3M Infection Prevention

NO MORE WHITE GLOVES

Cleaning Monitoring in Healthcare Today

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NO MORE WHITE GLOVES

Cleaning Monitoring in Healthcare Today

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- Northeast US Region
  Infection Prevention Division
  3M Healthcare

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Upon Completion of this program, the participant will be able to:

- Describe how environmental pathogens are transmitted to patients and healthcare workers.
- Evaluate if an environmental surface is at risk for environmental contamination.
- Describe which MDRO's are most often found on environmental surfaces.
- Describe the current methods used to monitor environmental cleaning.
- Evaluate if a cleaning monitoring program can be used to support an infection prevention program.

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Hospital Acquired Infections

Hospital Acquired Infections (HAI) persist and are costly

- 5%-10% of inpatients acquire infections during their hospital stay*
- 2 million infected per year in the United States
- 90,000 deaths attributed to HAI
- $5 ~ $50 billion additional cost to HC system

Increased total cost per patient who survived approximately $40,000

Center for Medicaid & Medicare (CMS) is pushing to classify HAI conditions in order to not reimburse for "preventable" hospital charges

New laws (state/federal) are requiring greater reporting of HAI

Research is providing more insight into infections and the role of the environment

**Burke JP. Infection control – a problem for patient safety. NEJM 2003; 348: 651-656*

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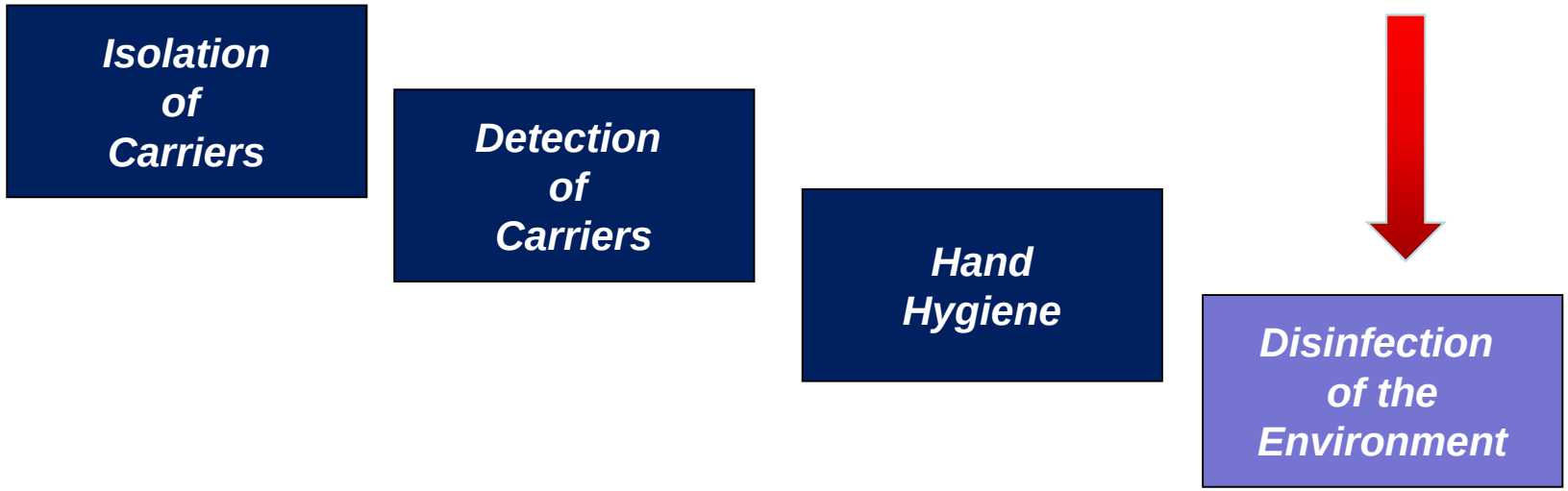
Institute for Healthcare Improvement (IHI) Guidelines for Combating Multi-Drug Resistant Organisms (MDROs)

Recommended interventions useful in reducing transmission of organisms resistant to multiple drugs



http:www.ihi.org.ihi

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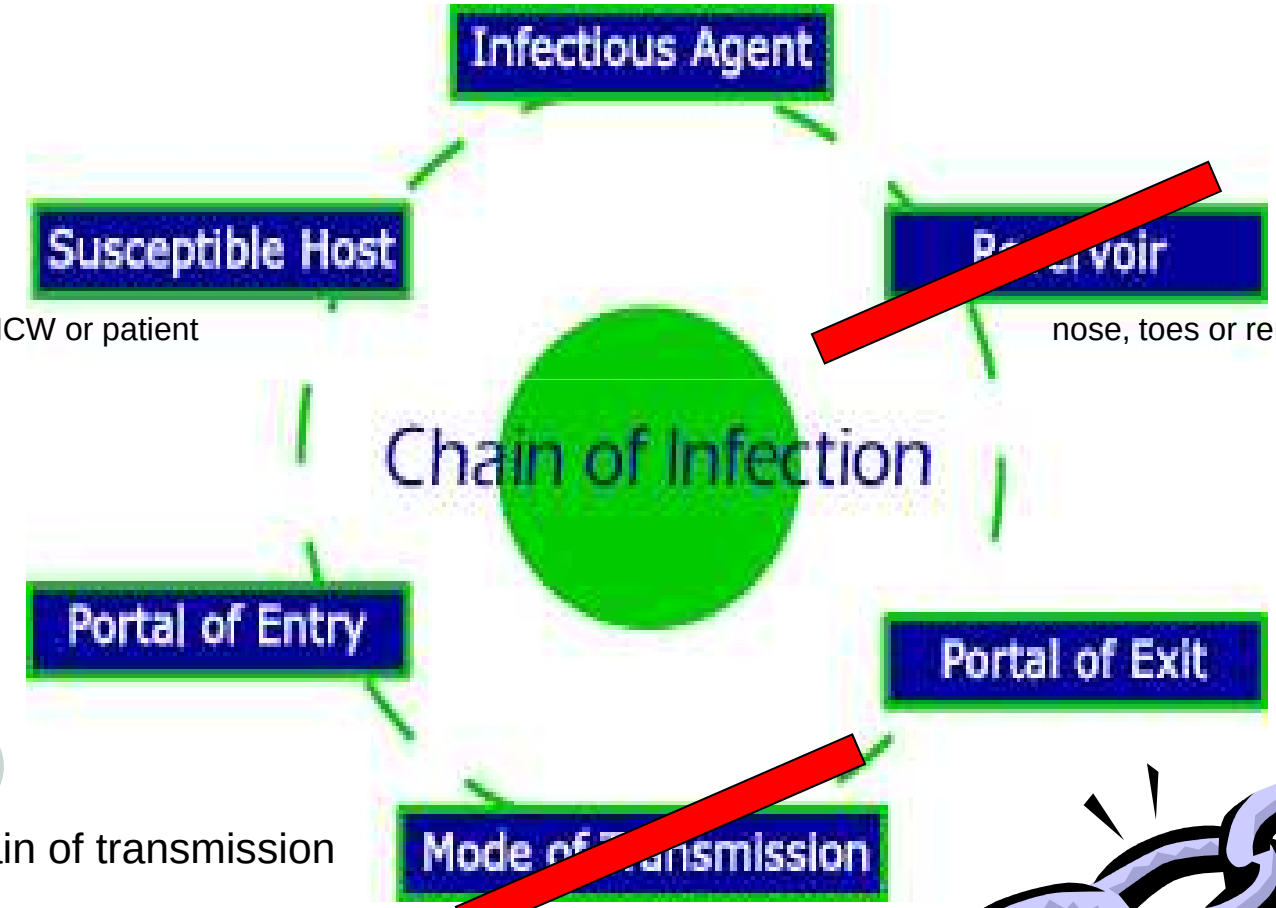
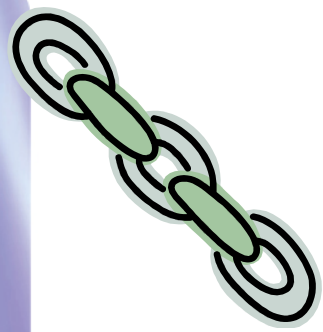
Cleaning – Why?

MRSA, VRE,C DIFF, A .bauminii



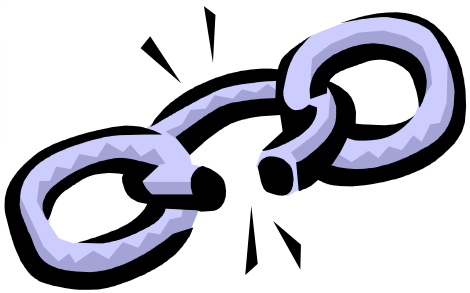
HCW or patient

nose, toes or remote control



Break the chain of transmission

sneezing, coughing, mosquito bite, bodily fluids



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US Historical Perspective on the Role of the Environment in Transmission of HAIs

- Routine culturing of surfaces and air in hospital environment was common prior to 1970's
- US Center for Disease Control and Prevention (CDC) and American Hospital Assn (AHA) recommended discontinuation of routine environmental culturing.
  - Labor Intensive, Lacked sensitivity
  - Lack of reliable data for horizontal transmission from contaminated surfaces
  - No standards

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The Perspective is Changing

- Frequent recovery of emerging MDRO's from environmental surfaces
  - *MRSA, VRE, Clostridium difficile, Acinetobacter baumanii*
- Data showing that pathogen strains from patient and the environment are the same
- MDRO's can survive better in the environment when compared to common bacteria
- Growing evidence for transmission of pathogen
  - Environment to patients
  - Environment to hands of healthcare worker
- Recent studies show that reducing environmental contamination reduces infection in patients
- Focus on "high-touch, high risk areas/objects" in patient rooms.

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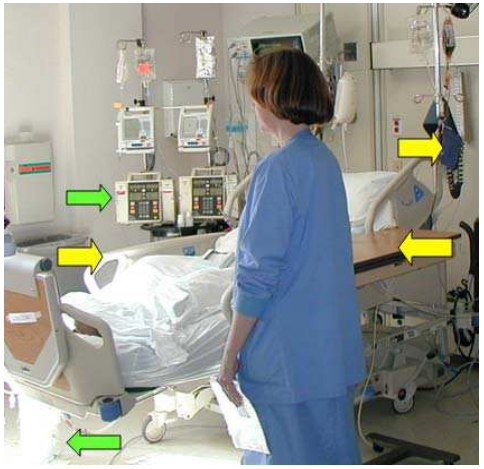
Where do you find MDRO's?



A. baumanii

- Stretcher
- Sink
- Blood pressure cuffs
- Door handle
- Mattress
- Curtains
- Respiratory care equipment
- Paper towel dispenser
- Shelving

- Hayden MK SHEA 2007

VRE

- Bedside rails
- Bedside tables
- Blood pressure cuffs
- Toilets, toilet rails
- TV remotes
- Floors
- Intravenous pumps
- Bed control buttons
- Nurse call buttons

- Duckro AN Arch Intern Med 2005; 165:304

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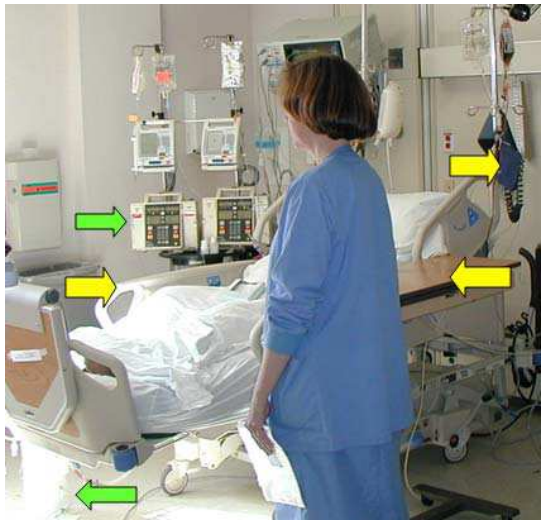
Where do you find MDRO's?

C. difficile

- Bedside rails
- Beside Tables
- Bed sheets
- Call buttons
- Toilet Seat
- Bathroom Door Handle
- Window sill
- Commodes
- Room Floors
- Toilet Floors

MRSA

- Bedside rails
- Bedside tables
- Blood pressure cuffs
- Patient gowns
- Bed linen
- Bathroom Door Handle



Samore MH et al Am J Med 1996; 100:32
Fekety R et al Am J Med 1981; 70:906
McFarland L et al NEJM 1989; 320:204
Struelens MJ et al Am J Med 1991; 91 (S3B):138S
McFarland LJ ICHE 2002; 23:639
Dubberke ER et al AJIC 2007; 35:315
Verity P et al J Hosp Infect 2001; 49:204

Boyce JM et al ICHE 1997; 18:622
Sexton T et al J Hosp Infect 2006; 62:187
Boyce JM et al ICHE 2007; 28:1142
Bhalla A et al ICHE 2004; 25:164
Dancer SJ Lancet Infect Dis 2008; 8:101
Boyce JM et al J Hosp Infect 2007; 65(S2):50

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Survival of Pathogens in the Environment

MDRO	***Duration of Survival***
Acinetobacter	Days to 5 months
Clostridium difficile	Weeks to 5 months
Enterococcus (VRE)	Days to 4 months
Staphylococcus aureus (MRSA)	Weeks to months
Hepatitis B virus	7 days
Norovirus	12-14 days

Kramer A et al. BMC Infect Dis 2006, 6:130

Hota B Clin Infect Dis 2004; 39:1182

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VRE Transmission Reduced by Removing Environmental Contamination

- VRE outbreaks were controlled by removal of contaminated electronic rectal or tympanic thermometers
- VRE transmission was reduced (26 to 34%) by enhanced environmental cleaning over a period
- VRE outbreak in a burn unit was terminated using enhanced environmental cleaning in combination with other control measures

Livornese LL et al. Ann Intern Med 1992; 117;112
Porwancher R et al. Infect Control Hosp Epidemiol 1997; 18:771
Brooks S et al. Infect Control Hosp Epidemiol 1998; 19:333
Falk PS et al. Infect Control Hosp Epidemiol 2000; 21:575

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Standards and Guidelines

- A real lack of standards and guidelines for Cleaning Monitoring for Environmental Surfaces
- Environmental cleaning regimens are not standardized or regulated and monitoring of cleaning efficacy is generally based on visual assessment.
- There are Guidelines/Recommendations from Professional Associations on the Verification of Cleaning as part of the Quality Processes.

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Recognized Need for Better Monitoring of Environmental Cleaning Practices

- From CDC ***"Monitor cleaning performance to ensure consistent cleaning and disinfection of surfaces . . .(1)"***
- SHEA/IDSA recommends ***"A system for monitoring adherence to environmental cleaning and disinfection*** *protocols is desirable."*

1. Management of Multi-Drug Resistant Organisms in Healthcare Settings, 2006. HICPAC guideline available at: www.cdc.gov/ncidod/dhqp/pdf/ar/mdroGuideline2006.pdf
**

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CDC Toolkit: Options for Environmental Cleaning

The Toolkit offers recommendations on how to implement a program to optimize terminal room cleaning.

- Level I & II programs – implementation & education recommendations
- Review of current monitoring technologies – Visual, Microbial, Fluorescent markers, ATP bioluminescence
- High-Touch point checklist
- Worksheet – Data collection/analysis tool

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CDC Toolkit: Options for Environmental Cleaning.

- *"In view of the evidence that transmission of many healthcare acquired pathogens (HAPs) is related to contamination of near-patient surfaces and equipment, all hospitals are encouraged to develop programs to optimize the thoroughness of high touch surface cleaning as part of terminal room cleaning at the time of discharge or transfer of patients."*

- http://www.cdc.gov/HAI/toolkits/Evaluating-Environmental-Cleaning.html

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CDC Environmental Checklist for Monitoring Terminal Cleaning[1]

Date:	
Unit:	
Room Number:	
Initials of ES staff (optional):[2]	

Evaluate the following priority sites for each patient room:

High-touch Room Surfaces[3]	Cleaned	Not Cleaned	Not Present in Room
Bed rails / controls			
Tray table			
IV pole (grab area)			
Call box / button			
Telephone			
Bedside table handle			
Chair			
Room sink			
Room light switch			
Room inner door knob			
Bathroom inner door knob / plate			
Bathroom light switch			
Bathroom handrails by toilet			
Bathroom sink			
Toilet seat			
Toilet flush handle			
Toilet bedpan cleaner			

Evaluate the following additional sites if these equipment are present in the room:

High-touch Room Surfaces[3]	Cleaned	Not Cleaned	Not Present in Room
IV pump control			
Multi-module monitor controls			
Multi-module monitor touch screen			
Multi-module monitor cables			
Ventilator control panel			

Mark the monitoring method used:

☐ Direct observation ☐ Fluorescent gel
☐ Swab cultures ☐ ATP system ☐ Agar slide cultures

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[1]Selection of detergents and disinfectants should be according to institutional policies and procedures
[2]Hospitals may choose to include identifiers of individual environmental services staff for feedback purposes.
[3]Sites most frequently contaminated and touched by patients and/or healthcare workers

CDC - Evaluating Environm...
www.cdc.gov/HAI/toolkits/Evaluating-Environmental-Cleaning.html
LeasePlan: The world ... Welcome to ePlan for ... Pumpkin Empanaditas... Epicurious.com: Recip... Hospital and Nursing ... Take Shape For Life - ... WebMD
CDC Home
Centers for Disease Control and Prevention
Your Online Source for Credible Health Information
A-Z Index A B C D E F G H I J K L M N O P Q R S T U V W X Y Z #

Healthcare-Associated Infections: Recovery Act

Healthcare-associated Infections
HAI Recovery Act
Performance Measures
Success Stories
State Resources
Newsletters
Toolkits
Collaboration Primer
Options for Evaluating Environmental Cleaning
Appendices to the Conceptual Program Model for Environmental Evaluation
Presentations
State Resource Q & As
Prevention Collaborative Q & A
Funding Programs
Agency Contacts

Options for Evaluating Environmental Cleaning

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Environmental Evaluation Workgroup[3]
December 2010

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[2]Carney Hospital and Boston University School of Medicine, Boston, MA; Dr. Philip Carling has been compensated as a consultant of Ecolab and Steris. He owns a patent for the fluorescent targeting evaluation system described in this document (DAZO Fluorescent Marking Gel).
[3]Brian Koll, Beth Israel Medical Center, New York, NY; Marion Kainer and Ellen Borchers, Tennessee Department of Health, Nashville, TN; and Brandi Jordan, Illinois Department of Public Health, Chicago, IL

On this Page
- Introduction
- Level I Program
- Level II Program

Introduction

In view of the evidence that transmission of many healthcare acquired pathogens (HAPs) is related to contamination of near-patient surfaces and equipment, all hospitals are encouraged to develop programs to optimize the thoroughness of high touch surface cleaning as part of terminal room cleaning at the time of discharge or transfer of patients. Since dedicated resources to implement objective monitoring programs may need to be developed, hospitals can initially implement a basic or Level I program, the elements of which are outlined below. Some hospitals should consider implementing the advanced or Level II program from the start, particularly those with increased rates of infection caused by healthcare acquired pathogens (e.g., high *Clostridium difficile* infection rate). All hospitals that have successfully achieved a Level I program should advance to Level II

Monitoring means:
Check, supervise, watch, keep track of….

How do we monitor environmental cleaning?

- Visual Inspection
- Aerobic Colony Counts (ACC)
- Fluorescent Dyes/Powders/Gel
- ATP Bioluminescence

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Current Standard Practice: Visual Examination

- Visual assessment is not an accurate measure of surface cleanliness nor of microbial contamination. It can be a misleading measure of cleaning efficacy.

Boyce *et al.* Monitoring the Effectiveness of Hospital Cleaning Practices by Use of an Adenosine Triphosphate Bioluminescence Assay Infection Control and Hospital Epidemiology. July 2009, 30: 678-684.

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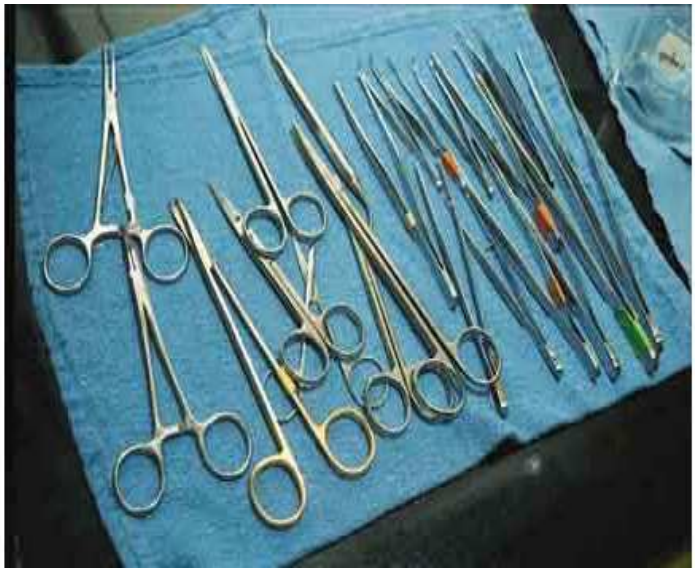
Just because it looks clean….
does not mean it *is* clean.

- You can't see biofilm or microbes
- You can't see biological residues



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Fluorescent Powders/Lotions/Gels

- UV fluorescent molecules are incorporated into water soluble gels , powders or lotions and used to mark an environmental surface.
- The surface is cleaned and then re-inspected by using a UVA light. The removal or partial removal of the fluorescent marker indicates if a surface has been wiped.
- Generate Qualitative Results: Has the surface been wiped? Yes/No

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Aerobic Colony Counts (ACC)

- Environmental surfaces are cultured for the presence of aerobic bacteria.
  - Swab surface and culture on nutrient media
  - Dip slides or RODAC plates –nutrient agar is pressed directly onto the environmental surface
- Results are quantitative: CFU/ area tested
- Pathogens are identified in some cases.

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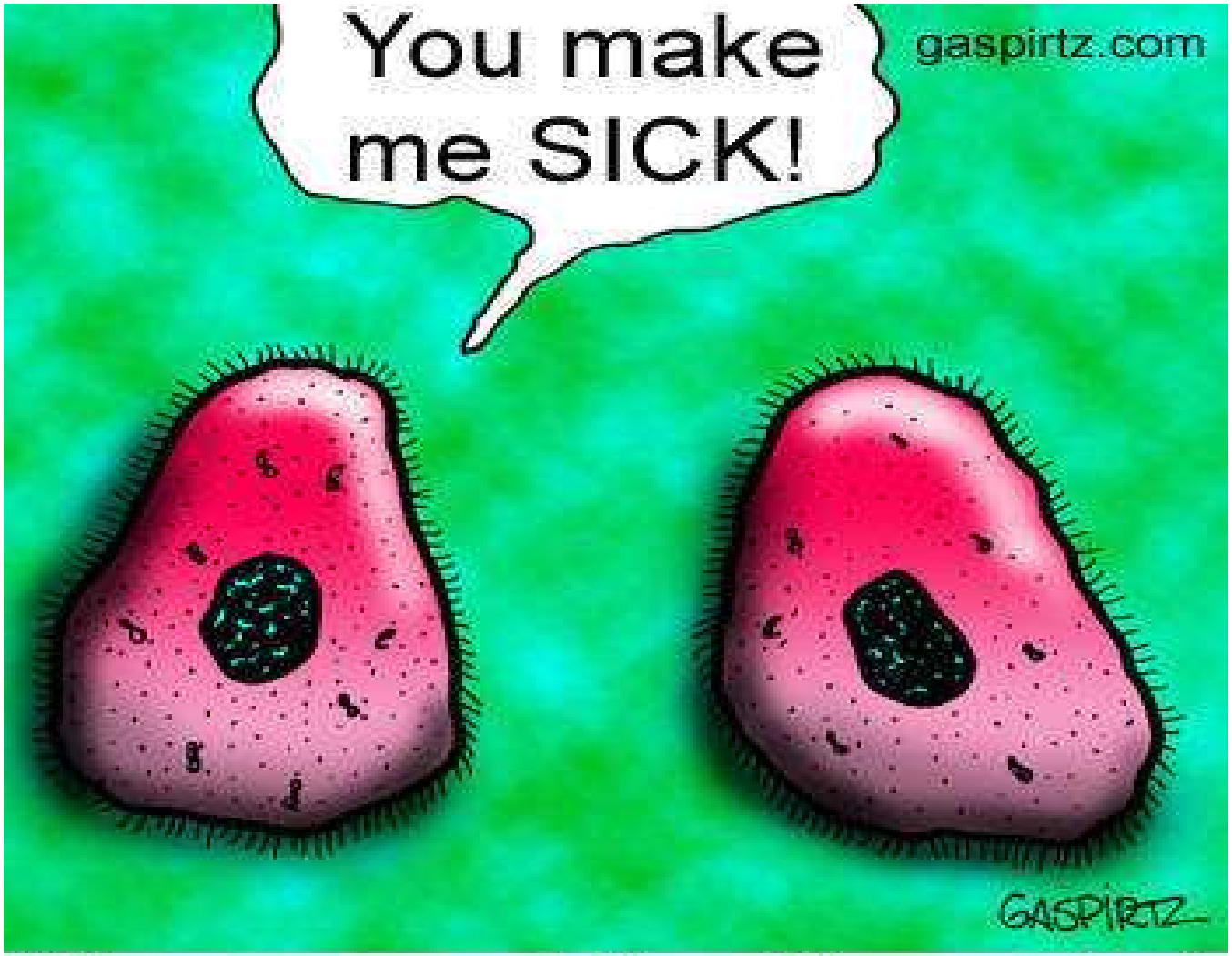

When germ relationships go bad

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Adenosine Tri-phosphate (ATP) Bioluminescence

- ATP is present in all living organisms – animal, plant, microorganisms, human secretions and excretions.
- Contaminated surfaces show high levels of ATP, clean surfaces show low ATP levels.
- The surface is swabbed and the ATP levels measured in a luminometer
- Results are quantitative: ATP bioluminescence is measured in Relative Light Units
- Benchmark RLU levels used to define "clean"

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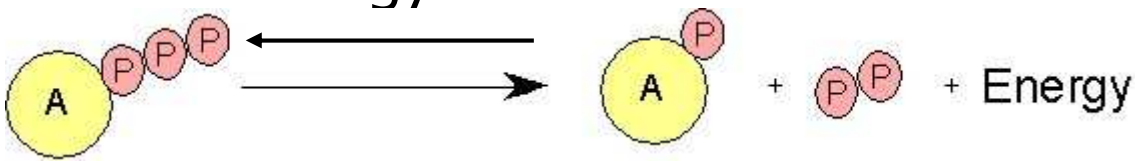
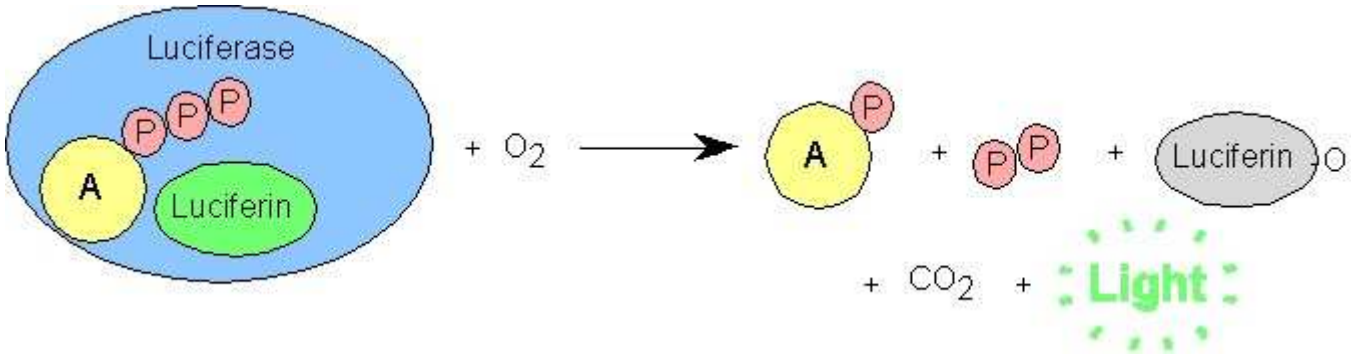
Detecting ATP

In cells, ATP loses one or more phosphates to release energy



Fire-fly Luciferase harnesses this energy to produce Light



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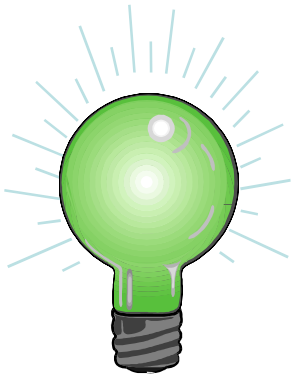
Simple Relationship



increase in light (RLU)

increase in ATP levels

increase in organisms or organic residues

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ATP Testing Attributes

ATP is present in every living cell; every microbe, human cell and plant cell contributes to the signal

- Tests are simple to perform
- Poor cleaning leaves sufficient ATP to register a clear signal
- Results are quantitative and linear with respect to ATP\
- Results are immediately available – no days long wait for results
- The fact that ATP is present in every living organism makes it a great marker for cleanliness.

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Please keep this in mind…..

- RLU does not equal CFU
  - In pure lab cultures, correlations are beautiful!
  - In the “real world” it’s a mixed culture
    - Bigger cells have more ATP’
    - ATP levels vary with the metabolic state of the cell
      - Spores do not have ATP as they are not metabolically active
    - Many environmental bacteria do not grow under “normal” culture conditions.
    - Flocculent groups/bio-film chunks = 1 CFU
  - Contributions to ATP readings come from non-bacterial sources (skin cells, blood, food residue, plants)

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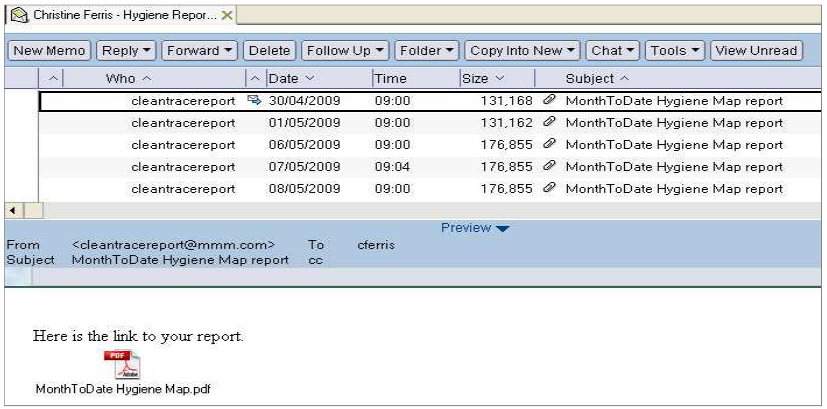
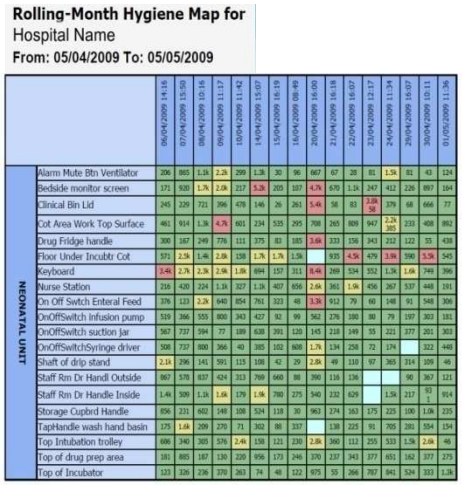
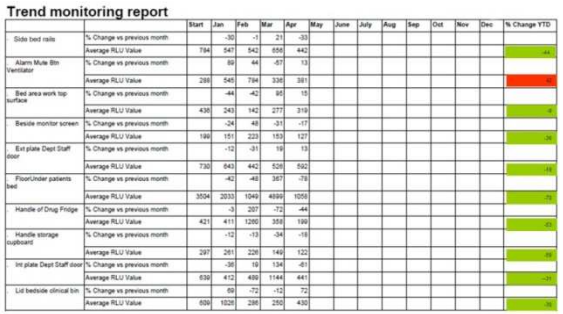
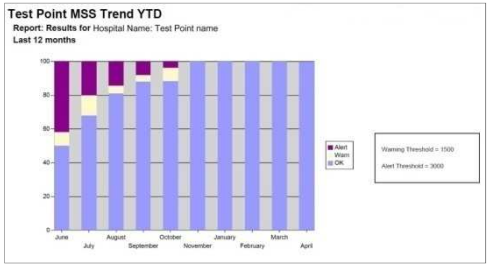
Most ATP monitoring devices have software

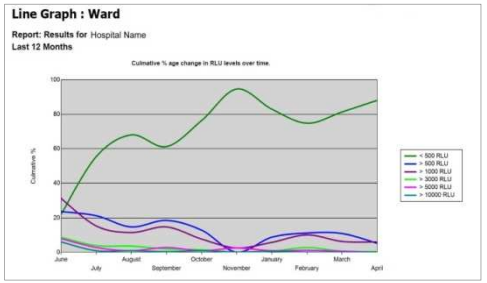
- Data from luminometer is transferred to the computer
- Ability to monitor trends











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Rolling-Month Hygiene Map for
Hospital Name

From: 05/04/2009 To: 05/05/2009

		06/04/2009 14:16	07/04/2009 15:50	08/04/2009 10:16	09/04/2009 11:17	10/04/2009 11:42	14/04/2009 15:07	15/04/2009 16:19	16/04/2009 08:49	20/04/2009 16:00	21/04/2009 16:18	22/04/2009 16:07	23/04/2009 12:17	24/04/2009 11:34	29/04/2009 16:07	30/04/2009 10:11	01/05/2009 11:36
NEONATAL UNIT	Alarm Mute Btn Ventilator	206	865	1.1k	2.2k	299	1.3k	30	96	667	67	28	81	1.5k	81	43	124
	Bedside monitor screen	171	920	1.7k	2.0k	217	5.2k	205	107	4.7k	670	1.1k	247	412	226	897	164
	Clinical Bin Lid	245	229	721	396	478	146	26	261	5.4k	58	83	3.8k 58	379	68	666	77
	Cot Area Work Top Surface	461	914	1.3k	4.7k	601	234	535	295	708	265	809	947	2.2k 385	233	408	892
	Drug Fridge handle	300	167	249	776	111	375	83	185	3.6k	333	156	343	212	122	55	438
	Floor Under Incubtr Cot	571	2.5k	1.4k	2.8k	158	1.7k	1.7k	1.5k		935	4.5k	479	3.9k	590	5.5k	545
	Keyboard	3.4k	2.7k	2.3k	2.9k	1.8k	694	157	311	8.4k	269	534	552	1.3k	1.6k	749	396
	Nurse Station	216	420	224	1.1k	327	1.1k	407	656	2.6k	361	1.9k	456	267	537	448	191
	On Off Swtch Enteral Feed	376	123	2.2k	640	854	761	323	48	3.3k	912	79	60	148	91	548	306
	OnOffSwitch infusion pump	519	366	555	800	343	427	92	99	562	276	180	80	79	197	303	181
	OnOffSwitch suction jar	567	737	594	77	189	638	391	120	145	218	149	55	221	377	201	303
	OnOffSwitchSyringe driver	508	737	800	366	40	385	102	608	1.7k	134	258	72	174		322	448
	Shaft of drip stand	2.1k	296	141	591	115	108	42	29	2.8k	49	110	97	365	314	109	46
	Staff Rm Dr Handl Outside	867	578	837	424	313	769	660	88	390	116	136			90	367	121
	Staff Rm Dr Handle Inside	1.4k	509	1.1k	1.6k	179	1.9k	780	275	540	232	629		1.5k	217	93 1	914
	Storage Cupbrd Handle	856	231	602	148	108	524	118	30	963	274	163	175	225	100	1.0k	235
	TapHandle wash hand basin	175	1.6k	209	270	71	302	88	337		138	225	91	705	281	554	154
	Top Intubation trolley	686	340	305	576	2.4k	158	121	230	2.8k	360	112	255	533	1.5k	2.6k	46
	Top of drug prep area	181	885	187	130	220	956	173	246	370	237	343	377	651	162	377	275
	Top of Incubator	123	326	236	370	263	74	48	122	975	55	266	787	841	524	333	1.3k

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TEST PLAN LOCATION: Operating Room 2 - Post Terminal Cleaning 4/28/2011

TEST POINT	OR #1	OR #2	OR #3	OR #4
Main Light Handle	1324	71	271	404
Smaller Light Handle	1246	118	90	320
Leads	2822	223	840	973
Pulse Ox	1088	1321	513	####
Door Handles	2152	1759	307	1131
Telephone	1417	717	1456	223
Anesthesia Machine	64	139	75	22
Bovie Buttons	3434	287	173	475
Anesthesia Monitor	4299	1396	990	1016
Storage Cabinets	1450	534	743	460
Table Controls	856	612	1548	####
Side rail clamps	347	299	421	665
Light switches	797	528	178	199
Tourniquets	N/A	4363	N/A	1985
Computer Keyboards	1800	1130	772	1464
Metal parts of Seat Belts	1087	507	1173	1965
Sterilizers	N/A	125	N/A	82
Warming Cabinets	N/A	1265	N/A	984
Pyxis Keyboard/Monitor	6340	1452	776	N/A
Fracture Table Handles	N/A	3203	N/A	N/A
Fracture Table Post Hole	N/A	5597	N/A	N/A

EXAMPLE "RLU" LEVELS - PASS/CAUTION/FAIL	
PASS	LESS THAN 500 RLU
CAUTION	501 - 999 RLU
FAIL	GREATER THAN 1000 RLU

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Which monitoring method is best? Depends on the question asked.

- Have important surfaces been wiped?
  - Visual Inspection/Checklist
  - Fluorescent powder/lotion/gel

- Is the surface “clean”?
  - Aerobic colony counts
  - Adenosine triphosphate (ATP) bioluminescence assay

Malik et al Am J Inf Cont 2003;31:181
Sherlock et al J Hosp Inf 2009

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Advantages and Disadvantages of Methods for Assessing Cleaning Practices

Method	Advantages	Disadvantages
Visual inspection	•Simple	•Not reliable measure of cleanliness
Fluorescent marker system	•Inexpensive •Minimal equipment needed •Can improve practices	•Must mark surfaces before cleaning, and check them after cleaning •Does not provide quantitative measures
Aerobic colony counts	•Relatively simple •Detects presence of pathogens	•More expensive •Results not available for 48 hrs later
ATP bioluminescence assay systems	•Provides quantitative measure of cleanliness •Quick results •Can improve practices	•More expensive •Requires special equipment

John M. Boyce, MD, APIC 2010 , Improving Cleaning and Disinfection and How to Monitor the Effectiveness of Surface Disinfection.

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Where do you start?
What is a high risk - high touch surface?

A Quantitative Approach to Defining "High-Touch" Surfaces in Hospitals

Kirk Huslage, RN, BSN, MSPH;
William A. Rutala, PhD, MPH;
Emily Sickbert-Bennett, PhD; David J. Weber, MD, MPH

Fifty interactions between healthcare workers and patients were observed to obtain a quantifiable definition of "high-touch" (ie, frequently touched) surfaces based on frequency of contact.

Five surfaces were defined as high-touch surfaces: the bed rails, the bed surface, the supply cart, the over-bed table, and the intravenous pump.

Infect Control Hosp Epidemiol 2010; 31(8):850-853

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CDC Guidelines for Multiple-Drug Resistant Organisms

Monitoring

V.B.8 Enhanced environmental measures

V.B.8.c. **Monitor** (i.e., supervise and inspect) **cleaning performance** to ensure consistent cleaning and disinfection of surfaces in close proximity to the patient and those likely to be touched by the patient and HCP (e.g. bedrails, carts, bedside commodes, doorknobs, faucet handles.) *Category 1B*

Strongly recommended for implementation and supported by some experimental, clinical or epidemiologic studies and strong theoretical rationale.

www.cdc.gov.ncidod/dhqp/gl_environinfection.html

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Monitoring the efficacy of environmental cleaning in healthcare facilities: A review of three studies.

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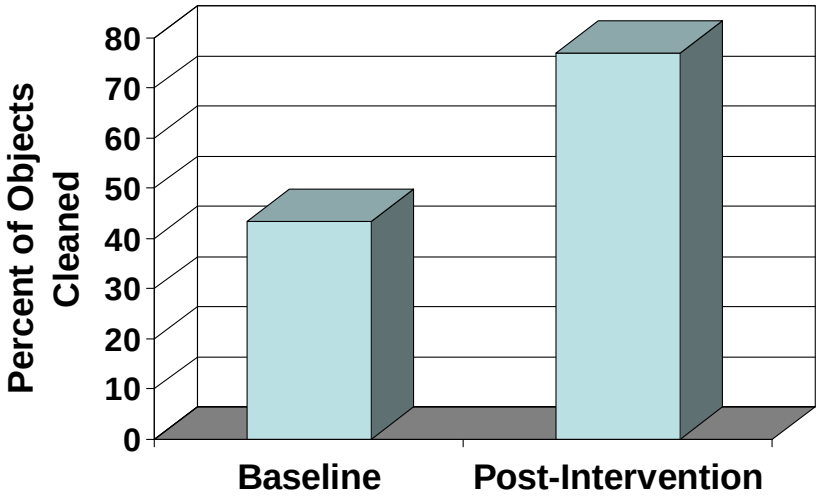
Improving Cleaning Practices by Using Fluorescent Marker System

Carling PC et al. ICHE 2008;29:1035

- Study performed in 36 acute-care hospitals
- Fluorescent markers covertly applied to environmental surfaces before terminal room disinfection
- Surfaces checked with UVA light after terminal cleaning
- Intervention included providing housekeepers with performance feedback

RESULT:

- Percent of objects cleaned
  - ✓ Before intervention: 47%
  - ✓ After interventions: 76 - 92%



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Is it really clean? An Evaluation of the Efficacy of Four Methods for Determining Hospital Cleanliness.

Sherlock et al. Journal of Hospital Infection 2009. 72:140-146

- Objective – Answer the following question: Is visual assessment a sufficient means of monitoring cleaning efficacy? Four methods were used to monitor cleaning:
  - Visual assessment, Aerobic colony counts, presence of MRSA and ATP
- Study design – Using each of the four assessment methods, the surface cleanliness of 10 environmental surfaces was compared before and after cleaning in two wards (medical and surgical).

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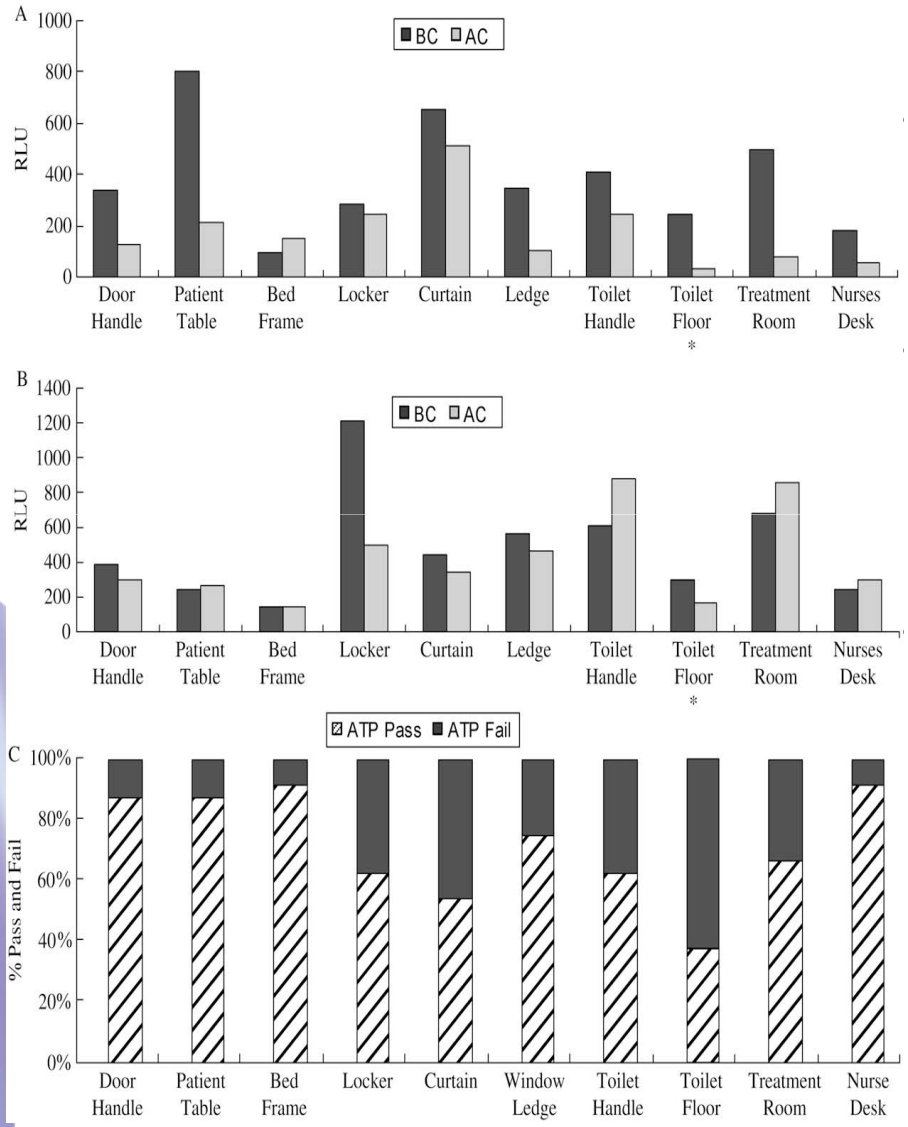
Results



Visual assessments alone did not always provide a meaningful measure of surface cleanliness or cleaning efficacy

The use of ATP to monitor cleaning efficacy is a sensitive test that reports not just the presence of microbiological, but also any organic, contamination.

ACCs are a good indicator of general bioburden in an environment, but they are slow to process.

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Sherlock et al. Summary

- "Visual methods to evaluate cleanliness are subjective and inadequate."

- "As standard methods for the isolation of micro-organisms from the hospital, environment have not been established, and as organism recovery is often low or absent, the use of rapid methods such as ATP bioluminescence monitoring in a hospital setting should be considered in conjunction with visual methods."

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Monitoring Daily Cleaning Practices Using an ATP Bioluminescence Assay

Boyce JM et al. ICHE 2009;30:678

- **Objective** - To evaluate the usefulness of an adenosine triphosphate (ATP) bioluminescence assay for assessing the efficacy of daily hospital cleaning practices.
- **Study design** - A 2-phase prospective intervention study at a university-affiliated community teaching hospital.
- **Conclusions -** Suboptimal cleaning practices were documented by determining aerobic colony counts and by use of an ATP bioluminescence assay. ***ATP readings provided quantitative evidence of improved cleanliness of high-touch surfaces after the implementation of an intervention program.***

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Study Design

- **Phase 1 Goals**
  - Assess the thoroughness of daily cleaning procedures by determining aerobic colony counts and by use of an ATP bioluminescence assay
- **Intervention**
  - In-service educational sessions for housekeeping. Data from Phase 1 reviewed to stress importance of cleaning procedures and performance feedback.
- **Phase 2 Goals**
  - Establish with greater certainty the range of ATP readings to be expected on high-touch surfaces in patient rooms before and after daily cleaning.
  - Determine whether alerting housekeepers that cleaning procedures were being monitored would result in improved cleaning practices, as reflected in the ATP readings.

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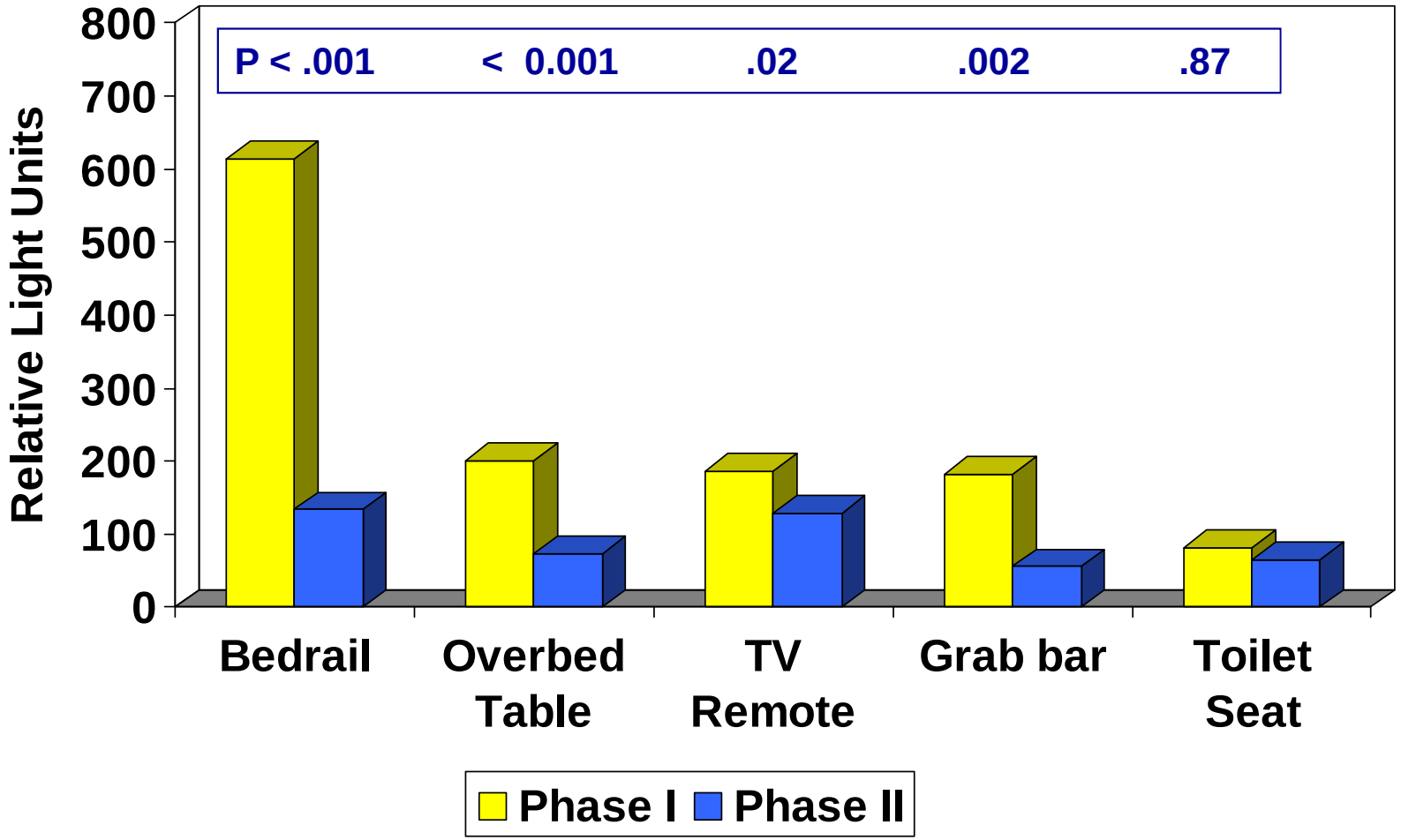
Median Relative Light Unit Readings, After Daily Cleaning, Phases I and II



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Monitoring Cleaning Effectiveness
How can this be used in your hospital?

- To Improve cleaning/disinfection practices in hospitals
  - You need a plan that includes:
  - Developing detailed protocols, educating housekeepers. monitoring cleaning and providing feedback to housekeepers

  You need to decide which method best answers your most important questions:
  - Has a surface been wiped? Visual assessment, fluorescent markers
  - Is the surface clean? ATP bioluminescence assay systems aerobic colony counts,

    Quantitative Monitoring cleaning practices can help establish the effectiveness of new technologies for “area decontamination”

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Summary

- MDRO pathogens survive in the environment leading to increased environmental contamination
- Environmental contamination may lead to direct transmission of MDRO to patients and HCWs
- Transmission of pathogens can be reduced by increased cleaning.
- Current recommended practices describe cleaning monitoring as part of a quality control program
- The standard practice of visual assessment is no longer adequate for the monitoring of cleaning efficacy
- Visual assessment, fluorescent powders/lotions/gels, aerobic colony counts and ATP bioluminescence are all currently used to monitor cleaning protocols.
- Together with educational interventions, monitoring technologies can be used to increase the efficacy of and compliance with cleaning protocols.

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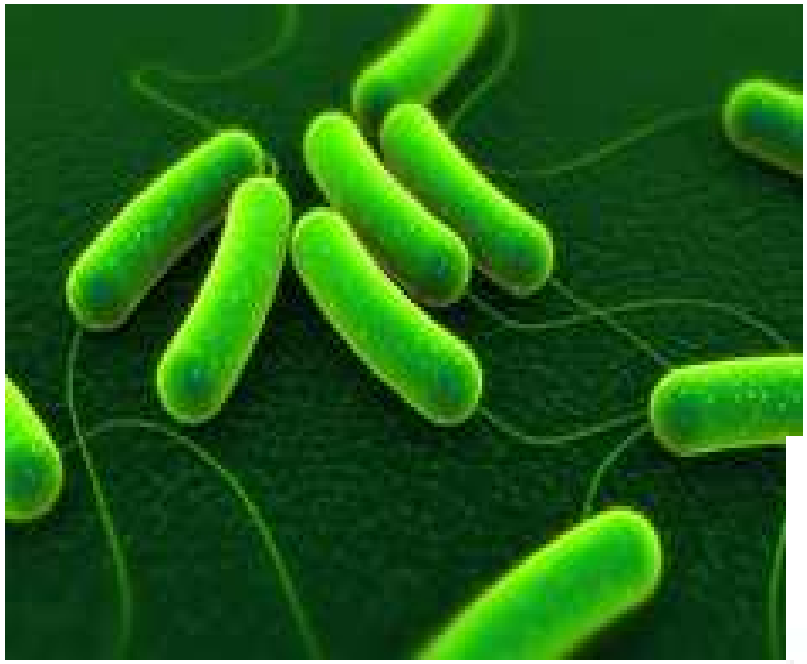

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Thank You

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