day 6, initial growth in MRSA USA300-infected wounds was observed with OCM alone compared with OCM plus skin protectant (Figure 4).
• Compared with Aquacel-treated wounds, MRSA USA300-infected wounds treated with OCM plus skin protectant showed increased epithelialization on Days 4 and 8 (Figure 5).
• In PA27312-infected wounds, increased re-epithelialization was observed with Aquacel compared with OCM alone at Day 4, and increased granulation was observed with Aquacel compared with OCM plus skin protectant at Day 8.

Conclusions
• OCM alone was significantly better at halting proliferation in both MRSA USA300- and PA27312-infected wounds compared with baseline before and after debridement and compared with all other treatment groups.
• OCM and OCM plus skin protectant significantly reduced MRSA USA300 and PA27312 counts in this in vivo model, recording the lowest bacterial counts of any treatment in the study.
• Compared to other treatments, OCM alone and OCM plus skin protectant showed significantly better formation of new tissue in MRSA USA300-infected wounds.
• These findings may have important clinical implications for the management of many wound etiologies, such as burns, diabetic foot ulcers, and pressure ulcers.

REFERENCES

DISCLOSURES
1, 2, 3, 4, 5, 6, 7: Employees, Omeza, Inc.

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