In Vivo Comparison of the Effectiveness of a Glycylcycline and a Lincosamide Antibiotic in Reducing MRSA Pathogenicity in Burn Wounds

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Introduction

In burn patients, mortality rates are increased with the presence of infectious complications. Virulence factors produced by pathogens can disrupt healing and result in systemic immune disruption. Treatment becomes increasingly more difficult with the introduction of antibiotic resistant species, such as methicillin-resistant *Staphylococcus aureus* (MRSA.) Means for reducing pathogenicity of these species are needed, especially in high-risk groups such as immune compromised burn patients.

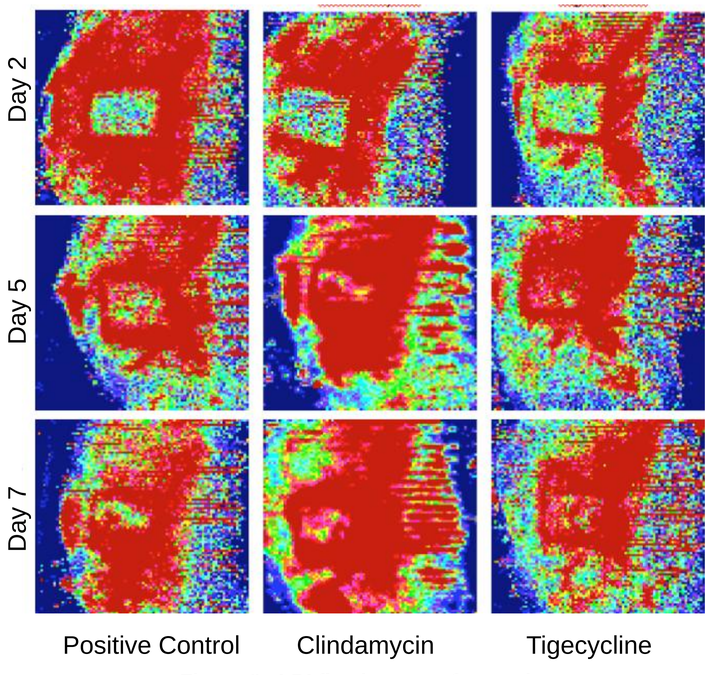

Figure 3. LDI flux images of wounds

Methods

Male Sprauge-Dawley rats received dorsal burn wounds, which were inoculated 1 day post-injury with virulence factor producing MRSA, or media alone (sham). Animals were divided into treatment groups with two groups receiving twice daily tigecycline, another two receiving twice daily clindamycin, and the sham group and an untreated infected group (positive control) receiving vehicle. Wound biopsies, and wound images were obtained daily for 8 more days. Quantitative cultures and ELISAs were done on biopsies to quantify bacteria and virulence factor levels respectively.

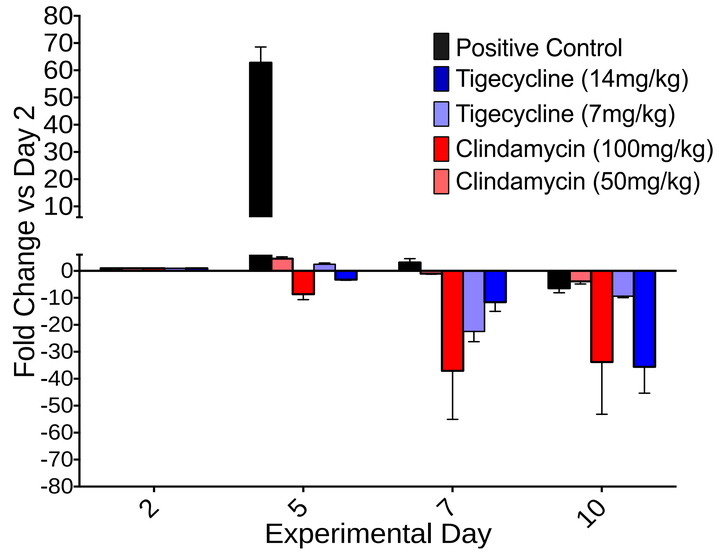

Figure 1. Bacterial levels in wound biopsies relative to Day 2.

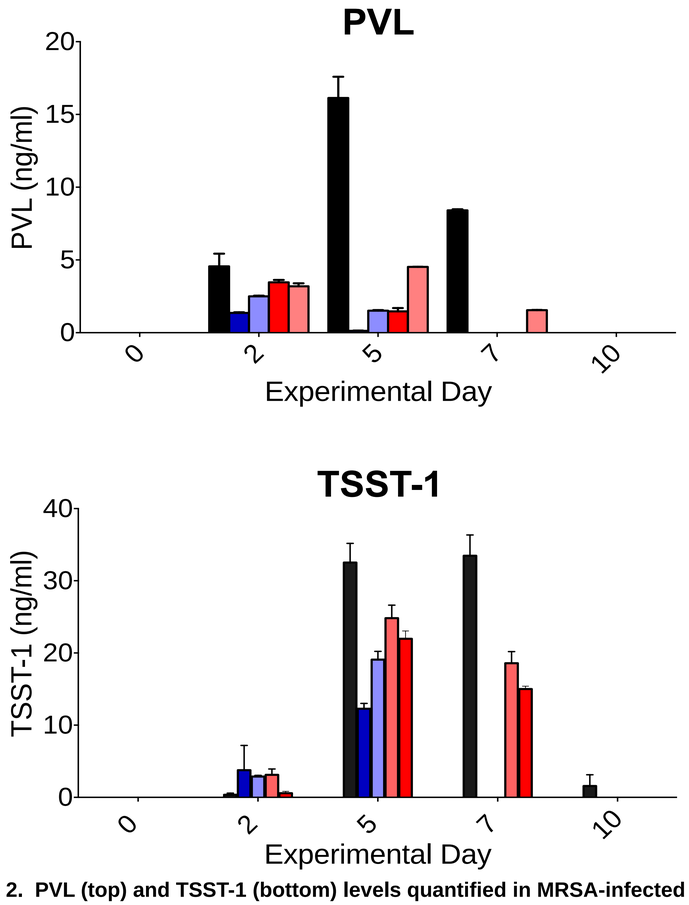

Figure 2. PVL (top) and TSST-1 (bottom) levels quantified in MRSA-infected wounds via ELISA.

Results

MRSA levels peaked in positive control animals by day 5 (Fig. 1). Also on day 5, biopsies from all antibiotic-treated groups had significantly lower levels of bacteria than those from positive controls ($p<0.01$). All antibiotic-treated groups had significantly lower levels of Toxic shock syndrome toxin 1 (TSST-1, $p<0.01$) and Panton-Valentine leukocidin (PVL, $p<0.001$) versus positive controls by day 5 (Fig. 2). TSST-1 and PVL levels were undetectable in tigecycline-treated groups on day 7. Clindamycin-treated groups had measureable levels of TSST-1 (15-20ng/ml) and PVL (2-3ng/ml) on day 7. Analysis of laser doppler images (LDI, Fig. 3) revealed a return of wound perfusion in tigecycline-treated groups similar to that seen in sham animals (Fig. 4).

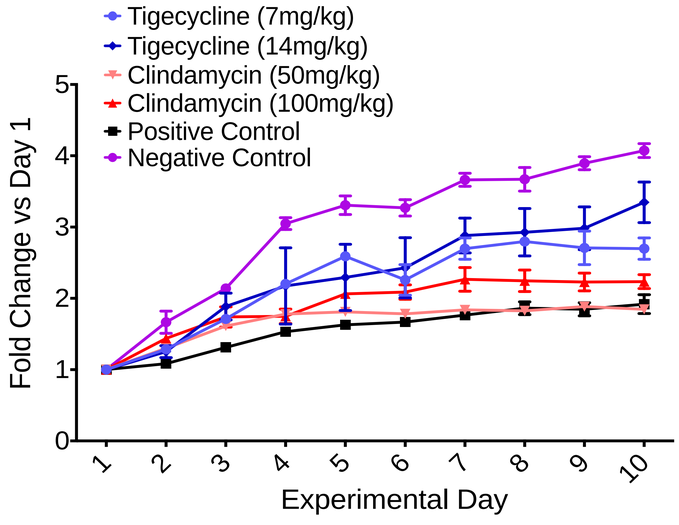

Figure 4. LDI analysis using regions of interest identified on flux images, perfusion units calculated, and averaged.

Conclusion

While both treatments appear to have had positive impacts on reducing both bacterial levels and toxin production, tigecycline was significantly better at eliminating toxin. Future research may investigate the effect various treatments have on the host innate immune response and pathogen mobility.