

Infection Control in the 21st Century

Dr. Stephanie Dancer, NHS Lankashire

Broadcast live from the 2014 Infection Prevention Society conference

Infection control in the 21st century

Dr Stephanie Dancer
NHS Lanarkshire

www.webbertraining.com October 1, 2014

If we only had eyes to see.....

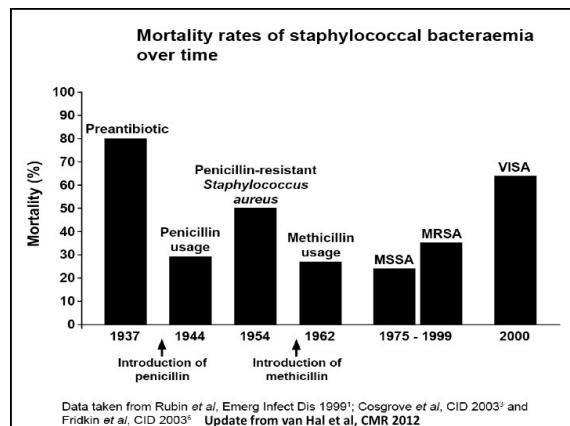
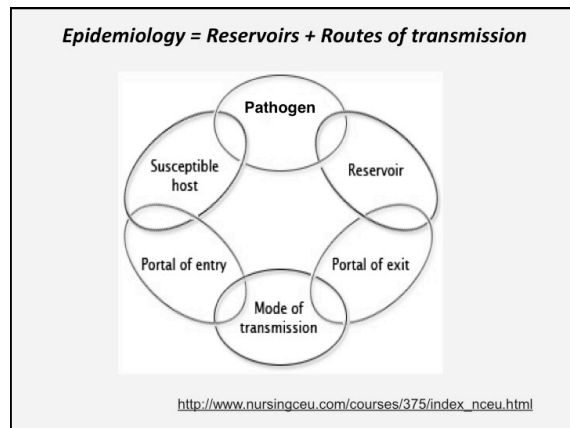
....what would we see?

'Hospital infection: From Miasmas to MRSA', Ayliffe & English, 2003

Properties of hospital pathogens

	Survival time	Infectious dose	Reservoir
MRSA	7 days-7 mths	4 cfu's	Hand; dust; air
Acinetobacter	3 days -5 mths	250 cfu's	Dust; hand; air
<i>C.difficile</i>	>5 mths	7 spores	Dust; hand; air
VRE	5 days-4 mths	<10 ³ cfu's	Dust; hand; air
<i>E. coli</i>	2 hrs-16 mths	10 ² -10 ⁶ cfu's	Hand; water; air
Klebsiella	2 hrs-30 mths	10 ² cfu's	Hand; water; air
Norovirus	8 hours-7 days	<20 virions	Air; hand; food

Kramer, BMC Infect Dis, 2006




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What's beneath the Infection Prevention Umbrella?



PROBLEM	SOLUTION
Hand transmission.....	HAND HYGIENE
Contaminated environment.....	CLEANING
Airborne pathogens.....	VENTILATION
Infected patient.....	ISOLATION
Patient at risk.....	SCREENING
Medical equipment.....	DECONTAMINATION
Hospital-acquired infection.....	SURVEILLANCE
Drug resistance.....	ANTIMICROBIAL STEWARDSHIP
Infection control service.....	INFECTION CONTROL TEAM

Fraise A, Bradley C (eds). (2009) 'Ayliffe's Control of Healthcare-Associated Infection Fifth Edition: A Practical Handbook'. Hodder Arnold: UK.



Solutions

*not all possible;
practical;
affordable;
or acceptable*

Photo: Johan Elisson

Dancer SJ, Infection control in the post-antibiotic era, Healthcare Infect, 2013

Recognising the conflict between healthcare funding and infection control



*'...patients don't fit into packets;
the patient journey isn't a production line....'*

...even simple control measures do not necessarily happen on the shop floor




Photo: Clare Kendall

Why doesn't hand hygiene work better? Sepkowitz K, Lancet Infect Dis 2012

What constitutes effective infection control?

Screening and isolation to control MRSA: sense, nonsense, and evidence, Fütkenheuer et al, The Lancet, 21st August 2014



'There is nothing wrong with lessons learned from the past, other than 21st century arrogance in forgetting them'

Dancer SJ, BMJ Rapid Response 2008

visinvis: pathogen goggles On Perception of domestic



Seeing is believing

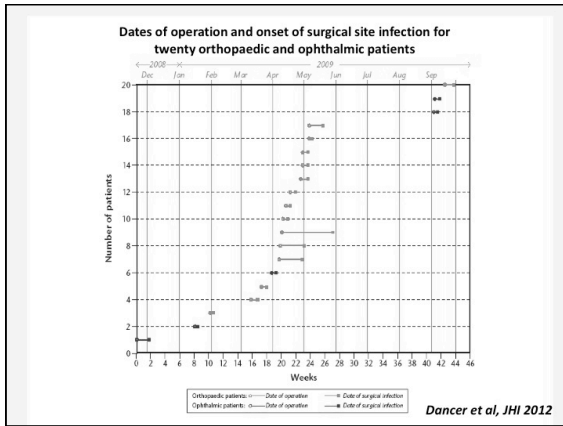
www.visinvis.org/

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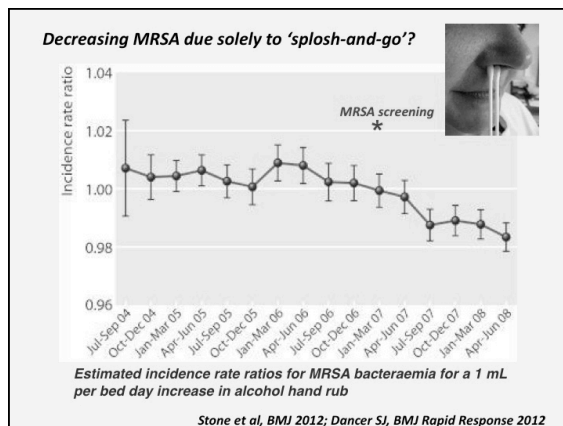
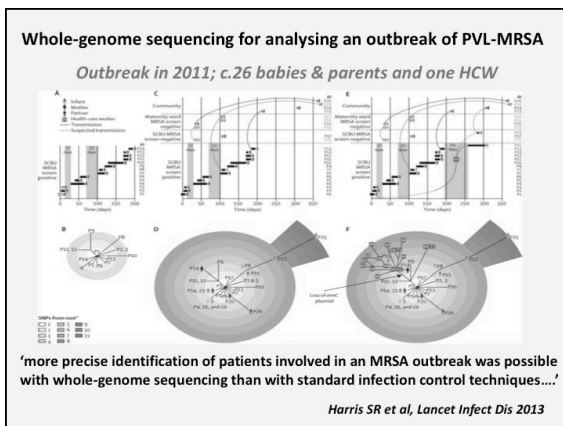
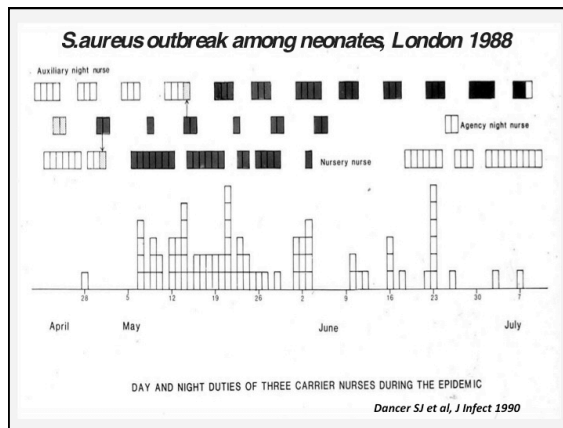
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Let's talk about *S.aureus*

S.aureus

Outbreak in Guy's Hospital neonatal unit, London 1989

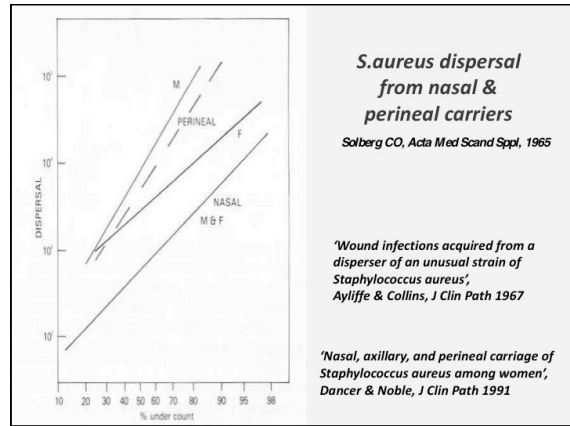
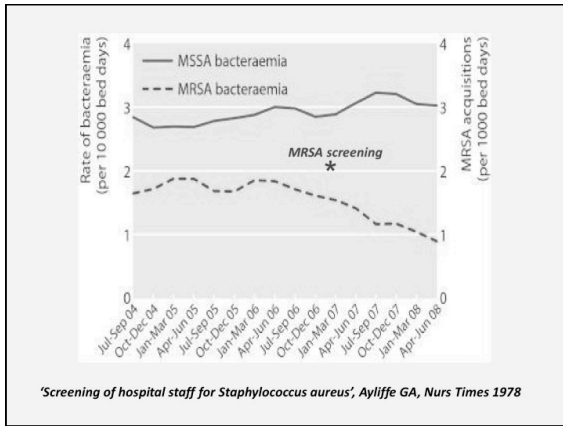


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Did you know that your choice of underwear could be an infection control risk?

It is only a matter of time before we are all forced to wear elasticated pants.

'Dispersal of Staphylococcus aureus', Ayliffe GA et al, Lancet 1974

Bacterial contamination of white coats.....

Stethoscopes, pens, cuffs, ties, rings, watches, and so on

Let's get rid of them!

Gotta be Bare Below The Elbows!

'Pants, Policies and Paranoia', Dancer SJ, J Hosp Infect 2010

'Contamination of protective clothing and nurses' uniforms in an isolation ward', Babb JR, Davies JG & Ayliffe GA, J Hosp Infect 1983

(Personal) Hygiene is key

FOR MALE **FOR FEMALE**

'Put your ties back on: scruffy doctors damage our reputation and indicate a decline in hygiene', Dancer SJ, BMJ 2013

The Hand-Touch equation

Hand = **Hand-touch site**

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

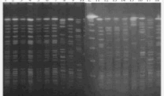
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Infection Control in the 21st Century

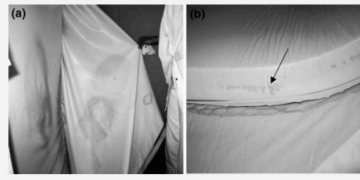
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MDR *Enterobacter cloacae* outbreak in ITU associated with contaminated foam mattresses




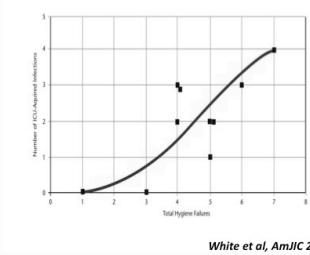
One *E. cloacae* clonal type found with:
four environmental isolates (lanes 1–4)
and six clinical isolates (lanes 5–7, 9, 11 and 18)



van der Mee-Marquet et al, Crit Care 2006

'Gentamicin-resistant *Pseudomonas aeruginosa* infection from mattresses in a burns unit'; Fujita, Lilly, Kidson & Ayliffe GA, *BMJ* 1981

Such a fuss over the importance of basic cleaning...

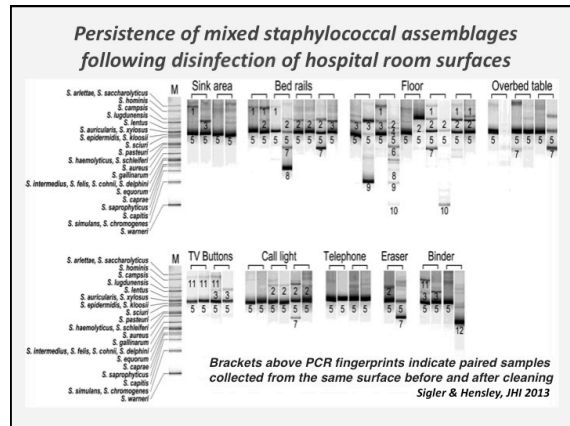



White et al, *AmJIC* 2008

'Ward floors and other surfaces as reservoirs of hospital infection', Ayliffe GA et al, *J Hyg (Lond)* 1967

Date	Specimen site	Environment	PFGE profile	
24.7.06	Foot		15e	Molecular relationships between patient & environmental MRSA
10.8.06	Nose		15b/15z/15-71	
18.8.06	Foot		16-237/16-296	
21.8.06	Groin		15h	
31.8.06	Nose		15a	
08.9.06	Nose		15d	
21.9.06	Groin		15b/15z/15-71	
25.9.06		Computer	15-73	
06.10.6		Patient notes	15-73	
11.10.06		Overbed table	15-73	
13.10.96	Throat		15a	Molecular relationships between patient & environmental MRSA
18.10.06	Heel		15b/15z/15-71	
25.10.06		* Patient notes	15b/15z/15-71	
07.11.06		Hoist	16-237/16-296	
07.11.06		Door handle	16-237/16-296	
27.11.06	Throat		15b/15z/15-71	
16.12.06	Leg		124b	
21.12.06	Central line tubing		16-237/16-296	
05.2.07	Stoma		16-216	
13.2.07		Hoist	15b	
13.2.07		Bedside locker	15a	
13.2.07		Desk	15e	
14.2.07		* Arm	15b/15z/15-71	
18.2.07	* Catheter line		15b/15z/15-71	
19.2.07		Bed frame	15e	
19.2.07		* Overbed table	15b/15z/15-71	
21.2.07	Throat		15a	
21.2.07	Nose		16-218	
08.3.07		Bed frame	15e	
22.6.07		Bed frame	15e	
27.6.07		Hoist	15d	
04.7.07		Desk	15b/15z/15-71	
12.7.07	Throat		15b/15z/15-71	
21.7.07		* BP stand	15b/15z/15-71	
23.8.07	Nose		15e	

Dancer et al, BMC Med 2009



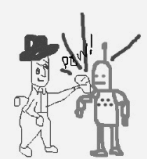

Disinfect everything.....

'Routine surface disinfection in health care facilities: should we do it?'; Allerberger, Ayliffe et al, *Am J Infect Control* 2002

Time to get PHYSICAL!

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



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

Two step cleaning is no more effective than one-step cleaning!
Gillespie et al, AmJIC 2011

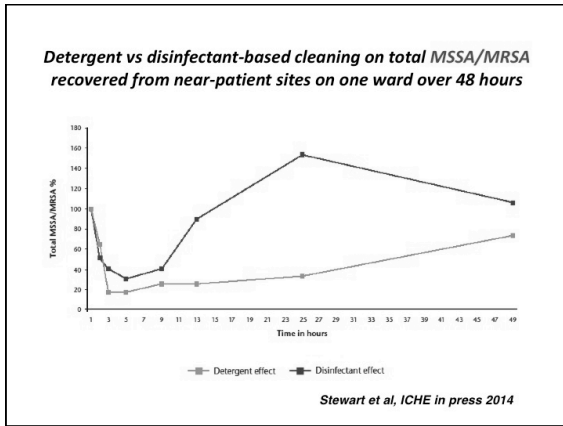
A single clean can reduce contamination by around 90%.....
Spight et al, J Hosp Infect 2011

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

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Antimicrobial surfaces



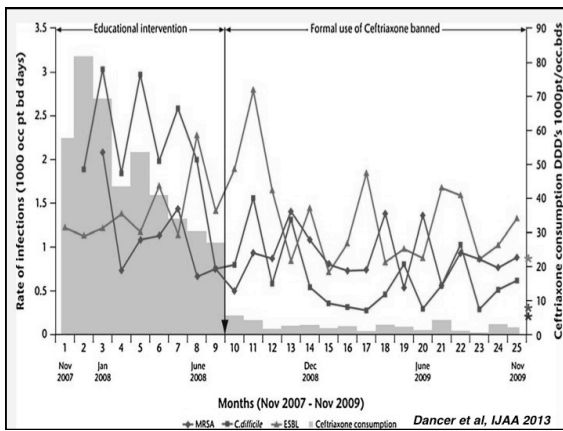
In a world first, IT suites in Finland's Jorvi Hospital have been coated with antimicrobial copper equipment to reduce the risk of infections spreading via frequently-touched surfaces

www.cleanroomtechnology.com, 23rd January 2014



Desks and keyboards used by staff on an emergency ward were replaced with copper and copper-alloy products

'A system of air recirculation and antibacterial surface treatment in a surgical ward', Ayliffe GA & Beard MA, J Clin Path 1962



'The Progressive Intercontinental Spread of Methicillin-Resistant *Staphylococcus aureus*'

Ayliffe GAJ, Clin Infect Dis 1997

'The restricted use of antibiotics, especially third generation cephalosporins, is another possible reason....for the low number of MRSA isolates in some countries'

'...third-generation cephalosporins, and more recently, the quinolones may have had a selective influence in the increasing incidence of MRSA...'

'How antibiotics can make us sick: the less obvious adverse effects of antimicrobial chemotherapy', Dancer SJ, Lancet Infect Dis 2004

'Licence to prescribe'?




'Hospital disinfectant and antibiotic policies', Ayliffe GA, Chemioterapia 1987

'Infection control in the post-antibiotic era', Dancer SJ, Healthcare Infect 2013

'Protective isolation in single-bed rooms: studies in a modified hospital ward'

Ayliffe et al, J Hyg (London), 1971

'...detailed specifications needed to prevent airborne dispersal of pathogens are still unknown'

'Roles of sunlight and natural ventilation for controlling infection', Hobday RA & Dancer SJ, J Hosp Infect 2013

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Germicidal effects of sunlight

Previous work confirms the germicidal effects of sunlight, with unexplored earlier studies suggesting a potential role for surface decontamination

Exposure to sunlight may enhance resistance to infection in those who receive it, even from behind glass

'Sunlight therapy and solar architecture', Hobday RA, Med Hist 1997
'Protective isolation in single-bed rooms: studies in a modified hospital ward', Ayliffe et al, J Hyg (London), 1971

Research into practice!

Healthcare

- Electronic hand hygiene monitor
- E-prescribing
- Global surveillance, with definitions
- Electronic 'nose'; glowing wounds
- Bacterial interference... probiotics
- Phage therapy
- New vaccines; new anti-infectives
- Hospital design: ventilation, UV light
- Decontamination 'Tardis' & 'Robots'

Community

- 'Find & Treat' TB vans.. or sniff it out?
- Promote hygiene – education, media
- Drains and sewage
- Farm-to-fork: bio-coated wrappers
- Animals & agriculture
- Quarantine; imprisonment?
- Soil searching

Hospital of the future

Infection control in the 21st century

It's not about antibiotics any more;
 It's about transmission and how to stop spread

Farewell antibiotics....

Hello Hygiene

Dancer SJ, BMJ June 2013

Infection control in the 21st century?

...it's in YOUR hands!

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- Raymond Hamill, R&D director, NHS Lanarkshire
- Professor Graham Ayliffe
- www.staggeringstories.net (previous slide)



NB. No relevant disclosures, no shares, no shady deals



NHS Scotland takes steam cleaning to a new level





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SECC, Glasgow

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Prof. Lisa Saiman, Columbia University Medical Center, New York

October 8 (Free WHO Teleclass – North America)
PUBLIC REPORTING AND DISCLOSURE OF HAI RATES: POSITIVE IMPACT OR CONFUSION?
Dr. Marianne McGuckin and John Govednik, McGuckin Methods International
Sponsored by the World Health Organization Patient Safety Agency

October 9 **ENHANCED ENVIRONMENTAL CLEANING IN CONTROLLING CLOSTRIDIUM DIFFICILE INFECTIONS IN THE HOSPITAL SETTING: DOES IT MATTER?**
Prof. Farrin A. Manian, Harvard Medical School

October 2 **HEALTHCARE LAUNDRY: EPIDEMIOLOGY AND MICROBIOLOGY ISSUES**
Dr. Lynne Schulster, Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention

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