Electrochemically deposited surfaces based on copper and silver with biocidal effect against methicillin resistant *S. aureus* (MRSA)

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Introduction

Healthcare-associated infections cost billions of dollars each year and are a major, yet often preventable, threat to patient safety. Inert surfaces such as stainless steel can be a reservoir for pathogenic agents and play an important role in the acquisition and spread of such infections. Copper can inactivate a multitude of bacteria, fungi and viruses and copper or copper alloys have been suggested as alternative to stainless steel to help reduce the occurrence of hospital-acquired infections. Silver also has antibacterial activity and it has been suggested to combine silver and copper for enhanced, potentially synergistic, antibacterial action. A novel electroplated copper-silver alloy was developed as a candidate for antibacterial surfaces for the medical and healthcare sector.

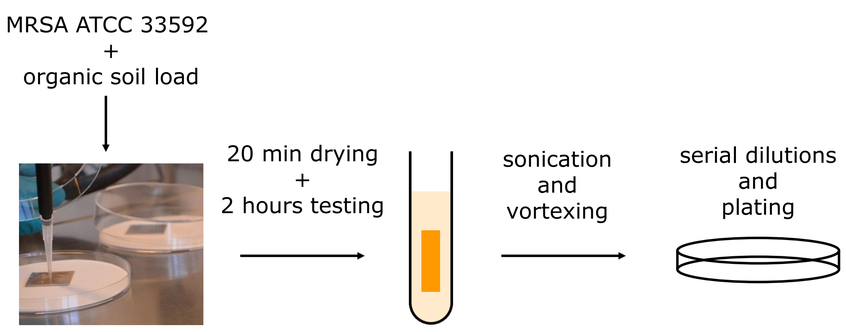
Aim

The purpose of this study was to benchmark a novel electroplated copper-silver alloy coating against stainless steel. The antibacterial efficacy of the alloy against methicillin resistant *S. aureus* (MRSA) will be investigated.

Methods

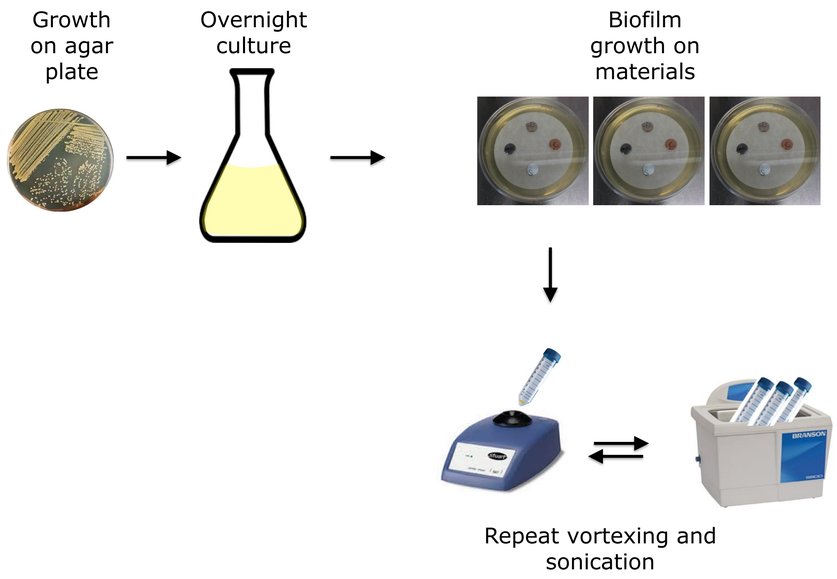
Strain: *S. aureus* ATCC 33592 (MRSA)

EPA test method for efficacy as a sanitizer



Materials:
Cu/Ag coating
Stainless steel

Agar based static biofilm method



Materials:
Cu coating
Ag coating
Cu/Ag coating
Stainless steel

Conclusions

Pure copper-coated and copper-silver alloy surfaces were effective in killing and preventing MRSA biofilm formation *in vitro*. Further research is planned to determine the efficacy against other clinically relevant pathogens and to do *in vivo* test for biocidal and antibiofilm efficacy in healthcare settings.

Results

EPA Test method for efficacy as a sanitizer

Under dry conditions, the Cu/Ag coating reduced in numbers of MRSA on the surface with more than 99.9% after 2 hours of exposure as compared to numbers on stainless steel.

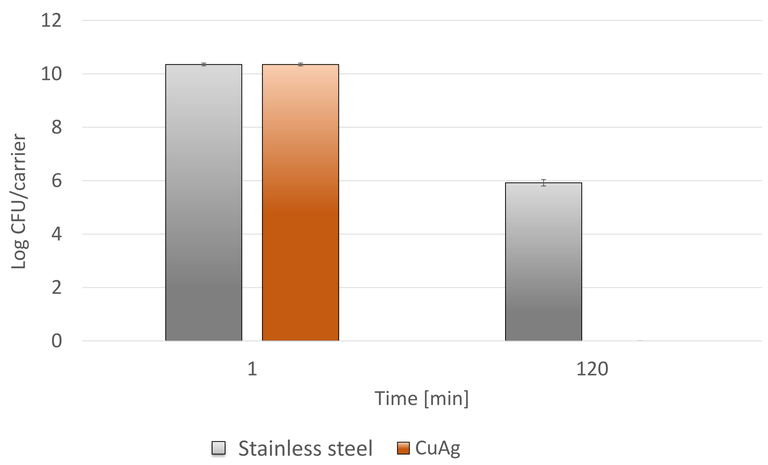


Figure 1: Survival of MRSA on Cu/Ag coating and stainless steel after 2 hours exposure.

Agar based static biofilm test

No difference was observed between silver and stainless steel coupons. However, compared with stainless steel, the most significant bacterial number reduction was found for the copper surface (close to 100 fold) followed by the Cu/Ag electroplated surfaces (10 fold) (P<0.001).

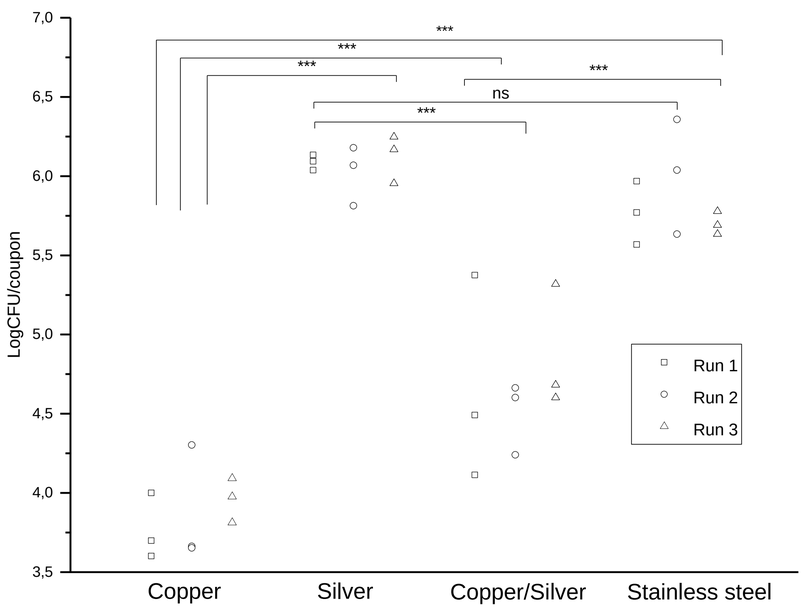


Figure 2: Growth of biofilm on 4 different materials. Mean: Cu (3.867), Ag (6.077), Cu/Ag (4.676), Stainless steel (5.826).

Reference:
EPA, Test Method for Efficacy of Copper Alloy Surfaces as a Sanitizer, 2015.

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