Barry Hunt

Education

- Honour's BSc – University of Guelph (1981 – 1985)
- Post-degree Science – University of Waterloo (1985 – 1986)

Experience

- Medical Lab Technologist – Grand River Hospital (1981 – 1989)
  - Pathology
  - Chemistry
  - Histology
- Hospital Sales and Product Development – Medigas / Praxair (1988 – 1995)
  - Anesthesia Equipment
  - Respiratory Equipment
  - Medical Gases
  - Medical Gas Equipment
- Class 1 Inc.
  - President & CEO (1995 – 2012)
  - Chairman & CTO (2012 – present)
- University of Waterloo
  - Research Scientist, Dept. of Chemistry (2012 – present)

Standards

- CSA (1995 – present)
  - Vice-Chair Strategic Steering Committee for Healthcare
  - Chair, Task Force on Hospital Acquired Infections
  - Member, Technical Committee for Perioperative Care
  - Member, Technical Subcommittee for Plume Scavenging
  - Chair, Technical Subcommittee for Medical Gases & Equipment
- ISO TC121 Anesthesia & Respiratory (2006 – present)
  - Head of Delegation to SC6, Medical Gases and Equipment
  - Head of Delegation to SC8, Medical Suction

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We Can Be Heroes

Hospital Acquired Infections (HAI)
& the
Physical Environment

October 2013

Barry Hunt

Chairman & CTO
Class 1 Inc.

Vice-Chair,
CSA Strategic Steering
Committee for Healthcare

Chair,
CSA Task Force
Hospital Acquired
Infections

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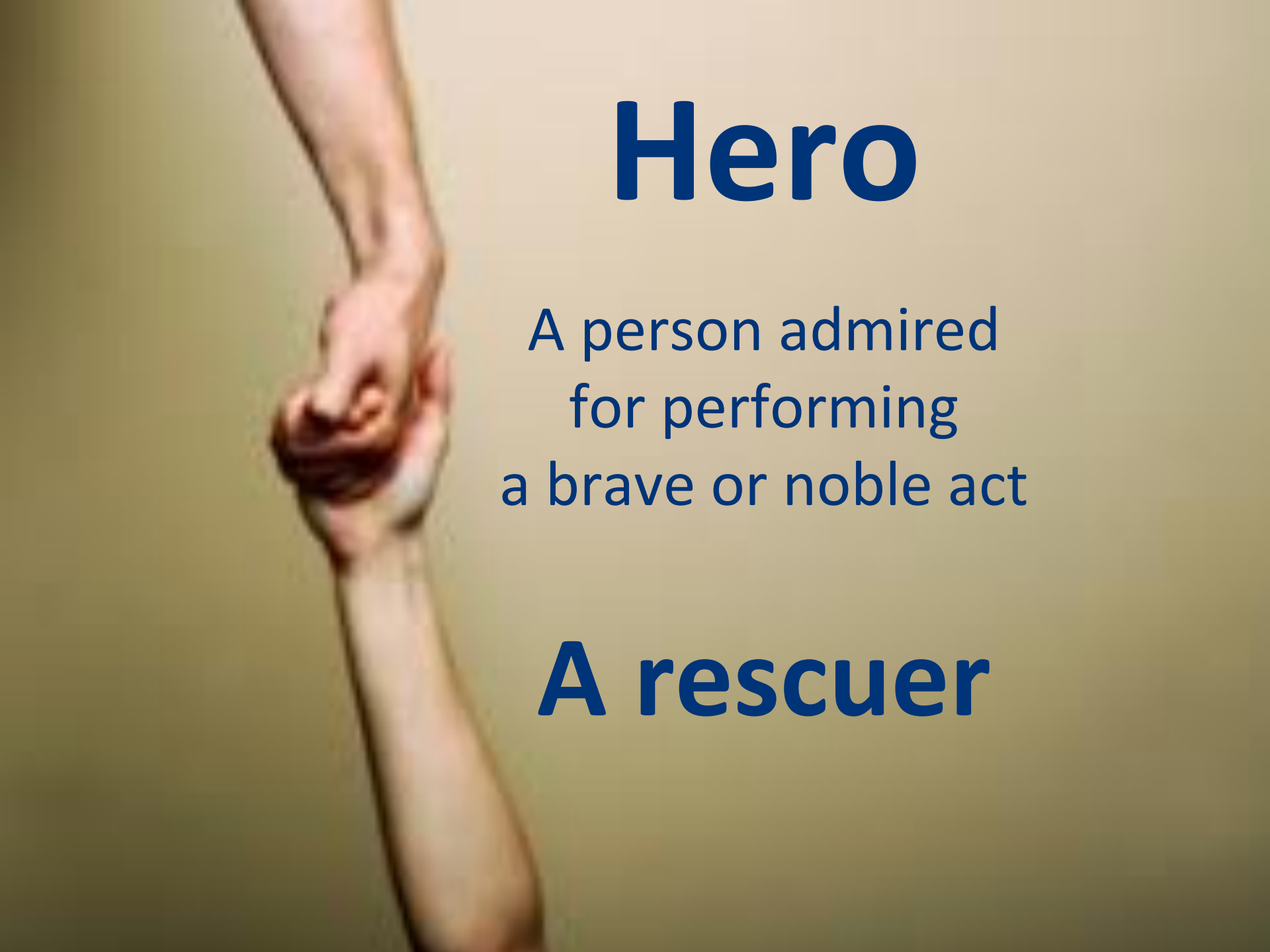
Hero
A person admired
for performing
a brave or noble act
A rescuer

The Danger…

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Hospitals are killing people…

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And it’s not the med gas…

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How many deaths due to med gas each year?

100 ish

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How many deaths due to HAI's each year?

100,000

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2,000,000

The number of Americans who will be infected by a hospital this year

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100,000

The number of Americans who will

die

from a hospital infection this year

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$40 Billion

The cost of treating Americans infected by a hospital this year

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1 in 20

The percentage of American inpatients infected by a hospital this year

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1 in 20

The percentage of hospital infected Americans who will die this year

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4th

“Hospital Acquired Infection is the 4th largest cause of death with a higher mortality rate than AIDS, breast cancer, and automobile accidents combined.”

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Source: HHS Report January 2009

Annual Deaths

Canada

• Breast Cancer	5,100
• Car Accidents	2,200
• HIV	400
• Hospital Acquired Infections	10,000

US

• Breast Cancer	40,460
• Car Accidents	32,800
• HIV	17,000
• Hospital Acquired Infections	102,000

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HAI's…the New Cancer

Everyone knows someone affected

And it can be cured

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Hospital Infection Rates in Developed Countries

HAI in Developed	Nations
Country	Prevalence
Canada	10.50%
Finland	8.50%
France	6.70%
Greece	8.60%
Ireland	7.60%
Italy	4.60%
Norway	5.10%
Scotland	9.50%
Slovenia	4.60%
Switzerland	10.10%
United Kingdom	7.60%
United States	4.50%
WHO 2009	

ICU prevalence rates of HAI in developed countries range from 9-37% in Europe and USA with crude estimates of mortality rates from 12-80%.

In ICU settings, the use of invasive devices is one of the most important risk factors for acquiring HAI.

Catheter related bloodstream infections caused by MRSA may cause US$ 38,000 per episode (WHO).

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Source: http://hospitalhygiene.info/index.php?option=com_content&view=article&id=48:hai-developed-nations&catid=15:infection-rates-in-developed-world&Itemid=22

50%

The percentage of ICU patients worldwide who will develop an HAI

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Source: http://hospitalhygiene.info/index.php?option=com_content&view=article&id=48:hai-developed-nations&catid=15:infection-rates-in-developed-world&Itemid=22

U.S.

“Hospital infections add more than $30 billion annually to the nation’s health tab in hospital costs alone.

The tab will increase rapidly, as more infections become drug-resistant.”

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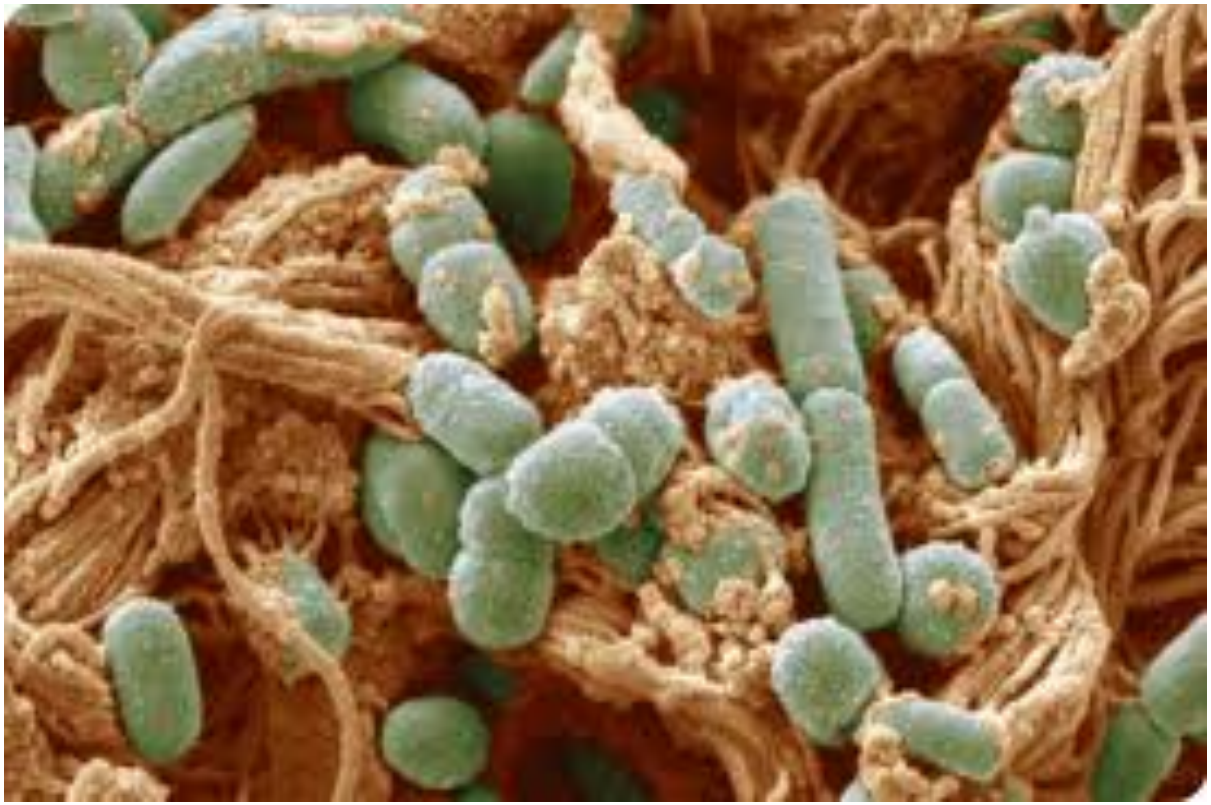
Source: http://www.hospitalinfection.org

The War on Bugs



Why are we losing?

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Antibiotic Resistance

If we wait until people are infected, we're too late

Prevention is key

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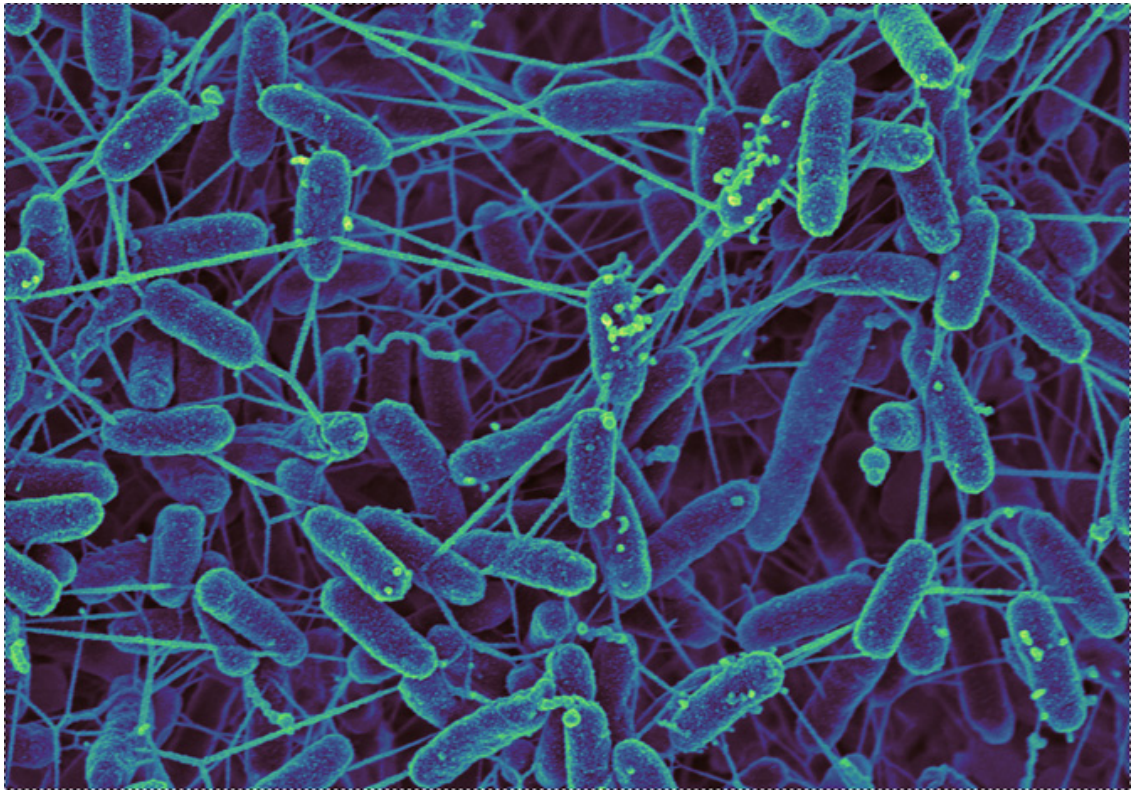
If we can do more to prevent infections…



Why aren't we?

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Root Causes

We either…

Don’t know

Don’t Care

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We Care…
So How Can We Help?

1) Learn

2) Tell everyone

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Infection Control 101

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3 Common Microbes Associated with Hospital Acquired Infections

MRSA (Methicillin-resistant Staphylococcus aureus)

25%- 30% of the population is colonized with Staph aureus ;
1% is colonized with MRSA.
8% of all hospital infections
70% of Staph aureus in hospitals are MRSA (CDC, WHO).

VRE (Vancomycin-Resistant Enterococci)

> 30% of ICU infections are VRE

C Diff (Clostridium difficile)

13% with hospital stays up to 2 weeks
50% in those with hospital stays longer than 4 weeks
frequency and severity of C. diff infections remains high and it is increasing (CDC, WHO).

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Source: http://hospitalhygiene.info/index.php?option=com_content&view=article&id=50:common-microbes-associated-with-hospital-acquired-infections&catid=18:hospital-acquired-infection&Itemid=24

KPC

Last summer, a patient was transferred from a New York hospital to the NIH hospital in Maryland for a lung transplant. As nurses perused the charts that uncovered a startling revelation – the patient was carrying an antibiotic-resistant infection.

Despite extreme measures to contain the superbug, it spread, killing three more patients. The hospital continued with desperation, but still *Klebsiella pneumonia* (KPC) came back stronger and more resistant than the case before. They found the bacteria in the most unexpected places – air vents that had been bleached twice and a sink drain, which prompted them to rip out the plumbing. Guards were employed to monitor nurses and other caretakers- anyone who fell down on the job was promptly fired.

Yesterday, the superbug, although currently contained, claimed a 7th life of the19 patients at the hospital to have contracted the antibiotic-resistant strain of KPC. *The Washington Post* reported on Friday that a young boy has died. He arrived in April from Minnesota and was sent to the research hospital after complications with a bone marrow transplant when he contracted the bug.

More than 41 states have reported outbreaks of KPC since 2000. Currently, 6 percent of hospitals are battling the superbug.

Air Vents
Sink Drains

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Source: http://www.examiner.com/article/superbug-claims-7th-life-at-nih-hospital

C. difficile blamed for 9 death in hospital near Montreal

MONTREAL (CP) — Nine people have died in a Quebec hospital from what doctors believe is a new and more powerful strain of C. difficile.

Since late July, health officials have identified a total of 22 C. difficile cases at Honore-Mercier Hospital in St-Hyacinthe, about 60 kilometres southeast of Montreal.

Doctors are at a loss to explain what caused the outbreak, but are concerned it is a different strain from others found in Quebec hospitals in the past.
The outbreak is even more troubling because the hospital recently underwent widespread renovations.

A spokesperson says 50 per cent of the hospital is being decontaminated and that the work should be finished by next week.

A strain of C. difficile is blamed for roughly 2,000 deaths in Quebec between 2003 and 2004.

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Source: http://cnews.canoe.ca/CNEWS/Canada/2006/10/27/2145519.html
October 27, 2006

C. difficile outbreak linked to fatal strain

Fourteen people have been diagnosed with C. difficile at a Mississauga, Ont. hospital, and at least one of four people who tested positive after death had the same strain that proved deadly in Quebec.

Meanwhile, CTV News has learned new cases of C. difficile have been confirmed at another Greater Toronto Area hospital. Scarborough Hospital General Division has diagnosed several patients with having the bacterium, CTV's Tom Hayes reports.

Last year, a committee set up by Ontario's chief coroner found that C. difficile was behind 10 deaths at a Sault Ste. Marie hospital. The committee investigated 26 deaths, which were thought to be related to the bacterial infection.

In recent years, hospitals in Quebec have struggled with numerous outbreaks. As recently as December, a person died in a Montreal-area facility due to C. difficile bacteria, bringing the toll at Honore-Mercier hospital to 16.

Source: toronto.ctv.ca
Published Wednesday, Feb. 28, 2007 11:08PM EST

Transmission

Contact

Droplets

Airborne

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Traditional #1 Defense?

Handwashing

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Just Do It...

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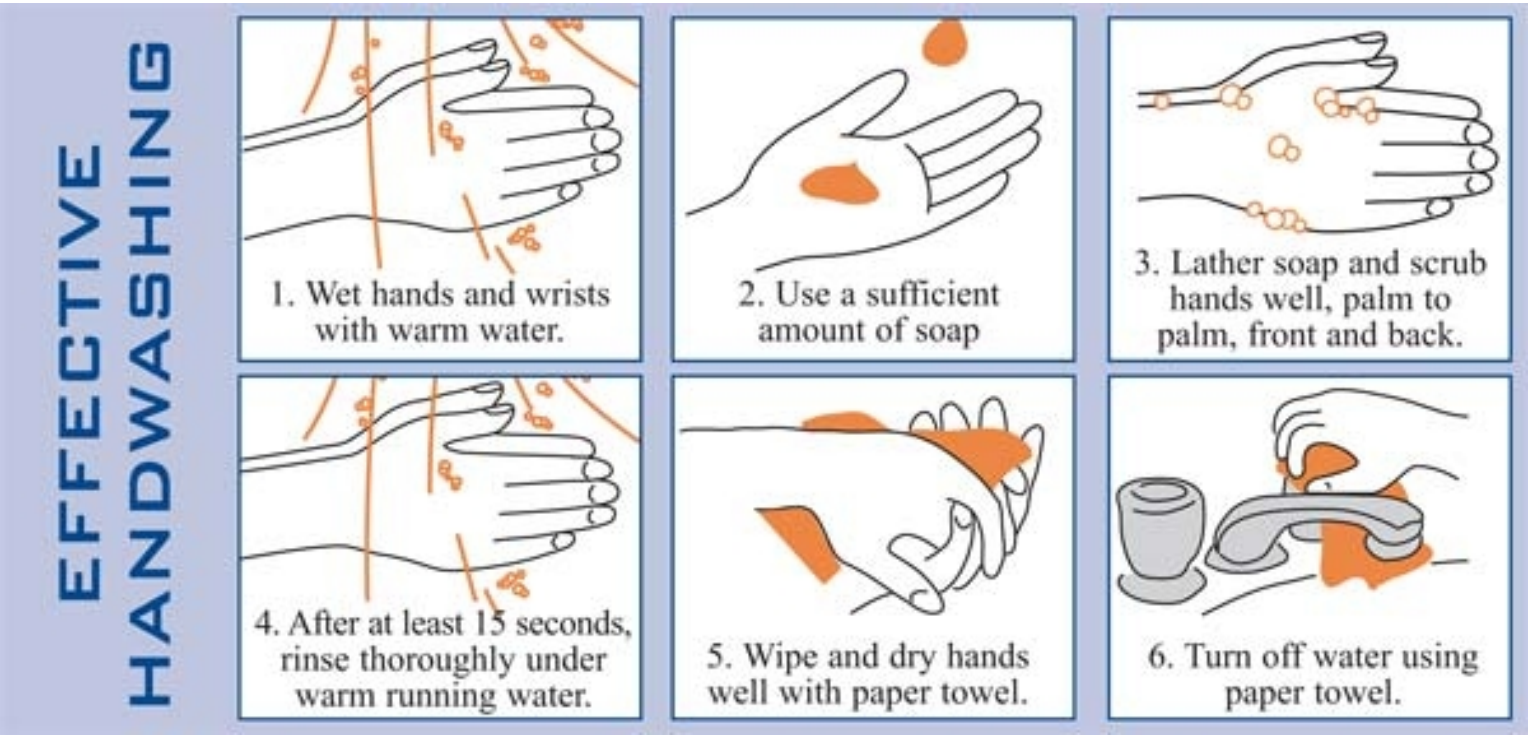
How…



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When…

4 Moments

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Source: http://www.oahpp.ca/services/jcyh/moments.html

Do people really do it?

Sort of

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5% to 81%

Hand hygiene is a primary measure with proven effectiveness in preventing Hospital Acquired Infections. Despite its important role in the reduction of the transmission of microbial pathogens, overall compliance of healthcare workers with hand hygiene remains low in both developed and developing countries.

The Centers for Disease Control (CDC) and the World Health Organization (WHO), suggest the mean baseline rates of 5% to 81%, with an average of 40% of personnel compliance.

The primary means of measuring compliance with hand hygiene protocols and their merits are direct observation, self-reporting or surveys, 'secret shopper' and product usage.

Primary sources of guidelines on hand hygiene are those published by CDC and WHO, and healthcare settings should adopt one such set of guidelines in their hygiene protocols.

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Source: http://hospitalhygiene.info/index.php?option=com_content&view=category&layout=blog&id=22&Itemid=26

Published Hand Hygiene Compliance

	Before Events %	After Events %
St Joseph's Health Centre - Toronto	87.34	94.51
Southlake Regional Health Centre	91.06	94.22
MacKenzie Health	59.00	78.01
Bluewater Health	91.78	96.71
St Catharines General Hospital Site - Niagara Health System	96.23	97.54
Centenary Hospital Site - Rouge Valley Health System	89.68	92.61
Welland County General Hospital Site - Niagara Health System	95.74	96.78
Niagara Falls The Greater Niagara Hospital Site - Niagara Health System	95.46	96.70
North York General Hospital	83.37	90.01
St Thomas-Elgin General Hospital	83.13	92.78
Royal Victoria Regional Health Centre	89.45	93.20
Toronto East General Hospital (The)	71.59	75.01
Ajax and Pickering Hospital Site - Rouge Valley Health System	88.85	95.26

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Source: http://patientsafetyontario.net/Reporting/en/PSIR_IndicatorComparison.aspx?hosptGroupTypeId=3&IndicatorId=8&hosptid=3734&seltype=1&lhin=3&city=&pc=&dist=0

90%

The typical reported level of hand hygiene compliance in Ontario Hospitals

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40%

RICN's estimated level of hand hygiene compliance in Ontario Hospitals

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15%

The likely level of
hand hygiene compliance
in
Ontario Hospitals

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90% Reported vs 15% Actual

Why the discrepancy?

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Compliance with hand hygiene on surgical, medical, and neurologic intensive care units: Direct observation versus calculated disinfectant usage

Simone Scheithauer, MD (Dr med), Helga Haefner, MD (Dr med),Thomas Schwanz, MD (Dr med), Henna Schulze-Steinen, MD,b Johannes Schiefer, MD (PD Dr med), Alexander Koch, MD (PD Dr med), Astrid Engels, and Sebastian W. Lemmen, MD (Prof Dr med) Aachen, Germany

Background: Hand hygiene (HH) is considered the single most effective measure to prevent and control health care-associated infections (HAIs).

Although there have been several reports on compliance rates (CRs) to HH recommendations, data for intensive care units (ICUs) in general and for shift- and indication-specific opportunities in particular are scarce.
Methods: The aim of this study was to collect data on ICU-, shift-, and indication-specific opportunities, activities and CRs at a surgical ICU (SICU), a medical ICU (MICU), and a neurologic ICU (NICU) at the University Hospital Aachen based on direct observation (DO) and calculated disinfectant usage (DU).

Results: Opportunities for HH recorded over a 24-hour period were significantly higher for the SICU (188 per patient day [PD]) and MICU (163 per PD) than for the NICU (124 per PD).

Directly observed CRs were 39% (73/188) in the SICU, 72% (117/163) in the MICU, and 73% (90/124) in the NICU.

However, CRs calculated as a measure of DU were considerably lower: 16% (29/188) in the SICU, 21% (34/163) in the MICU, and 25% (31/124) i the NICU. Notably, CRs calculated from DO were lowest before aseptic tasks and before patient contact.

Conclusions: To the best of our knowledge, this study provides the first data picturing a complete day, including shift- and indication- specific analyses, and comparing directly observed CRs with those calculated based on DU, the latter of which revealed a 2.75-fold difference. Worrisomely, CRs were very low, especially concerning indications of greatest impact in preventing HAIs, such as before aseptic task. Thus, the gathering of additional data on CRs and the reasons for noncompliance is warranted.

CR likely skewed by Hawthorne Effect

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Source: Am J Infect Control 2009;37:835-41

Hawthorne Effect

If you follow someone around with a clipboard, they will do their job better… and skew the results

Nurses wash their hands 3X as much when they are being watched

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Real Time Monitoring

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Source: http://www.handgienecorp.com

Hand Hygiene Monitoring Costs

Sample: A Large Ontario Hospital

		Annual Compensation	Total
ICP Director	1	$ 100,000	$ 100,000
ICP FTE	15	$ 70,000	$ 1,050,000
			$ 1,150,000

8,000 Annual Hand Hygiene Audits

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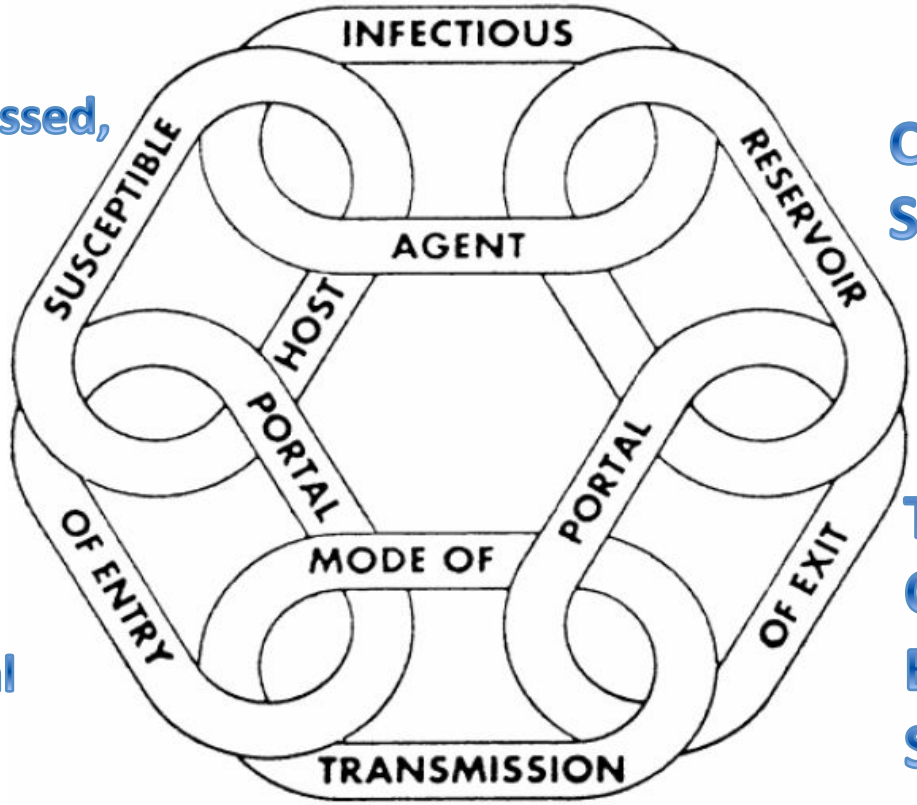
Wheel of Fortune

Antibiotics, surgery

Sick, Trapped,
Immune suppressed,
Antibiotics



Cleaning
Sterilization

Mouth, Nose
Eyes, Airway
IV, Catheter
Blood, Surgical

Toilet, Vomit
Cough, Sneeze
Blood,
Surgical Smoke

Contact
Droplets
Air

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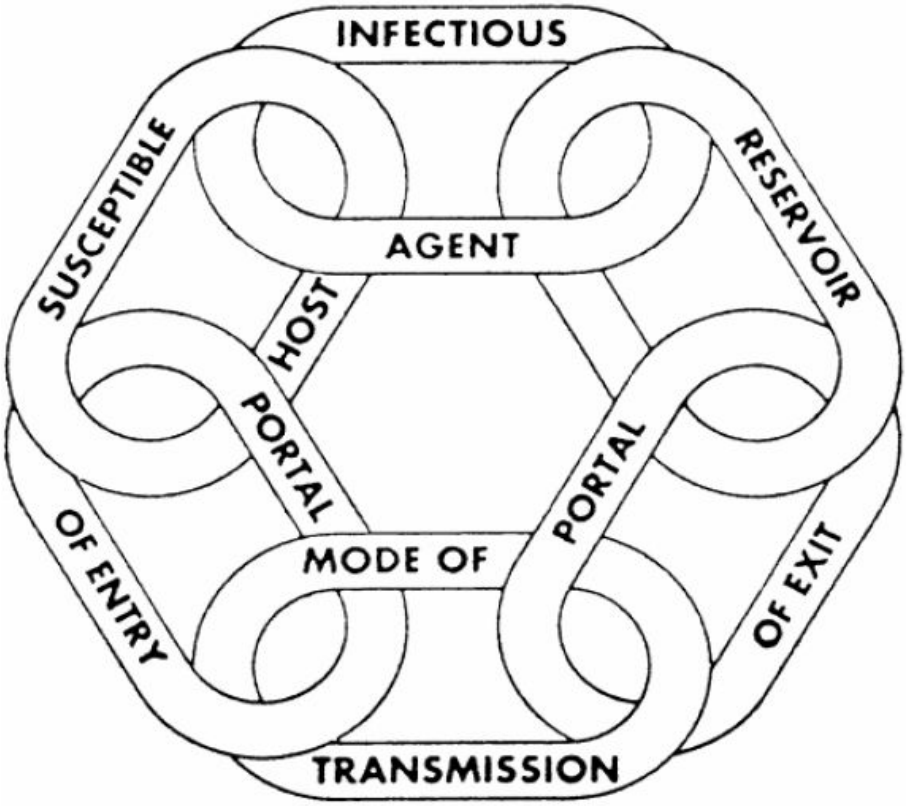
Traditional Approach



80%

Especially Hand Hygiene

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20%

The percentage of HAI's that can be reduced by improving hand hygiene compliance

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Source: HHS Report January 2009

Is handwashing the answer?

No

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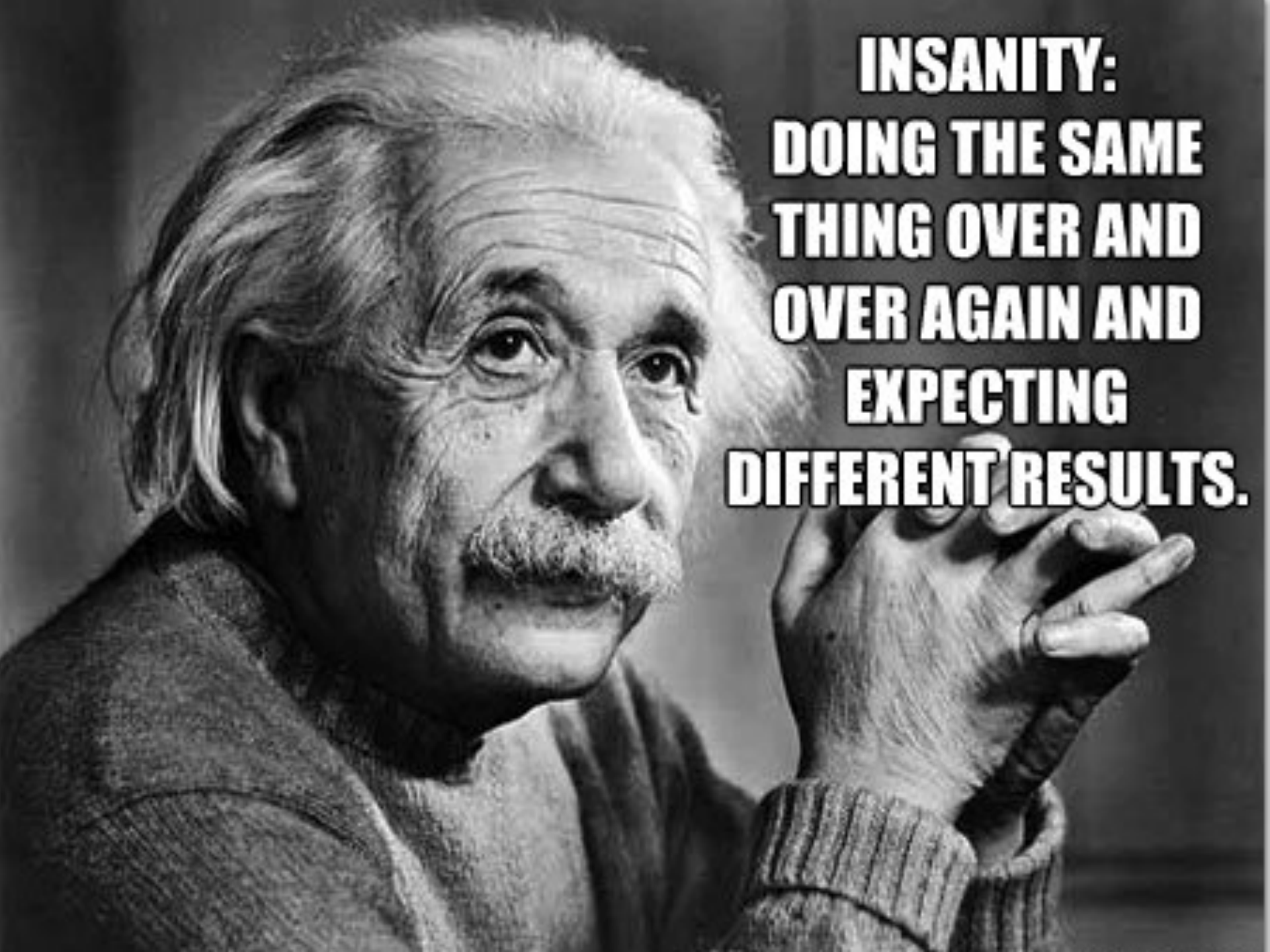
INSANITY:
DOING THE SAME
THING OVER AND
OVER AGAIN AND
EXPECTING
DIFFERENT RESULTS.

80%

The percentage of HAI's that can be reduced by improving the physical environment

Air, Water, Touch Surfaces

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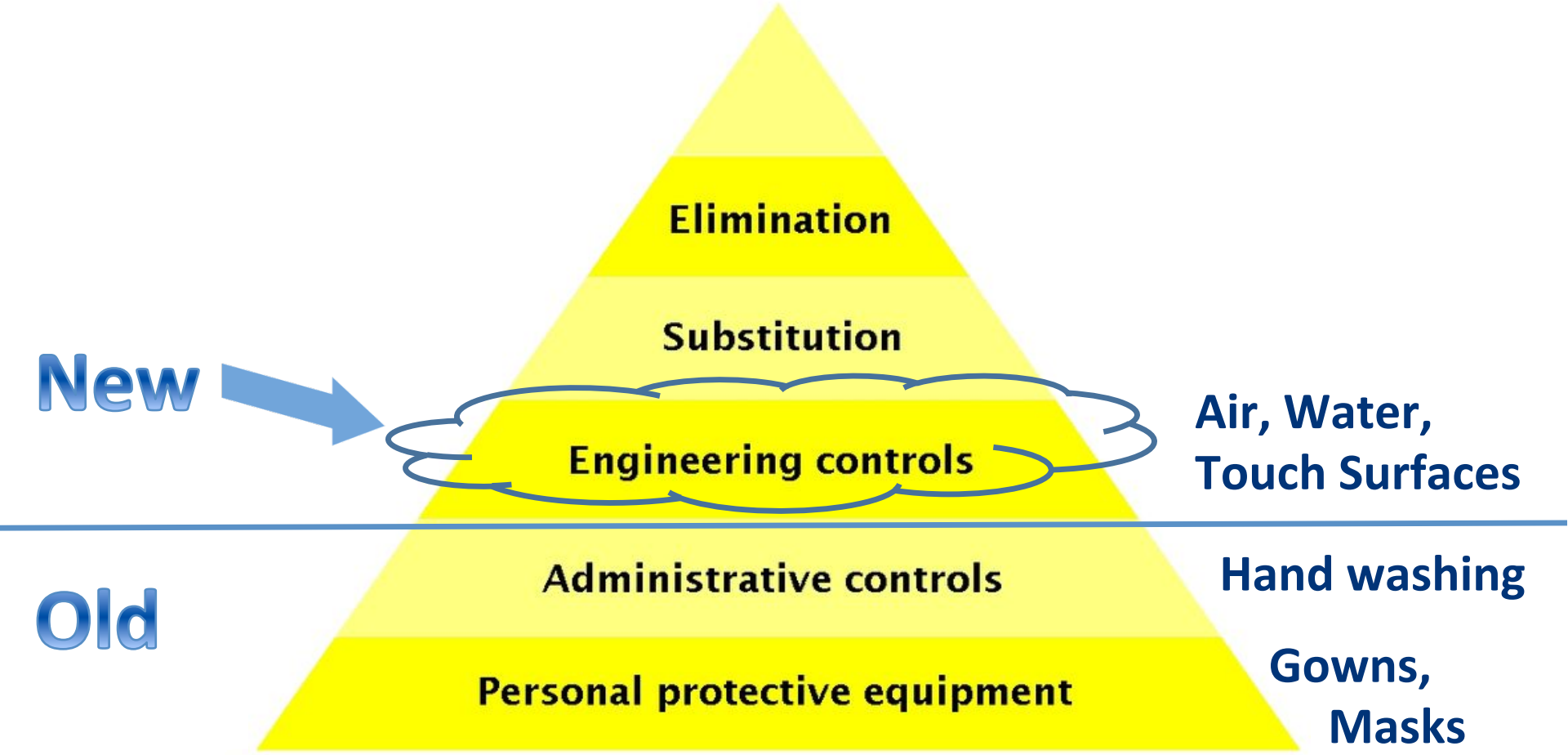
Source: HHS Report January 2009

Hazard Control



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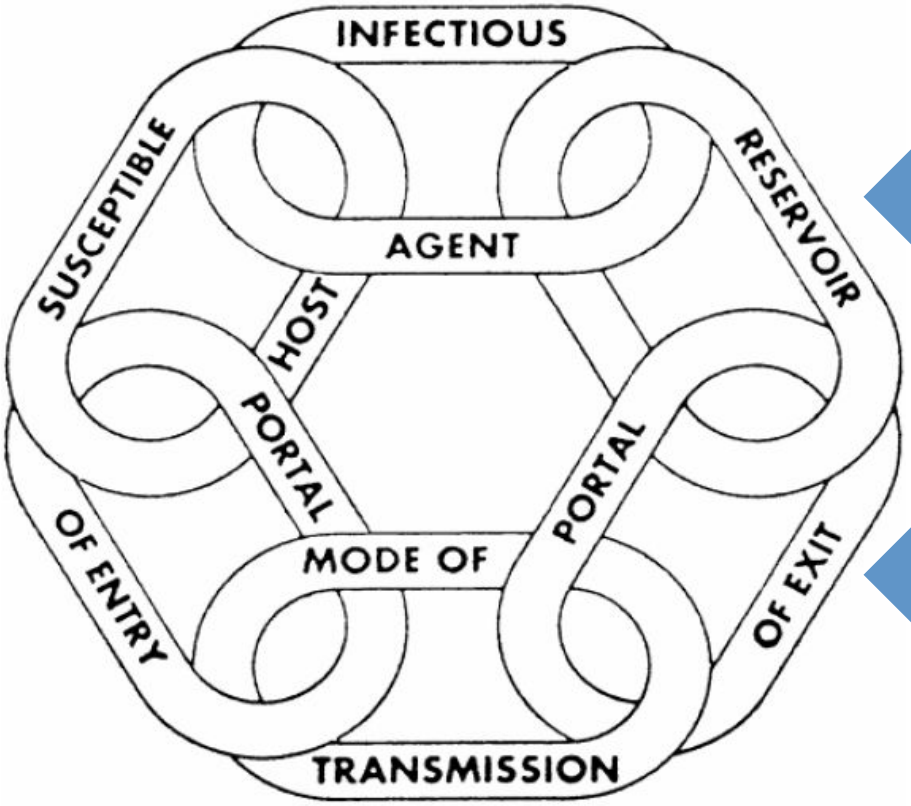
New Target



80%

Air, Water, Touch Surfaces

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Air, Water, Touch Surfaces

80% of infectious diseases are transferred by touch

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Source: Tierno, 2001

Touch Surfaces

- Bed Rails
- Chair Arms
- Tray tables
- Pull Cords
- IV Poles
- Handrails
- Door Hardware
- Keyboards & Mice
- Charting Stations
- Telephones
- Ventilators
- Anesthesia Machines
- Tubing

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Between Cleanings

Between cleanings, surfaces are re-infected.

We need a solution that disinfects for us 24/7 between cleanings

We need Antimicrobial surfaces

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Ideal Antimicrobial Material

Non-porous
Non-toxic
Easy-to-clean
Continuous antimicrobial action
Long life
Broad spectrum – Bacteria, Viruses , Fungi
Broad activity range – temperature, RH
Self-disinfecting
Self-cleaning

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Typical Materials

- Metals
- Fabric
- Solid Surface
- Plastic
- Glass

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Antimicrobial Materials

Chemicals

e.g. – Triclosan

Metals

Copper

Silver

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How good is copper?

Copper

Antimicrobial under all environments
< 2 h kill time

Silver

Antimicrobial in select environments
90+% RH, 34 – 37° C, 24 h kill time

Stainless Steel

Zero antimicrobial properties
Great surface to grow microbes

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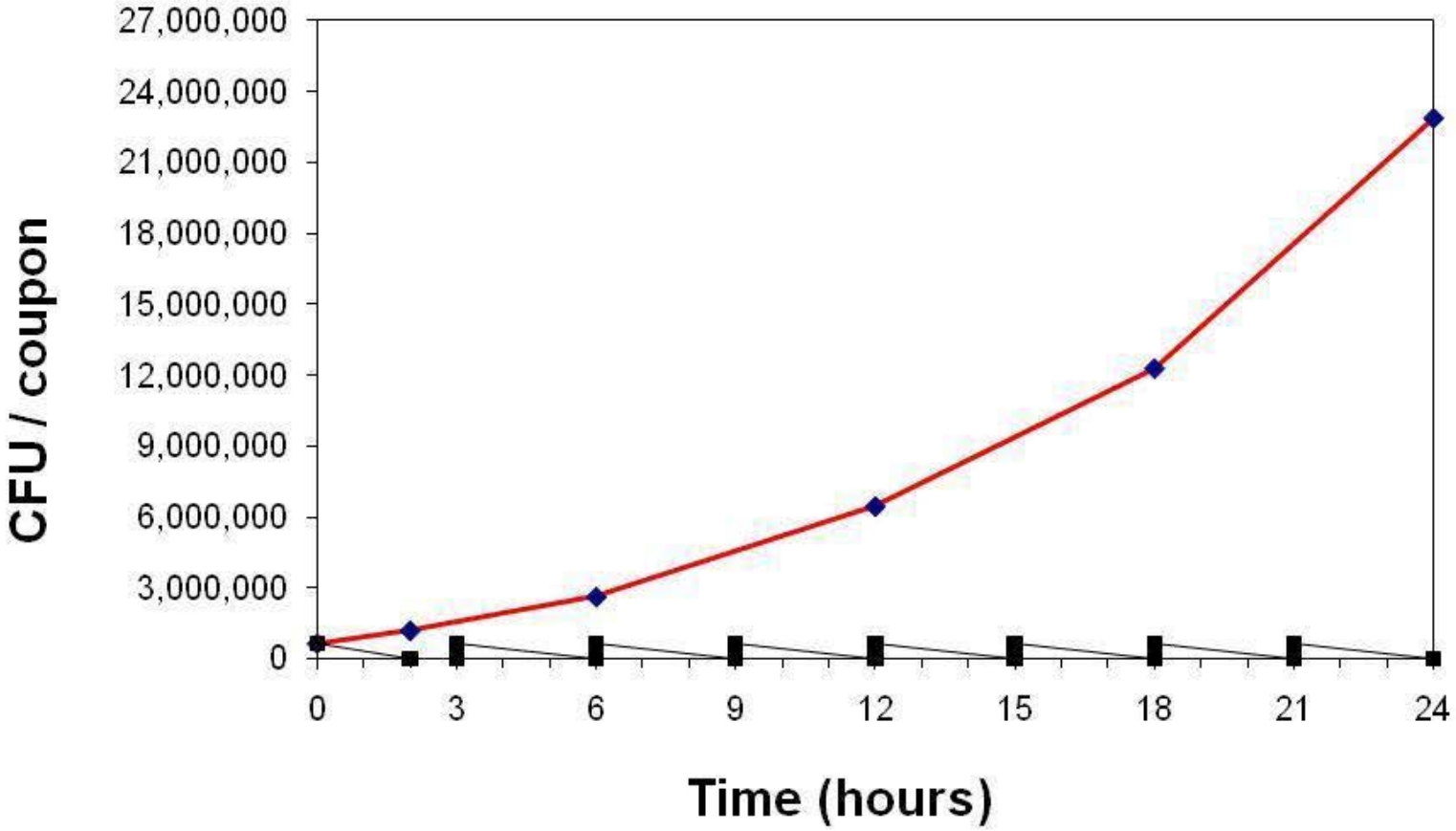
Copper vs Stainless Steel



8 inoculations over 24 hours; no cleaning

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Copper is the Silver Bullet

Copper is clearly superior to silver as an antimicrobial agent

Why then is silver popular as an antimicrobial additive?

50 year head start

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Copper is EPA Registered

EPA approved label claim:

"This doorknob is made from an Antimicrobial Copper alloy which continuously kills greater than 99.9% of MRSA within 2 hours of exposure."

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EPA Statement

"[Antimicrobial Copper has] been **rigorously tested** and [has] demonstrated antimicrobial activity. After **consulting with independent organizations** – the Association for Professionals in Infection Control and Epidemiology (**APIC**) and the American Society for Healthcare Environmental Services (**ASHES**) – as well as a leading expert in the field (Dr. William A. Rutala, Ph.D., M.P.H.) the Agency has concluded that the use of **these products could provide a benefit as a supplement to existing infection control measures. "**

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Source:
http://www.epa.gov/pesticides/factsheets/copper-alloy-products.htm

How antimicrobial is antimicrobial?

Plastics and fabrics and powder coats may use additives:

Copper, Silver, Triclosan…

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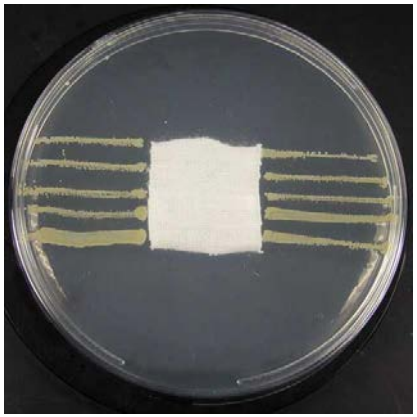
Qualitative Antibacterial Test (AATCC l47)

Untreated

Treated



The microbiologist prepares the plate by streaking five lines of a liquid solution containing live bacteria across the surface of the agar.
A small piece of the cotton sample is placed over the live bacteria.
The Petri plate is placed in an incubator, set at 37ºC, for 24 hours.
The following day, the microbiologist removes the Petri plate and checks the amount of bacterial growth.

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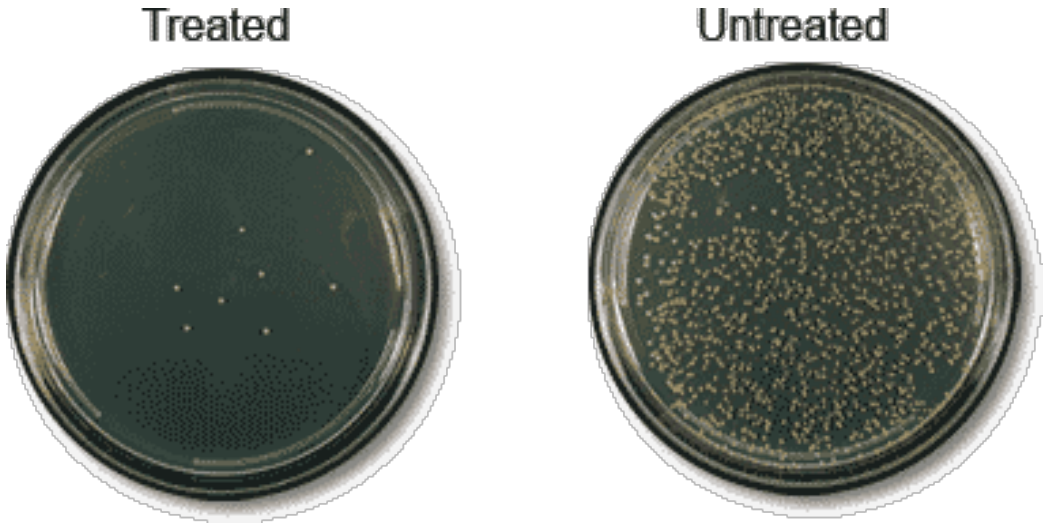
Source:
http://www.ultra-fresh.com/consumers-how-bacteria.php

Quantitative Antibacterial Test (ISO 20743:2007)



In a quantitative test a known amount of bacteria is put onto both a treated sample and onto an untreated sample. The samples are incubated for 24 hours to allow the bacteria time to grow.

After 24 hours, the samples are shaken in a liquid solution to remove all of the bacteria from the samples. The liquid is then tested to see which sample had the highest bacterial counts.

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Source:
http://www.ultra-fresh.com/manufacturers-science-ISO.php

Multi-site clinical trial

- Funded by the US Department of Defense
- Trials at three sites:

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Source: http://www.antimicrobialcopper.com/uk/news-and-download-centre/news/research-proves-antimicrobial-copper-reduces-the-risk-of-infections-by-more-than-40-percent.aspx


Memorial Sloan Kettering Cancer Cente


Ralph H. Johnson
VA Medical Center
stryker
stryker

WHO 1st International Conference on Prevention and Infection Control

Geneva, Switzerland, 1st July 2011

Early results from a comprehensive, multi-site clinical trial in the US demonstrate that the use of antimicrobial copper surfaces in intensive care unit rooms resulted in a

40.4% reduction

in the risk of acquiring a hospital infection.

Rooms with copper surfaces demonstrated a

97% reduction in surface pathogens,

the same level achieved by "terminal" cleaning

Bacteria present on ICU room surfaces are probably responsible for

35-80% of patient infections,

demonstrating how critical it is to keep hospitals clean.

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Source: http://www.antimicrobialcopper.com/uk/news-and-download-centre/news/research-proves-antimicrobial-copper-reduces-the-risk-of-infections-by-more-than-40-percent.aspx

97%

The reduction in surface pathogens by changing touch surfaces to copper

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40%

The reduction in ICU HAIs by changing just 6 touch surfaces to copper

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55%

The reduction in
ICU HAIs
if the 6 copper touch surfaces
remain throughout the patient's stay

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Case Studies of Antimicrobial Copper

1. Centre Hospitalier de Rambouillet, France
2. Centre Inter Générationnel Multi Accueil (CIGMA), France
3. Craigavon Area Hospital, Northern Ireland
4. Evangelisches Geriatriezentrum (EGZB)
5. Homerton Hospital, London, UK
6. Hua Dong Hospital, China
7. The Kohitsuji Child Center, Mitaka, Tokyo, Japan
8. The Medical University of South Carolina, Charleston
9. Mehiläinen Medical Facility, Pori, Finland
10. Mejiro Daycare Center for Children, Japan
11. Memorial Sloan-Kettering Cancer Center, New York, USA
12. Ochiai Clinic, Japan
13. The Ralph H Johnson Veterans Medical Center, USA
14. Roberto del Rio Children's Hospital, Chile
15. Ronald McDonald House of Charleston, USA
16. Santiago Bueras Station, Chile
17. Sheffield Teaching Hospitals NHS Trust, UK
18. St Francis Hospital, Mullingar, County Westmeath, Ireland
19. Trafford General Hospital, UK
20. UHB Selly Oak Hospital, Birmingham, UK
21. University Medical Center Groningen, Netherlands
22. West-Finland Deaconesses' Institution Veterans' Nursing Home and Rehabilitation Institution
23. Willmott Dixon Healthcare Campus of the Future, UK
24. WSSK Hospital, Wroclaw, Poland

24 Studies
13 Countries

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Source: http://www.antimicrobialcopper.com/uk/news-and-download-centre/case-studies.aspx

List of Approved Applications for Antimicrobial Copper Alloys in Healthcare Facilities

o Bedrails, footboards
o Over-bed tables
o Bed-side tables in hospitals, extended care facilities, senior housing etc. (knobs, pulls, handles; surfaces)
o Handrails, (corridor/hallways) (Senior housing), automatic door push plates
o Stair rails, handrails, tubular railing, and supports, rail fittings T's, elbows and brackets
o Bedrails, assistance rails,
o Toilet safety rails
o Carts:
♣ Hospital carts (table surfaces, handles, legs)
♣ Computer carts
♣ Record carts
♣ Phlebotomy carts
♣ Other Carts (tables/surfaces, shelving, railings, handles, pulls)
♣ Equipment carts (horizontal surfaces, frames, handles)
o Door push plates, kick plates, mop plates, stretcher plates
o Sinks: spigots, drains, sinks themselves
o Faucet: handles, spigot, drain control lever
o Water fountains: bubbler head, drain strainer, handle
o Alcohol sanitizer dispenser, handle
o Paper towel holders, facial tissue holders, toilet paper holders
o Air hand dryer, controls and push buttons on air hand dryers
o Hydrotherapy tanks (whirlpool tanks): shells, covers, headrests, drain fittings (outer surfaces without water contact)
o Door handles, doorknobs (outer touch surfaces)
o Grab bars in bathrooms showers and bathtubs
o Panic bars on emergency room doors
o Towel bars
o Showerheads
o Countertops and tabletops (non-food use only)
o Hinges, locks, latches, and trim

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o Door stops, door pulls, and protector guards
o Toilet and urinal hardware, levers, push buttons
o Toilet seat inlay for lifting of seat
o Closures
o Vertical locking arms
o Vertical cover guards
o Protection bars
o Light switches, switch plates
o Visitor chairs: armrests, metal frames
o Thermostat covers, control knobs and wheels
o Telephone handsets and surfaces (housings), keypad
o Kitchen surfaces (non-food contact only): table tops, counter tops, handles (microwave, refrigerator, stove), cabinet doors, cabinet hinges, pulls, backsplash, hoods, control knobs (appliances, fans)
o Floor tiles
o Ceiling tiles (non-porous)
o Wall tiles
o Instrument handles
o Medical equipment knobs, pulls and handles for:
• Drug delivery systems
• Monitoring systems
• Hospital beds
• Office equipment
• Operating room equipment
• Stands and fixtures
• Types of knobs: e.g., Prong, fluted, knurled, push/pull, T-handle, tapered, and ball knobs
o Intravenous (IV) poles, bases, hangers, clips
o Trays (instruments, non-food contact)
o Pans (bed)
o Walkers, wheelchair handles, and tubular components
o Computer keyboards: keys, housings, computer mouse surfaces
o Exercise and rehabilitation equipment, handles, bars
o Physical therapy equipment: physical therapy tables, treatment chairs and portable taping tables

o Chairs (shower chairs, patient chairs, visitor chairs): rails, backs, legs, seats
o Lighting products: X-ray illuminators, operating rooms, patient examination rooms, surgical suites, and reading lamps for hospital rooms and assisted living facilities etc. Components can include bases, arms, housings, handles, hinges)
o Headwall systems: the unit themselves, outlet covers, knobs and dials, lighting units (lamp housings and adjustable arms), CRT monitors with rotating knobs and levers and adjustments. Baskets, monitor housings, knobs, baskets, tables, IV poles
o Critical care cart: Table top, drawer, drawer pull, lock, copper wire baskets for storage of equipment and charts.
o Bedside lavatory: sink, faucet, handles, drawer pulls, toilet seat, toilet seat cover, toilet handle, door and cabinet facings, counter tops
o Medical records: Chart holders, clipboards, filing systems
o Storage Shelving: wire shelving etc. for medical supplies
o Grab handles on privacy curtains
o Lids of laundry hampers, trash canisters, and other containers
o Bedside pitchers
o Closet rods and hangers
o Television controls: knobs, buttons, remote
o Monitor (television, computer, etc.) housing
o Cup Holder
o Toothbrush holder
o Soap holder
o Magazine rack
o Signage
o Coat rack and hooks
o Shower curtain rings
o Radiator cover
o Bracelets
o Pens
o Badge clips
o Name tags
o Patient

Source: http://www.antimicrobialcopper.com/media/339854/am%20cu%20proper%20use%20and%20care%20vaugust%202012.pdf

Antimicrobial Copper Case Studies

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Antimicrobial Copper Case Studies

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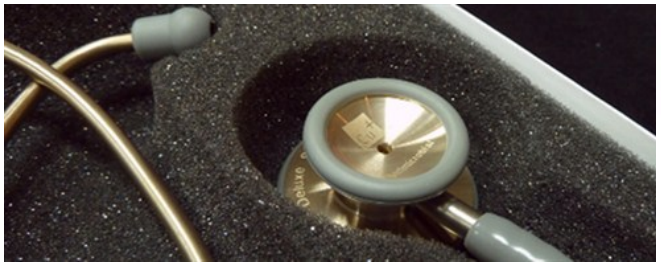
Case Study - Roberto del Rio Children's Hospital - ICU with extensive antimicrobial copper installation

Antimicrobial Copper Medical Equipment



REGISTERED CUVERRO® ANTIMICROBIAL COPPER ALLOYS

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Antimicrobial Copper Wash Stations

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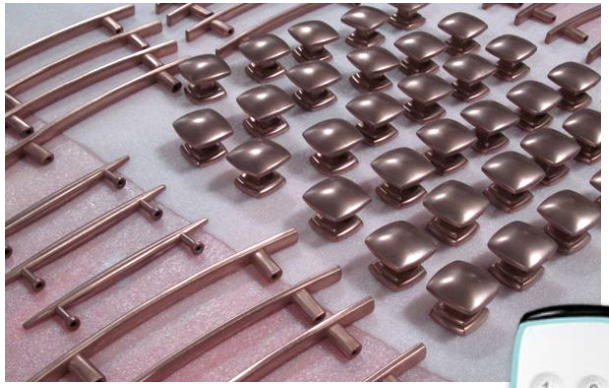
Antimicrobial Copper Furniture Parts



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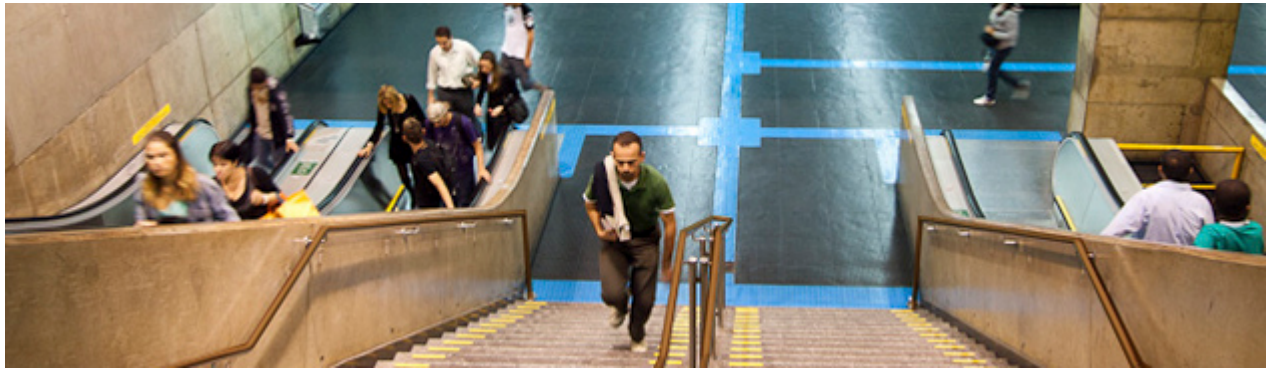
Antimicrobial Copper Fixtures and Infrastructure



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Copper Keyboards & Key Pads

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NonCopper - Washable, Antimicrobial NonMedical Devices

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Common Areas - Staff Lounges, Cafeterias, Waiting Rooms

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Copper still requires hygienic practice

Cu

Periodic surface cleaning must continue

Antimicrobial Copper alloy surfaces must not be waxed, painted, lacquered, varnished, or otherwise coated. The alloys tarnish to varying degrees, which does not impair their antimicrobial efficacy

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Copper locksets reduced bacteria by 94%

Before **After**

1,936
CFU/100 cm^2

43
CFU/100 cm^2

4,475
CFU/100 cm^2

233
CFU/100 cm^2

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Grand Central Station,
New York City

Copper has Staying Power…

563 CFU/100cm^2

88 CFU/100cm^2

1,866 CFU/100cm^2

51 CFU/100cm^2

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…after 100 years!

Antimicrobial Soft Goods

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Antimicrobial Consumer Products

Socks, T-Shirts, underwear…

Reebok, UnderArmor…

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Coffee Break 

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It's in the air…

Aerosols Float…

like hot air balloons…

10’ with each sneeze

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Superbugs Ride Air Currents Around Hospital Units

Reference: M.F. King, C.J. Noakes, P.A. Sleigh, M.A. Camargo-Valero. Bioaerosol Deposition in Single and Two-Bed Hospital Rooms: A Numerical and Experimental Study. Building and Environment. 2012.

Hospital superbugs can float on air currents and contaminate surfaces far from infected patients' beds, according to University of Leeds researchers. The results of the study, which was funded by the Engineering and Physical Sciences Research Council (EPSRC), may explain why, despite strict cleaning regimes and hygiene controls, some hospitals still struggle to prevent bacteria moving from patient to patient.

It is already recognized that hospital superbugs, such as MRSA and C. difficile, can be spread through contact. Patients, visitors or even hospital staff can inadvertently touch surfaces contaminated with bacteria and then pass the infection on to others, resulting in a great stress in hospitals on keeping hands and surfaces clean.

But the University of Leeds research showed that coughing, sneezing or simply shaking the bed linens can send superbugs into flight, allowing them to contaminate recently cleaned surfaces.

PhD student Marco-Felipe King used a biological aerosol chamber, one of a handful in the world, to replicate conditions in one- and two-bedded hospital rooms. He released tiny aerosol droplets containing Staphyloccus aureus from a heated mannequin simulating the heat emitted by a human body. He placed open petri dishes where other patients' beds, bedside tables, chairs and washbasins might be and then checked where the bacteria landed and grew.

The results confirmed that contamination can spread to surfaces across a ward. "The level of contamination immediately around the patient's bed was high but you would expect that. Hospitals keep beds clean and disinfect the tables and surfaces next to beds," says Dr. Cath Noakes, from the University's School of Civil Engineering, who supervised the work. "However, we also captured significant quantities of bacteria right across the room, up to 3.5 meters away and especially along the route of the airflows in the room."

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Source: http://www.infectioncontroltoday.com

One Solution

Single patient rooms

e.g. – CSA Z8000 Design for Healthcare Facilities

Other advantages

- individual temperature control;
- humidity control

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Dust Floats

Dust control during construction, renovation, and maintenance

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O.R.'s

A special case

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89%

The # of
anesthesia environments
contaminated
by bacteria during surgery

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Source: (Anesth Analg 2010;X:●●●–●●●)

32%

The # of IV sets contaminated with VRE during anesthesia

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Source: Anesthesiology 2008; 109:399–407

Surgical Smoke

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Aka “Plume”

Laser
Electrocautery
Electrosurgery
Bone saws & drills

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Solution 1

Plume Evacuation

Solution 2
Antimicrobial surfaces

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Solution 3

Total Room UV Disinfection

New – portable machines

Focused on ICU and patient rooms, but application for O.R.`s

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50%

The high touch surfaces disinfected in patient rooms.

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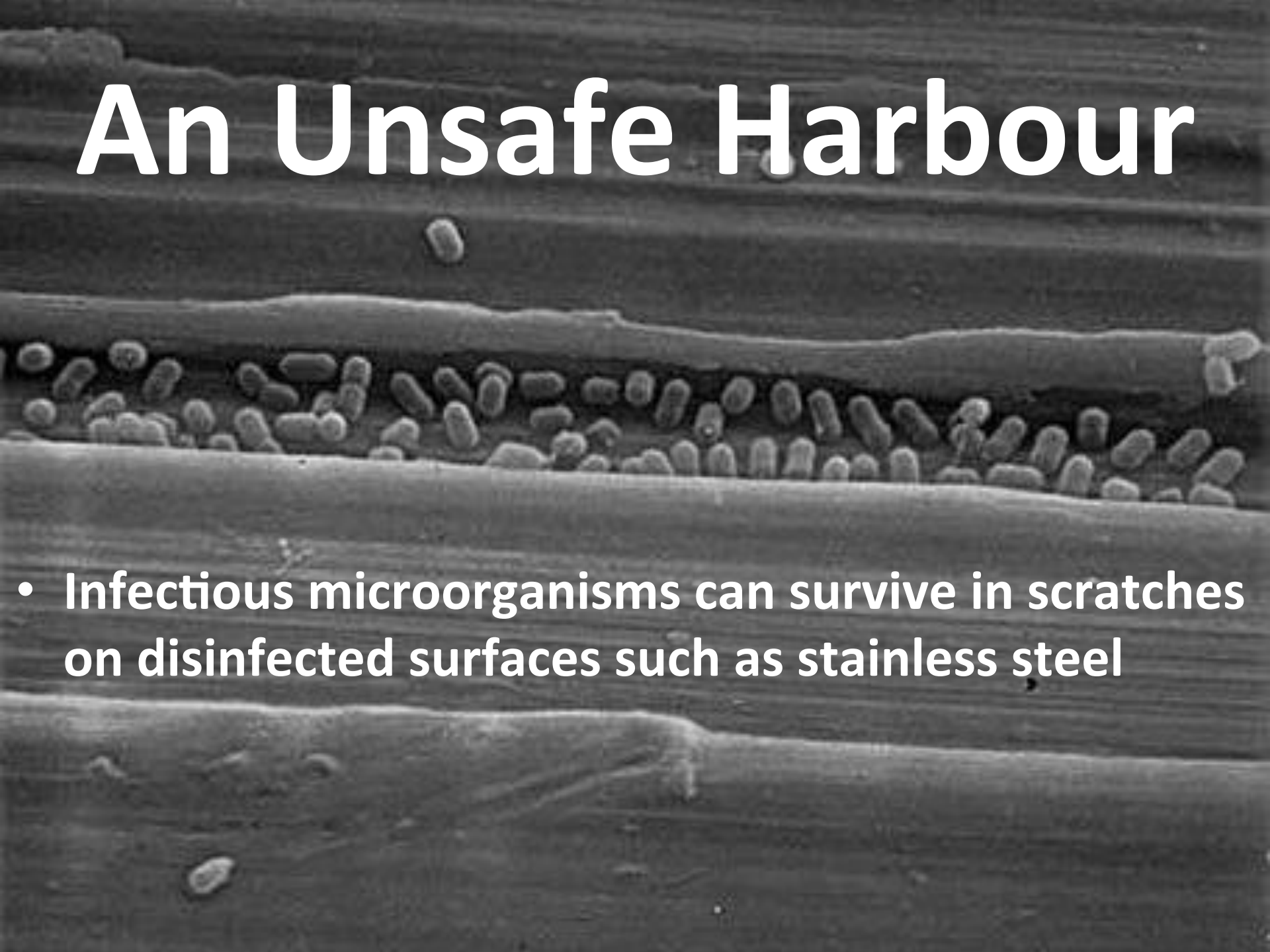
Source: Carling PC. Infection Control and Hospital Epidemiology. 29(1), 1-7. Eckstein BC. BMC Infectious Diseases, 7, 61. doi: 1471-2334-7-61. Manian F. ICHE, 32(7), 67-72.

An Unsafe Harbour



- Infectious microorganisms can survive in scratches on disinfected surfaces such as stainless steel

Constant UV

- Mercury Vapor
- 20 min
- narrow frequency band

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Pulsed UV

- Xenon
- 5 min
- Wider frequency band

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UV Works!

53 to 56% reduction in MRSA and C. Diff*

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Source:
Simmons, Journal of Infection Prevention, 2013
Levin, American Journal of Infection Control, 2013


XENEX


TOR
EllisDon

Water

- Potable
- Lavatory
- Dialysis
  - RO water, No dead legs, Automated disinfection
- Humidification
  - Atomization / spray injection using RO water

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Potable Water

- ASHRAE 188P – Guideline 12-2000 being converted into a standard for monitoring and controlling Legionella in public buildings
- Copper Silver Ionization
  - NASA – 1960's Apollo
  - Dr Janet Stout
  - 2003 – Journal of Infection Control and Hospital Epidemiology – First 16 Hospitals to install Cu/Ag surveyed in 1995 and 2000
  - 2007 – ASHRAE Journal – Preventing Legionellosis

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Important information for users of silver/copper ionisation water treatment systems used for legionella control

The Health and Safety Executive has revised the information published below. Please see Important information for users and suppliers of water treatment systems that use elemental copper for legionella control for the updated information.

The Health and Safety Executive (HSE) have informed the Department of Health that from 1 February 2013 **it will be illegal** (under the terms of the EU Biocidal Products Directive) to utilise elemental copper as a biocide in water treatment systems or to supply the copper needed for their use.

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Organisation: UK Department of Health
Page history: Updated 22 January 2013.

Lavatories

A special case

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Bathrooms

C Diff and VRSE are intestinal bacteria

Transmission is primarily by aerosol and contact

http://dsc.discovery.com/tv-shows/other-shows/videos/time-warp-toilet-flush.htm

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Potential for aerosolization of Clostridium difficile after flushing toilets: the role of toilet lids in reducing environmental contamination risk.

Microbiology Department, Old Medical School, Leeds General Infirmary, Leeds Teaching Hospitals NHS Trust, Leeds, UK.

C. difficile was recoverable from air sampled at heights up to 25 cm above the toilet seat.

The highest numbers of C. difficile were recovered from air sampled immediately following flushing, and then declined 8-fold after 60 min and a further 3-fold after 90 min. Surface contamination with C. difficile occurred within 90 min after flushing, demonstrating that relatively large droplets are released which then contaminate the immediate environment.

The mean numbers of droplets emitted upon flushing by the lidless toilets in clinical areas were 15-47, depending on design.

C. difficile aerosolization and surrounding environmental contamination occur when a lidless toilet is flushed.

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Source:
J Hosp Infect. 2012 Jan;80(1):1-5.
Epub 2011 Dec 2.

Copper?

Lids?

Chemical?

Downdraft?

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Filtered Downdraft

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SOUTH HEALTH CAMPUS
TEREX

Calgary South Campus

- All incoming water UV disinfected
- Large RO water treatment plant
- Tepid water loop to 1300 sinks
- Clear waste water loop to all lavatories (RO discharge)
- No mixing valves
- Minimal dead legs
- High temperature flush capable

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CREAM
CRÈME

Separate Toilet Water

- Allows separate infection control treatment of toilet water for C. Diff and VRE
- Not limited by potable water limitations
- Can use higher levels of monochloramine, Cu/Ag, or other means than could be used in drinking water

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CSA HCF Infrastructure Standards

Design
Electrical
Plumbing
HVAC
Lighting
Area Measurement
Fume Hoods
Medical Gas
Oxygen Concentrators
Assessment
Commissioning
Infection Control during Construction

Design for Infection Control

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Economics 101 – The US

Original Contribution | April 17, 2013

Relationship Between Occurrence of Surgical Complications and Hospital Finances

Sunil Eappen, MD; Bennett H. Lane, MS; Barry Rosenberg, MD, MBA; Stuart A. Lipsitz, ScD; David Sadoff, BA; Dave Matheson, JD, MBA; William R. Berry, MD, MPA, MPH; Mark Lester, MD, MBA; Atul A. Gawande, MD, MPH

Hospital Profit *without* complications: **$ 1,749**

Hospital Profit *with* complications: **$39,017**

"The magnitude of the numbers was eye-popping…Having a complication was profitable, and fighting complications was highly unprofitable."

Atul Gawande, MD

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Source: Journal of the American Medical Association, Original Contribution, April 17, 2013

The New Economy – The US

Medicare will no longer pay hospitals for treatment related to HAI's

HAI's have been instantly transformed from profit makers to profit losers.

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HAI Cost

- Up to $45,000 per case to treat

- Lawsuits are extra
  - Joseph Brant recently settled for $9M for 200 patients, an additional $45,000 per person
  - A lawsuit for $600M was recently launched against a Toronto long term care facility

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Economics 101

Approximately 2% of healthcare costs are associated with HAI's - $ 40 Billion annually

`	XS	S	M	L	XL
Annual Budget	$ 25,000,000	$ 50,000,000	$ 100,000,000	$ 250,000,000	$ 500,000,000
2%	$ 500,000	$ 1,000,000	$ 2,000,000	$ 5,000,000	$ 10,000,000

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Copper Clinical Trial
14 Infections Prevented

Infections/Patients in Copper Rooms: 10/294 patients

Infections/Patients in Control Rooms: 26/320 patients

Normalizing to the number of patients in the Copper Rooms:
(26 x 294)/320 = 23.9 = 24 Infections in Control Rooms

24 - 10 = 14 infections prevented by copper

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ROI- Copper Clinical Trial

Low Cost Scenario (assumes $29K/HAI)

- 14 infections prevented X $29,000/Infection = **$406,000 Costs Saved**
- $406,000 ÷ 338 days = **$1201 per day**
- $52,000 ÷ 1201/day = **43.3 day payback period**

- High Cost Scenario (assumes $43K/HAI)
- 14 infections prevented X $43,000/Infection = **$602,000 Costs Saved**
- $602,000 ÷ 338 days = **$1781/day**
- $52,000 ÷ $1781/day = **29.2 day payback period**

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Results may vary. :)

Beta Site Trial

St. Mary's General Hospital

University of Waterloo

Class 1

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F = Frequency = # of touches per day

TF = Threshold Factor = CFU per cm2 / Threshold CFU per cm2 estimated to cause infection

RS = Raw Score = F x TF

LRS = Lowest Raw Score

HI = Hazard Index = RS / LRS = F x TF / LRS

Note: Assume2. 5 CFU / cm2 as the threshold for infection

Note: Estimate Level 500 TF's based generally on input from ICU study data

Note: Estimate # of touches per day per surface

ICU Study Data	CFU / 100 cm2		CFU/cm2	Threshold CFU / cm2	CFU Threshold Factor
Bed Rails	6567	100	66	2.5	26
nurse call	4973	100	50	2.5	20
chair arm	3093	100	31	2.5	12
IV Pole	1060	100	10.6	2.5	4.2
tray table	717	100	7.2	2.5	2.9
monitor	33	100	0.3	2.5	0.1

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Touch Surface Test Site – Basic Assumptions

	Device	Location	Estimated Frequency of Touches per day	Estimated CFU Threshold Factor	Raw Score	Hazard Index
1	Bed rails	patient room	20	26	520	173
2	telephones	nurses' station	30	10	300	100
3	desktop	nurses' station	24	10	240	80
4	charting stations	hallway	20	10	200	67
5	nurse call pull	patient room	6	20	120	40
6	overbed light pullstring	patient room	6	20	120	40
7	chair arm	patient room	10	12	120	40
8	medicine carts	hallway	20	6	120	40
9	housekeeping carts	hallway	20	6	120	40
10	nurse call central station	nurses' station	12	10	120	40
11	nightside tables	patient room	12	10	120	40
12	overbed table	patient room	10	10	100	33
13	handwash dispensers	patient room	12	6	72	24
14	washroom door - interior knob	patient room	6	10	60	20
15	flush handle	washroom	6	10	60	20
16	toilet seat	washroom	6	10	60	20
17	faucet hot lever	washroom	6	10	60	20
18	faucet cold water lever	washroom	6	10	60	20
19	sink	washroom	6	10	60	20
20	charts	hallway	6	10	60	20
21	elevator buttons	hallway	10	6	60	20
22	soiled linen carts	hallway	4	10	40	13
23	bed linens	patient room	6	6	36	12
24	pillows	patient room	6	6	36	12
25	washroom door - exterior knob	patient room	6	6	36	12
26	chart trays	hallway	6	6	36	12
27	utility carts	hallway	6	6	36	12
28	telephones	hallway	6	6	36	12
29	telephone	patient room	6	6	36	12
30	toilet paper holder	washroom	6	6	36	12
31	paper towel dispenser	washroom	6	6	36	12
32	linen supply carts	hallway	4	6	24	8
33	clean supply carts	hallway	4	6	24	8

	Device	Location	Estimated Frequency of Touches per day	Estimate dCFU Threshold Factor	Raw Score	Hazard Index
1	Bed rails	patient room	20	26	520	173
2	telephones	nurses' station	30	10	300	100
3	desktop	nurses' station	24	10	240	80
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5	nurse call pull	patient room	6	20	120	40
6	overbed light pullstring	patient room	6	20	120	40
7	chair arm	patient room	10	12	120	40
8	medicine carts	hallway	20	6	120	40
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17	faucet hot lever	washroom	6	10	60	20
18	faucet cold water lever	washroom	6	10	60	20
19	sink	washroom	6	10	60	20
20	charts	hallway	6	10	60	20
21	elevator buttons	hallway	10	6	60	20
22	soiled linen carts	hallway	4	10	40	13
23	bed linens	patient room	6	6	36	12
24	pillows	patient room	6	6	36	12
25	washroom door - exterior knob	patient room	6	6	36	12
26	chart trays	hallway	6	6	36	12
27	utility carts	hallway	6	6	36	12
28	telephones	hallway	6	6	36	12

Results?

Ask me next year. :)

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Any Questions?

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Thank You!

Barry Hunt, BSc
Chairman & CTO
Class 1 Inc.

Life is short. Have fun. Make a difference.

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