



# WPI

## MATERIALS SCIENCE & ENGINEERING

### Kristin Sundberg

#### PhD Doctoral Proposal

Thursday, April 26, 2018  
10.00 am – 12.00 pm

Higgins Lab 102



#### Advisors:

Prof. Richard Sisson Jr.  
Prof. Danielle Cote

#### Committee:

Prof. Terry Camesano  
Prof. Satya Shivkumar  
Prof. Jianyu Liang  
Prof. Brajendra Mishra

#### Application of Material Characterization, Efficacy Testing, and Modelling Methods on Conventional and Nanomaterial Copper Cold Spray Coatings for Antimicrobial Applications

#### *Abstract:*

Bacterial and viral contamination of touch surfaces allows for transmission of pathogens leading to increased risk of infection. Previous work has demonstrated the antimicrobial properties of copper for contact-killing of microbes for use in hospitals. Less research exists on copper as an antiviral surface and on the effects of nanomaterial copper surfaces in the contact-killing of viruses and other microbes. Nanomaterial (nano agglomerates) and conventional copper powder feedstock are used in the cold spray process to form copper coatings on aluminum substrates. These samples are tested for antiviral contact-killing of Influenza A Virus in a dry environment. Testing is also extended to bacteria, *Pseudomonas aeruginosa*, in both water and saltwater environments. The differences in the powder feedstock and consolidated material are examined in order to better understand the mechanisms causing the observed differences in efficacy. Results are proposed to show that nanomaterial copper is more effective than conventional copper at contact-killing because of its differing mechanical and microstructural properties. Further analysis is being done on the relationship between kill-rate and surface roughness, as well as work on Cu-ion leaching and Cu-ion efficacy versus that of the bulk samples. Results collected will be used to model the relationship between mechanical, microstructural, and antimicrobial properties in relation to cold spray parameters.

