Research Study

In Vitro Comparison of Rapid Bactericidal Efficacy of Commercially Available Surgical Solutions

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INTRODUCTION

Intraoperative irrigation is a commonly used method aimed at reducing microbial burden by mechanically removing tissue debris, metabolic waste, and tissue exudate from the surgical field prior to site closure.[1] With the absence of universally established standard of care and robust clinical data, the selection of appropriate irrigation solution remains a topic of debate. Isotonic saline has long been considered a safe and cost-effective irrigation solution and is most broadly used. Besides saline, the only other irrigation solution currently supported by the American Academy of Orthopaedic Surgeons, the Centers for Disease Control and Prevention, and World Health Organization is povidone-iodine.[2-3]

Reported here is a comparative assessment of the *in vitro* rapid bactericidal efficacy of a panel of nine commercially available irrigation solutions using short (60 seconds) contact time. The study was performed using two representative species of bacteria – Gram-positive methicillin-resistant *Staphylococcus aureus* (MRSA) and Gram-negative *Pseudomonas aeruginosa.* The irrigation solutions evaluated in the study involved an array of antimicrobial technologies and preservatives, including acids, surfactants, chlorhexidine gluconate (CHG), benzalkonium chloride (BZK), polyhexamethylene biguanide (PHMB) alone and in synergy with other additives, and povidone iodine (PI).

METHODOLOGY

Briefly, aliquots of the different irrigation solutions were placed in sterile containers followed by the addition of the microbial inoculum (approximately 10^7 CFU/mL) and thorough mixing. After 60 seconds of contact time, aliquots of the irrigation solutions were taken out, neutralized, and surviving bacteria enumerated through serial dilution and agar plating. The testing was performed against two representative bacteria , Gram-positive *S. aureus*, a methicillin-resistant strain (MRSA), and Gram-negative *P. aeruginosa.*

RESULTS AND DISCUSSION

The results are shown in **Figure 1** and demonstrate rapid and complete bactericidal effect with the synergistic PHMB-based technology[4] in BIASURGE Advanced Surgical Solution as well as benzalkonium chloride (BZK)-containing irrigation solution. The remaining irrigation solutions showed varying levels of efficacy with triple antibiotic solution having no detectable effectiveness, as expected given the short treatment time.

Further investigation, including *in vivo* and clinical studies, is needed to translate these findings and identify the irrigation solution with desired balance of low cytotoxicity and optimal antimicrobial preservative properties.

Pre-clinical study results may not directly correlate to human clinical outcomes.

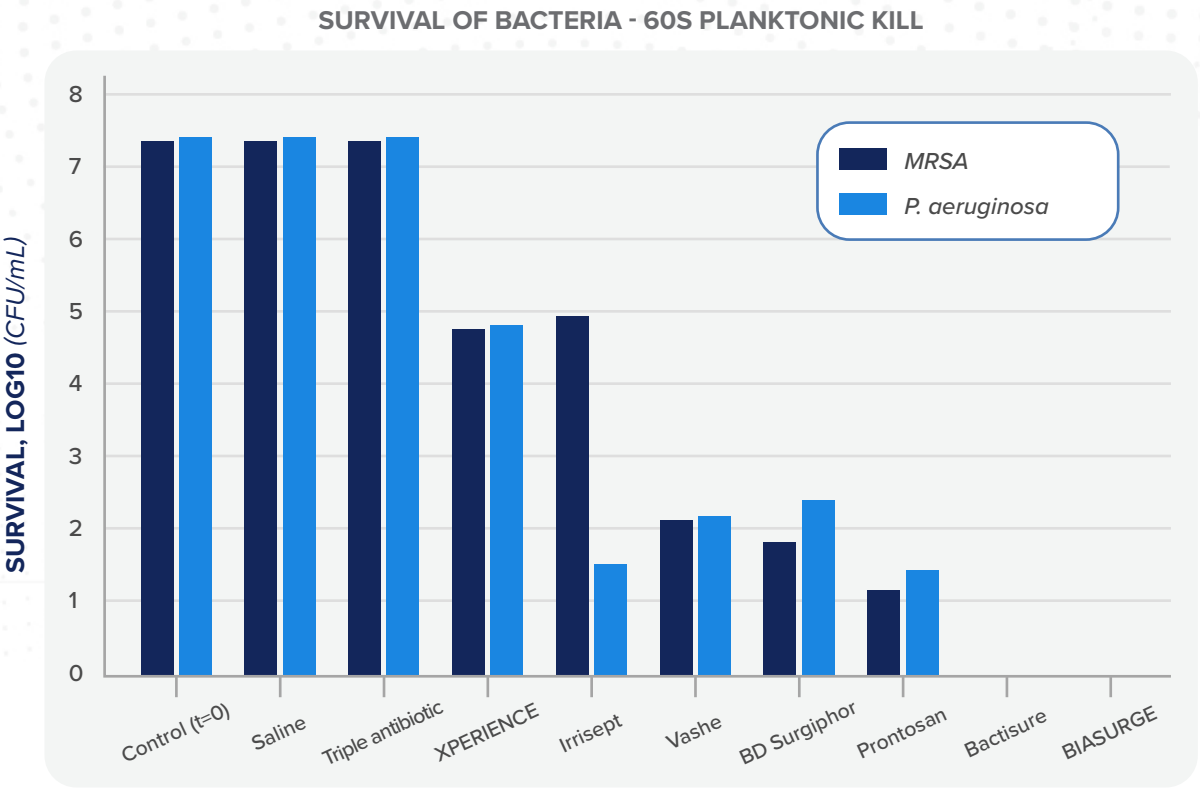

Figure 1: *Full names of irrigation solutions tested are listed below.*

Products tested (in order of appearance): *Control (t=0) • Saline • Triple antibiotic solution* • XPERIENCE™ Advanced Surgical Irrigation • Irrisept Antimicrobial Would Lavage • Vashe® Wound Solution • BD Surgiphor™ Antimicrobial Irrigation Solution • Prontosan® Irrigation Solution • Bactisure Would Lavage • BIASURGE® Advanced Surgical Solution*

RESEARCH REFERENCES

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The unapproved use(s) of the medical product has not been reviewed by FDA and the safety and effectiveness of the medical device for the unapproved use(s) has not been established.