



## **Questions and Answers on Antimicrobial Copper**

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### **What is meant by “antimicrobial?”**

“Antimicrobial” is the ability of a substance to kill or inactivate microbes, such as bacteria, fungi (including moulds), and viruses.

### **Is it just pure copper that has an antimicrobial effect?**

No, copper alloys do too. Tests have been performed on pure copper, high coppers, brasses, bronzes, copper-nickels and copper-nickel-zincs. The latter are sometimes referred to as nickel silvers because of their shiny white color, even though they contain no silver. Alloys with higher copper content kill organisms faster.

### **Has any official body endorsed copper’s antimicrobial efficacy?**

Yes. On February 29, 2008, the US Environmental Protection Agency (EPA) registered 275 copper alloys with public health claims.

### **Has copper been tested in clinical trials?**

Yes, clinical trials are currently under way at hospitals around the world where the impact of copper touch surfaces on the amount of microbes in the hospital environment is being assessed. In the UK, Selly Oak Hospital, Birmingham, part of University Hospitals Birmingham NHS Trust, was selected to be the test centre for this new approach to infection prevention. The first results from the trial showed conclusively that copper is antimicrobial in a real ward situation and that copper-containing surfaces had 90-100% less bacterial contamination than controls made from conventional materials. Other trials are under way in Germany, Chile, Japan, and the US.

### **How is copper currently used as an antimicrobial agent?**

Copper is already an active ingredient in many different types of antimicrobial products, in agriculture, in marine environments, in healthcare environments and in the home. Copper is an active ingredient in antiplaque mouthwashes, toothpastes and medicines. Copper sink strainers and scourers for pots and pans can help prevent cross-contamination in the kitchen.

### **How can copper help prevent the spread of infection?**

Pathogens can remain alive and infectious on surfaces for hours, days even months, providing a reservoir of infection which can be transferred by touch. Pathogens simply cannot survive on copper surfaces. Copper can break the chain of infection act as a supplement to regular cleaning to improve hygiene.

### **Where can antimicrobial copper be further used?**

Antimicrobial copper alloys can be used for frequently touched surfaces in hospitals care homes, schools, gyms, public transport and public buildings

### **By what means does copper kill pathogens?**

Scientific studies are ongoing but it appears that for viral inactivation, the interaction of copper with proteins is the main pathway. Viral inactivation was found to be mediated by oxidative damage to

proteinaceous components of the viral phage through site-specific oxidative damage by the protein-bound copper rather than through copper binding to nucleic acids. Sometimes, copper can also inhibit a certain protein which is vital for the survival of a virus. For example, HIV-1 protease, which is essential for the replication of the HIV virus, is inhibited by copper. Copper binds to this protein irreversibly, and leads to complete inactivation of the enzyme .

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. They include:

- Cause leakage of potassium or glutamate through the outer membrane of bacteria
- Disturb osmotic balance
- Bind to proteins that do not require copper
- Cause oxidative stress by generating hydrogen peroxide

### **If copper inactivates microbes, is it safe?**

Yes, copper, brass and bronze surfaces are safe and long lasting. In fact, copper is an essential micronutrient in the human diet, along with zinc and iron. Adults need 1mg of copper per day to maintain good health and daily copper intakes between 1 and 11mg are safe for humans. Foods rich in copper include chocolate, nuts and seeds. A balanced diet should provide enough copper to avoid a copper deficiency.