Novel Antibody Disrupts Biofilm in Implant Associated Infection Model

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INTRODUCTION: Bacterial biofilms on implants are highly resistant to the host immune response and traditional antibiotic therapy. Implant associated infections frequently require revision surgery. Novel therapies to treat biofilm infections are needed to improve patient outcomes. We hypothesize that a novel human monoclonal antibody against bacterial biofilm matrix will reduce bacterial burden in a mouse model of implant associated infection.

METHODS: TRL1068 is a human monoclonal antibody against a biofilm scaffolding protein that is conserved across both gram-positive and gram-negative species. The efficacy of TRL1068 was assessed in a mouse model of implant associated infection. A stainless-steel pin is implanted in the L4 spinous process and inoculated with a bioluminescent strain of S. aureus. Bacterial burden is monitored in vivo. Mice were randomized to treatment on POD 4 and 7 with subcutaneous 15 mg/kg TRL1068, inactive control antibody (CAb), vancomycin alone, or vehicle control. All treatment groups received BID vancomycin 120 mg/kg on POD 7-21. On POD 35 all animals were sacrificed. Implants and periimplant tissue were harvested separately and sonicated for CFU analysis.

RESULTS: Treatment with TRL1068 + vancomycin accelerated the decline of the bacterial burden compared to the inactive antibody + vancomycin or vancomycin alone. There was a 3.3-log₁₀ (99%) reduction in average implant CFUs in the TRL1068+vancomycin group relative to the vancomycin only group (6.17 x 10⁻¹ vs. 1.13 x 10⁴, p=0.02). CFUs were enumerated from 42% (5/12) of implants of mice treated with vancomycin alone and 26% (7/27) of implants in mice treated with the inactive control antibody (CAb) + vancomycin. In contrast, only 4% (1/27) of the mice treated with TRL1068 + vancomycin were found to have an infected implant.

DISCUSSION AND CONCLUSION: Implant related infections remain a major burden for patients and health systems. The novel human monoclonal antibody TRL1068 may add a valuable therapy to the armamentarium of treatment options as biofilm disruption facilitates the clearance of otherwise recalcitrant bacterial reservoirs.