



Clinical trial on using copper and brass surfaces in a hospital in West-Finland using microbiological assessment

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INTRODUCTION

Copper is an antimicrobial substance which has been used since ancient times to disinfection and cleaning. Using copper in furniture and fitments does not cause hazards to human health. Antimicrobial properties of copper have been researched in several laboratory and clinical tests.

Behind this trial is a hypothesis, that copper and brass surfaces in places that are critical to hospital infections' spreading, work as inhibitors to microbe growth and ease cleaning. They would also reduce the need to use chemical disinfection agents, which would contribute to health of cleaning personnel and increase life of surfaces. Copper and brass surfaces can be a cost effective solution to contribute to hospital cleaning.

Using copper surfaces to prevent growth of microbes is safe according to research. Copper's action mechanism is not too specific, and it is not based on one protein or enzyme, which makes it active on broad-spectrum. Copper is harmless to human in solid metal form and it doesn't cause eye or skin irritation.

RESEARCH

Copper and brass surfaces were tested in normal use in hospital environment during a period of 6 weeks at West-Finland Deaconesses' Institute Veteran Rehabilitation Center and Nursing Home. Helsinki University Hjelt Institute contributed to the research with expertise and analysis.

PARTNERS

Research partners were Luvata Oy, Cupori Oy, Outokumpu Nordic Brass Oy, Abloy Oy, Merivaara Oy, Länsi-Suomen Diakonialaitoksen Sotainvalidien Sairaskoti ja Kuntoutuslaitos, Scandinavian Copper Development Association and Helsinki University Hjelt Institute.

COPPER AND BRASS SURFACES AND INSTALLING THE TEST FITMENTS

The following items were selected as test pieces:

- Patient room door handle, brass – chromium plated reference on the other side of the door
- Patient room toilet door handle, copper plated – chromium plated reference on the other side of the door

- Patient room toilet wall handle, brass – painted metal reference
- Sauna shower room wall handle, brass – chromium plated reference
- Serving trolley upper tray, Nordic Royal - chromium plated lower tray reference
- Serving trolley upper tray, copper - chromium plated lower tray reference
- Automatic door switch of department downstairs, Nordic Royal – reference on the other side of door plastic
- Automatic door switch of department upstairs, copper - reference on the other side of door plastic
- Elevator handrail, copper - reference stainless steel
- Physiotherapy department shower floor drain cover, copper plated – reference stainless steel

0-samples were taken before installing the test items. Copper and brass test items were approximately 3 to 6 months old before the trial started. They had been stored in ambient air conditions after manufacture without any surface treatment. No polishing took place after installation.

CLEANING

Rooms were cleaned in an ordinary manner once a day with universal cleaning agents. Special chlorine containing cleaning agent was used for shower floor drain once a week.

MEASURING THE HYGIENIC RESULTS

Environmental microbiological samples were taken once a week at noon. Sampling started on the 14th of December 2009, when 0-samples were taken before installation. Sampled items are listed above. Dates of sampling were 21/12, 29/12, 5/1, 12/1, 19/1 and 26/1.

Samples were numbered and sampling location was marked on sampling protocol. Sampling was performed by a designated and trained person at the hospital and they were sent by post to Helsinki University Microbiological laboratory.

The following indicator microbes were investigated:

- Total microbe growth, cfu
- Staphylococcus aureus and MRSA
- Escherichia coli
- Candida albicans
- Clostridium difficile

CONCLUSIONS

Results show that copper and brass items remained microbiologically cleaner during the trial period than reference items. The strongest contaminated items as toilet wall handle and shower floor drain cover didn't stay totally disinfected but even on these challenging surfaces bacteria levels were significantly lower than on reference surfaces. The reference samples showed growth of gram-negative urine- and faeces-derived microbes like *E.coli* and *Candida albicans* and *S.aureus*, but on copper and brass samples grew only normal gram-positive environmental and skin microbes (coagulase-negative staphylococci and *Bacillus* spp.). On trial period no *Clostridium difficile* nor MRSA was detected.



RESULT TABLE

(-) = no growth

(+) = 1-10 cfu

(++) = 10-100 cfu

(+++)=> 100 cfu/dish

Description	Sample	14.12.09 0-sample	21.12.09 sample1	29.12.09 sample2	5.1.10 sample3	12.1.10 sample4	19.1.10 sample5	26.1.01 sample6
Patient room door handle brass	01	-	-	-	-	-	-	broken tube
Patient room door handle chromium plated	02	-	-	+	+	+	-	++
Patient room toilet door handle copper plated	03	-	-	-	-	-	-	-
Patient room toilet door handle chromium plated	04	+ E.coli	+ E.coli	+ E.coli	++ E.coli	-	++ E.coli	+++ E.coli
Patient room toilet support handle brass	05	-	-	+	+	+	++	+
Patient room toilet support handle painted	06	+	broken tube	+++	+++	+++	++	+++ C.albicans
Sauna shower room support handle brass	07	-	-	-	-	-	-	-
Sauna shower room support handle chromium plated	08	not taken	+	+	+	+	++	broken tube
Serving trolley upper tray Nordic Royal	09	-	++	+	-	-	+	-
Serving trolley lower tray chromium plated	10	+	++	+++ S.aureus	++ S.aureus	+	++	+++
Serving trolley upper tray copper	11	-	-	-	-	-	-	-
Serving trolley lower tray chromium plated	12	+	++	+ S.aureus	+	+	++ S.aureus	+++
Automatic door switch downstairs Nordic Royal	13	-	-	-	-	-	-	-
Automatic door switch downstairs plastic	14	+	+	+	+	+	++ S.aureus	+
Automatic door switch upstairs copper	15	-	-	-	-	-	-	-
Automatic door switch upstairs plastic	16	++ S.aureus	+	+++	-	+	++	+
Elevator handrail copper	17	+	-	-	-	-	-	-
Elevator handrail stainless steel	18	++	+	-	++	+	-	-
Physiotherapy shower room floor drain copper plated	19	+	++	+	-	++	++	++
Physiotherapy shower room floor drain stainless steel	20	+++ E.coli	+++ E.coli	+++ E.coli	+++ E.coli	+++ E.coli	+++ E.coli S.aureus	+++ E.coli