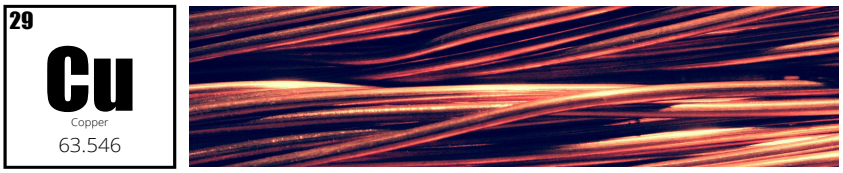
CASE STUDY

Copper as a new “super weapon” against virus?



Copper is a metal that kills germs on contact. Its antimicrobial effect has long been recognized. Currently it is far from being used extensively, however, the current coronavirus pandemic may well put it back into the limelight.

Copper, as well as its alloys (brasses, bronzes, cupronickel, copper-nickel-zinc, etc.) are known for being natural antimicrobial materials.
It turns out that people have known about the disinfectant powers of copper long before knowing about germs, viruses, bacteria, and microbes!

The first recorded medical use of copper is from one of the oldest-known books, the Smith Papyrus, written between 2600 and 2200 B.C. It said that copper was used to sterilize chest wounds and drinking water: Egyptian and Babylonian soldiers would sharpen their bronze swords (an alloy of copper and tin) after a battle, and place the filings in their wounds to reduce infection and speed healing. As far back as 1,600 B.C., the Chinese used copper coins as medication to treat heart and stomach pain as well as bladder diseases.
Copper was also used to cure medical problems in ancient India and still is an important component in Ayurveda medicine today.
In addition to several copper medicinal preparations, it was also observed centuries ago by women, that their children were less likely to get diarrhea when they drank water from copper vessels or if it was transported in copper conveyance systems. They passed on this knowledge to subsequent generations.
Later, in the 19th century, Copper workers in Paris were protected from cholera epidemics and French wineries even applied copper sulphate and slaked lime, called “Bordeaux mixture”, to vines to prevent fungal attack.

So, what makes copper antimicrobial?

Copper exhibits impressive antibacterial, antiviral and anti-fungal properties.
It can kill viruses and other germs by disrupting the protective layers of the organisms and interfering with its vital processes: when microbes land on a copper surface, ions (electrically charged particles) are released, which prevent cell respiration and make their way through the outer membranes to the inside of the cell to destroy it, including its DNA or RNA. This prevents the cell from mutating and becoming resistant to the copper, or to pass on genes (like the ones responsible for antibiotic resistance) to other microbes.

The antimicrobial properties of copper are still under active investigation: its “contact killing”, and the molecular mechanisms responsible for its antibacterial action have been a subject of intensive research. Scientists are also actively demonstrating the intrinsic efficacy of copper alloy “touch surfaces“ to destroy a wide range of microorganisms that threaten public health.
According to a 2015 study which was published in Health Environments Research and Design Journal, some of the common germs copper has been proven to kill are MRSA (Methicillin-resistant Staphylococcus aureus), E. coli, Influenza A and Norovirus.

Copper to fight against HAIs (Healthcare Acquired Infections)?

Microbes living on surfaces in patient rooms and common spaces in hospitals do play a role in getting a HAI. A study from the early 1980s found that hospital doorknobs made of brass (an alloy of copper and zinc), barely had any E. coli growth on them, compared to stainless steel knobs which were “heavily colonized.”
HAIs are rampant: In American hospitals, estimates indicate that they account for an estimated 1.7 million infections and 99,000 associated deaths each year. In 2009 already, the extra treatments people needed when they got infected already cost between $35.7 and $45 billion annually.
While properties of copper are being investigated further as an additional method for infection prevention, this virus-killing substance seems worthwhile to implement at a larger scale to reduce environmental contamination and prevent HAIs.
Michael Schmidt, a professor of microbiology and immunology at the Medical University of South Carolina, said that using copper along with standard hygiene protocols has been shown to reduce bacteria in healthcare settings by 90%.
Knowing that resistance to antibiotics is increasing, therefore, in the long run the impact on public health could be positive.

What could hinder widespread use of copper?

The good news is that copper is far from depletion. But on the other hand, implantation of copper components is off to a slow start.
European countries have been ahead of U.S. hospitals in implementing copper components: several **regulatory issues** prevented manufacturers from being able to make copper components until late 2011 in the United States.
Its **cost** could prevent copper from being used widely. However, the expenses linked to treating HAIs are high too. If copper turned out to be efficient way to prevent them, the benefits could offset the investments. An independent study by University of York’s Health Economics Consortium from 2013 has shown that, taking the reduced costs of shorter patient stay and treatment into consideration, the payback time for installing copper fittings is only two months.
Education is also certainly going to play a key role too. Knowledge of copper and its benefits are not as widely known. People are used to stainless steel products and plastics because of their appearance and the length of time they have been relied upon. These materials ‘seem’ cleaner in the sense of their appearance, so our lack of understanding means we have moved away from truly taking advantage of the benefits of copper.

Should we move towards a more extensive use of copper?

Copper is a virus-killing substance which could find applications at a much wider scale than just in the medical field: think about public transportation systems! The scope for using this metal could easily be beneficial to any public area, where people touch surfaces which are literally teeming with microbial life.

In Chile, one of Latin America's largest theme parks has replaced its most frequently touched surfaces with copper to help reduce the spread of germs and protect the health of its visitors.
Also, one could wonder if it was intentional that the handrails of the grand staircase in New York City's Grand Central Station installed over 100 years ago are made of copper. It turns out that their anti-microbial effect did not go away since then!

Copper has the intrinsic advantage of disinfecting merely by being there. Taking this into consideration, it could find many applications and could be beneficial in any place where germs are likely to spread. This resonates particularly well in the current Covid-19 pandemic, especially considering the serious concerns about the spread of the virus via contaminated surfaces.

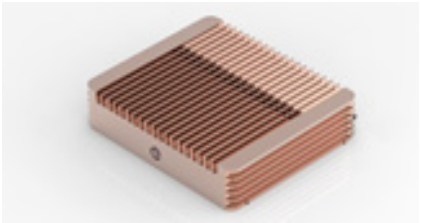
Brand new research published in the New England Journal of Medicine found that copper can be effective against the virus responsible for the coronavirus pandemic, SARS-CoV-2. The study showed that after four hours, the virus was no longer infectious on copper surface. In comparison, it could survive on plastic surfaces for 72 hours.

The future seems full of opportunities for copper, and even more so if you think of all the places in hospitals where germs, bacteria and viruses are likely to spread: bed rails, call buttons, grab bars, chair arms, tray tables, soap dispenser push plates, toilet flush levers, light switches data input, IV pole... the list is long!

In a 2012 clinical trial ran in three hospitals, researchers enveloped some of these items with copper and the results were very promising, as it turned out that compared to the rooms made with traditional materials, there was an 83% reduction in bacterial load on the surfaces in the rooms with copper components. As a result, HAIs were reduced by 58%, even though the researchers had introduced copper to less than 10% of the surface area of the room.

Amongst all the equipment required and used in hospitals, IT is a must, too! Fanless computers are necessary are known for bringing numerous benefits, including silent operation, energy efficiency, compactness, and reliability. Their rugged case makes them water resistant (rated IP66) as they are sealed, with no air circulating inside to prevent contaminants from getting into the enclosure.
Such computers can also be leveraged for standard tasks, like the daily routines of nurses visiting their patients and needing to compile and store patient information on the go. In such situations rugged fanless computers are the most reliable choice, as they will be moved around all day long throughout corridors and hospital rooms.

Now, based on the antimicrobial properties of copper, can you picture the benefits of a fanless PC with an antimicrobial copper case that would help prevent the spread of infections? Our in-house capabilities allow us to set up a POC for you to test such a solution on site!



To find out more about the 2CRSi / Tranquil PC computer hardware solutions that are built to protect everyone and last, contact us today.

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contact@2crsi.com

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