SUPPLEMENTAL MATERIALS AND METHODS

FABRICATION OF ITEMS SURFACED WITH ANTIMICROBIAL COPPER ALLOYS:

Copper alloys were selected to cover an object was based on its ability to be fabricated and/or surfaced into a particular component; its strength and durability; its ability to withstand the rigors placed on materials by standard hospital cleaners and the ability of the surface finish to provide consistent wear and aesthetics over the trial. Because of the small quantities involved in the study, items selected were custom built with prototype tooling and designs. However, all of the alloys are commercially available in sheet, rod, castings, and tube form. Consequently, on a production-quantity basis, these same items that were custom fabricated for this study, could be easily and economically manufactured through high-volume stamping, casting, and other common manufacturing techniques.

SELECTION OF ROOMS TO PLACE COPPER OBJECTS: In order to minimize bias and potential Hawthorne effects, a cluster of rooms (6 rooms at Hospitals 1&2 and 4 rooms at Hospital 3) within each MICU were selected. Six copper objects were placed in rooms that were immediately adjacent to control rooms within the cluster.

WIPE SAMPLE COLLECTION PROCEDURE: A sterile 2" x 1" 50%, rayon/50%, cotton wipe (Kimberly Clarke, KimTech Critical Task Wipers®) pre-moistened with 200 µl of sterile phosphate buffered saline ((PBS-LT) (137 mM NaCl; 3µM KCl; 10mM Na_2HPO_4; 1 mM KH_2PO_4 (pH 7.0)) supplemented with 0.5% tween 80 and 0.07% lecithin was aseptically placed into a sterile 50 ml screw-top conical tube. At the time of sampling a sterile glove was donned. The wipe was aseptically removed. After sample collection, the wipe was placed back into the sterile tube from which it came. Samples were stored immediately after collection on a frozen refrigerant pack until processing. For the majority of the surfaces sampled, either a 10 cm x 10 cm or 4 cm x 25 cm sterile template was placed over the

appropriately shaped surface. The exposed area was vigorously wiped using uniform pressure and motion, five strokes horizontally and vertically for a total of ten total strokes in each direction. Samples from MSKCC and RHJVA were transported to MUSC and processed. Technical staff responsible for sampling were trained and calibrated by a common technician to insure the fidelity of the process.

SHIPPING: Samples were shipped for processing from MSKCC to MUSC via overnight carrier (FedEx). The temperature of the samples was maintained at 4°C using frozen, reusable, foam refrigerant packs (PolarPack (ThermoSafe Brands)) according to the manufacturer's specifications. The temperature of the samples was continuously monitored using a Dickson SP425 data logger (www.DicksonData.com). Samples exceeding 20°C, for greater than 3 hours during the shipping process, were deemed spoiled and discarded.

SAMPLE PROCESSING: Each sample was assessed for the presence of viable bacteria by adding three ml of sterile PBS/LT to each wipe-containing tube whereupon the tube containing the wipe was vortexed at high speed for 1 minute. Samples and various dilutions were plated (100 µl) onto TSA+sheep's blood plates, Mannitol Salt Agar, BBL™ MacConkey II Agar, BBL™ CHROMagar™ MRSA and an Bile Esculin Azide + Vancomycin Agar. The plates were inverted and incubated between 35 - 37° C for 48 hr or as specified by the manufacturer (CHROMagar™ MRSA) and were processed as described by Schmidt and others (1).

REFERENCES

1. **Attaway, H. H., S. Fairey, L. L. Steed, C. D. Salgado, H. T. Michels, and M. G. Schmidt.** Intrinsic bacterial burden associated with intensive care unit hospital beds: Effects of disinfection on population recovery and mitigation of potential infection risk. American Journal of Infection Control. DOI 10.1016/j.ajic.2011.11.019

TABLE S1

ASSESSMENT OF THE INTRINSIC MICROBIAL BURDEN FOUND ON COMMONLY ENCOUNTERED OBJECTS BEFORE AN INTERVENTION WITH ANTIMICROBIAL COPPER

	PRE-INTERVENTION PHASE						
	Colony Forming Units/100 cm^2						
	Bed	**Call Button**	**Arms of Chair**	**Tray Table**	**Input Device**	***IV-Pole***	***Total Burden***
Average MB All Sites, N=668 Rooms	***17,336***	***7,118***	***3,579***	***3,925***	***9,244***	***668***	***41,586***
Average MB Hospital 1, N=253	14,419	12,736	6,231	2,114	322	1,124	36,871
Average MB Hospital 2, N=244	11,162	668	670	7,248	23,601	68	42,934
Average MB Hospital 3, N=171	30,449	7,787	3,791	1,955	2,086	843	46,637
Standard Error of Mean All Sites	**2,896**	**1,899**	**679**	**2,574**	**8,572**	**217**	**9,618**
Standard Error of Mean Hospital 1	3,627	4,787	1,687	1,005	107	538	7,146
Standard Error of Mean Hospital 2	5,560	508	237	7,058	23,554	20	24,892
Standard Error of Mean Hospital 3	5,947	1,663	740	403	574	277	6,448
Number of Items Sampled	**664**	**661**	**666**	**660**	**665**	**661**	**668**
Number of Items Sampled Hospital 1	252	253	253	252	253	251	253
Number of Items Sampled Hospital 2	242	238	243	238	242	240	244
Number of Items Sampled Hospital 3	170	170	170	170	170	170	171

TABLE S2

DETERMINATION OF THE INTRINSIC MICROBIAL BURDEN ASSOCIATED WITH SIX HIGH TOUCH OBJECTS WITH OR WITHOUT COPPER SURFACES WITHIN THREE ICUS

			Colony Forming Units/100 cm^2			
Surface	**Composition**	**Sample Size**	**Mean**	**Standard Error of Mean**	**% Reduction**	**p Value**
All Objects Considered	Plastic	511	14,813	1,812		
	Copper Alloy	501	2,521	342	83%	
Bed Rail	Plastic	455	6,471	1,047		
	Copper Alloy	383	366	77	94%	<0.0001
Call Button	Plastic	486	5,027	1,158		
	Copper Alloy	458	954	199	81%	<0.0001
Chair	Wood	448	2,812	678		
	Copper Alloy	441	682	119	76%	<0.0001
Tray Table	High Pressure Laminate	478	673	158		
	Copper Alloy	474	224	64	67%	<0.0001
Data Input Device	Plastic	487	304	44		
	Copper Alloy	489	443	198	-46%	
IV-Pole	Stainless Steel or Chrome	477	950	519		
	Copper Alloy	469	133	26	86%	<0.0001

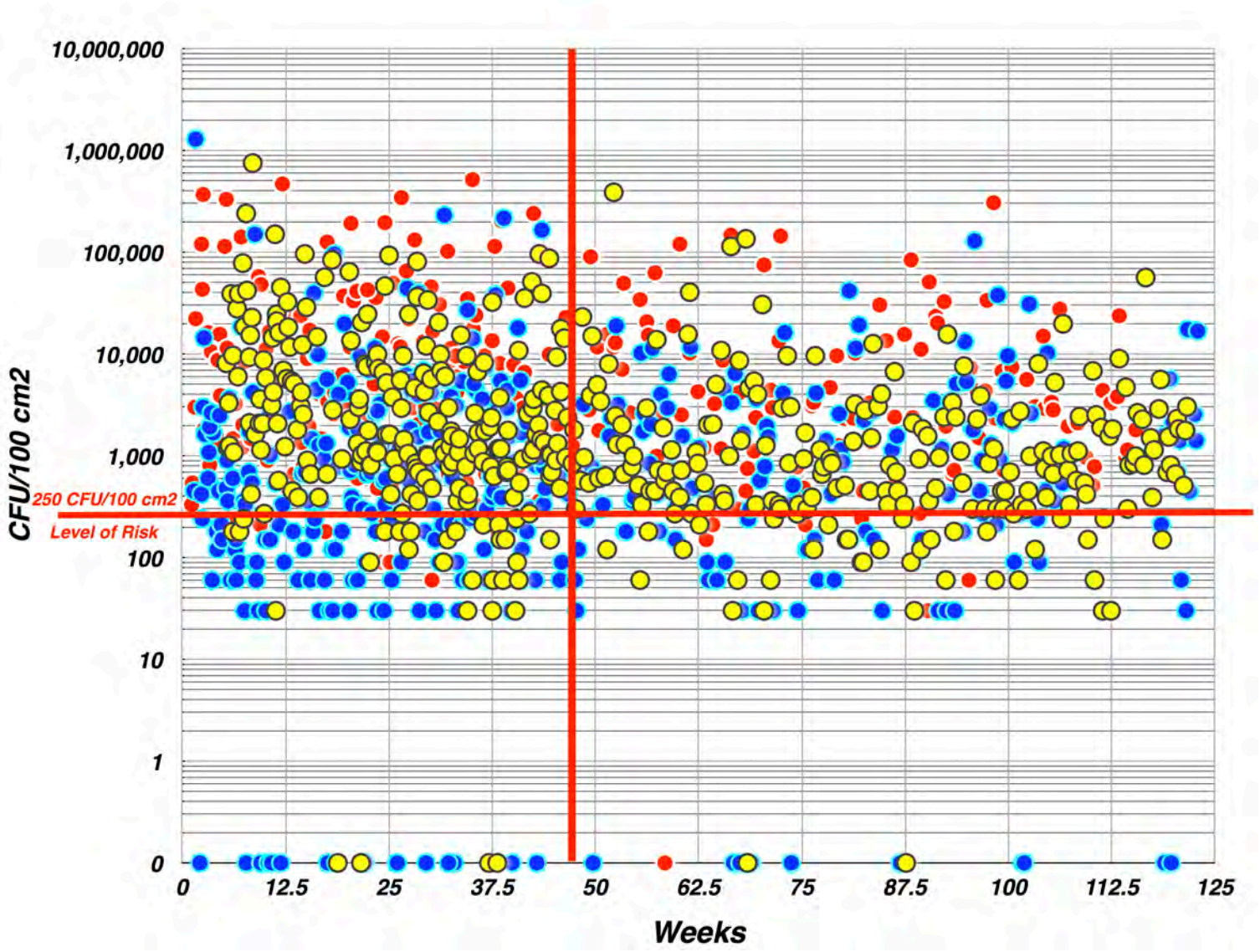

FIGURE S1. DISTRIBUTION OF THE MICROBIAL BURDEN IN THE BUILT ENVIRONMENT IS SUBJECT TO STOCHASTIC FORCES. The microbial burden (aerobic colony forming units/100cm^2 (cfu/100cm^2)) associated with each bed rail is plotted as a function of time (weeks). Values to the right of the vertical red line represent samples collected during the intervention with copper surfaced objects and those to the left represent those collected prior to the intervention.

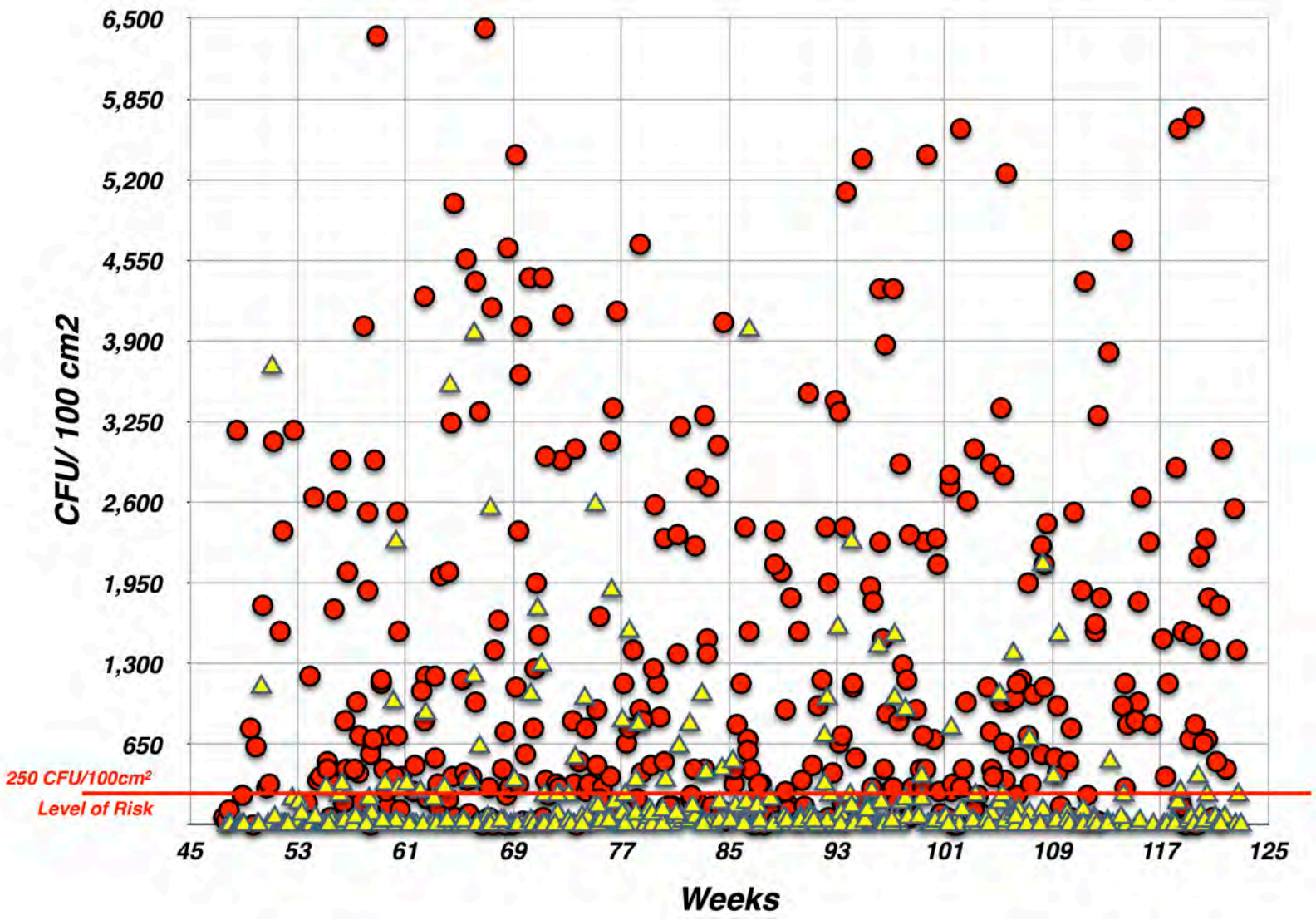

Figure S2. Copper Surfaces Attenuate the Inherent Variability of the MB Recovered from High Touch Objects in the ICU. The microbial burden (aerobic colony forming units/100cm^2 (cfu/100cm^2)) associated with each bed rail is plotted as a function of time (weeks). Red circles represent MB collected from polypropylene bed rails (control) and yellow triangles represent MB collected from copper bed rails.