

# *Eradication of an established Staphylococcus aureus biofilm with synergistic combination of an anti-biofilm and an antibiotic agent*

## 2022 Lifespan Research Day Abstract

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**Author(s):**

Rebecca M O'toole, Undergraduate Student, University of Rhode Island. College of Pharmacy

Katie Daffinee, Staff, Providence VA Medical Ctr. Dept of Infectious Diseases Research Department

Kerry L Laplante, Professor, Providence VA Medical Ctr, Brown University, University of Rhode Island.  
College of Pharmacy

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### Abstract

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**Background & Aim:**

Biofilms are intrinsically resistant communities surrounded by a protective extracellular polymeric substance (EPS) causing high recurrent infections.<sup>1,2</sup> We aim to combine biofilm destabilizing agents, cellulase, and ascorbic acid with vancomycin or daptomycin in a novel strategy to eradicate established Staphylococcus Aureus biofilms.<sup>1,3</sup>

**Methods:**

Four unique MRSA biofilms of varying strengths/stabilities were grown in tryptic soy broth with 1% dextrose, 12.5mg/mL magnesium, 25mg/mL calcium, and 6 log<sub>10</sub>CFU/mL bacterial inoculum. Biofilms were grown 20hrs in 96-well tissue culture treated polystyrene plates then gently rinsed with sterile water before 24hr lock treatment with anti-biofilm agents or antibiotics, monotherapy or in combination. Subsequently, plates were rinsed and dried overnight to fix biofilms to the well surface. Biofilms were stained with 0.1% crystal violet (CV) for 15 minutes and then rinsed before glacial acetic acid (33%) was added to resolubilize the remaining CV. BioTek plate reader at 570nm read the optical density of the remaining CV. Eradication was defined as readings of =0.09 optical density.

**Results:**

Cellulase minimum biofilm eradication concentration (MBEC) was 1.5–25mg/mL, while ascorbic-acid, vancomycin and daptomycin MBECs were greater than tested concentrations. Daptomycin with 2.5% cellulase lock caused an 76% biofilm reduction. Pre-locking with 2.5% cellulase lock for 4 hours before 5mg/mL daptomycin lock caused a 86% biofilm reduction. Ascorbic acid and vancomycin did not surpass cellulase or daptomycin therapies.

**Conclusion:**

Anti-biofilm pre-locking before antibiotic was more effective than exposing both agents simultaneously. Daptomycin (5mg/mL) with 2.5% cellulase was the most effective biofilm eradication. Vancomycin (5mg/mL) with 2.5% ascorbic acid was the least effective

**Clinical Implications:**