Identifying the most efficacious surgical irrigant

Christopher D Hamad, William L Sheppard, Rene F Chun¹, Zeinab Mamouei, Matthew Dipane², Jonathan S Yu, Rahul Sobti, Nicholas M Bernthal³, Edward J McPherson²

¹Ucla-Orthopedic Hospital, ²UCLA, ³UCLA, Dept. of Orthopaedic Surgery INTRODUCTION:

There is no clear consensus regarding the most efficacious surgical irrigant. Surgeon or institutional preference often determines which irrigant is used for surgical prophylaxis or in the setting of hardware infection. Most studies compare single agents to normal saline and there is a paucity of evidence to dictate decision making. This study will compare the efficacy of various surgical irrigants *in vitro* against *S. aureus (Xen36) (SA)* and *C. albicans (CA)* in both planktonic and biofilm states.

METHODS:

Irrigants include: 0.05% chlorhexidine gluconate (CG), sodium lauryl sulfate and citric acid (surfactant 1), benzalkonium chloride and acetic acid (surfactant 2), 0.5% sodium hypochlorite, .35% povidone iodine (.35 Pl), 10% povidone iodine (10 Pl), 3% hydrogen peroxide (HP), 1:1 (10 Pl + HP), and normal saline (NS). For planktonic testing, 1E6 colony forming units (CFUs) of *SA*, *CA*, or both were utilized and biofilms were grown in these aforementioned conditions on 0.8mm x 10mm titanium implants for 48hrs. All killing assays were performed using 5-minute contact times, representing the average surgical dwell time. Success was defined by complete eradication of planktonic or biofilm CFUs. RESULTS:

HP, 10 PI + HP, surfactant 1 and surfactant 2 were the only irrigants capable of eliminating planktonic *SA* (Figure 1A). In addition, only .35 PI, 10 PI, HP, 10 PI + HP, and surfactant 2 eradicated *SA* biofilms (Figure 1B). 10 PI + HP and surfactant 2 were the only irrigants capable of eliminating *SA* in both planktonic and biofilm states and were tested against polymicrobial infection. Only 10 PI + HP was able to eradicate polymicrobial *SA* + *CA* infections in both planktonic and biofilm states (Figures 1C & 1D).

DISCUSSION AND CONCLUSION:

10 PI + HP and surfactant 2 appear to be superior irrigants against *SA* as they are able to eliminate this bacterium in both planktonic and biofilm states. However, only 10 PI + HP was able to eradicate polymicrobial biofilm and planktonic infections and is superior in this study. Our *in vitro* data demonstrates that irrigants have variable killing efficacy against microbes depending on their state. Future studies are needed to confirm these findings *in vivo*.

