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# Commercialization of Antimicrobial Copper

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**Copper Development Association, US**

**Medica**  
**Dusseldorf**

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Antimicrobial  
Copper



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# Agenda

- Overview of Copper and its Alloys
- Manufacturing Benefits of Copper Alloys
- Commercializing Antimicrobial Copper in the US
- Antimicrobial Copper Supply Chain: What's Next?

# Overview of Copper and its Alloys

# Copper: Naturally occurring element

1 <b>H</b> Hydrogen 1.00794																	2 <b>He</b> Helium 4.002602														
3 <b>Li</b> Lithium 6.941	4 <b>Be</b> Beryllium 9.012182																	5 <b>B</b> Boron 10.811	6 <b>C</b> Carbon 12.0107	7 <b>N</b> Nitrogen 14.0067	8 <b>O</b> Oxygen 15.9994	9 <b>F</b> Fluorine 18.9984032	10 <b>Ne</b> Neon 20.1797								
11 <b>Na</b> Sodium 22.98976928	12 <b>Mg</b> Magnesium 24.3050																	13 <b>Al</b> Aluminium 26.9815386	14 <b>Si</b> Silicon 28.0855	15 <b>P</b> Phosphorus 30.973762	16 <b>S</b> Sulfur 32.065	17 <b>Cl</b> Chlorine 35.453	18 <b>Ar</b> Argon 39.948								
19 <b>K</b> Potassium 39.0983	20 <b>Ca</b> Calcium 40.078	21 <b>Sc</b> Scandium 44.955912	22 <b>Ti</b> Titanium 47.867	23 <b>V</b> Vanadium 50.9415	24 <b>Cr</b> Chromium 51.9961	25 <b>Mn</b> Manganese 54.938045	26 <b>Fe</b> Iron 55.845	27 <b>Co</b> Cobalt 58.933195	28 <b>Ni</b> Nickel 58.6934	29 <b>Cu</b> Copper 63.546	30 <b>Zn</b> Zinc 65.38	31 <b>Ga</b> Gallium 69.723	32 <b>Ge</b> Germanium 72.64	33 <b>As</b> Arsenic 74.92160	34 <b>Se</b> Selenium 78.96	35 <b>Br</b> Bromine 79.904	36 <b>Kr</b> Krypton 83.798														
37 <b>Rb</b> Rubidium 85.4678	38 <b>Sr</b> Strontium 87.62	39 <b>Y</b> Yttrium 88.90585	40 <b>Zr</b> Zirconium 91.224	41 <b>Nb</b> Niobium 92.90638	42 <b>Mo</b> Molybdenum 95.96	43 <b>Tc</b> Technetium [98]	44 <b>Ru</b> Ruthenium 101.07	45 <b>Rh</b> Rhodium 102.90550	46 <b>Pd</b> Palladium 106.42	47 <b>Ag</b> Silver 107.8682	48 <b>Cd</b> Cadmium 112.411	49 <b>In</b> Indium 114.818	50 <b>Sn</b> Tin 118.710	51 <b>Sb</b> Antimony 121.760	52 <b>Te</b> Tellurium 127.60	53 <b>I</b> Iodine 126.90447	54 <b>Xe</b> Xenon 131.29														
55 <b>Cs</b> Cesium 132.9054519	56 <b>Ba</b> Barium 137.327	57 <b>La</b> Lanthanum 138.90547	72 <b>Hf</b> Hafnium 178.49	73 <b>Ta</b> Tantalum 180.94788	74 <b>W</b> Tungsten 183.84	75 <b>Re</b> Rhenium 186.207	76 <b>Os</b> Osmium 190.23	77 <b>Ir</b> Iridium 192.22	78 <b>Pt</b> Platinum 195.084	79 <b>Au</b> Gold 196.966569	80 <b>Hg</b> Mercury 200.59	81 <b>Tl</b> Thallium 204.3833	82 <b>Pb</b> Lead 207.2	83 <b>Bi</b> Bismuth 208.98040	84 <b>Po</b> Polonium [209]	85 <b>At</b> Astatine [210]	86 <b>Rn</b> Radon [222]														
87 <b>Fr</b> Francium [223]	88 <b>Ra</b> Radium [226]	89 <b>Ac</b> Actinium [227]	104 <b>Rf</b> Rutherfordium [267]	105 <b>Db</b> Dubnium [268]	106 <b>Sg</b> Seaborgium [271]	107 <b>Bh</b> Bohrium [272]	108 <b>Hs</b> Hassium [270]	109 <b>Mt</b> Meitnerium [276]	110 <b>Ds</b> Darmstadtium [281]	111 <b>Rg</b> Roentgenium [280]	112	113	114	115	116	117	118														
																		58 <b>Ce</b> Cerium 140.116	59 <b>Pr</b> Praseodymium 140.90765(2)	60 <b>Nd</b> Neodymium 144.242	61 <b>Pm</b> Promethium [145]	62 <b>Sm</b> Samarium 150.36	63 <b>Eu</b> Europium 151.964	64 <b>Gd</b> Gadolinium 157.25	65 <b>Tb</b> Terbium 158.92535	66 <b>Dy</b> Dysprosium 162.500	67 <b>Ho</b> Holmium 164.93032	68 <b>Er</b> Erbium 167.259	69 <b>Tm</b> Thulium 168.93421	70 <b>Yb</b> Ytterbium 173.054	71 <b>Lu</b> Lutetium 174.9668
																		90 <b>Th</b> Thorium 232.03806	91 <b>Pa</b> Protactinium 231.03588(2)	92 <b>U</b> Uranium 238.02891	93 <b>Np</b> Neptunium [237]	94 <b>Pu</b> Plutonium [244]	95 <b>Am</b> Americium [243]	96 <b>Cm</b> Curium [247]	97 <b>Bk</b> Berkelium [247]	98 <b>Cf</b> Californium [251]	99 <b>Es</b> Einsteinium [252]	100 <b>Fm</b> Fermium [257]	101 <b>Md</b> Mendelevium [258]	102 <b>No</b> Nobelium [259]	103 <b>Lr</b> Lawrencium [262]

Atomic Number — 29  
 Element Symbol — **Cu**  
 Element's Name — Copper  
 Atomic Weight — 63.546

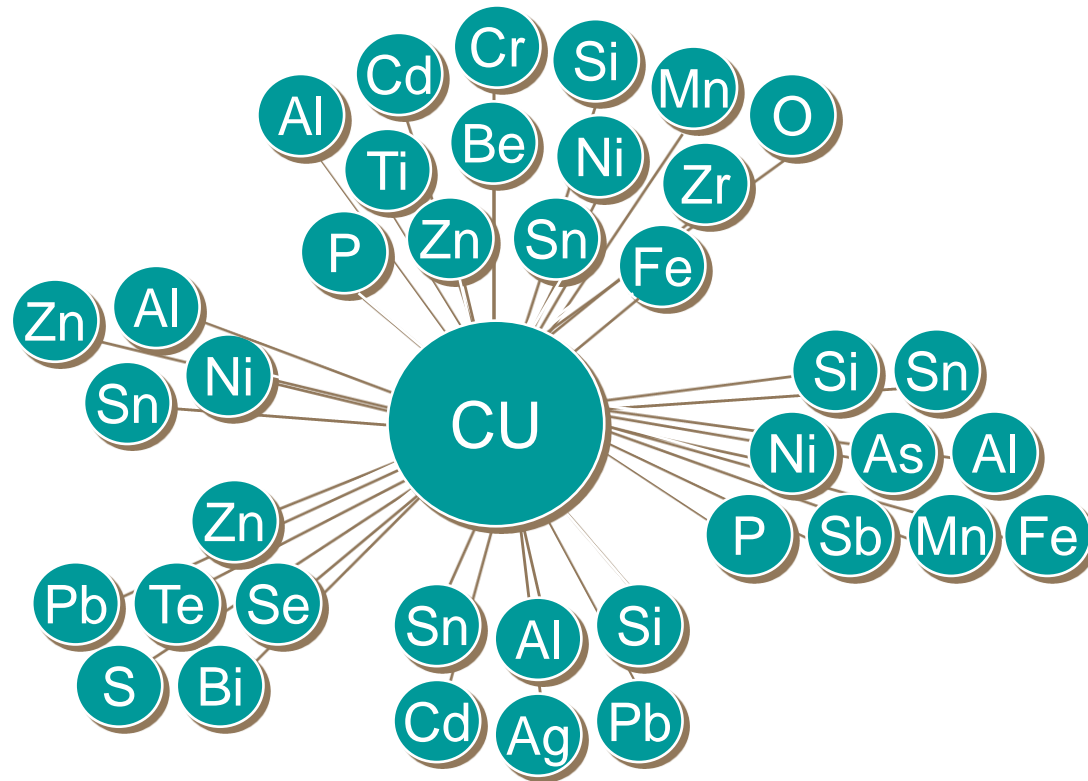
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# Copper: Basic material properties

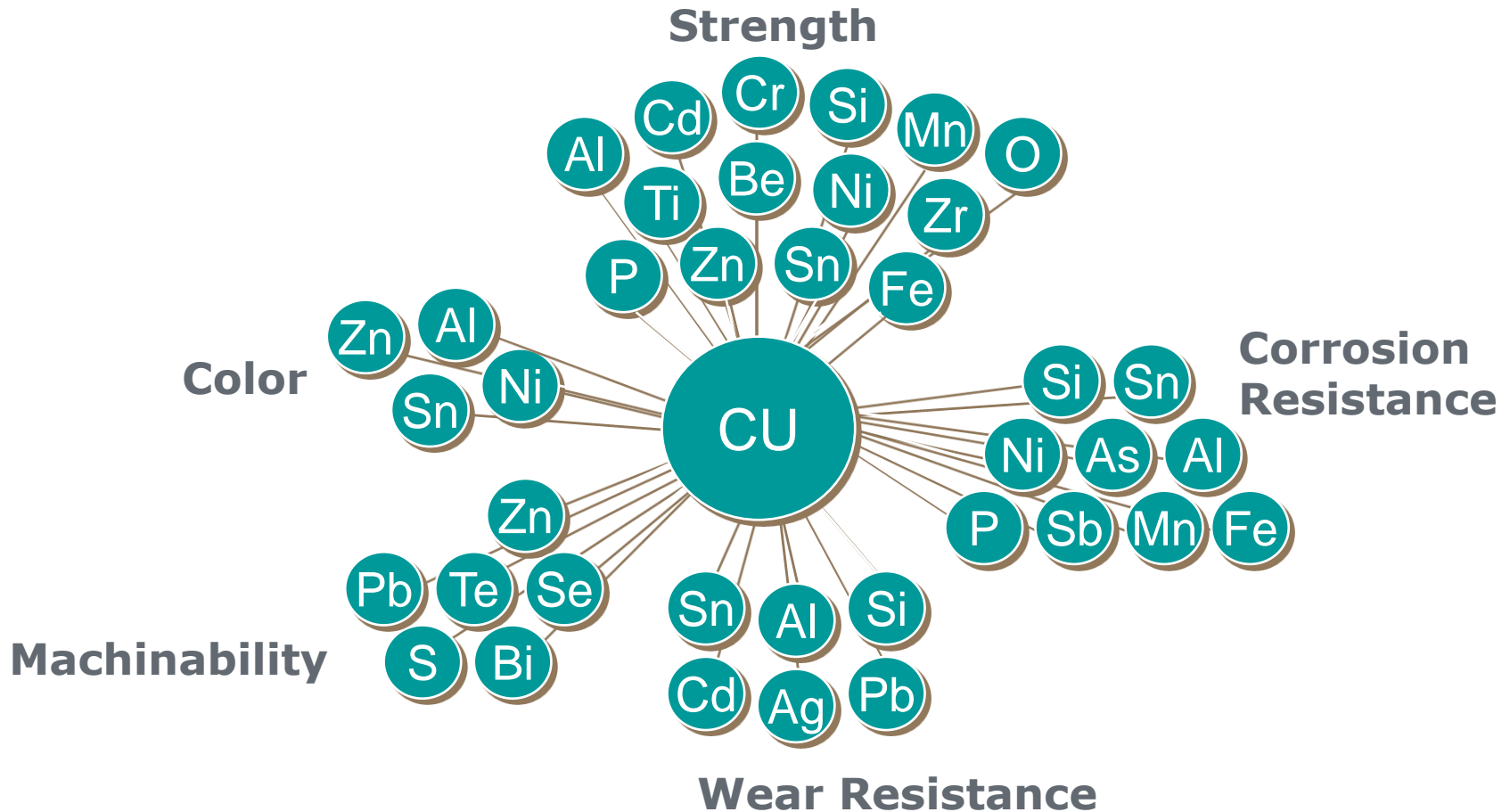
- Ductile
- Malleable
- High thermal Conductivity
- High electrical Conductivity
- Easily alloyed
- Good corrosion resistance
- Readily available
- Highly recyclable
- Antifouling
- **Antimicrobial**



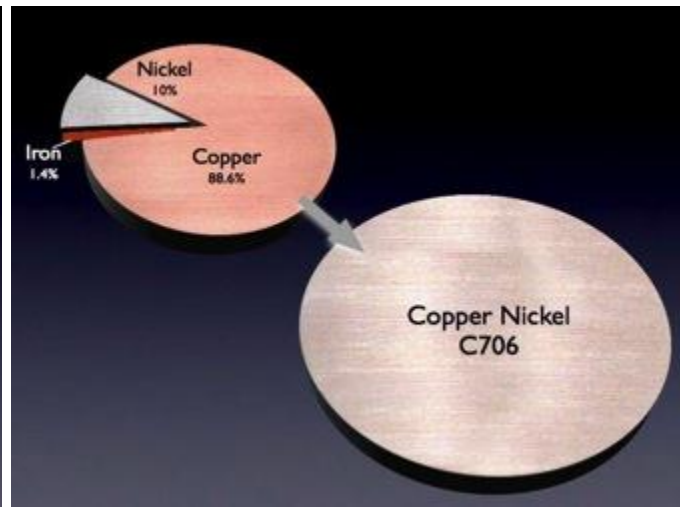
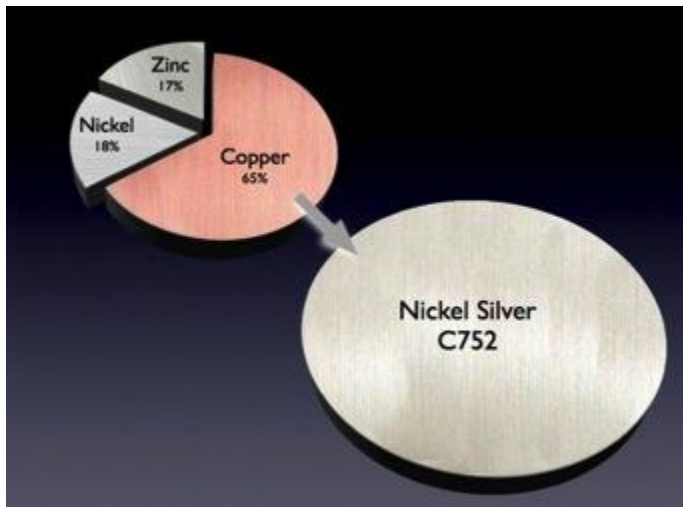
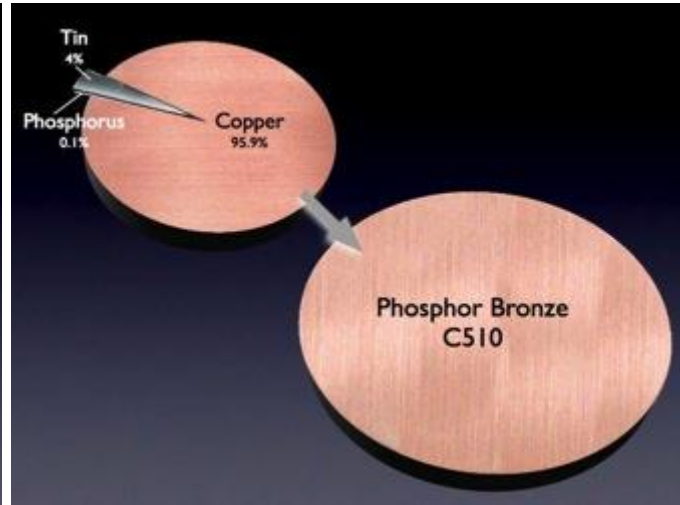
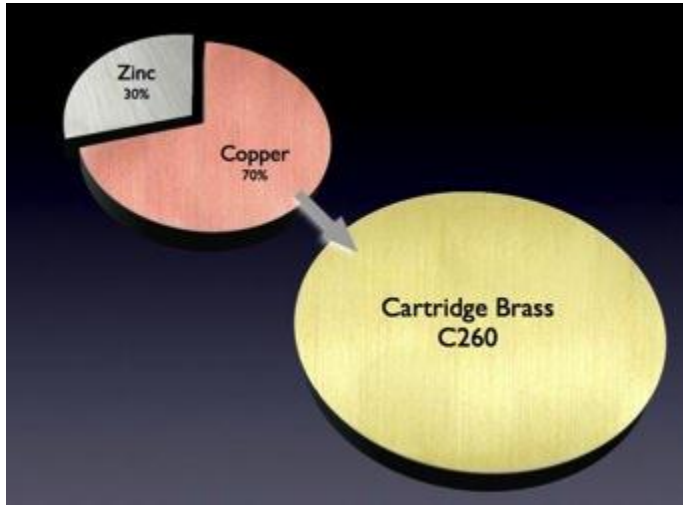
# Copper can be easily combined with many other elements to form alloys



# Over 500 commercially available copper alloys provide an unmatched combination of properties



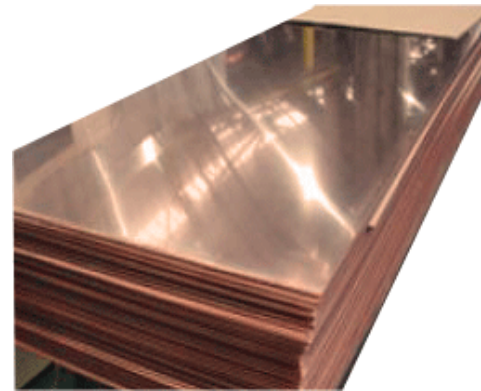
# Example alloys





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# Copper alloys are readily available in a wide variety of shapes and semi-fabricated forms



# Manufacturing Benefits of Copper Alloys

# Ease of Fabrication: Copper alloys are malleable, highly machinable, readily joined...



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# Excellent combinations of strength, ductility, and corrosion resistance



# 100% recyclable

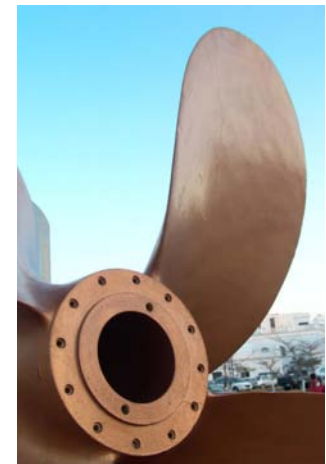
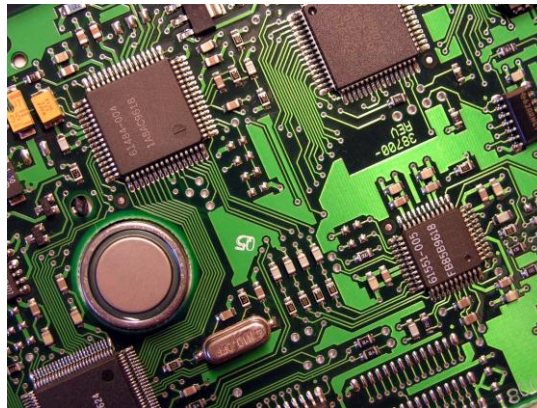
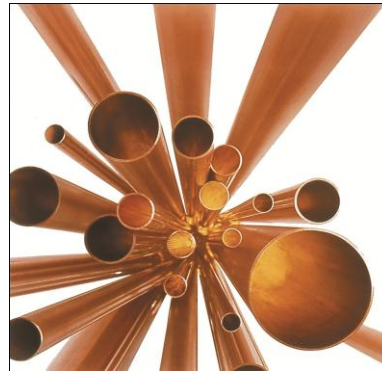
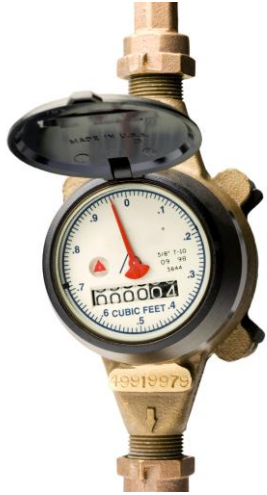


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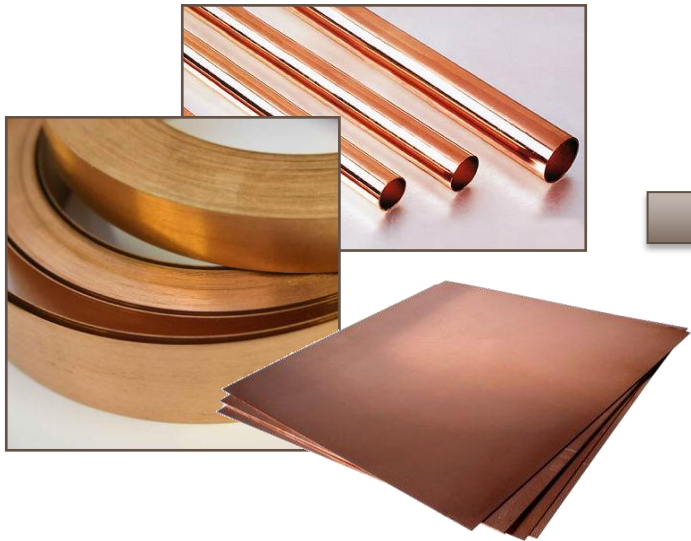
# Many tarnish resistant alloy options available



# Copper alloys are the third most important group of commercial metals behind iron/steel and aluminum



**“Antimicrobial Copper” designates copper alloys used for touch surface applications to kill human pathogens**



**Minimum 60% copper content**

**No additional processing or special treatment required**



# Commercializing Antimicrobial Copper in the US

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**Challenge: Manufacturing benefits of copper alloys were well understood, but not for touch surface applications**



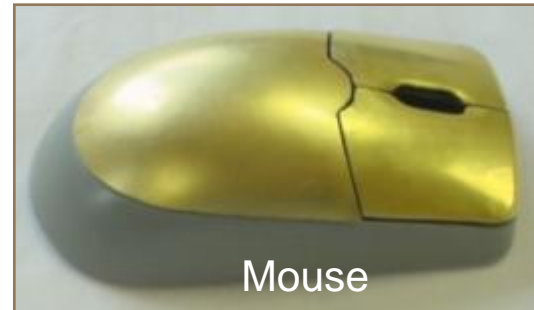
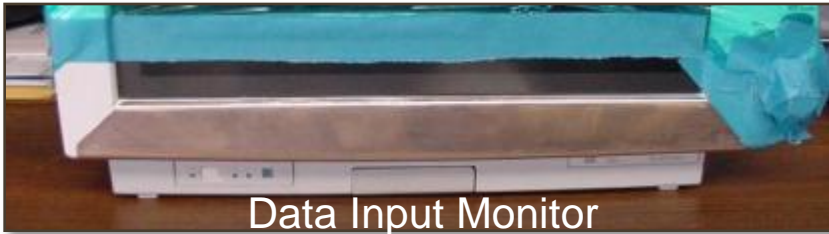
***Stainless steel, plastic, wood are the standard materials, but they do not kill pathogens***

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## Supply Chain: Initial barriers

- No commercial products available
- Manufacturers unfamiliar with copper alloys
- Unusual geometries and applications for metals
- High raw material cost compared to stainless steel
- Short and long term aesthetic concerns

# US Clinical Trials Products, 2008: Prototypes



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# Growing awareness stimulated supply chain activity

- US clinical trials engaged several manufacturers
- Increased media attention on HAIs increased awareness
- Copper industry awareness campaign fueled interest
- Manufacturers began experimenting with copper alloys
- Material suppliers helped address manufacturing concerns

# Copper alloy components can cost less to manufacture

## Barbed hose fitting case study

	 Stainless Steel	 Brass
Rod Cost	2 €/kg	8 €/kg
Value of Scrap	0.5 €/kg	7.0 €/kg
Time	T x 5	T
Component Cost	<u>6.90 €</u>	<u>1.47 €</u>

- Additional benefit: longer tool life with Brass

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# Manufacturing and health benefits addressed cost concerns

- Material cost is a small percentage of total manufacturing cost
- Copper alloys have higher manufacturing efficiency compared to many other materials
- Copper alloy products can command a premium for health benefits
- Antimicrobial Copper is the only alloy system with a US EPA public health registration



# Manufacturers progressed through the copper alloy learning curve

- Bending
- Welding
- Stamping
- Deep-drawing
- Casting
- Forging
- Finishing





# Ronald McDonald House demonstration project accelerated commercialization

- Significant orders enticed manufacturers to scale up operations
- Industry funding supported manufacturers' investments
- Media attention helped manufacturers realize market potential



# Ronald McDonald House Components: Before Antimicrobial Copper retrofit



**Locksets**



**Sinks & Faucets**



**Tables**



**Cabinet Pulls**



**Visitor Chairs**



**Stair Railings**

# Ronald McDonald House Components: After Antimicrobial Copper retrofit



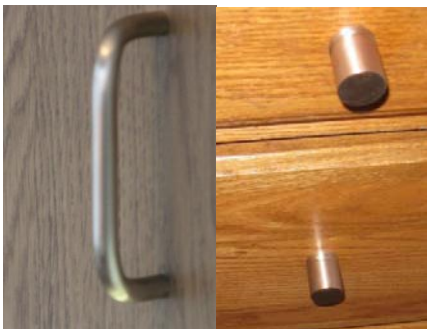
**Locksets**



**Sinks & Faucets**



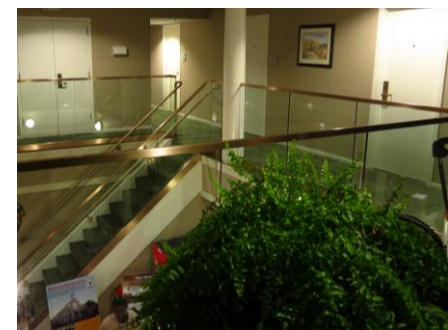
**Tables**



**Cabinet Pulls**

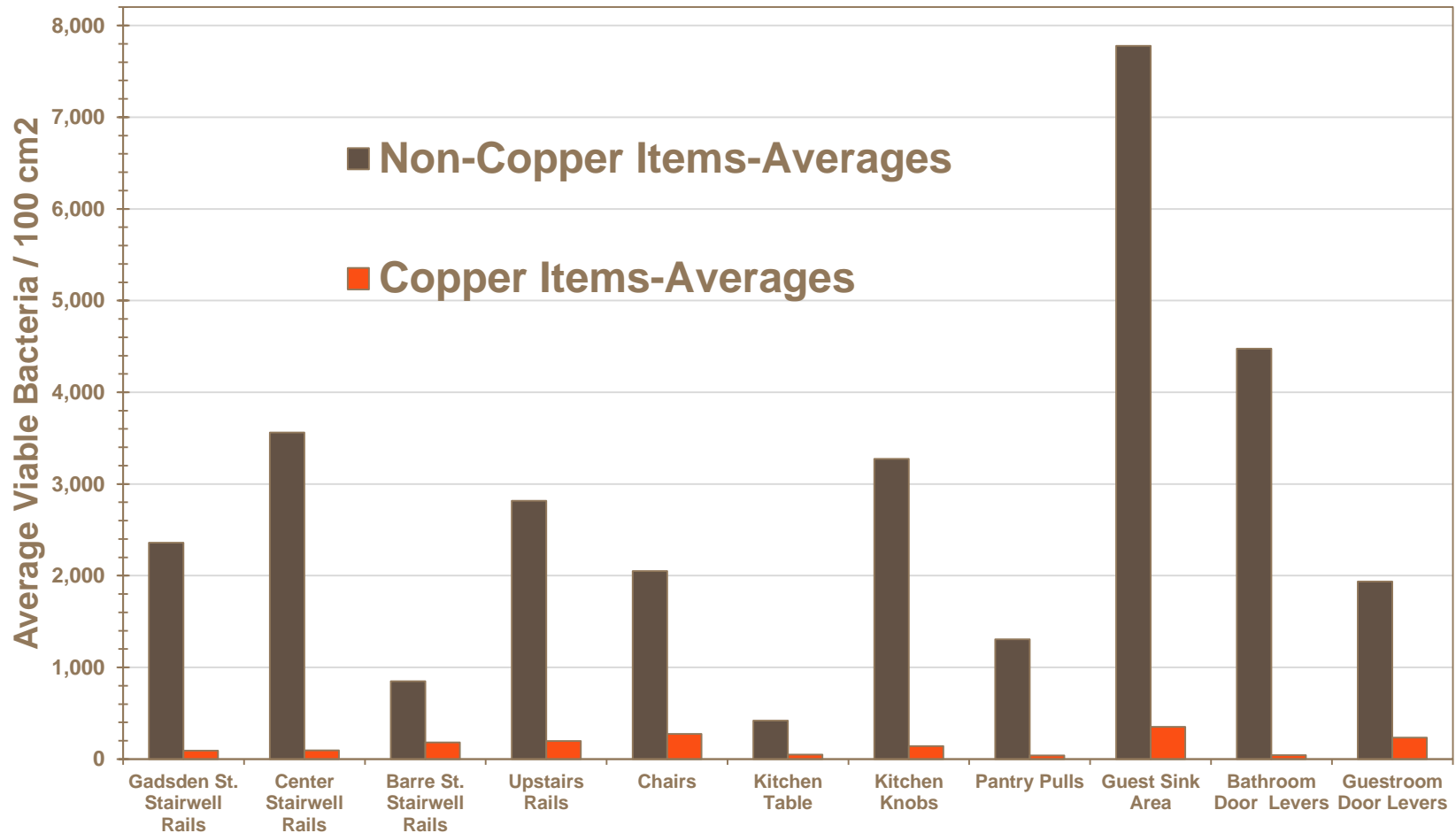


**Visitor Chairs**



**Stair Railings**

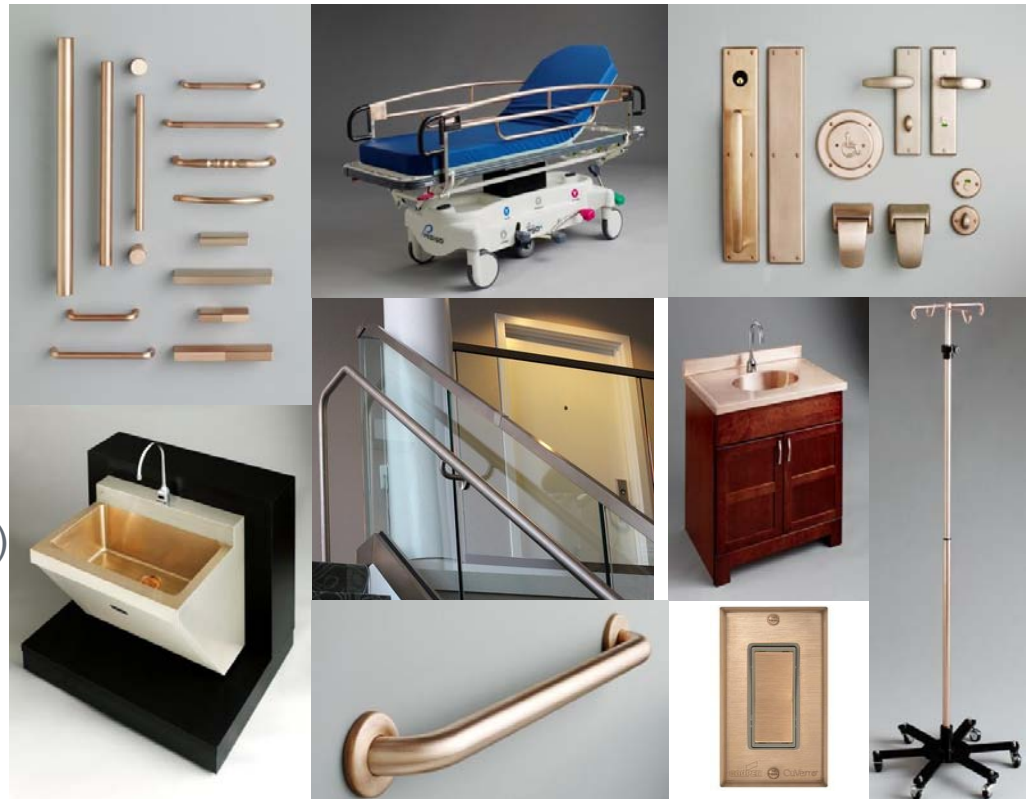
# Ronald McDonald House data validated efficacy



# Growing demand supported commercialization

15 US Manufacturers launched commercial Antimicrobial Copper products in the US market to date

- A.T. Cross
- Black Iron Strength
- Colonial Bronze
- Cooper Industries
- Denise Siegel Bronze
- Elkay Commercial Products
- Frigo Design
- Just Manufacturing
- Larco
- Midbrook Medical
- NuAire
- Operator Interface Technology (OIT)
- Pedigo Products
- R.B. Wagner
- Rocky Mountain Hardware
- More close to launch



# Downstream marketing increased exposure

## Component makers launched sophisticated marketing campaigns

**ELKAV**  
commercial products

**CuVerro® Antimicrobial Copper**

Discover the professional's choice!

- Registered EPA Health Claim\*\* - kills more than 99.9% of bacteria\*\* within 2 hours
- Supplements routine cleaning and sanitizing
- Aesthetically pleasing soft rose color

**ROCKY MOUNTAIN**

**PURE**  
Nature's Gift of Antimicrobial Copper Alloys

CuVerro® Antimicrobial Copper

**Fixtures, Sinks and Hand Wash Stations**  
Antimicrobial copper surfaces help reduce microbes on contact and help to bring you to enhanced healthy environments.  
Produced from CuVerro® Healthy Copper Sinks

**Antimicrobial Defense**  
Copper is a naturally occurring antimicrobial element that kills bacteria, viruses and fungi. It also acts as a natural disinfectant, reducing the spread of germs and preventing the growth of mold and mildew. Copper's antimicrobial properties are unique and last for years, making it an ideal choice for fixtures and hand wash stations in hospitals, schools and other public buildings.

**The Mission**  
We have a mission to provide the most advanced antimicrobial copper surfaces to the world. We are committed to providing you with the most advanced antimicrobial copper surfaces available. Our products are made from the highest quality copper and are finished with a soft rose color that is both aesthetically pleasing and durable. Our products are also certified to meet the most stringent antimicrobial standards in the world.

**Key Products**

- Hospital Rooms
- Public Restrooms
- Fitness Centers
- School Restrooms
- Food Service

JUST...the copper-nickel spec for spec series sinks

**CuVerro®**

**NEW PRODUCT! AUTOMATIC DOOR PRODUCTS (LATCH) W/ HEALTH SWITCH**

**Coppershield™ Wall Switches**

In the battle against harmful bacteria, these switches for the well-being of people in hospitals, schools and other buildings can welcome new ally copper. The U.S. Environmental Protection Agency (EPA) registered this specific alloy of copper as antimicrobial material that kills surface bacteria\*

Larco's Coppershield™ push plates are made from a copper material certified by the U.S. Environmental Protection Agency (EPA) to kill more than 99% of bacteria, including MRSA, within two hours. Surfaces have been shown to reduce microbial contamination\*\*, but they do not necessarily prevent cross-contamination\*\*\*. The material helps inhibit buildup and growth of bacteria between routine cleaning and sanitizing steps, and it continues to kill 99% of bacteria even after repeated contamination.

**Features and Benefits**

- Kills more than 99% of bacteria, including MRSA, within two hours.
- CuVerro® antimicrobial copper alloy used for Larco's Coppershield™ is being also recognized by the EPA as antimicrobial.
- CuVerro® antimicrobial alloy is comprised of pure copper and post-consumer recycled materials and are works applicable.

**Larco**  
AN IRVING-CLOUD PRODUCT

**ARROW HART Healthcare Product Solutions**

**ARROW/HART Featuring CuVerro**

**What is CuVerro®?**  
CuVerro is a pure form of high surface natural ingested beneficial for areas where bacteria is a concern.

- Kills over 99.9% of bacteria, including MRSA, within 2 hours
- Registered by the U.S. Environmental Protection Agency (EPA) as a surface that antimicrobial kills bacteria\* within 2 hours
- 100% responsible dirt
- Proven medical grade appearance that is instant cleaning
- Proven to kill bacteria health
- Continuously kills bacteria between touches and regular cleaning

**CuVerro® Antimicrobial Copper Surfaces**

**Antimicrobial**  
**Environmental**  
**Safe**

**Benefits with CuVerro® Antimicrobial Copper**

- Kills more than 99.9% of bacteria, including MRSA, within 2 hours
- Registered by the U.S. Environmental Protection Agency (EPA) as a surface that antimicrobial kills bacteria\* within 2 hours
- 100% responsible dirt
- Proven medical grade appearance that is instant cleaning
- Proven to kill bacteria health
- Continuously kills bacteria between touches and regular cleaning

**Substrate**

Arrow Hart's products made with CuVerro® antimicrobial copper surfaces are designed to help you reduce bacteria on contact and help you reduce bacteria on contact and help you reduce bacteria on contact.

**PEDIGO**

**P-1083-6**

**Features**

- Accommodates up to six infusion pumps
- Dual Flow Pressure Device allows for controlled decant of pods
- Additional height from 59" to 124" height in 6" increments
- Heavy duty 3" coated casters

**Accessories**

- P-253 Stainless Cart
- P-261 Stainless Stand
- P-262 Stainless Stand
- P-1083-6
- P-1083-6

**CuVerro® Wallplates & Switches**  
The new Arrow Hart™ line that features EPA registered CuVerro Antimicrobial Copper Surfaces

**LEARN MORE**

**ONLY COPPER...**

Antimicrobial Copper is the only solid surface material registered by the U.S. EPA to continuously kill bacteria\* and pose a threat to human health. No other solid surface has this kind of registration.

In order to receive this registration, the three EPA approved Good Laboratory Practice (GLP) test protocols used to register Antimicrobial Copper with public health claims are:

1. Efficacy as a sanitizer - which measures viable bacteria count after two hours
2. Residual self-sanitizing activity - which measures antimicrobial on daily before and after 5 wet and dry wear cycles in a standard wear sequence which mimics cleaning
3. Continuous reduction of bacterial contaminants - which measures bacteria after incubating on a flat surface for 24 hours in 24-hour periods without intermediate cleaning or wiping

Laboratory testing has shown that when cleaned regularly copper alloys continuously reduce bacterial contamination, achieving 99.9% reduction within two hours of exposure.

\*Using immunofluorescence and confocal microscopy.

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**Colonial Bronze Company**  
FINE BRASS HARDWARE SINCE 1921

**WE HANDLE WHAT YOU CAN SEE**

**OUR HARDWARE WITH ANTIMICROBIAL COPPER HANDLES WHAT YOU CAN'T**

**CABINET AND ARCHITECTURAL HARDWARE MADE WITH ANTIMICROBIAL COPPER FOR HEALTHCARE AND INSTITUTIONAL USE**

Our hardware has been certified by Scientific Diffusion, Inc. to contain 99.9% antimicrobial copper, an EPA registered material.

Colonial Bronze is an EPA approved facility for the production of products from CuVerro® antimicrobial copper, an EPA registered material.

Our EPA establishment number is 087753-CF-001.

**The Colonial Bronze Company**  
PO Box 207, 3711 Winstead Road  
Fort Lauderdale, Connecticut 07424  
Phone: 800-484-9233  
Fax: 860-682-3765  
www.colonialbronze.com

**Finishes for Life**

**CuSatus™**

# Antimicrobial Copper Supply Chain: What's Next?

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# Published US clinical trial results are supporting the business case

- **1<sup>st</sup>** study to show surfaces can reduce infections
- **7%** of hospital room surface area converted to copper
- **83%** less bacteria on copper surfaces
- **50%** of infections or more caused by environment
- **58%** fewer infections in copper rooms



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# Publicized installations around the world are driving demand

- Roberto del Rio Pediatric Hospital / Santiago, Chile
- Aghia Sofia Children's Hospital / Greece
- Bueras Metro Station / Santiago, Chile
- Centre Inter Générationnel Multi Accueil / France
- Craigavon Area Hospital / Northern Ireland
- Sheffield Teaching Hospitals NHS Trust / United Kingdom
- Lewis County Hospital / Lowville, NY
- Jason's Deli / 10 US locations and counting
- Congonhas International Airport / Sao Paulo, Brazil
- Cancer Treatment Centers for America / Atlanta, GA, Phoenix, AZ

***And Many More...***

# The portfolio of commercially available Antimicrobial Copper products is growing daily...



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# Thank you

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Antimicrobial  
Copper

