

The World Needs Clean Hospitals

Dr. Stephanie Dancer, NHS Scotland

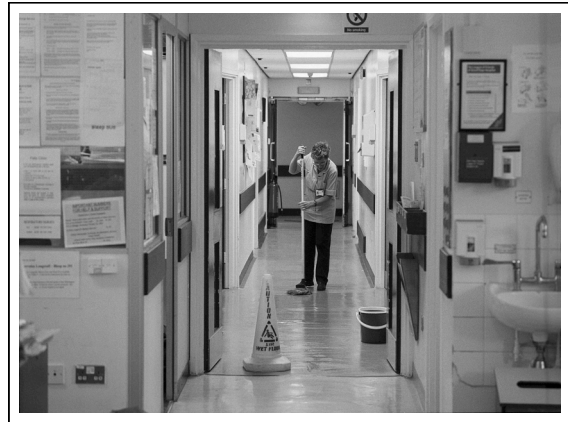
Broadcast live from the Australasian College of Infection Prevention and Control

ACIPC
Australasian College
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CONFERENCE 2013
Gold Coast / Australia | 18 September - 3 October

THE WORLD NEEDS CLEAN HOSPITALS

Dr Stephanie Dancer, NHS Scotland

www.webbertraining.com October 2, 2013



'Traditional environment-based hospital hygiene has long been considered a weak science.....

usually arising from the creation of a global hypothesis.....

.....poetically elaborated upon by its creator....

without any appeal to patient-orientated facts that would be capable of confirming or refuting it'

Harbarth S, Lowbury Lecture 2012

Who says patients don't know whether a hospital is clean or not?

Patient's non-evidence based perceptions are associated with objective measures of hospital quality

Evidence from the USA

Patient's perceptions of room cleanliness are associated with infection and mortality rates from 87 hospitals

Trucano & Kaldenberg, Pt Safety & Qual Healthcare 2007

Evidence from the UK

Better web-based patient ratings of hospital cleanliness were associated with lower MRSA ($p < 0.001$) and *C. difficile* ($p = 0.04$) infection rates per 1000 bed-days

Greaves et al, Arch Intern Med 2012

WHY are we still debating the value of cleaning?

Invisible
Aesthetic bias
Pathogen detection
Evidence-based science?
No accepted measure
Women's work
Fabric deficits
Costly

Low paid; low status;
and dirty

Properties of hospital pathogens

	Survival time	Infectious dose
MRSA	7 days to >7 months	4 cfu's
Acinetobacter	3 days to >5 months	250 cfu's
<i>C. difficile</i>	>5 months	5 spores
VRE	5 days to >4 months	<10 ³ cfu's
<i>E. coli</i>	2 hrs to 16 months	10 ² -10 ⁶ cfu's
Klebsiella	2 hrs to >30 months	10 ² cfu's
Norovirus	8 hrs to 7 days	<20 virions

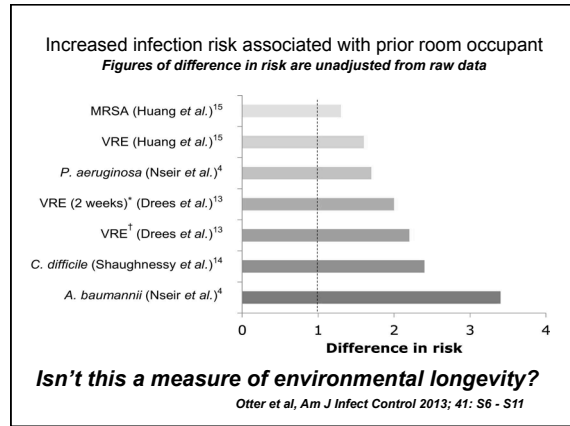
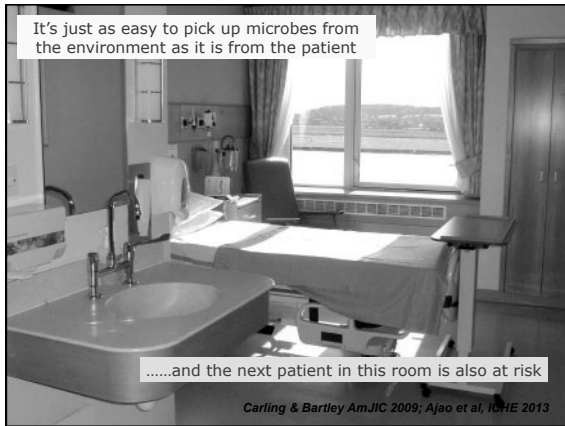
Kramer, BMC Infect Dis, 2006; Wagenvoort, JHI 2000; Chiang, Crit Care Med 2009; Lawley et al, Appl Environ Micro 2010; Larson, Lancet 1978; Kjerulf et al, APMIS 1998

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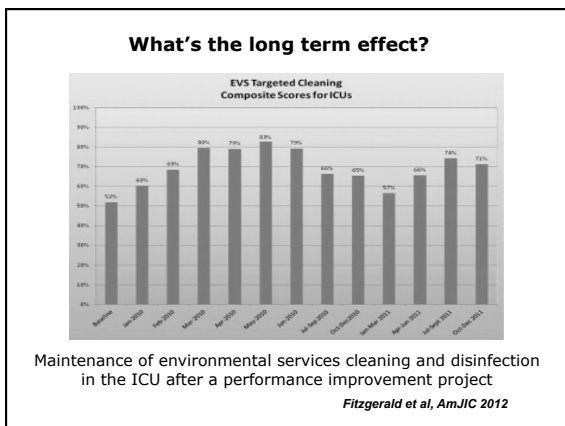
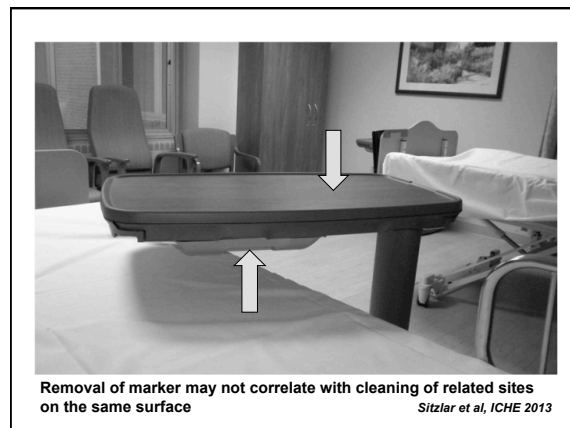
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How good is the cleaning in your hospital?

Fluorescent gel placed on chosen sites
After patient discharge, a site is considered cleaned if the fluorescent material is removed or disrupted

Carling et al, Am J Infect Control, 2006



How do we measure hospital cleanliness?

82-91% Visually clean
10-24% ATP clean
30-45% Microbiologically clean

What is clean?

"what an individual thinks it is"

Griffith CJ et al, J Hosp Infect 2000

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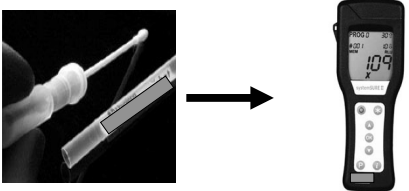
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Surface evaluation using ATP bioluminescence

Swab surface → luciferase tagging of ATP → Luminometer



Used in the commercial food preparation industry to evaluate surface cleaning and as an educational tool

ATP values (RLU's) for sites on medical & surgical wards

Site		Before	After	Site Mean ATP Before	Site Mean ATP After
Locker (M)	Range	15-316	17-148	120	69
	Mean	106	47		
Locker (S)	Range	7-325	5-208	105	131
	Mean	134	91		
L Bed (M)	Range	4-243	4-1512	181	309
	Mean	106	206		
L Bed (S)	Range	4-181	32-115	132	57
	Mean	103	56		
O/B Table (M)	Range	28-625	13-75	181	309
	Mean	116	36		
O/B Table (S)	Range	33-550	55-3846	132	57
	Mean	246	581		
R Bed (M)	Range	3-409	3-200	132	57
	Mean	145	60		
R Bed (S)	Range	0-266	16-128	132	57
	Mean	118	54		

Mulvey et al, JHI 2011

Would microbiological standards help?



5 cfu/cm²



45 cfu/cm²

Slide from Chris Griffith

Microbiological standards for hospital surfaces


Standard 1
There should be <1 cfu/cm² pathogen (MRSA; C.difficile; VRE; etc) in the clinical environment

Standard 2
Aerobic Colony Count (ACC) from a hand contact surface should be <5 cfu/cm²

These standards are based upon food industry counts as applied to food preparation surfaces but could be utilised for frequent hand-touch surfaces in hospitals


Dancer S, J Hosp Infect 2004

Dirt, busy wards and risk




High aerobic colony counts at a hand-touch site is significantly associated with finding *S.aureus* & MRSA at that site (p=0.001);

....and there is a significant association between high counts and bed occupancy



Dancer SJ et al, Int J Environ Health Res 2008



Application of cleaning standards on ICU

25% of 200 samples failed the standards, mostly hand-touch sites

Hygiene fails were associated with bed occupancy and incidence of ICU-acquired infection

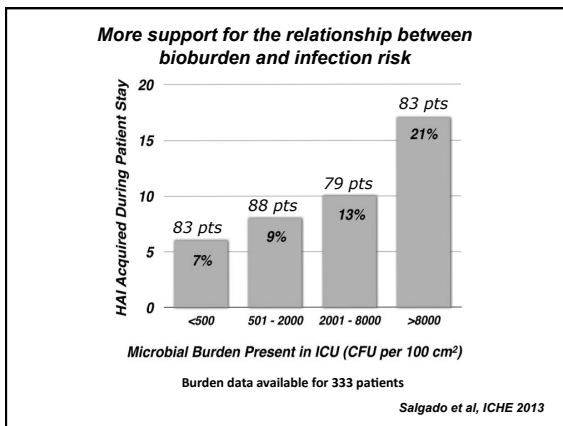
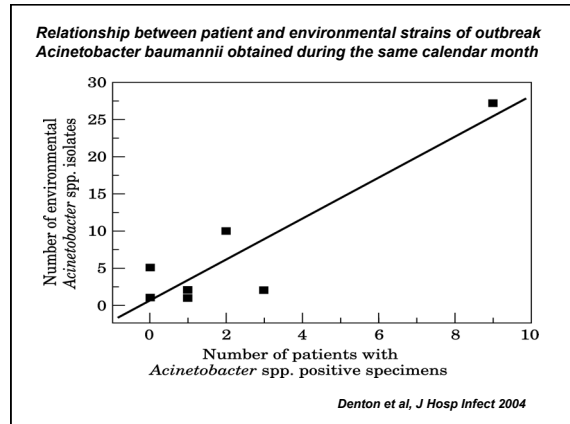
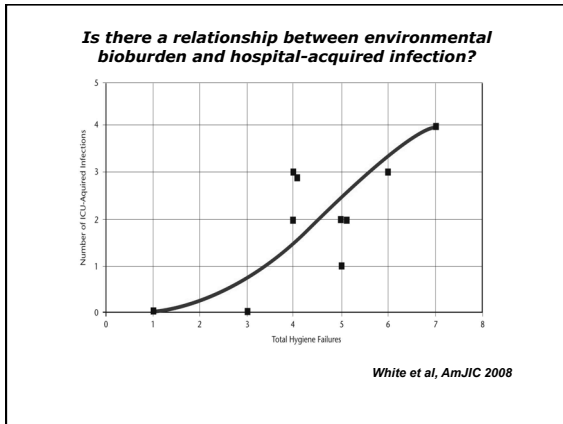
Hygiene standards reflect patient activity and provide a means to risk manage infection

White et al, AmJIC, 2008

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Lessons from the food industry

Comparison of approaches to monitoring cleaning efficacy between food and healthcare industries.

FOOD	HEALTHCARE
Isolation of pathogens from environmental surfaces causes concern	Isolation of pathogens from environmental surfaces may or may not cause concern
Environmental surface sampling in food manufacturing used as part of a preventative strategy	Environmental surface-sampling only likely to be used in response to an outbreak
Range of surface-sampling techniques used, including visual, microbiological and rapid methods in coordinated and integrated approaches	Assessment of cleaning efficacy dominated by visual inspections (ICNA, PEAT, Healthcare Commission etc)

Griffith C.J, Biomed Scientist, 2006

Environmental sampling is important

One study suggests that if an organism is found in the food preparation environment, there is a 70% chance of it getting into the food....

Environmental monitoring provides an early indication of loss of control...and it's better than end-product testing

Chris Griffith, IAFF Rome 2007

Does extra cleaning have an effect on MRSA?

Two acute surgical wards received targeted (high-touch near-patient) cleaning from Monday to Friday, with each ward receiving extra cleaning for six months in a prospective cross-over design over 1 year

Hand-touch sites on both wards were screened weekly and patients were monitored for MRSA infection

Patient and environmental MRSA isolates were characterized using CHEF PFGE with CHEF-mapper system

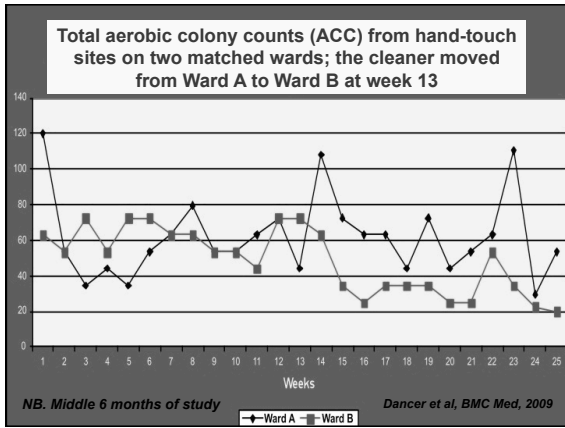
Dancer et al, BMC Med 2009

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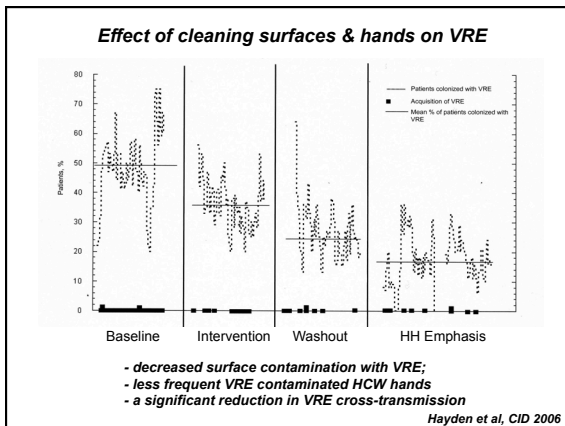
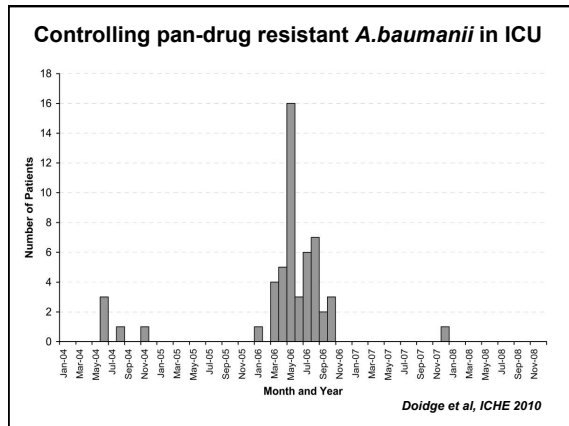
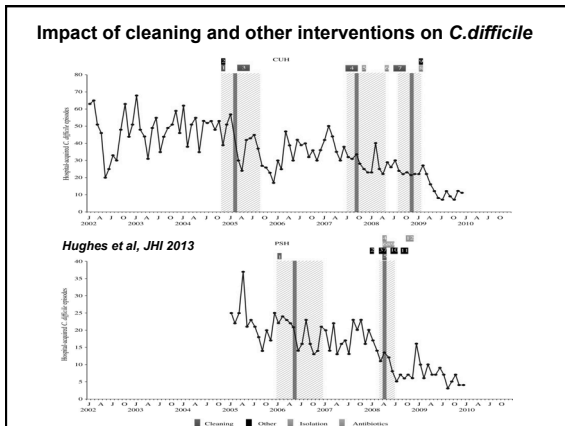
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Date	Specimen site	Environment	PFGE profile
24.7.06	Foot		15a
10.8.06	Nose		15a/15/15-71
18.8.06	*Foot		16-237/16-236
21.8.06	Groin		15a/15-133
21.8.06	Nose		15a
23.8.06	Nose		15a
23.8.06	Groin		15a/15-133
26.8.06	Groin		16-237/16-236
31.8.06	Nose		15a
08.9.06	Nose		15a/15-74
21.9.06	*Groin		15a/15z/15-71
25.9.06		Computer	16-738
06.10.6		Patient notes	15-738
11.10.06		Overbed table	15-738
13.10.06	Throat		15a
18.10.06	Heel		15a/15z/15-71
07.11.06		Hoist	16-237/16-236
07.11.06		Door handle	16-237/16-236
27.11.06	Throat		15a/15z/15-71
13.2.07		Hoist	15a
13.2.07		Bedside locker	15a
13.2.07		Desk	15a/15-121
14.2.07	*Arm		15a/15z/15-71
18.2.07	*Catheter line		15a/15z/15-71
19.2.07		Bed frame	15a/15-121
19.2.07		Overbed table	15a
21.2.07	*Throat		15a
08.3.07		Bed frame	15a
22.6.07		Bed frame	15a/15-121
27.6.07		Hoist	15a/15-74/15-304
04.7.07		Desk	15a/15z/15-71
12.7.07	*Throat		15z/15/15-119
21.7.07		BP stand	15a
23.8.07	Nose		15a

Dancer et al, BMC Med 2009

Table to show the molecular relationships between patient and environmental strains of MRSA on one surgical ward over a one year period



The Hand-Touch equation

Hand = Hand-touch site

WHY....is all the emphasis on cleaning hands, and not on the surfaces that they touch?

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What do most successful cleaning interventions have in common?



Cleaners were subjected to some type of performance monitoring!

Observation; supervision; environmental screening; covert fluorescent tagging of surfaces; feedback & education, etc

Hota et al, J Hosp Infect 2009; Guerrero et al, ICHE 2013

Hawthorne effect is readily seen from cleaning staff.....

'Why aren't we achieving better results? A literature review of HAI interventions.'

Lewis et al, Proc Human Factors Ergonom Soc Meeting, 2012



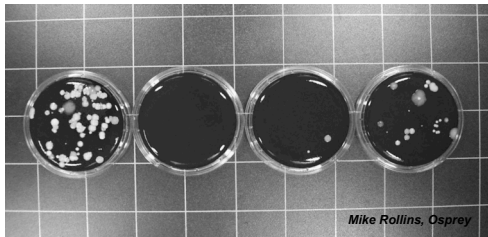
Who cleans what? And how often?



Young et al, JHI 2011

How long do hospital surfaces stay 'clean'?

Contact plates from patient locker surface
Left to right: Pre clean, 1 hour, 2 hour, 3 hour assessment

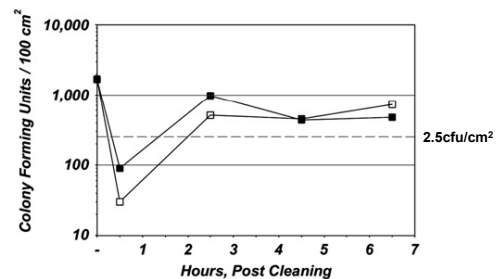


Mike Rollins, Osprey

MRSA rapidly recontaminates high-touch sites after cleaning

Hardy KJ et al, JHI 2007

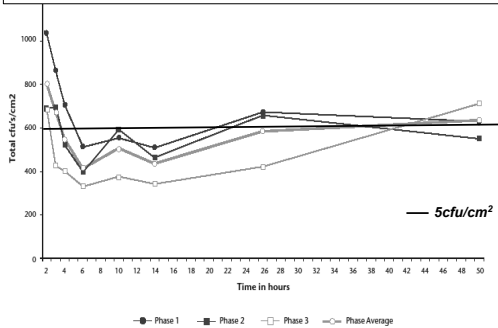
Disinfectant cleaning reduces microbial soil on beds.....



Attaway et al, AmJIC 2012

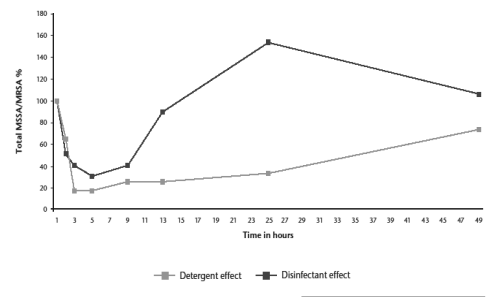
....but not for long!

Effect of three detergent cleans on total aerobic colony counts from 120 hand-touch sites on a 30 bed ward over 48 hours



Bogusz et al, Healthcare Infect, 2013

Effect of detergent and disinfectant cleaning on total MSSA/MRSA recovered from hand-touch sites on one 30 bed ward over 48 hours



Stewart et al, submitted 2013

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Time to get *PHYSICAL!*
Sattar & Maillard, Am JIC 2013

C.difficile and cleaning – alternative options to using chlorine-releasing disinfectants.....could *C.difficile* be removed by routine physical cleaning?
Awadel-Kariem et al, J Hosp Infect 2011




A single clean can reduce contamination by around 90%.....
Speight et al, J Hosp Infect 2011

When surfaces are wiped 3 or more times, detergent wipes are **just as effective** as disinfectant wipes
Berendt et al, AmJIC 2011

Physical removal of *C.difficile* spores is more important than sporicidal inactivation
Rutala et al, ICHE 2012


How should we clean clinical equipment?



Three methods:


1. Disposable barrier
2. Detergent
3. Disinfection with 1/10 dilution of 5% sodium hypochlorite

All three protocols decreased MRSA surface load by >99% from 10-14 cfu/cm² to 0.1 cfu/cm² (p<0.001)
Petti et al, AmJIC 2012



Floor wars: the battle for 'clean' surfaces....
Dancer SJ, J Hosp Infect 2013

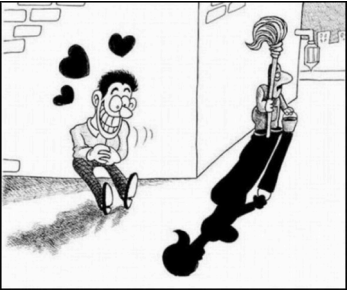
Cleaning in the 21st century: what's best?



**Detergent!
 Targeted!
 Frequently!**

...but we STILL need practical standards for surface level cleanliness in hospitals that reflect clinical risk

NB. No disclosures



Thank you!



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