

# Anti-Bacterial & Anti-Microbial Uses of Copper/Copper Alloys

Copper and Copper Alloys have long been used for their anti-biofouling properties especially in shipbuilding, water treatment systems and related applications.

Less well known is the fact that slugs and snails have an aversion to Copper and generally will not cross over it. This has been used to good effect to protect mail within post-boxes from attack – Snails it seems are partial to some of the paper and glue combinations used for envelopes! It should of course be used far more widely to protect plants from attack.

Equally, Moulds and fungi will not grow and are inactivated on copper surfaces.

More recently it has been shown that a number of harmful bacteria such as Listeria, E-Coli & MRSA survive for much shorter periods of time on Copper and Brass surfaces than on Stainless Steel. This Natural Anti-Microbial or Bactericidal property could prove of major benefit in the fight against infection in hospitals and food processing or preparation facilities.

## History

The Egyptians, Greeks, Romans and Aztecs used copper compounds for the treatment of disease and good hygiene. Egyptians used copper as a sterilisation agent for drinking water and wounds. Hippocrates treated open wounds and skin irritations with copper. The Romans catalogued numerous medicinal uses for copper for various diseases. The Aztecs treated sore throats with copper, while Persia and India applied copper to treat boils, eye infections and venereal ulcers.

## Anti-Biofouling

This is simply defined as the ability to inhibit the deposition of bacteria, moulds, algae, fungi and other organic matter such as barnacles, crustaceans, etc.

Copper, Brass, Bronze and Copper-Nickel have all been used to good effect in marine environments where their other properties including corrosion resistance and high strength have also made them particularly suitable solutions.

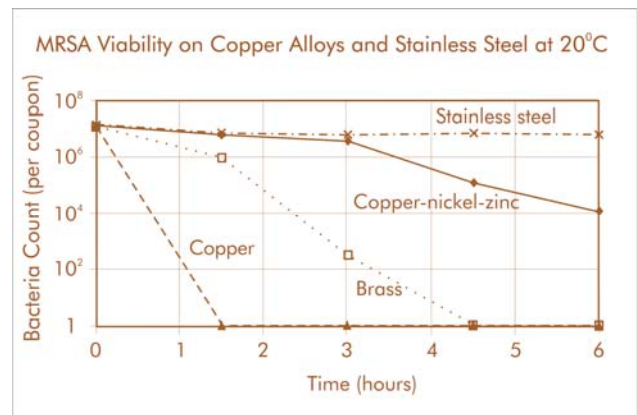
## Combating Slugs & Snails

Copper strip has been effectively protecting wall-mounted mail boxes in the West of England for over 10 years. It apparently gives them a shock similar to when cooking foil makes contact with an amalgam tooth filling! This is an excellent and very environmentally-friendly alternative to other methods that generally involve undesirable chemicals and pesticides. Note that the Copper is most effective when kept bright and shiny. An effective range of products has been commercially available for some time but these have not yet become well known:

- ◆ Copper Slug Rings – Adjustable rings to scrunch lightly into the soil around target plants
- ◆ Copper Snail & Slug Tape – Self adhesive tape for application to plant pots or pet-food bowls
- ◆ Slug & Snail Shocka Mats – A roll of ground-cover fabric coated with copper - Cut the mat to size and place under pots or use to create a collar around susceptible plants like hostas, strawberries and lettuce

## Combating Micro-Organisms

Recent and ongoing research at various laboratories throughout the world has shown that Copper-Based Alloy surfaces are a better solution than Stainless Steel as they inactivate the MRSA 'superbug' which persist on stainless for extended periods:



Source: University of Southampton, Keevil et al. 2004

Survival times of Methicillin-resistant *Staphylococcus aureus* (MRSA) at room temperature.

Copper - commercially pure 99% copper

Brass - 80% copper, 20% zinc

Copper-Nickel-Zinc - 55% copper, 27% zinc, 18% nickel

Stainless steel - 18% chromium, 9.5% nickel



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## Applications

As has already been shown, these valuable properties of Copper Alloys can be exploited in a wide range of applications, which can be sub-divided as follows:

- ◆ Anti-Biofouling
- ◆ Pest Control
- ◆ Anti-Microbial

## Applications – Anti-Biofouling

Copper was first used in this application during Nelson's time. When 60/40 Brasses were developed and hot rolled brass sheet became available this was a better choice and lower cost so would have been used on the Cutty Sark. Today Copper Nickel alloys are the preferred solution due to their improved strength and higher corrosion resistance.

- ◆ Hull Cladding for ship building and boat building
- ◆ Solid Hulls (*The Copper Mariner was one of the early vessels to have a solid Copper-Nickel hull and after 16 years it has not required lifting for hull cleaning*)
- ◆ Cladding the legs of marine structures such as Oil Rigs, Piers, Jetties, etc.

## Applications – Anti-Microbial

Copper and Copper Alloy surfaces can now be considered a better solution than the traditionally used stainless steel in a number of applications where the inactivation of various organisms such as Bacteria (MRSA, E-Coli, Listeria) Moulds and Fungi is desirable.

- ◆ Touch Surfaces and Door Furniture in health-care facilities (Handles, Levers, Knobs, Push-Plates, Grab Bars, Railings, Switch Plates, etc.)
- ◆ Taps, Sinks and Work Surfaces in HealthCare Facilities
- ◆ Patient Handling Equipment
- ◆ Taps, Sinks and Work Surfaces in Food Processing/Preparation Facilities
- ◆ Drinking Water and Water Treatment Systems
- ◆ Food preparation surfaces
- ◆ Cooking pots, pans and utensils

## Copper and Health

- ◆ Copper is necessary for the growth, development and maintenance of bone, connective tissue, brain, heart and human life
- ◆ Copper is involved in the formation of red blood cells, the absorption and utilisation of iron, plus the synthesis and release of life-sustaining proteins and enzymes
- ◆ Copper is known to stimulate the immune system, repair injured tissue and promote healing
- ◆ Copper is essential for the normal growth and development of a human foetus, infants and children

## References

The best sources of further information on the antimicrobial properties of Copper Alloys are the web site of the UK, European and USA Copper Development Associations, in particular:

- ◆ <http://www.cda.org.uk/antimicrobial/homepage.htm>
- ◆ <http://www.eurocopper.org/eci/doc/anti-bacterial.pdf>
- ◆ [Naturally Antimicrobial Alloys for Touch Surfaces](#)
- ◆ [Copper Touch Surfaces in Healthcare Facilities - Naturally Antimicrobial](#)
- ◆ [Doorknobs: a source of nosocomial infection?](#)

For specific information on the Copper products used to deter slugs and snails see: the Organic Gardening Catalogue web site:

- ◆ [www.organiccatalog.com/catalog/index.php?cPath=61\\_179](http://www.organiccatalog.com/catalog/index.php?cPath=61_179)

For specific information on preventing biofouling with Copper-Nickel see Copper Development Association Publication 157.

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