Copper's antimicrobial Power – Re-use of historical knowledge to meet actual problems in health care

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Increasingly high numbers of bacterial infections including death cases represent a big challenge for hospitals and nursing homes in developed countries for both, epidemiological as well as economical reasons. Beneath the demography based changes towards a higher percentage of patients in need of care this phenomenon is mostly due to the fast distribution of bacterial resistance to antibiotics [1, 2, 3].

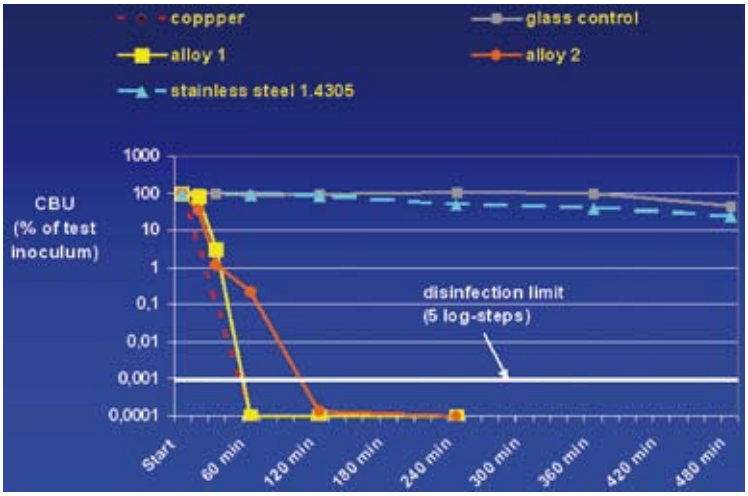

Fig 1: Results on the test JIS Z 2801 [8] with copper, Cu-alloys and stainless steel coupons. The inoculum (Staphylococcus aureus ATCC 6538) was about 1.000.000 cfu (colony forming units) per coupon (50 * 50 mm) each. A reduction rate of > 5 log steps is needed for disinfection.

Health care facilities assist the dispersion of pathogenic germs via the high density of infected and immune attenuated patients meeting each other within a small area. Bacteria resistant to one or more antibiotics complicate the handling or avoidance of infections. Against this background, a series of weapons needs to be used against the further development and distribution of harmful micro-organisms. As highly frequented touch-surfaces are well known to be one of the major infection pathways, the furnishing of those with strongly antimicrobial material should be one of the strategies.

Idea, methods, results

The knowledge around copper-compounds or dissolved copper as measure for infection control and drinking water disinfection is described for a number of historical cultures [4,5,6] and has been written down since the 3rd Millennium B.C. [5, 7]. Combining this historical knowledge and the need for surface-specific solutions related to the youngest health-care problems, a series of massive copper based alloys were analysed regarding their hygienic power. Results on the efficacy-approval (test: JIS Z 2801 [8]) with Staphylococcus aureus ATCC 6538 on pure copper and 2 alloys are given in fig. 1. in comparison to glass control - and stainless steel results.

Fig 2: First products installed in a hospital for approval

It is shown, that a reduction of 5-6 log steps (beginning with an inoculum of about 1.000.000 colony forming units/coupon) was achieved within 2 hours or less for the tested copper materials, whereas the control and stainless steel coupons didn't show relevant shifts in bacteria density during the first 8 hours. These positive results led to the hypothesis, that "Special massive copper alloys are highly effective in reducing potentially pathogenic bacteria including strains resistant to antibiotics. They therefore can help reducing germ spreading and lowering infection rates".

This hypothesis is now under approval in different hospital trials. Newly fabricated products (door knobs, light switches, see fig. 2) have been installed and regularly now are screened regarding their hygienic power, other products are under development or production and will be added to the test.

Literature

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