Medical Waste Management Refresher

in Collaboration with
Al-Essa Medical and Scientific Equipment Company

Decontamination, Antisepsis, Sterilisation

Kuwait University
Health Science Center
19 March – 23 March 2017

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Activities for the next week

Sunday March 19th

Presentations – Cleaning and Disinfection/Disease Transmission
Journal articles!
Pipetting technique (Trolley Walk)/Donning Doffing PPE
Waste Management Review

Monday March 20th – Wednesday March 23rd

"Trolley Walk"
Pipetting exercise
Hand Hygiene
How good is your cleaning technique? – Protein swabs
Waste management review

Thursday March 24th

Recap of events from the "Trolley Walk"

1. Team Competition – What do you remember from this past week?
2. Team competition Hand Hygiene Competition – Take 2!

Quinnah!

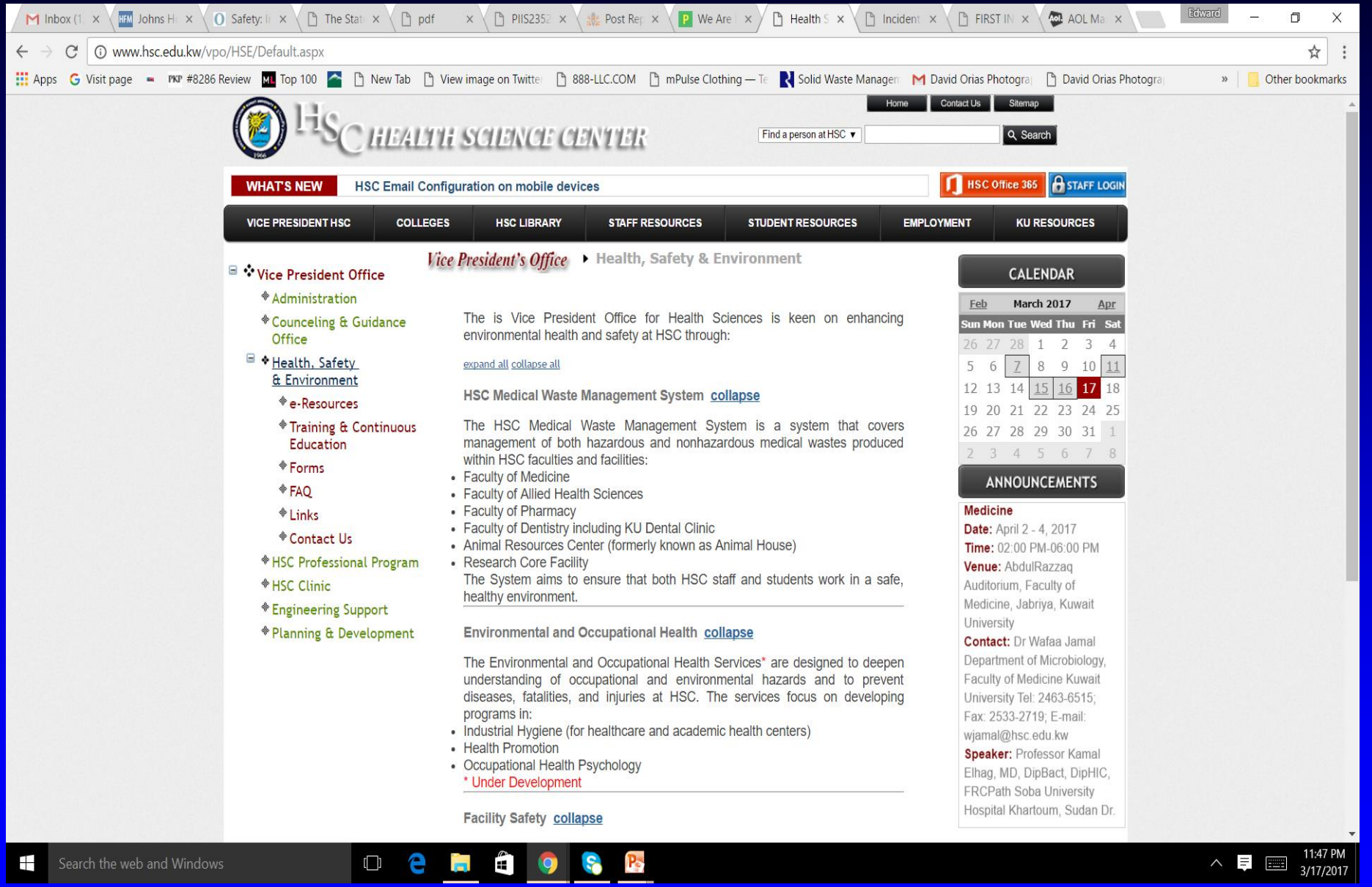
Laser Protective Eyewear

Protective laser eyewear must always be ***Marked with Optical Density and Wavelength.***

Must be worn anytime there is a ***Possibility*** of viewing the beam.

Must meet ***ANSI Z87.1*** standards.

Is Not the Primary Line of Defense.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Training & Continuous Education
Forms
FAQ
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Contact Us
HSC Professional Program
HSC Clinic
Engineering Support
Planning & Development
The is Vice President Office for Health Sciences is keen on enhancing environmental health and safety at HSC through:
expand all collapse all
HSC Medical Waste Management System collapse
The HSC Medical Waste Management System is a system that covers management of both hazardous and nonhazardous medical wastes produced within HSC faculties and facilities:
Faculty of Medicine
Faculty of Allied Health Sciences
Faculty of Pharmacy
Faculty of Dentistry including KU Dental Clinic
Animal Resources Center (formerly known as Animal House)
Research Core Facility
The System aims to ensure that both HSC staff and students work in a safe, healthy environment.
Environmental and Occupational Health collapse
The Environmental and Occupational Health Services* are designed to deepen understanding of occupational and environmental hazards and to prevent diseases, fatalities, and injuries at HSC. The services focus on developing programs in:
Industrial Hygiene (for healthcare and academic health centers)
Health Promotion
Occupational Health Psychology
* Under Development
Facility Safety collapse
CALENDAR
Feb March 2017 Apr
Sun Mon Tue Wed Thu Fri Sat
ANNOUNCEMENTS
Medicine
Date: April 2 - 4, 2017
Time: 02:00 PM-06:00 PM
Venue: AbdulRazzaq Auditorium, Faculty of Medicine, Jabriya, Kuwait University
Contact: Dr Wafaa Jamal Department of Microbiology, Faculty of Medicine Kuwait University Tel: 2463-6515; Fax: 2533-2719; E-mail: wjamal@hsc.edu.kw
Speaker: Professor Kamal Elhag, MD, DipBact, DipHIC, FRCPath Soba University Hospital Khartoum, Sudan Dr.
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11:47 PM
3/17/2017

Risk Tolerance


RC 2453


RC-0479-1
RENAULT 19
STOP
STOP
RC 0768 0

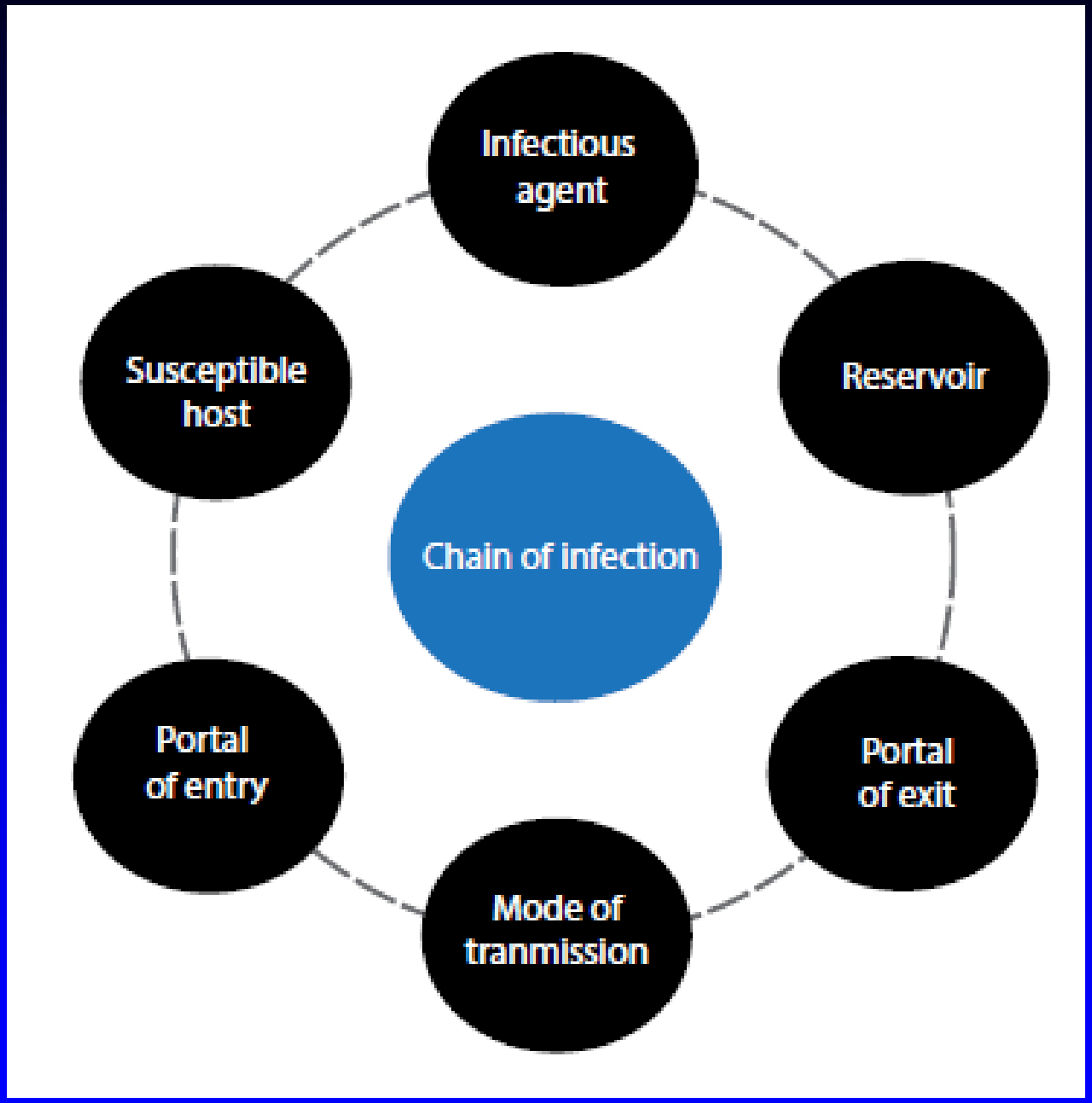
SIMPLE DEFINITON OF RISK

Hazard = The Inherent Potential to Cause Damage (Physical /Biological)



Risk = The Actual Chances of Circumstances Occurring that the Hazard Will Cause Damage




Infectious agent
Reservoir
Portal of exit
Mode of tranmission
Portal of entry
Susceptible host
Chain of infection

Decontamination

- Encompasses:
  - antisepsis, disinfection, decontamination, and sterilization
  - Antisepsis
    - chemical applied to living tissue that will control or arrest the growth of a microorganism
  - Decontamination
    - disinfection or sterilization of contaminated materials

Decontamination

- Disinfection
  - To free from infection, reduction of contaminant load to a safe level, does not imply total destruction of all microorganisms. Will not always destroy spores.
- Sterilization
  - The destruction of all forms of microbial life. Difficult to achieve (usually referred to a very low chance that a microbe survived).

Disinfection in Healthcare

- High-Level Disinfection
  - sporicidal/tuberculocidal (but used for shorter times than required for sterility). Equipment that will have invasive contact with patient.
- Intermediate
  - tuberculocidal (equipment that will contact mucous membranes of patient)
- Low-level (kills vegetative bacteria)
  - for non-critical equipment (no invasive contact)

Sterilants - Physical Methods

- Steam Autoclave
  - steam under pressure --> moist heat
  - 121 C/250 F @ 15 psi for 30 - 60 minutes
- Dry Heat
  - 160 - 170 C/320 - 356 F for 2 - 4 hours
- Incineration
  - 2 stage burn, 1400 & 1800 F

Sterilants - Gases

- Formaldehyde gas
  - heat formalin to vaporize it (1 ml/ft^3)
  - heat paraformaldehyde (0.3 g/ft^3)
  - 2 hour exposure time required (8 hour or overnight contact period recommended)
  - can neutralize HCHO (toxic, suspect carcinogen) with ammonium bicarbonate
  - room temperature $\geq$ 70 F, %RH - $\geq$ 70%

Sterilants - Gases

- Ethylene Oxide
  - 400 - 800 mg/L
  - 35 - 60 C temperature, 30 - 60% RH
  - contact time up to 4 hours
- Hydrogen Peroxide
  - vaporize from 30% H_2O_2

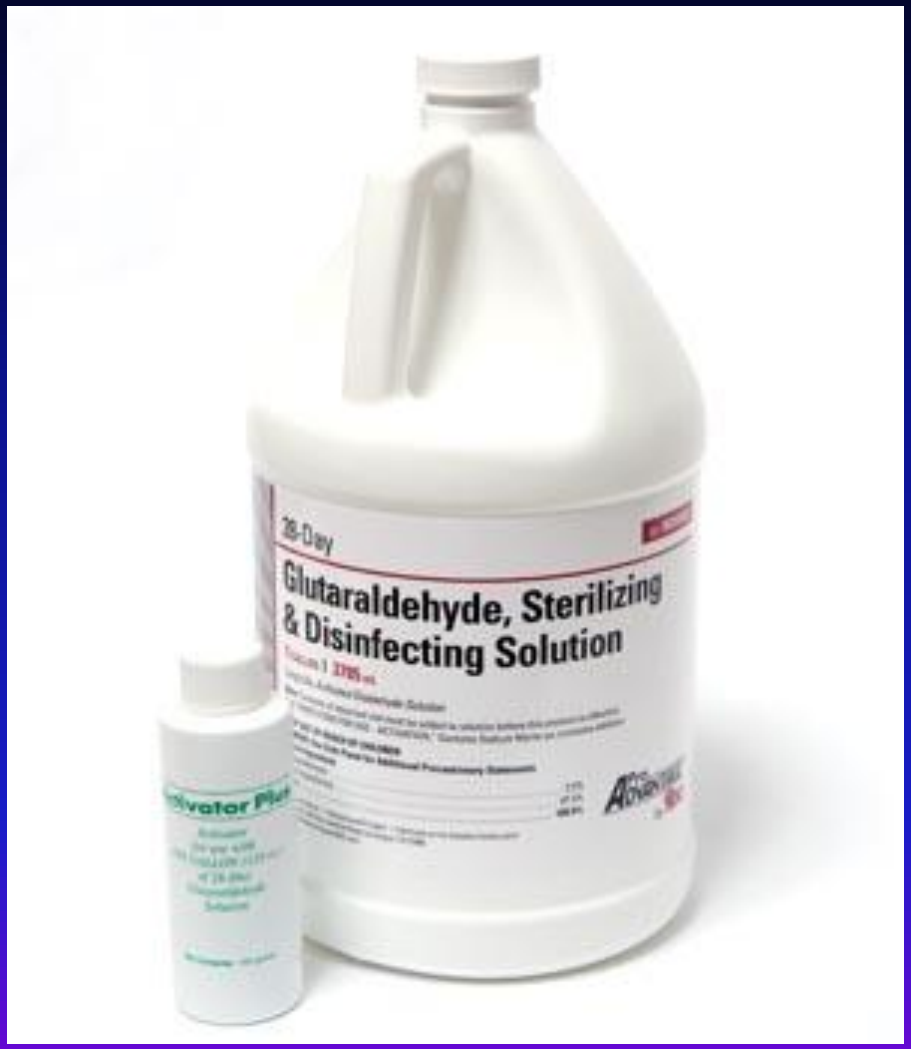
Liquid Disinfectants

- Surface treatment or to treat liquid waste
- Inactivate by
  - coagulation, denaturation, lysis, enzyme inactivation
- Factors to consider:
  - temperature, humidity, pH
  - contact time, concentration
  - penetrability
  - presence of organic material

What comes to mind?

Liquid Disinfectants

- Alcohol
  - Ethanol, Isopropanol (70 - 85%)
    - requires presence of water for protein denaturation
  - bactericidal (vegetative bacteria)
  - virucidal (enveloped viruses)
  - Not sporicidal
  - Not as effective against non-enveloped viruses)
  - flammable
  - low BP, higher evaporation rate, difficult to get 10 minute contact time



What comes to mind?

Liquid Disinfectants

- Glutaraldehyde
  - stable in and stored in acid pH range
  - activated by adding sodium bicarbonate to elevate pH to ≥ 7.5 (14 day shelf-life)
  - contact time (10 - 180 minutes)
  - sporicidal at longer contact times
    - sterility requires 6 - 10 hours
  - non-corrosive
  - effective in presence of organic material

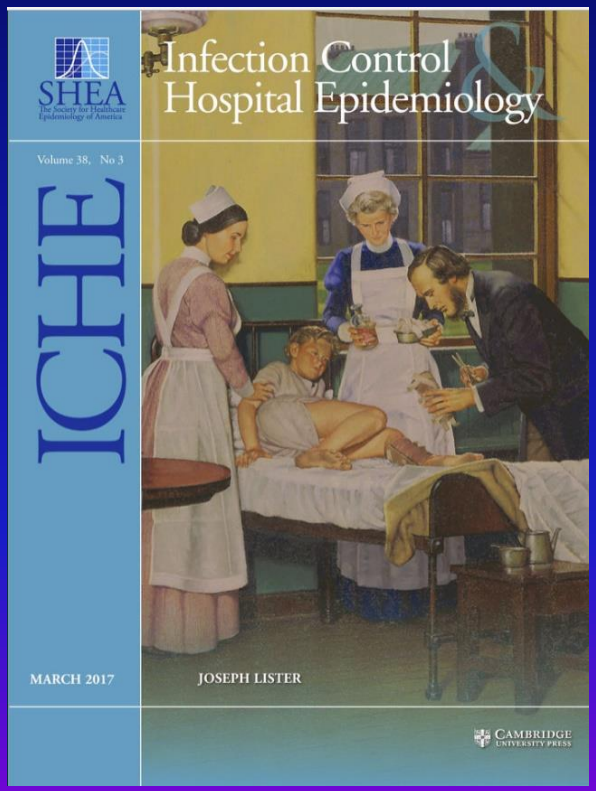
What comes to mind?

Liquid Disinfectants

- Formaldehyde (4 - 8 %)
  - active in alkaline pH range, non-corrosive
  - effective in presence of organic material
  - diminished activity in colder temperatures
  - 10 - 30 minute contact time required
  - fixative (penetration rate of 8mm/24 hours in tissue specimens)
  - wide spectrum disinfectant
  - suspect carcinogen, toxic at low levels

What comes to mind?

Joseph Lister / Carbolic acid



Liquid Disinfectants

- Phenol (0.2 - 3%)
  - Not sporicidal, not effective against non-enveloped viruses
  - Tuberculocidal, fungicidal, bactericidal
  - not affected by presence of organic material
  - hard water can affect effectiveness
  - Toxic, can be absorbed through skin (large spills to skin can be fatal)

What comes to mind?

Liquid Disinfectants

- Quaternary Ammonium Compounds (0.1 - 2%)
  - cationic detergents, very good cleaning agents
  - inactivated by organic material
  - bactericidal, algicidal, fungicidal, will destroy enveloped viruses
  - not tuberculocidal or sporicidal
  - low-level disinfectant
  - good for general surfaces and floors
  - very toxic to eyes (a few drops can lead to blindness)

What comes to mind?

Liquid Disinfectants

- Halogens - chlorine (0.01 - 5%)
  - wide spectrum of activity
  - acts rapidly at low concentrations (10 - 30 min.)
  - inactivated by organic material (use more)
  - will lose chlorine upon exposure to light/air
  - more cidal at low pH, good at lower temps.
  - very corrosive

What comes to mind?

Liquid Disinfectants

- Halogens - Iodine (0.47%, 75 - 1600 PPM)
  - inactivated by protein
  - 1600 PPM inactivates wide spectrum of agents
  - effective over wide pH range
  - tuberculocidal, sporicidal
  - corrosive, will stain, toxic, allergenic
  - Dilution issue - must follow recommended dilutions for iodophors (or iodophor may not be as effective)

What comes to mind?

Liquid Disinfectants

- Hydrogen Peroxide (3% - 25%)
  - stable, non-toxic, fast acting
  - 10 - 25% solutions are sporicidal
  - inactivated by organisms that produce catalase

Rank Order of Resistance to Disinfection

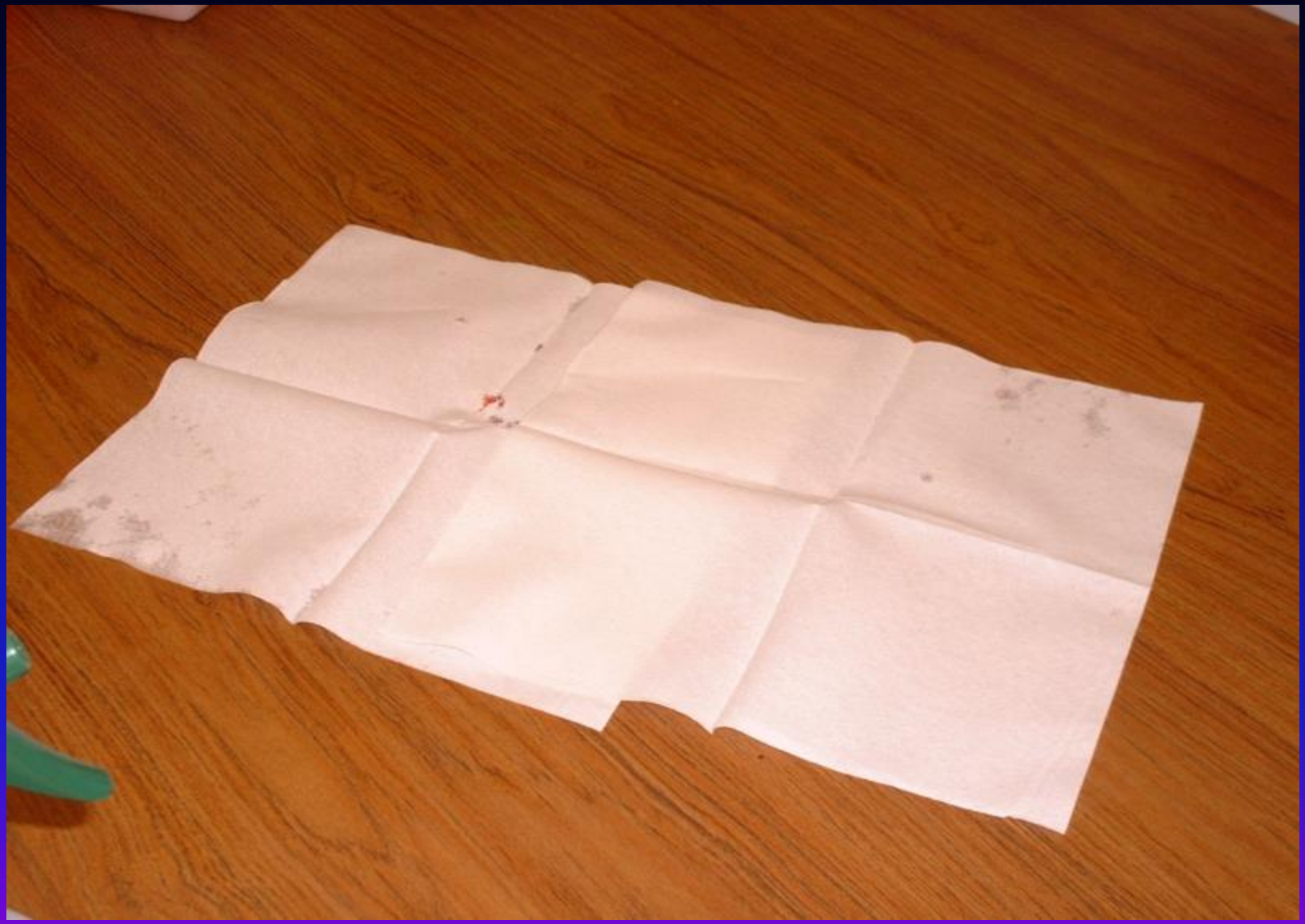
- Prions
- Protozoan cysts
- Bacterial spores
- Non-enveloped (hydrophilic) viruses
- Mycobacteria
- Fungal spores, fungi
- Vegetative bacteria
- Enveloped viruses (lipophillic)

Verification of Decontamination

- Autoclave tape
  - time/temperature/date records on chart
- Chemical indicators (diack melt pellets)
  - fuse if temperature reached for at least 1 second
- Biological Spore indicators
  - *Geobacills stearothermophillus*
  - *Bacillus atrophaeus*
- Manifest for biomedical waste (incineration)

Spill Decontamination

- COVER
  - cover spill area with paper towels
- DISINFECT
  - slowly pour disinfectant around perimeter and into the center of spill area. 10-15 minute contact time.
  - Clean/disinfect surrounding areas
- CLEAN
  - absorb spill and paper towels and place in biohazard bag. Sharps placed in sharps container.
- DISINFECT
  - spray spill area with disinfectant, allow to air dry



The most important step in instrument reprocessing or surface management is….

Cleaning!!

Environmentally Transmitted Infections

- Healthcare workers and patients can be infected directly or indirectly from environmental sources
  - Sources can be air, fomites, instruments, or aerosols

Fomite: An inanimate object or substance capable of carrying infectious organisms and hence transferring them from one individual to another

Environmental Sites Positive for MRSA in Endemic and Outbreak Situations

Item or Surface	Mean %	Range %
Floor	34.5	9.0 – 60.0
Patient Gown	40.5	34.0 – 53.0
Bed Rails	27.0	1.0 – 60.0
Bed Linens	41.0	34.0 – 54.0
Overbed Table	40.0	18.0 – 67.0
Bathroom Door Knob	14.0	8.0 – 24.0
Room Door Knob	21.5	4.0 – 59.0
Furniture	27.0	11.0 – 59.0
Flat Surfaces	21.5	7.0 – 38.0
Sink Taps	23.5	14.0 – 33.0
Infusion Pump Button	19.0	7.0 – 30.0

Adapted from: Dancer SJ. The Lancet Infectious Diseases: epub 10/31/07

Antimicrobial Resistance And Emerging Pathogens

- Newly discovered pathogens or organisms that acquire antimicrobial resistance are usually erroneously assigned extraordinary resistance to commonly used disinfection and sterilization procedures
- Examples: SARsCo-V, HIV, HBV, Ebola virus, Hantavirus, MDR-Tb, VRE, MRSA, VRSA

Drug Resistant Pathogens

- No correlation to drug resistance and resistance to disinfection
- Some organisms may develop tolerance at concentrations hundreds to thousand folds below use dilution
- Current protocols do not have to be altered; use products per manufacturer's label or per laboratory protocols

Cleaning and Disinfecting of the Housekeeping Surfaces

- Clean on a regular basis to remove soil and dust
- Physical removal of microorganisms and organic soil is as important as the antimicrobial effect of the disinfecting agent
- Surfaces not touched frequently by hand (i.e., floors) in general care areas are cleaned and disinfected
- ***This is controversial – routine disinfection of floors is not supported by epidemiology; lack of consensus among infection control staff and hospital epidemiologists BUT….***

American Journal of Infection Control 45 (2017) 336-8

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Brief Report

Are hospital floors an underappreciated reservoir for transmission of health care-associated pathogens?

Abhishek Deshpande MD, PhD [a,b], Jennifer L. Cadnum BS [b,c], Dennis Fertelli BS [b,c], Brett Sitzlar BS, MPH [b,c], Priyaleela Thota MD [b,c], Thriveen S. Mana MS, MBA [b,c], Annette Jencson MT, CIC [c], Heba Alhmidi MD [c], Sreelatha Koganti MD [c], Curtis J. Donskey MD [b,d,*]

[a] *Medicine Institute Center for Value Based Care, Cleveland Clinic, Cleveland, OH*
[b] *Department of Medicine, Case Western Reserve University School of Medicine, Cleveland, OH*
[c] *Research Service, Cleveland VA Medical Center, Cleveland, OH*
[d] *Geriatric Research, Education, and Clinical Center, Cleveland Veterans Affairs Medical Center, Cleveland, OH*

Key Words:
Clostridium difficile
Methicillin-resistant *Staphylococcus aureus*
Vancomycin-resistant enterococci

In a survey of 5 hospitals, we found that floors in patient rooms were frequently contaminated with pathogens and high-touch objects such as blood pressure cuffs and call buttons were often in contact with the floor. Contact with objects on floors frequently resulted in transfer of pathogens to hands.

Published by Elsevier Inc. on behalf of Association for Professionals in Infection Control and Epidemiology, Inc.

An Example on Why Instructions are so Important

- EPA-registered products labeled as “cleaner/disinfectants:”
  - Label clearly distinguishes between use of the product as a cleaner OR as a disinfectant
  - Level of soil, precleaned surface
  - Contact time
  - Surface is to remain WET for the full contact time

Clinical Contact Surfaces

Dentistry

Housekeeping Surfaces

General Cleaning Recommendations

- Use barrier precautions (e.g., heavy-duty utility gloves, masks, protective eyewear) when cleaning and disinfecting environmental surfaces
- Physical removal of microorganisms by cleaning is as important as the disinfection process
- Follow manufacturer's instructions for proper use of EPA-registered hospital disinfectants
- Do not use sterilant/high-level disinfectants on environmental surfaces

Cleaning Clinical Contact Surfaces

- Risk of transmitting infections greater than for housekeeping surfaces
- Surface barriers can be used an changed between patients

OR

- Clean then disinfect using an EPA-registered low- (HIV/HBV claim) to intermediate-level (tuberculocidal claim) hospital disinfectant

Article

ABSA INTERNATIONAL

Applied Biosafety:
Journal of ABSA International
2016, Vol. 21(4) 203-207

DOI: 10.1177/1535676016683194
journals.sagepub.com/home/apb
SAGE

A Searchable Laboratory-Acquired Infection Database

David Gillum[1], Partha Krishnan[2], and Karen Byers[3]

Abstract

Published peer-reviewed accounts of laboratory-acquired infections (LAIs) are difficult to track and assess due to several underlying factors. Reports of LAI in peer-reviewed journals are recognized as "goal posts" for biosafety programs and may contain invaluable information for proactive steps to take to prevent a potential incident in the laboratory. Objectively reviewing published studies enhances prevention efforts and reinforces training by providing examples of LAI and associated procedures. In an effort to make this information more accessible, ABSA International has developed an online searchable database of peer-reviewed published LAIs. This article presents the questions included in the repository and discusses the need for consistency in the data being collected for LAIs. In addition, this article presents historical information leading up to the development of these questions, as well as the formalization of the online database of published LAIs.

Keywords

laboratory-acquired infection, ABSA International, training, prevention, infectious disease reporting


ACETONE

Cleaning and Disinfecting of the Housekeeping Surfaces

- Follow manufacturer's instructions if using proprietary cleaners or disinfectants
  - Use conditions (e.g., concentration, contact time)
- Clean and disinfect surfaces that are touched by hand on a frequent and regular basis
  - Door knobs, light switches, bed rails
  - Surfaces around the toilet

Minimize Glove "Misuse"

- Failure to remove or change contaminated gloves
- 18.3% (4/22) samples showed potential transferral of microorganisms [a = from patient, b = from gloves]

Source: Girou E, Chai SHT, Oppein F, et al. *J Hosp Infect* 2004; 57: 162-9

	Glove Cultures		Environmental Cultures		
No. of Contacts Before Sampling	Bacterial Counts (CFU)	Pathogenic Bacteria	Sampled Surfaces	Bacterial Counts (CFU)	Pathogenic Bacteria
6	4,500	*P. aeruginosa* (a), *Serratia marcescens* (a)	Bed barrier (rail)	85	*P. aeruginosa*, *Serratia marcescens* (a, b)
10	>30,000	*P. aeruginosa*	Bedside table	2	*P. aeruginosa*
10	>30,000	*P. aeruginosa*	Bedside table	>300	*P. Aeruginosa* (a)
17	>30,000	*P. aeruginosa*	Weighing machine	169	*P. aeruginosa* (b)

So Why All the Fuss About Hand Hygiene?

- *Most common mode of transferral of pathogens is via the hands!*
- Infections acquired in healthcare
- Spread of resistant microorganisms

Evidence of Relationship Between Hand Hygiene and Healthcare-Associated Infections

- Substantial evidence that hand hygiene reduces the incidence of infections
- Historical study: Semmelweis
- More recent studies: rates lower when antiseptic handwashing was performed

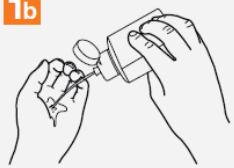
How to Handrub?

RUB HANDS FOR HAND HYGIENE! WASH HANDS WHEN VISIBLY SOILED

Duration of the entire procedure: 20-30 seconds

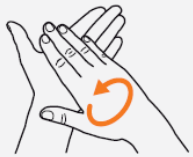
1a

1b



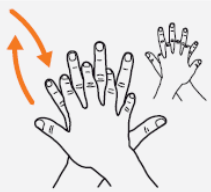
Apply a palmful of the product in a cupped hand, covering all surfaces;

2



Rub hands palm to palm;

3



Right palm over left dorsum with interlaced fingers and vice versa;

4

Palm to palm with fingers interlaced;

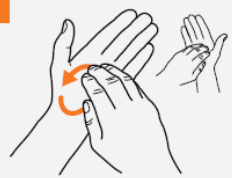
5

Backs of fingers to opposing palms with fingers interlocked;

6

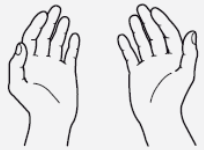
Rotational rubbing of left thumb clasped in right palm and vice versa;

7



Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;

8



Once dry, your hands are safe.

World Health Organization | Patient Safety — A World Alliance for Safer Health Care | SAVE LIVES Clean Your Hands

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

May 2009

INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY

ORIGINAL ARTICLE

Hand Hygiene With Alcohol-Based Hand Rub: How Long Is Long Enough?

Daniela Pires, MD;[1,2] Hervé Soule, PharmD;[1] Fernando Bellissimo-Rodrigues, MD,PhD;[1,3] Angèle Gayet-Ageron, MD,PhD;[1] Didier Pittet, MD,MS[1]

BACKGROUND. Hand hygiene is the core element of infection prevention and control. The optimal hand-hygiene gesture, however, remains poorly defined.

OBJECTIVE. We aimed to evaluate the influence of hand-rubbing duration on the reduction of bacterial counts on the hands of healthcare personnel (HCP).

METHODS. We performed an experimental study based on the European Norm 1500. Hand rubbing was performed for 10, 15, 20, 30, 45, or 60 seconds, according to the WHO technique using 3 mL alcohol-based hand rub. Hand contamination with *E. coli* ATCC 10536 was followed by hand rubbing and sampling. A generalized linear mixed model with a random effect on the subject adjusted for hand size and gender was used to analyze the reduction in bacterial counts after each hand-rubbing action. In addition, hand-rubbing durations of 15 and 30 seconds were compared to assert non-inferiority (0.6 $\log_{10}$).

RESULTS. In total, 32 HCP performed 123 trials. All durations of hand rubbing led to significant reductions in bacterial counts ($P < .001$). Reductions achieved after 10, 15, or 20 seconds of hand rubbing were not significantly different from those obtained after 30 seconds. The mean bacterial reduction after 15 seconds of hand rubbing was 0.11 $\log_{10}$ lower (95% CI, −0.46 to 0.24) than after 30 seconds, demonstrating non-inferiority.

CONCLUSIONS. Hand rubbing for 15 seconds was not inferior to 30 seconds in reducing bacterial counts on hands under the described experimental conditions. There was no gain in reducing bacterial counts from hand rubbing longer than 30 seconds. Further studies are needed to assess the clinical significance of our findings.

Infect Control Hosp Epidemiol 2017:1–6

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journal homepage: www.ajicjournal.org

Letters to the Editor

Orthodontic instruments and supplies: Are they semicritical or critical items?

To the Editor:

Rutala and Weber recently stated: "Semicritical items represent the greatest risk of disease transmission because far more health care-associated infections have been caused by reusable, semicritical items than critical or noncritical items" and that "strict adherence to current guidelines is required for semicritical items because more outbreaks have been linked to inadequately cleaned or disinfected semicritical items, such as endoscopes undergoing high-level disinfection, than any other reusable medical device."[1]

Here, we discuss these statements concerning orthodontic items. It is only recently that the reprocessing of orthodontic instru-

Fig 1. A standard kit for fixed orthodontics with an integrator and green silicon mat.

Routine quality control is achievable by inserting appropriate controls for cleaning efficacy and the moist heat process inside the cassette. Nevertheless, some disadvantages are the overall working time, higher requirement of OIs, and the overall weight (number of orthodontic kits, cassettes, and containers) in light of the maximum load of small steam autoclaves.

Strategies to Enhance the Safety and Efficacy of Cleaning and Disinfecting

- Be familiar with the product's ~~M~~SDS and instructions for proper and safe application
- Be familiar with the item to be cleaned and decontaminated

How to Determine if Cleaning Products Are Hazardous or Contain Hazardous Substances

Review ingredients on material safety data sheet (MSDS). You can check products or ingredients against the following databases or lists.

- IARC – International Agency for Research on Cancer: www.iarc.fr
- NTP – National Toxicology Program; http://ntp-server.niehs.nih.gov
- OSHA – Occupational Safety and Health Administration: www.osha.gov
- IRIS – EPA Integrated Risk Information System: www.epa.gov/iris
- NIOSH – National Institute of Occupational Health and Safety: www.cdc.gov/niosh
- ACGIH – American Conference of Governmental Industrial Hygienists: www.acgih.org
- CleanGredients Database – Green Blue Institute: www.greenblue.org
- Green Seal: www.greenseal.org
- EPA DfE - EPA Design for the Environment: www.epa.gov/dfe/pubs/projects/formulat/index.htm
- IRCHS - Indiana Relative Chemical Hazard Score: www.ecn.purdue.edu/CMTI/IRCHS/
- **TURI –** Toxic Use Reduction Institute: www.cleanersolutions.org
- **WHO – World Health Organisation www.who.org**
- ECHA – European Chemicals Agency - http://echa.europa.eu/

Safety Assessment of Cleaning and Disinfectant Products

- How is the product diluted and how frequently is it being used?
- What is the product's intended use?
- What is the likelihood it will be misused?
- What is the experience level of users?
- What are the hazard ratings for the product?
- What does the MSDS say about the product safety?
- Does the product present an acceptable level of risk?
- What do others report about the product safety?

Strategies to Enhance the Safety and Efficacy of Cleaning and Disinfecting

- Be familiar with the product's MSDS and instructions for proper and safe application
- Look for opportunities to prevent surface contamination from occurring

Cleaning and Disinfecting of Medical Equipment

- FOLLOW THE MANUFACTURER'S INSTRUCTIONS!!!
- In the absence of instructions, clean and follow with low- to intermediate-level disinfection depending on the degree of contamination
- Consider covering those surfaces that are frequently touched during delivery of care

Strategies to Enhance the Safety and Efficacy of Cleaning and Disinfecting

- Be familiar with the product's MSDS and instructions for proper and safe application
- Look for opportunities to prevent surface contamination from occurring
- Look for opportunities to reduce the amounts of chemicals used

Microorganism Removal with Microfiber

Cleaning Solution	Cleaning System	Dry Time (mins)	Mean % Reduction CFU ± SD
QUAT	Cotton string mop/standard bucket with wringer	2:48	94.84 ± 4.8
QUAT	Microfiber mop/standard bucket with wringer	2:13	87.94 ± 17.2
QUAT	Microfiber mop/microfiber bucket	7:04	95.31 ± 5.7
Detergent	Cotton string mop/standard bucket with wringer	2:48	67.75 ± 31.6
Detergent	Microfiber mop/standard bucket with wringer	2:23	79.74 ± 24.8
Detergent	Microfiber mop/microfiber bucket	8:03	94.50 ± 4.6

- QUAT = 1:128 dilution of product containing 5.15% didecyl dimethyl ammonium chloride, 3.43% dimethyl benzyl ammonium chloride. Detergent was a neutral cleaner with no germicidal properties
- RODAC plates with D/E Neutralizing agar; CFU compared before and after cleaning

Source: Rutala WA, Gergen MF, Weber DJ. Microbiologic evaluation of microfiber mops for surface disinfection. *Am J Infect Control* 2007; 35: 569-73.

INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY NOVEMBER 2016, VOL. 37, NO. 11

ORIGINAL ARTICLE

Healthcare Personnel Attire and Devices as Fomites: A Systematic Review

Nicholas Haun, MD;[1] Christopher Hooper-Lane, MA;[2] Nasia Safdar, MD, PhD[3,4]

BACKGROUND. Transmission of pathogens within the hospital environment remains a hazard for hospitalized patients. Healthcare personnel clothing and devices carried by them may harbor pathogens and contribute to the risk of pathogen transmission.

OBJECTIVE. To examine bacterial contamination of healthcare personnel attire and commonly used devices.

METHODS. Systematic review.

RESULTS. Of 1,175 studies screened, 72 individual studies assessed contamination of a variety of items, including white coats, neckties, stethoscopes, and mobile electronic devices, with varied pathogens including *Staphylococcus aureus,* including methicillin-resistant *S. aureus,* gram-negative rods, and enterococci. Contamination rates varied significantly across studies and by device but in general ranged from 0 to 32% for methicillin-resistant *S. aureus* and gram-negative rods. *Enterococcus* was a less common contaminant. Few studies explicitly evaluated for the presence of *Clostridium difficile.* Sampling and microbiologic techniques varied significantly across studies. Four studies evaluated for possible connection between healthcare personnel contaminants and clinical isolates with no unequivocally direct link identified.

CONCLUSIONS. Further studies to explore the relationship between healthcare personnel attire and devices and clinical infection are needed.

Infect Control Hosp Epidemiol 2016;37:1367–1373

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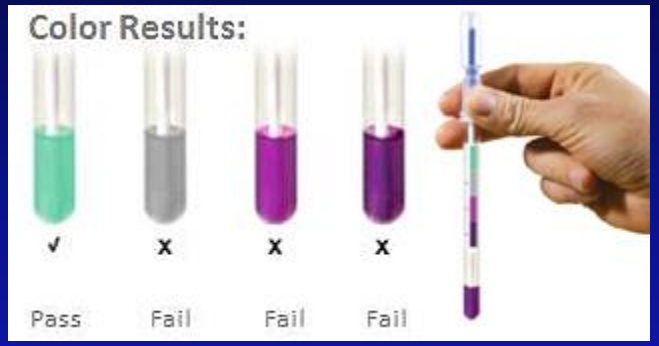
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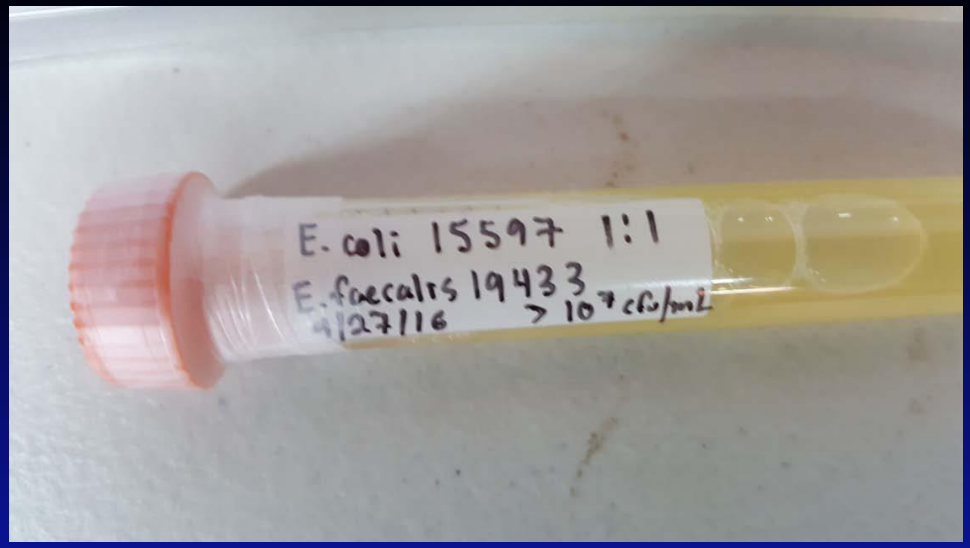
Pass
Fail
Fail
Fail


UNIKON

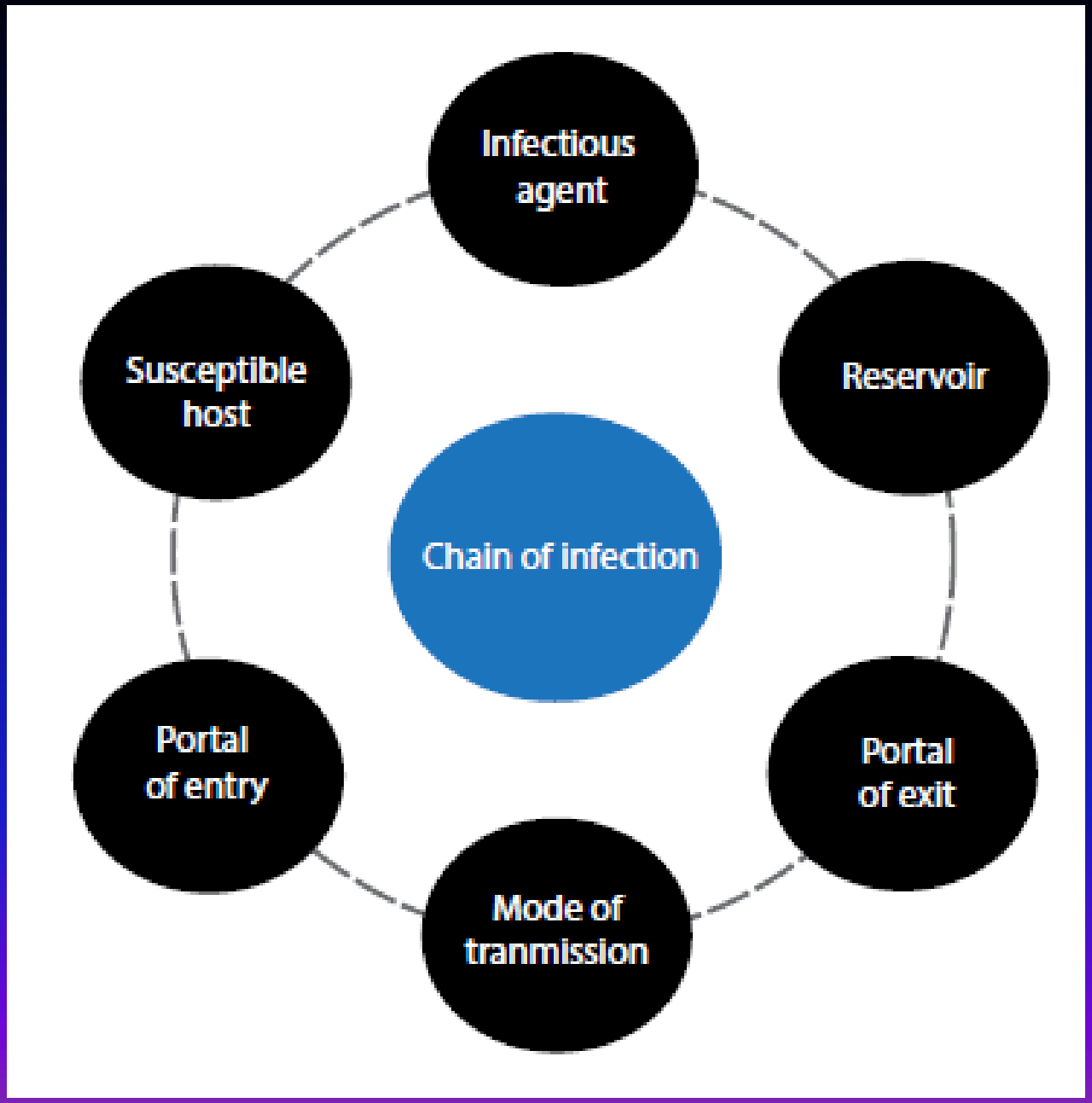

PRO Clean
PCS


E. coli 15597 1:1
E. faecalis 19433
4/27/16
> 10⁸ cfu/mL


#1
#2
#3
SHARPS
BIOHAZARD


SOIL +
NEG C

Sample Ref.:
PROTEIN RESIDUE TEST
PROTEIN RESIDUE TEST


Infectious agent
Reservoir
Portal of exit
Mode of tranmission
Portal of entry
Susceptible host
Chain of infection

Chain of Infection

1. Infectious Agents - Bacteria, Fungi, Viruses

Rapid, accurate identification of organism

2. Reservoirs - People, Equipment, Water

Employee health, Environmental Sanitation, Disinfection, Sterilization

3. Portal of Exit - Excretions, Secretions, Skin, Droplets

Proper attire, Handwashing, Control of excretions &secretions, Trash &waste disposal

Chain of Infection

4. Means of Transmission - Direct contact, ingestion, fomites, airborne

Handwashing, Sterilization, Isolation, Foodhandling, Air flow control

5. Portal of Entry - Mucous membrane, GI tract, Respiratory tract, Broken skin

Aseptic technique, Personal Protective Equipment

6. Susceptible Host - Immunocompromised, Diabetes, Nutritional status, Age

Recognition of high risk patient, Treating underlying diseases

Final Points

- Clean before you disinfect/sterilize
- Always wear appropriate Personal Protective Equipment
- Understand the products/equipment you are using whether they be a chemical or physical device
- Determine a way to evaluate your process

BREAK TIME!