Reducing the risk of Healthcare-Associated Infections

Deployment of antimicrobial copper touch surfaces in hospital ICUs reduces infections by more than 40%

The evidence of the efficacy of copper as an effective measure against healthcare-associated infections is growing; copper and copper alloy surfaces are being introduced in healthcare facilities around the world to help mitigate the 7 million infections and over 365,000 deaths that occur each year[i]. These infections cost over $80 billion globally, according to the World Health Organization[ii].

A number of peer-reviewed and published laboratory and clinical studies support the replacement of frequently-touched equipment and fittings with copper and copper alloy surfaces in the healthcare environment.

The same evidence suggests incorporating copper can reduce microbial burden and therefore reduce the risk of infection. In the laboratory, when challenged with over 10 million disease-causing microbes per cm^2, copper and copper alloys demonstrate a continuous and rapid kill of greater than 99.9%. Independent laboratory testing[iii] supported the US Environmental Protection Agency's decision to approve the registration of more than 350 copper alloys as materials protective of human health. No other material has this approval.

Results from a US clinical trial, funded by the Department of Defense, take this evidence to a new level by evaluating the connection between contamination on frequently-touched surfaces and patient acquisition of infections. The preliminary findings demonstrate that patients treated in ICU rooms with copper and copper alloy products have a greater than 40% reduction in risk of acquiring an infection.

Cu Copper Development Association
Copper Alliance

Antimicrobial Copper Cu+™

Clinical trial:

Study shows copper reduces bacterial burden by >97% and infections by >40%

Three world-class medical centres – The Medical University of South Carolina, Charleston (MUSC), The Ralph H Johnson Veterans Administration Medical Center, Charleston, South Carolina and The Memorial Sloan Kettering Cancer Center in New York City – participated in a clinical trial assessing copper's antimicrobial efficacy in intensive care units (ICUs). The institutions replaced stainless steel, aluminium and plastic touch surfaces with antimicrobial copper alloys, hereafter referred to as 'copper', on the following frequently-touched objects within selected rooms in each of the ICUs: nurses' call devices, monitor bezels, bed rails, chairs, IV poles, data input devices (computer mice, laptop keyboard bases), arms of the patient visitor's chair and tray-tables. The surfaces shown to be most contaminated and, not surprisingly, in closest proximity to patients and visitors, were replaced with copper components. During the trial, the level of bacterial contamination on an equivalent number of the selected copper and non-copper surfaces was determined weekly. No changes were made to clinical practices or cleaning regimes in the study rooms.

The trial, conducted by renowned infectious disease clinicians and led by Dr Michael Schmidt, Professor and Vice Chair of the Microbiology and Immunology Department at MUSC, was executed in three stages.

The first stage established the baseline microbial burden on the frequently-touched objects in ICU rooms before installation of the copper products. The average microbial burden of the rooms was found to be 16,885 colony forming units (cfu) per 100 cm^2 [iv].

The second stage was the replacement of the most contaminated touch surfaces with copper and subsequent comparison of the microbial burden on these and non-copper equivalent surfaces over a period of 135 weeks. The median bioburden observed on copper surfaces was 97% less than on the non-copper surfaces [v].

The third stage, reported at ICPIC 2011[vi], assessed the incidence of healthcare-associated infections in ICU rooms with and without copper products. Results to date show that there is a significant reduction in the risk of acquiring an infection in rooms where copper products are installed.

The number of copper components in the individual rooms was recorded throughout each patient's stay, e.g. whether or not the patient was in a bed with copper rails (bariatric patients needed special beds which were not available with copper rails). The preliminary results show that where patients were in a room with 75% of the copper components present (by surface area), they had a 40.4% lower risk of acquiring an infection (N=651, p=0.039). This percentage increased to 61% if the patients were in a 'copper' bed in a copper room (N=541, p=0.006). For patients in a copper room with all copper components present throughout their stay, the risk reduction was 69.1% (N=642, p=0.008).

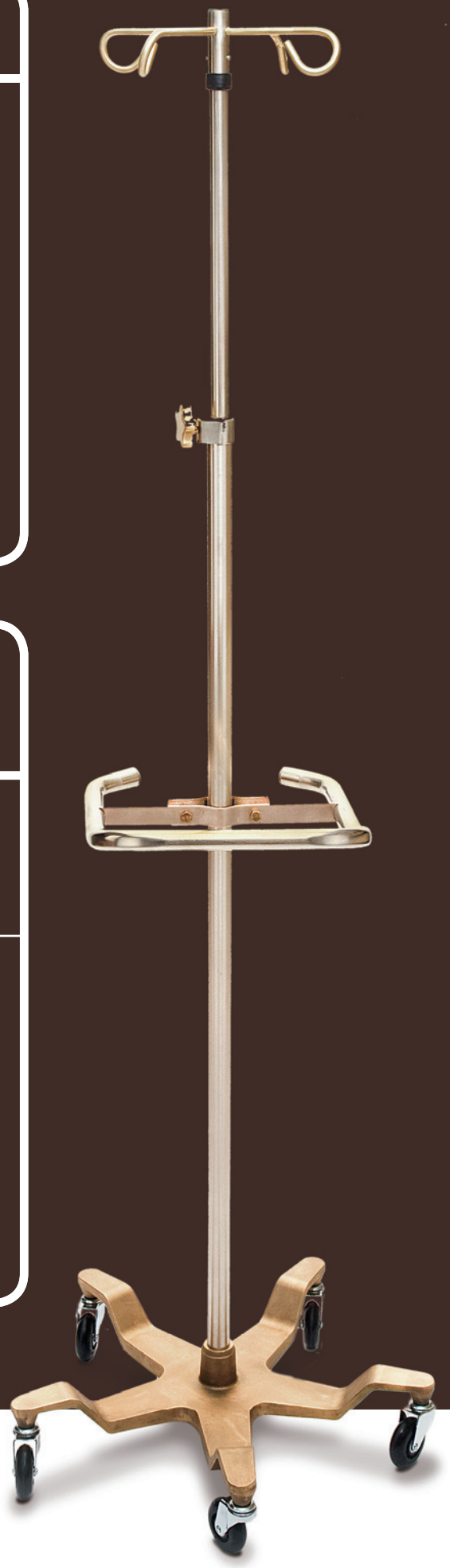
Trials over 4 years in 3 hospitals

- Non-copper touch surfaces in regularly-cleaned ICUs serve as significant microbial reservoirs that could transfer microbes to patients, healthcare workers and visitors[iv].
- Objects made of plastics, stainless steel and other conventional materials, closest to patients, had a higher microbial burden[iv]:
  - Average microbial burden of the rooms was 16,885 cfu/100 cm^2
  - Bed rails averaged the highest concentrations:
    - Total bioburden: 14,287 cfu/100 cm^2
    - MRSA: 123 cfu/100 cm^2
    - VRE: 500 cfu/100 cm^2.

Copper provides clinical benefits to patients

The results to date suggest that replacement of key frequently-touched surfaces with copper components reduces microbial burden which results in a significant and consistent reduction in infection rates.

- Copper reduces the median amount of microbes by 97%.
- Virtually no MRSA or VRE were found on the copper surfaces.
- Microbial burden reduction on copper surfaces continuously achieves the same levels as terminal cleaning.
- The deployment of copper surfaces led to a 40 to 70% reduction in infection rates.
- Copper's antimicrobial activity is continuous - it works non-stop and around the clock.



For more information on clinical trials, scientific references, case studies and products, or to book an in-house presentation, visit www.antimicrobialcopper.org

Copper's mode of action and preventing the spread of antibiotic resistance

Copper is an essential nutrient for humans as well as bacteria but, in high doses, copper ions can cause a series of negative events in bacterial cells. The exact mechanism by which copper kills bacteria is still unknown, however several theories exist and are being studied by groups around the world. They include:

- Causing leakage of potassium or glutamate through the outer membrane of bacteria
- Disturbing osmotic balance
- Binding to proteins that do not require copper
- Causing oxidative stress by generating hydrogen peroxide.

Professor Bill Keevil, Director of Environmental Healthcare at the University of Southampton, UK, leads a research group looking at the antimicrobial properties of copper. In his laboratory, he has demonstrated copper's efficacy against antibiotic-resistant organisms, including MRSA and VRE.

"Bacteria such as MRSA can survive on ordinary surfaces like door handles, taps and grab rails for days, even months, and be transferred on hands, spreading bacteria to other surfaces or to patients," explains Professor Keevil. "As more resistant bacteria emerge, we're running out of drugs to treat the infections they cause, so we need to do everything practicable to prevent their spread. Copper is a powerful antimicrobial, which quickly and continuously reduces the number of bacteria on its surface. We've demonstrated it in the lab, and it's also been shown to be effective in busy clinical environments as part of a set of infection control procedures.
"Changing common touch surfaces in hospitals to copper can help break the chain of infection, leading to a more hygienic environment, which must have a positive impact on the well-being of patients, even in the face of antibiotic-resistant bacteria."

Microbiologists and clinicians worldwide witnessed tens of thousands of MRSA bacteria perishing rapidly on copper, yet surviving on stainless steel, in a live experiment in Professor Keevil's laboratory. This demonstration was organised to mark 2011 World Health Day, the theme of which was 'Antimicrobial Resistance and its Global Spread'.

To see the video demonstration visit: www.antimicrobialtouchsurface.com

Antimicrobial copper in figures

99.9 percent of the bacteria that cause HCAIs is eliminated by antimicrobial copper alloys
100 percent: the recyclability of copper
97 percent: the reduction in contamination on copper surfaces compared to other materials
40-70 percent: the reduction in infection rates in ICUs with key surfaces replaced with copper
355 alloys are registered by the US Environmental Protection Agency as public health products
10 years of laboratory and clinical research support copper's antimicrobial efficacy
1 global network of non-profit organisations and commercial companies advising on the use of copper for combatting infections, united behind the industry stewardship scheme 'Antimicrobial Copper Cu+'

www.antimicrobialcopper.org

i bioMérieux Corp, First World Forum on HCAIs, 2007
ii World Health Organization, The Burden of Health Care-Associated Infection Worldwide, 2010
iii H.T. Michels, and D. Anderson "Antimicrobial regulatory effi cacy testing of solid copper alloy surfaces in the USA". Metal Ions in Biology and Medicine 2008: Vol. 10. 185-190, Eds Ph. Collery, I. Maymard, T. Theophanides, L. Khassanova, T. Collery. John Libbey Eurotext, Paris
iv C.D. Salgado et al "Microbial Burden of Objects in ICU Rooms". Poster presentation, Interscience Conference for Antimicrobial Agents in Chemotherapy (ICAAC), October 25-28, 2008, Washington D.C., USA
v Michael G Schmidt et al "Sustained Reduction of Microbial Burden on Common Hospital Surfaces through Introduction of Copper". Journal of Clinical Microbiology. 2012, 50(7):2217. DOI: 10.1128/JCM.01032-12
vi Schmidt MG, Copper Touch Surface Initiative. Microbiology and Immunology, Medical University of South Carolina, Charleston, USA, BMC Proceedings 2011, 5(Suppl 6):053 (Oral presentation delivered at 1st International Conference on Prevention and Infection Control, June 29-July 2, 2011, Geneva, Switzerland)

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