



/eterans Health Administration Central Texas Veterans Health Care System

# Efficacy of Copper Impregnated Self-Sanitizing Surface Against Clostridioides difficile Spores

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#### INTRODUCTION

- Clostridioides difficile (C. difficile) is one of the most common causes of healthcare-associated infections (HAIs), leading to increased hospital stay, cost, and mortality.
- Elimination of *C. difficile* spores is difficult as they are resistant to kill by common hospital grade disinfectants.
- Copper impregnated self sanitizing surfaces (SSSCu) provide continuous reduction of vegetative pathogens, potentially lowering the risk of infections, but their efficacy on C. difficile spores has not been previously evaluated.

#### METHODS

- Control (no copper) and copper coupons containing 20% copper-oxide were inoculated with varying *C. difficile* spore loads ranging from 10<sup>5</sup> to 10<sup>7</sup> spores, prepared using environmental protection agency protocol, with or without 5% fetal bovine serum (FBS) soil load.
- After 4 hours of contact time, the *C. difficile* spores were recovered and tested for viability.
- The efficacy of copper (log<sub>10</sub> kill) was estimated using a Bayesian linear multilevel model.



Figure 1: Photograph of tested coupons, Copper on the bottom and Control on the top.





addition of soil load.



#### RESULTS

After 4 hours, the copper coupons, at mean initial spore load (6.60 log<sub>10</sub>) and no soil load, had a mean 1.29 (95% uncertainty interval: 1.21 - 1.38) log<sub>10</sub> reduction compared to control coupons.

With the addition of soil load, the treatment effect of copper was reduced from the above estimated effect by 0.56 (95% uncertainty interval: 0.43 - 0.70) log<sub>10</sub>

Also, for each additional standard deviation (sd) increase in initial spore load there was a 0.56 (95% uncertainty interval: 0.44 - 0.68) log<sub>10</sub> decrease in the treatment effect of copper when there was no

The soil load in combination with increasing initial spore load further decreased the treatment effect of copper by an additional 0.12 (95% uncertainty interval: -0.07 - 0.31) log<sub>10</sub> for each sd increase in initial spore load, though this estimate includes a small probability for values compatible with the reverse direction of effect (increased treatment effect) as the 95% UI spans zero.

## CONCLUSIONS

Copper coupons can substantially reduce C. difficile spores after 4 hours by 61% - 98%, depending on the initial spore concentration and presence or absence of organic material (the range given is for +0.5 sd initial concentration and soil load to - 0.50 sd and no soil load) Higher initial spore loads or excess organic material may prevent the spores from coming in contact with the copper-impregnated surface thus decreasing the kill efficacy.

Continuous sporicidal effect of copper impregnated surfaces might prevent transmission of spores and help reduce HAIs.

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