

We have recently demonstrated that modest elevations of temperature lead to increased staphylococcal susceptibility to vancomycin and significantly soften the biofilm matrix” Richardson et al (2015).

Abstract:

Central line-associated bloodstream infections (CLABSIs) are not easily treated and many catheters (e.g., hemodialysis catheters) are not easily replaced. Biofilms (the source of infection) on catheter surfaces are notoriously difficult to eradicate. We have recently demonstrated that modest elevations of temperature lead to increased staphylococcal susceptibility to vancomycin and significantly soften the biofilm matrix.

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In this study, using a combination of microbiological, computational, and experimental studies, we demonstrate the efficacy, feasibility, and safety of using heat as an adjuvant treatment for infected hemodialysis catheters. Specifically, we show that treating with heat in the presence of antibiotics led to additive killing of *Staphylococcus epidermidis* with similar trends seen for *Staphylococcus aureus* and *Klebsiella pneumoniae*. The magnitude of temperature elevation required is relatively modest (45-50°C) and similar to that used as an adjuvant to traditional cancer therapy. Using a custom-designed benchtop model of a hemodialysis catheter positioned with tip in the human vena cava as well as computational fluid dynamic simulations we demonstrate that these temperature elevations are likely achievable in situ with minimal increased in overall blood temperature.

Reference:

Richardson, I.P., Sturtevant, R., Heung, M., Solomon, M.J., Younger, J.G. and VanEpps, J.S. (2015) Hemodialysis Catheter Heat Transfer for Biofilm Prevention and Treatment. ASAIO Journal. October 23rd. .

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