

# **Antimicrobial Copper: Proper Use & Care**

---

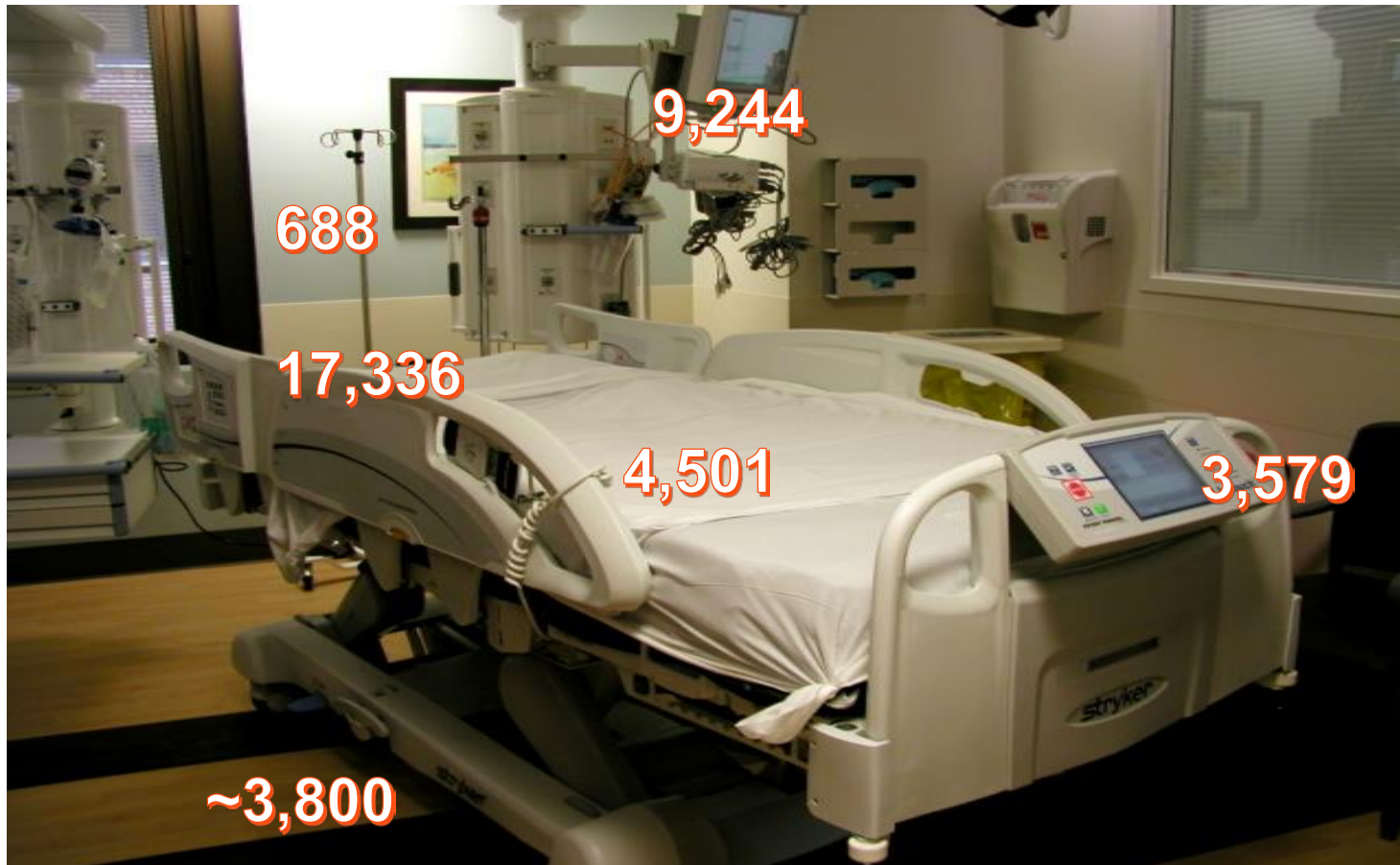
# Agenda

1. The need for antimicrobial surfaces
2. What is antimicrobial copper?
3. Efficacy testing and EPA registration
4. Product availability
5. Use case: Pullman Regional Hospital

# **The need for antimicrobial surfaces**

**Hospital-acquired infections result in  
substantial loss of life, a significant  
decrease in the quality of patient care,  
and add an additional cost to the US  
healthcare system of \$45 billion dollars.**

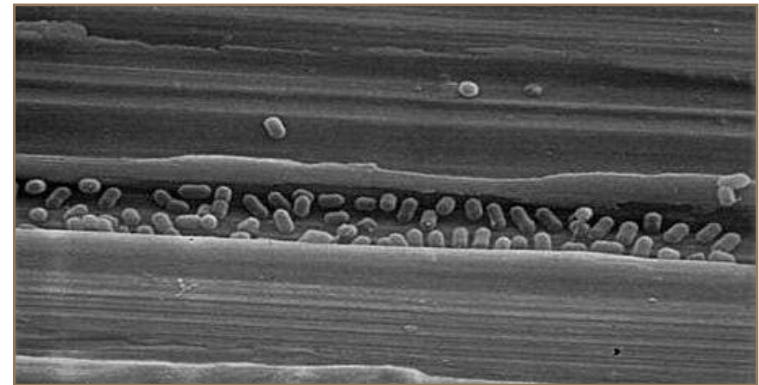
# Hospital surfaces are a source of pathogens



*Total bacteria count per 100 cm<sup>2</sup> (n = 668 rooms)*

# Bacteria can survive on conventional surface materials for a long time

- VRE: 4 months
- MRSA: 7 months
- *S. aureus*: 7 months
- *E. coli*: 16 months
- *P. aeruginosa*: 16 months



# Good hygienic practices are essential, but what happens in between cleanings?



# Hospital surfaces still harbor unsafe levels of microorganisms, even after cleaning

	% of Rooms with Contaminated Surfaces
<b>MRSA<sup>1</sup></b>	<b>46% (18 out of 41 Rooms)</b>
<b>VRE<sup>2</sup></b>	<b>22% (8 out of 37 Rooms)</b>
<b>C. diff<sup>3</sup></b>	<b>78% (7 out of 9 Rooms)</b>

1) Blythe et al. J Hosp Infect 1998;38:67-70

2) Goodman et al. ICHE 2008;29:593-9

3) Eckstein et al. BMC ID 2007;7:61








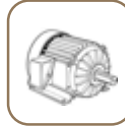

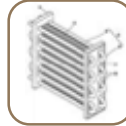








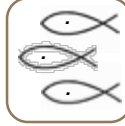

# **What is Antimicrobial Copper?**

# *Copper has many properties and is used in a broad range of applications and products*

## *Copper Properties*

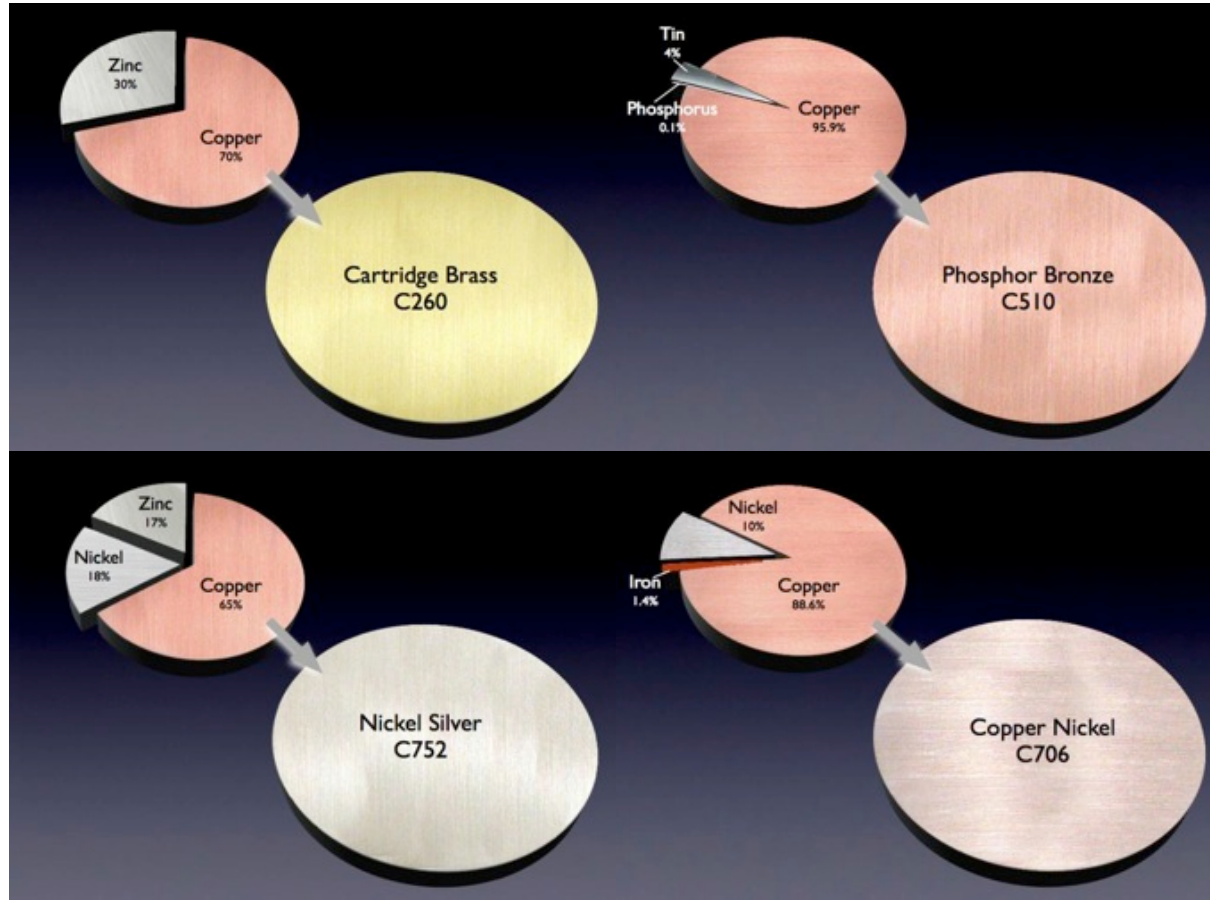
Aesthetic	Thermally Conductive	Recyclable
Formable	Electrically Conductive	Antimicrobial
Non-Magnetic	Catalytic	Ductile
Essential nutrient	Malleable	Easy to alloy
Corrosion resistant	Easy to join	Machinable

## *Copper (Product) Applications*

 ELECTRICAL WIRING	 ELECTRICITY TRANSMISSION & DISTRIBUTION	 CONSUMER APPLIANCES & TOOLS	 INDUSTRIAL EQUIPMENT & FITTINGS	 AUTOMOTIVE HARNESSES & MOTORS	 INDUSTRIAL TRANSFORMERS & MOTORS
 PLUMBING & PIPING	 HVAC & REFRIGERATION	 RAIL & MARINE EQUIPMENT	 ELECTRONICS & IT	 COMMUNICATIONS NETWORKS	 ARCHITECTURAL SURFACES
 BUILDERS HARDWARE	 VEHICLE RADIATORS	 ELECTRICITY GENERATION	 ENERGY STORAGE	 AQUACULTURE & AGRICULTURE	 MEDICAL & HEALTHCARE

*Metallic copper is also inherently **antimicrobial***

# Copper's properties can be enhanced by combining with other elements to make alloys

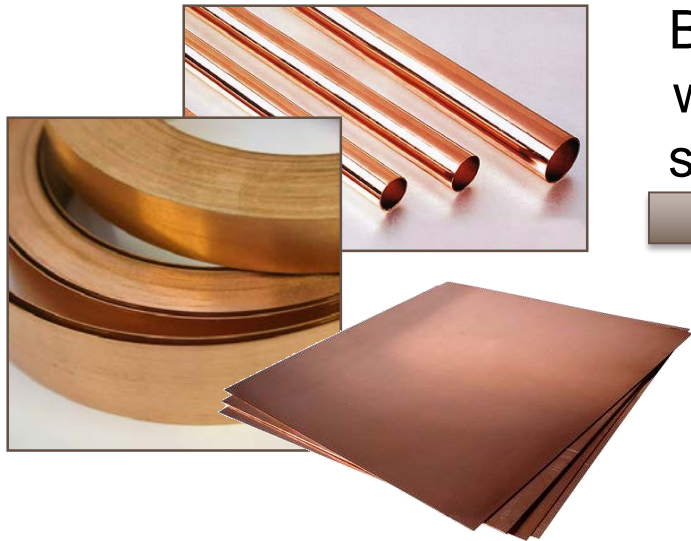


**Copper alloys are available in different colors and finishes**



# Copper alloys can be readily fabricated into many shapes and forms

Solid, copper-based metals



Bent, formed,  
welded, cast,  
stamped, etc.

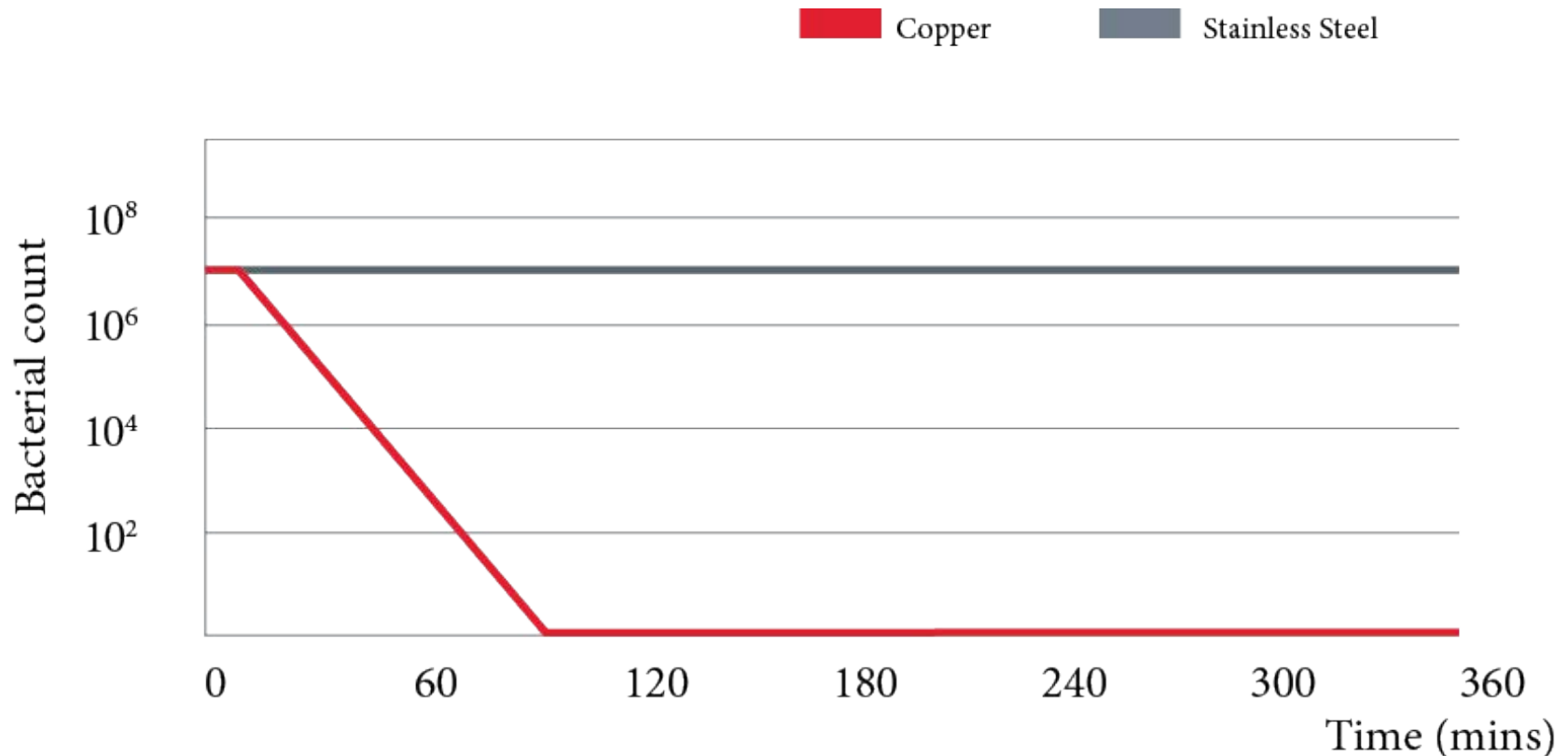


Durable surfaces



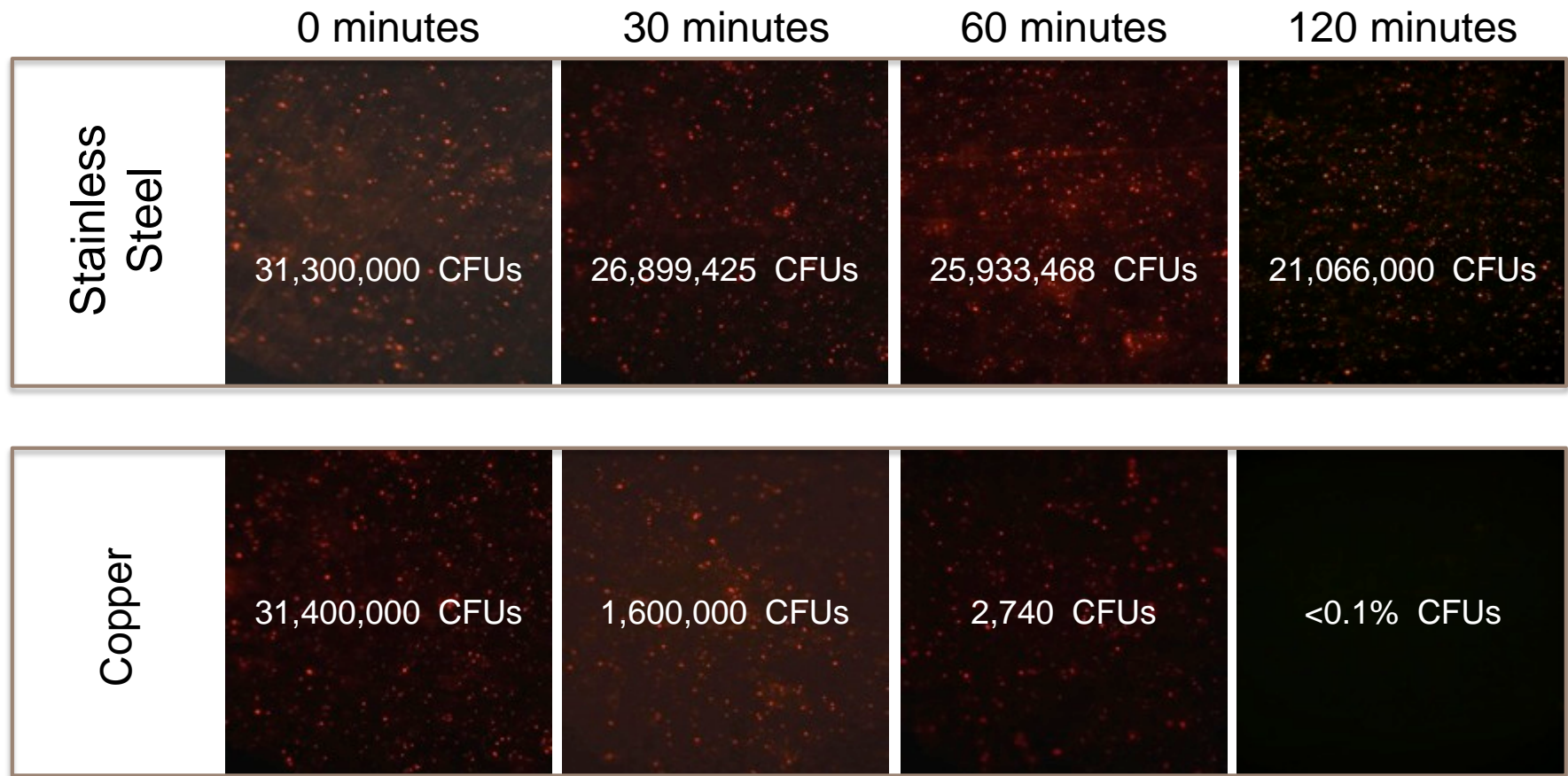
**Not a coating or surface treatment!**

# Copper alloy surfaces kill Methicillin-Resistant *Staphylococcus aureus* (MRSA)





# Time lapse of test as seen through microscope: *E. Coli* O157:H7 on stainless steel and copper surfaces



Epifluorescence Images after Staining with Viability Fluorophore CTC

# **Efficacy testing and EPA registration**



# Products that claim to kill bacteria are regulated by the US Environmental Protection Agency (EPA)

- Controls distribution, sale and use
- EPA classifies bacteria as “pests”
- All pesticides must be
  - Registered
  - Properly labeled
  - Present no harm to environment
  - Demonstrate efficacy



# **Three unique protocols were developed with EPA to test the efficacy of copper alloy surfaces**

## **1. Efficacy as a Sanitizer**

- Kills bacteria within two hours

## **2. Residual Self-Sanitizing Activity**

- Standard wear/cleaning will not reduce efficacy

## **3. Continuous Reduction of Bacterial Contaminants**

- Kill bacteria after repeated contaminations

# Six bacteria were tested on copper alloy surfaces using the three test protocols

*Staphylococcus aureus*

*Enterobacter aerogenes*

*Escherichia coli* O157:H7

*Pseudomonas aeruginosa*

Methicillin-Resistant *S. aureus* (MRSA)

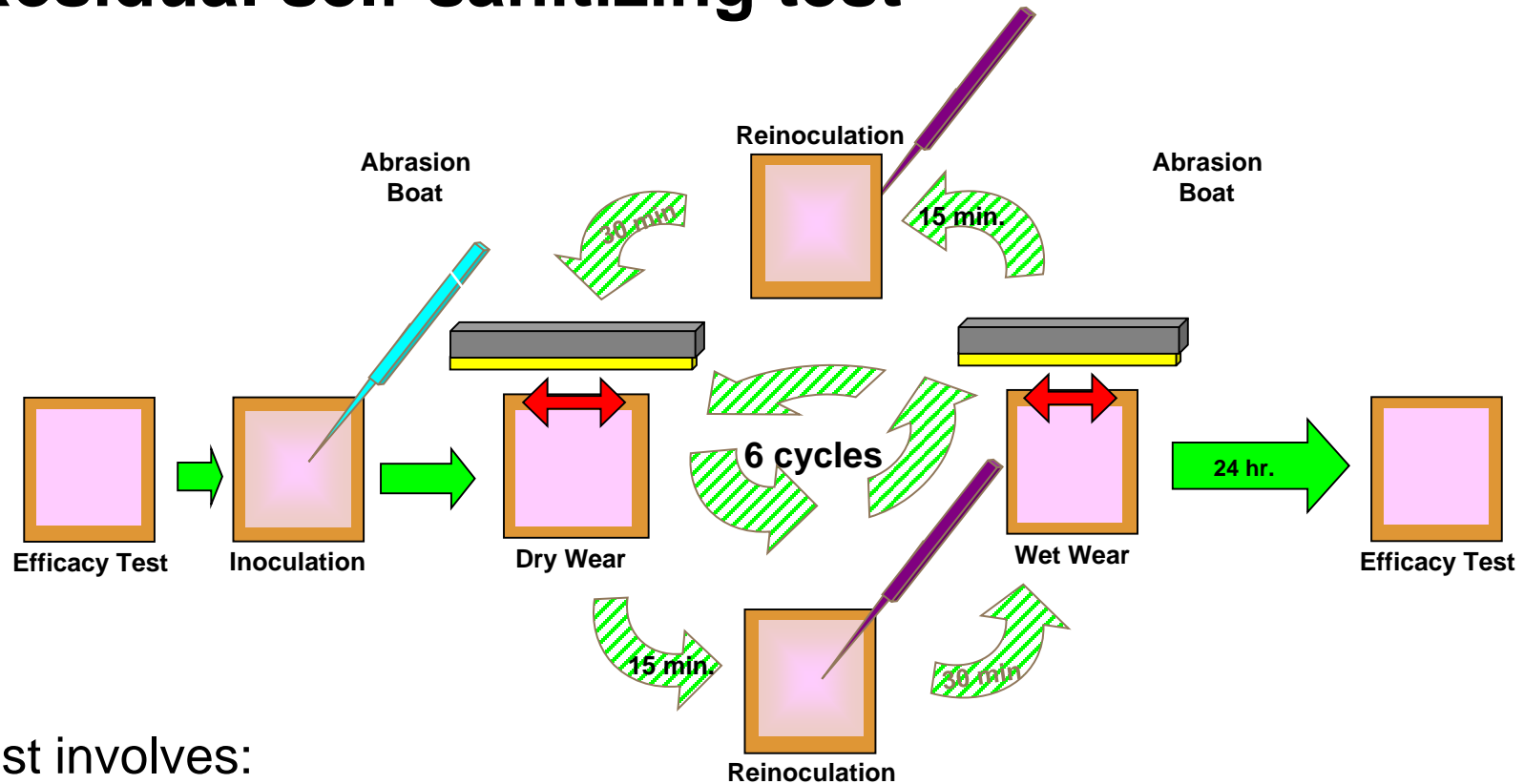
Vancomycin-Resistant *E. faecalis* (VRE)

# Six copper alloy 'families' were tested

- Representing nearly 500 copper alloy compositions down to 60% minimum copper content
- Tightly controlled industry standards ensure consistent performance across supply chain
- Lead, Arsenic, and Chromium levels below 0.09 weight %



# Residual self-sanitizing test

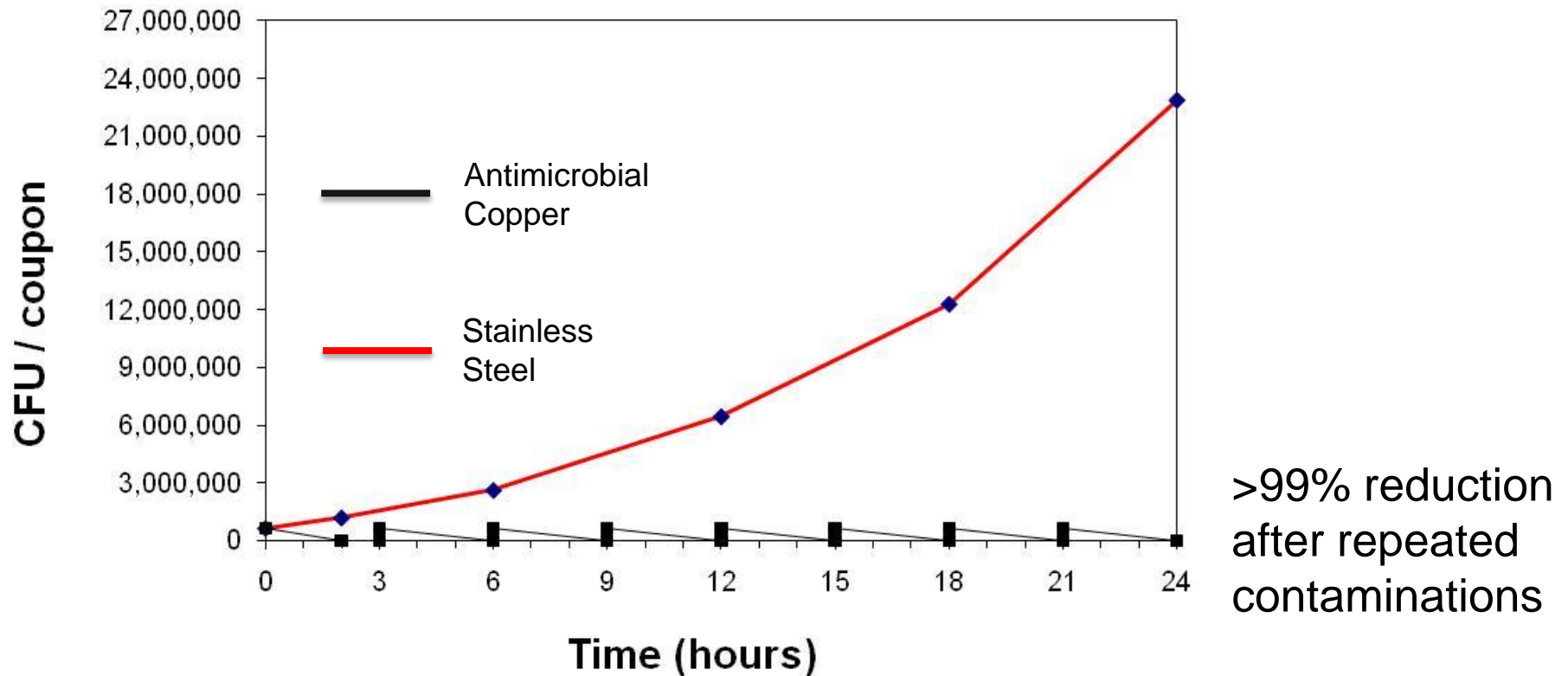


Test involves:

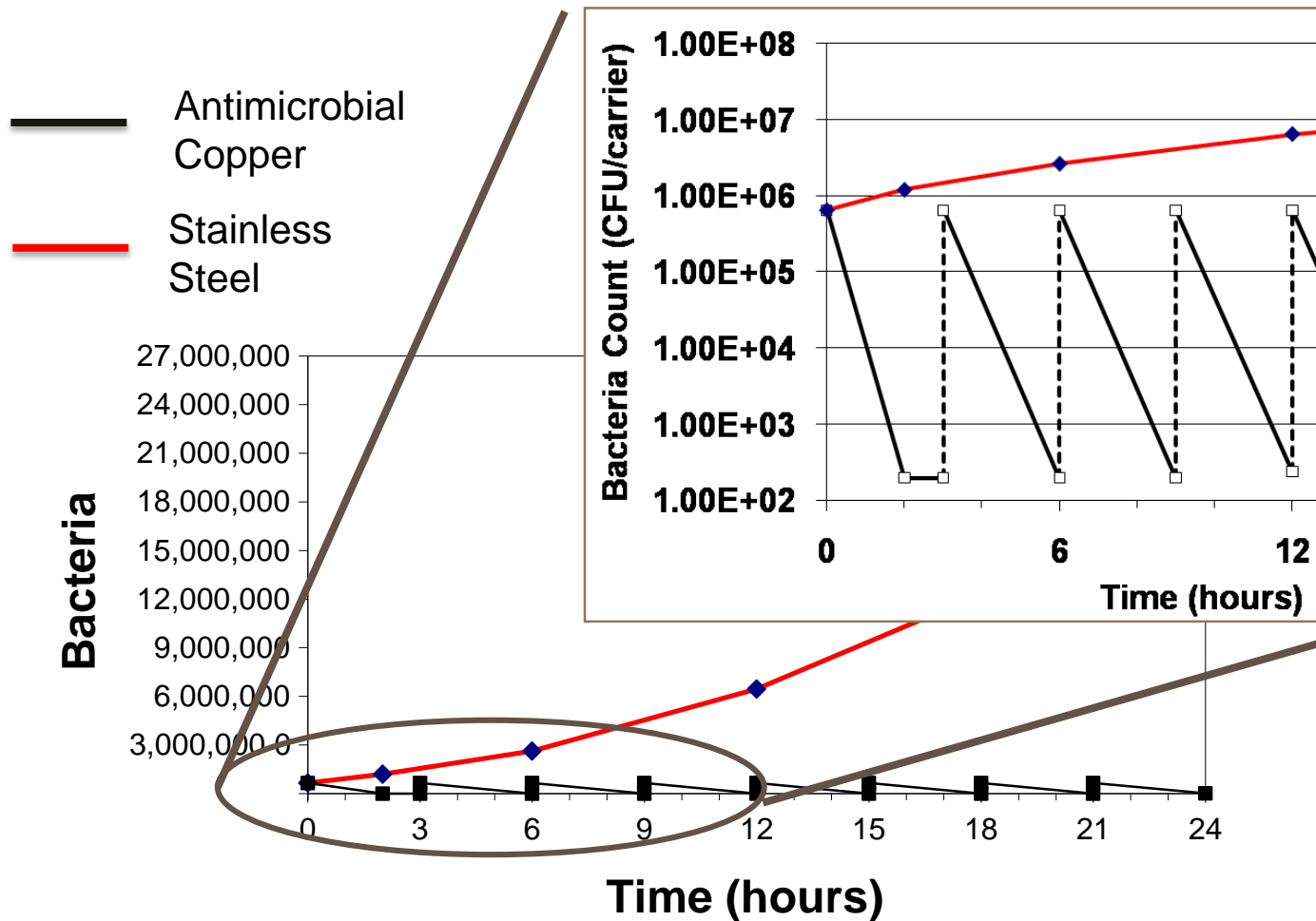
- 1) Initial reading after 120 min.
- 2) Twelve 'reinoculation and wear' cycles (using Abrasion Boat), and
- 3) Final reading after 24 hours

# Data from a continuous reduction test on copper and stainless steel challenged with MRSA:

8 inoculations over 24 hrs, no cleaning in between



# EPA testing: continuous reduction of MRSA



# EPA Testing Results: % Reduction Summary

Average Percent Reduction of Bacterial Contamination (GLP Studies)																	
	Group	Alloy	% Cu	<i>S. aureus</i>			<i>E. aerogenes</i>			MRSA		<i>P. aeruginosa</i>		<i>E. coli</i> O157:H7		VRE	
Efficacy as a Sanitizer	I	C110	99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9
	II	C510	94.8	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9
	III	C706	88.6	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9
	IV	C260	70.0	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9
	V	C752	65.0	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9
	VI	C280	60.0	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9
Residual Self-Sanitizing	I	C110	99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9
	II	C510	94.8	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9
	III	C706	88.6	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9
	IV	C260	70.0	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9
	V	C752	65.0	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9
	VI	C280	60.0	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9
Continuous Reduction of Bacterial Contaminants (Results at 24 Hr)	I	C110	99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9
	II	C510	94.8	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9
	III	C706	88.6	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9
	IV	C260	70.0	99.3	99.7	99.7	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	99.9
	V	C752	65.0	>99.9	99.6	99.6	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9	>99.9
	VI	C280	60.0	99.7	99.7	>99.9	>99.9	>99.9	>99.9	>99.9	99.8	>99.9	>99.9	>99.9 *	>99.9	>99.9	>99.8

- ALL tests on Antimicrobial Copper alloys showed >99% reduction
- 241 of the 252 tests showed >99.9% reduction



“[Antimicrobial Copper has] been **rigorously tested** and [has] demonstrated antimicrobial activity. After **consulting with independent organizations** – the Association for Professionals in Infection Control and Epidemiology (**APIC**) and the American Society for Healthcare Environmental Services (**ASHES**) – as well as a leading expert in the field (Dr. William A. Rutala, Ph.D., M.P.H.) the Agency has concluded that the use of **these products could provide a benefit as a supplement to existing infection control measures.**”

- *U.S. Environmental Protection Agency\**

# U.S. EPA public health registration for solid, copper alloys (Antimicrobial Copper)

- Groundbreaking registration
- Claims against 6 deadly bacteria
- First class of solid surfaces to obtain this form of registration
- Previously reserved for liquid and aerosol disinfectants



U.S. ENVIRONMENTAL PROTECTION  
AGENCY

Antimicrobials Division (7510C)  
1200 Pennsylvania Avenue NW  
Washington, D.C. 20460

NOTICE OF PESTICIDE:

☒ Registration  
☐ Reregistration

(under FIFRA, as amended)

EPA Reg. Number: 82012-2	Date of Issuance: 022908
Term of Issuance: Conditional	
Name of Pesticide Product: Antimicrobial Copper Alloys – Group II	

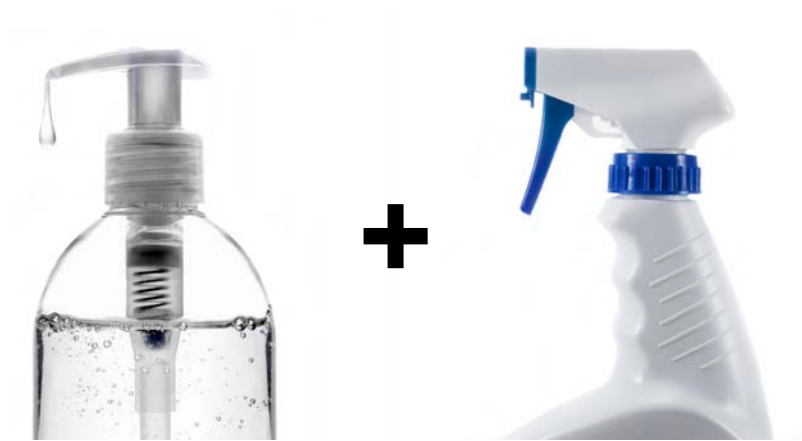
# Sample label claim and qualifiers for products made from Antimicrobial Copper

Laboratory testing shows that, when cleaned regularly:

- This surface continuously reduces bacterial\* contamination, achieving 99.9% reduction within two hours of exposure.

**\*Laboratory testing shows that, when cleaned regularly, antimicrobial copper surfaces kill greater than 99.9% of the following bacteria within 2 hours of exposure: MRSA, VRE, *Staphylococcus aureus*, *Enterobacter aerogenes*, *Pseudomonas aeruginosa*, and *E. coli* O157:H7. Antimicrobial copper surfaces are a supplement to and not a substitute for standard infection control practices and have been shown to reduce microbial contamination, but do not necessarily prevent cross contamination or infections; users must continue to follow all current infection control practices.**

# Infection control is a multifaceted challenge



***Antimicrobial copper surfaces must be seen as a supplement to, not a substitute for, standard infection control practices. One must continue to follow all current practices, including those practices related to cleaning and disinfection of environmental surfaces.***

# Proper use and care of antimicrobial copper surfaces

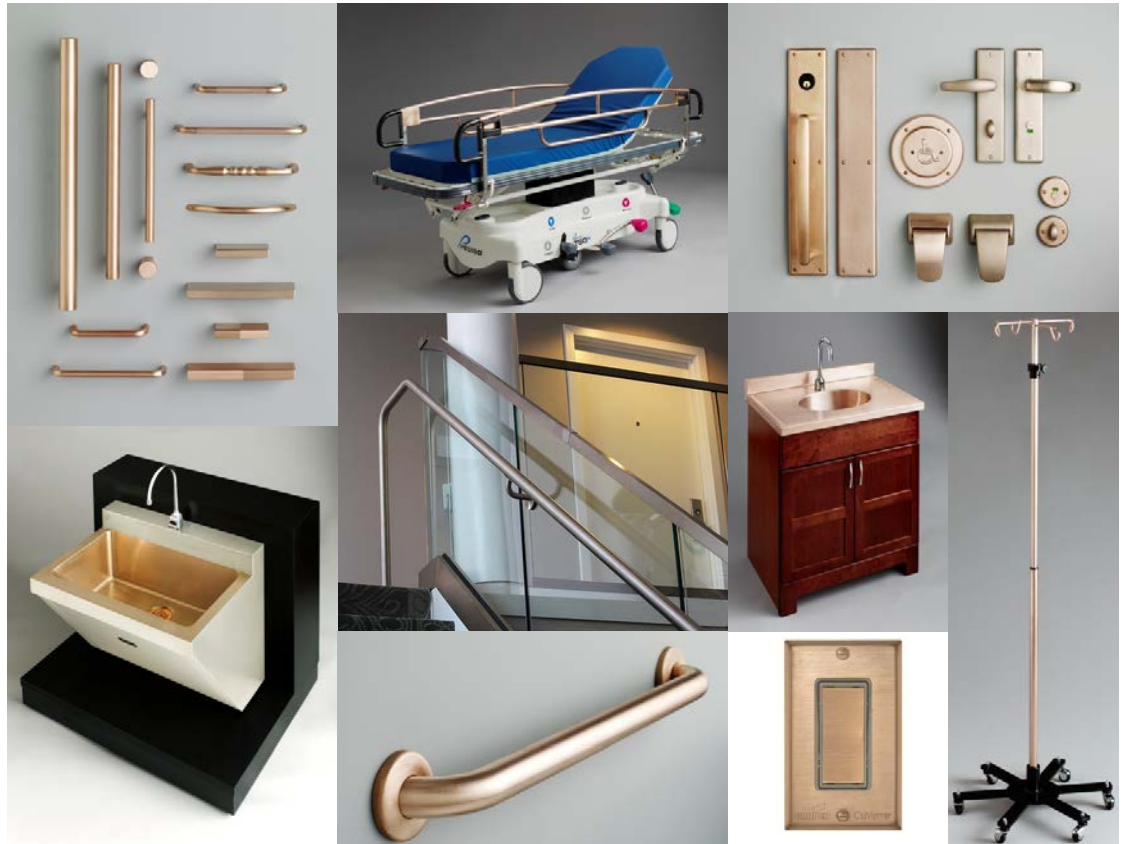


- Antimicrobial copper alloys must be cleaned regularly just as any other hard surface. Standard hospital cleaners are compatible with antimicrobial copper materials
- Antimicrobial Copper alloy surfaces must not be waxed, painted, lacquered, varnished, or otherwise coated. The alloys tarnish to varying degrees, which does not impair their antimicrobial efficacy.

# **Product Availability**

# Many commercial products are now available

- Diverse applications
  - Hardware
  - Healthcare
  - Fitness
  - Residential
- Design options
  - Color selection
  - Surface finish
  - Various forms



# **Use Case: Pullman Regional Hospital**



# Pullman Regional Hospital: Pullman, WA



- Critical Access Hospital
- 95,000 sq ft level IV trauma center
- 25 patient beds, 3 ORs
- 24-hour emergency care



# Pullman Hospital installed antimicrobial copper surfaces throughout their facility



Faucet Levers

# Pullman Hospital installed antimicrobial copper surfaces throughout their facility



Door access devices

# Pullman Hospital installed antimicrobial copper surfaces throughout their facility



## IV Pole Handles



# Pullman Hospital installed antimicrobial copper surfaces throughout their facility



## Cabinet Hardware

# Antimicrobial copper surfaces are easy to install and maintain



# Antimicrobial copper take away messages

- Surfaces that continuously kill bacteria between routine cleanings
- Efficacy does not diminish over time if properly maintained
- Rigorously tested and registered by US EPA
- Supplement to, not a substitute for cleaning and disinfection
- Must be cleaned regularly like other hard surfaces

# Building a more sustainable and safer planet

Antimicrobial copper products not only help combat pathogens, they can be recycled, again and again, without any loss of performance, helping to conserve our planet's resources.





# Thank you