POSTER 18

Title: Decreasing bacterial colonization: Non-eluting Zimmer Bactiguard® implant coating decreases burden of implant infection seven days after surgery

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Background:
Periprosthetic infection is a morbid complication of endoprosthetic reconstruction in orthopaedic oncology patients. Currently, a multi-modal approach of prophylactic antibiotics, intraoperative field sterility, surgical wound irrigation, and intrawound vancomycin powder are used to prevent PJI, but breakthrough cases still occur. Implant coatings could provide additional protection against early biofilm formation on implants. Bactiguard® (Zimmer Biomet, Warsaw, IN) is an FDA approved coating currently used on urinary catheters to prevent infection. It consists of three noble metals: silver, gold, and palladium that generate a pico-current dispersion force that prevents microbial adhesion.

Questions/Purposes:
Does Bactiguard® coating decrease bacterial burden? If so, how long does this protective effect last? Does prevention of bacterial adhesion and biofilm formation on the implant allow for clearance of planktonic bacteria by the immune system?

Methods:
An established mouse model of PJI was utilized. A 6 x 0.8mm Bactiguard® or uncoated pin were implanted retrograde into the distal femur of 10-week-old C57BL/6 mouse and inoculated with 1E3 CFUs of S. *aureus* (Xen36) or sterile saline. Bacterial burden was longitudinally measured *in vivo* by quantifying bacterial bioluminescence using an IVIS Spectrum. Animals were sacrificed on post-operative days (PODs) 7, 21, and 35 to collect implants and harvest tissue for CFU analyses. Additional implants were harvested on PODs 7 and 35 for scanning electron microscopy (SEM) analysis.

Results:
There was no difference in *in vivo* bioluminescence between Bactiguard® and uncoated pins, indicating similar burden of planktonic bacteria in surrounding tissue (Figure 1-A). Bactiguard® coated pins had significantly lower CFUs compared to that of uncoated pins on POD7 ($p=0.0085$). There were no significant differences in CFUs on PODs 21 ($p=.44$) and 35 ($p>0.99$) (Figure 1-B). On SEM, there were fewer staphylococci observed on Bactiguard® coated implants harvested on POD7 compared to uncoated pins (Figure 2). On POD35, there were no observed differences between groups on SEM.

Conclusion:
Bactiguard® coating has demonstrated efficacy in reducing infections in urinary and venous catheters. Despite extensive soft-tissue infection seen on *in vivo* bioluminescence, non-eluting Bactiguard® coating provides protection against bacterial colonization of titanium implants on POD7, which is observed on CFUs and SEM. Implant coatings such as Bactiguard® could be helpful in conjunction with current multi-modal approaches to help prevent PJI caused by microbial contamination at the time of surgery, especially in immunocompromised oncologic patients who are more susceptible to direct wound contamination at the time of surgery.

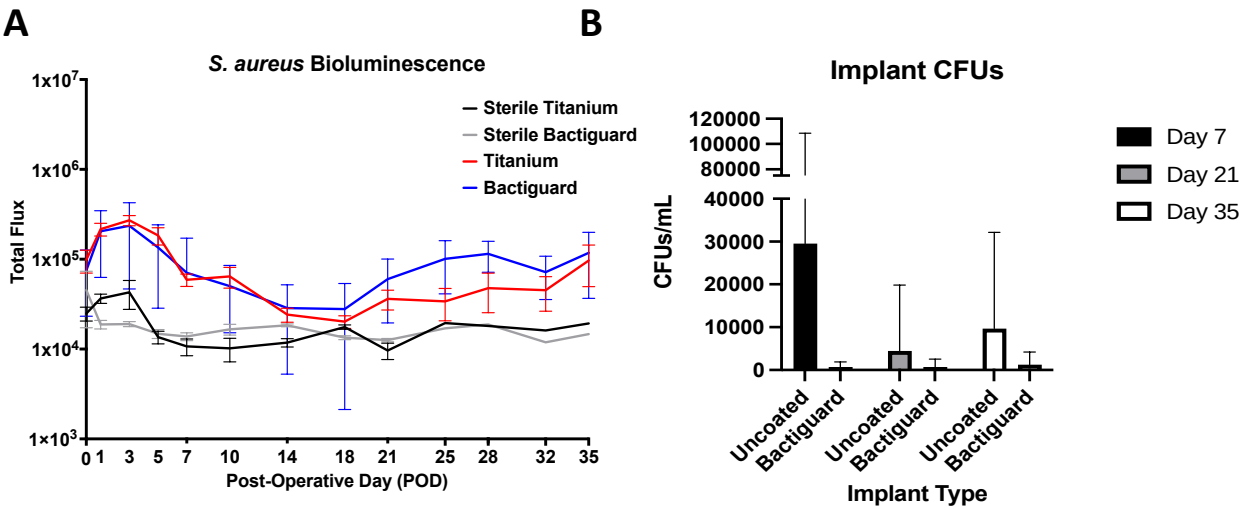

Figure 1). (A) Longitudinal bacterial burden quantified via *S. aureus* bioluminescence on PODs 0-35. **(B)** Implant CFUs from uncoated and Bactiguard® pins explanted on PODs 7, 21, and 35.

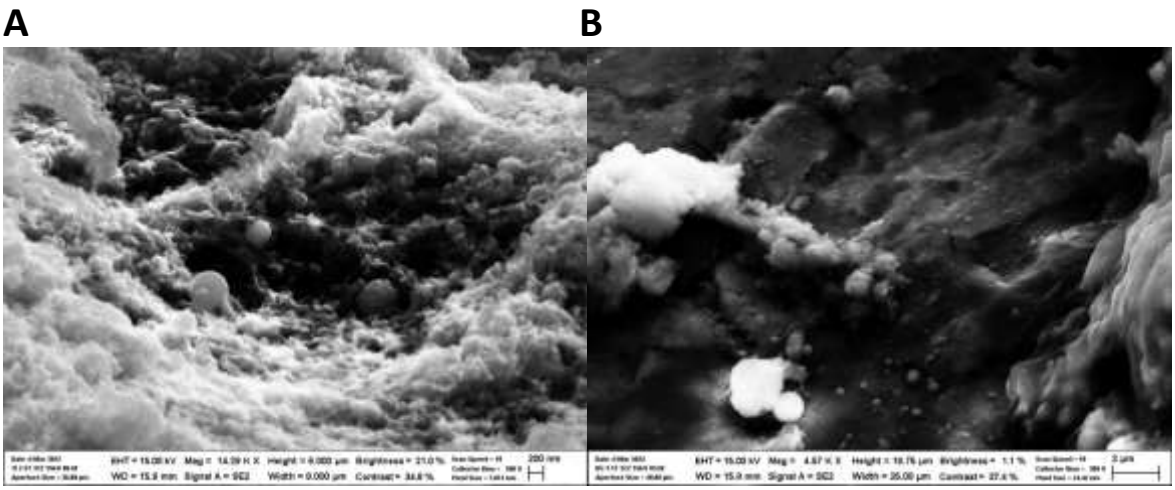

Figure 2). Scanning electron microscopy images obtained on POD7 of *S. aureus* biofilm on titanium **(A)** and Bactiguard® **(B)** implants.