

# CHICA CONFERENCE, VANCOUVER, MAY-JUNE 2010

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## DISINFECTION OF ENVIRONMENTAL SURFACES: CAN IT BE MADE BETTER AND SAFER?

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## ACKNOWLEDGEMENTS

- CHICA
  - JACKIE BOSC (TRAVEL)
  - GERRY HANSEN
  - LINDA KINGSBURY
  - KELLI WAGNER
- VIROX
  - NICOLE KENNY
- CENTRE FOR RES. ON ENVIRON. MICROBIOL.
  - STAFF & STUDENTS

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## DISCLOSURE (PAST TWO YEARS)

- PERSONAL
  - MEMBER, BOARD OF DIRECTORS, VIROX TECH, OAKVILLE, ON
  - TECHNICAL ADVISOR TO STERIS CORP. (MENTOR, OH), KIMBERLY-CLARK (ROSWELL, GA); VIROX TECH
- CREM - RESEARCH STUDY CONTRACTS:
  - CALTECH INDUSTRIES (MIDLAND, MI); DEB GROUP (DERBYSHIRE, UK); LERNAPHARM (MONTREAL, QC); GOJO INDUSTRIES (AKRON, OH); PROCTER & GAMBLE CO (CINCINNATI, OH); UMF CORP. (CHICAGO, IL); VIROX TECH
- ADVISORY SERVICES
  - WORLD HEALTH ORGANIZATION
  - ORGANIZATION FOR ECONOMIC CO-OP & DEVELOPMENT
  - AOAC INTERNATIONAL
  - GOVT. OF CANADA
  - INTERNATIONAL CIVIL AVIATION ORGANIZATION
- NO SPECIFIC PRODUCT OR SERVICE TO BE MENTIONED

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**OBJECTIVES**

- PREVENTIVE STRATEGIES
- CLEANING & DISINFECTION
- USE OF CHEMICALS AS DISINFECTANTS
- WIPE TESTING OF DISINFECTANTS
- THE 'GREEN' MOVEMENT
- CONCLUDING REMARKS

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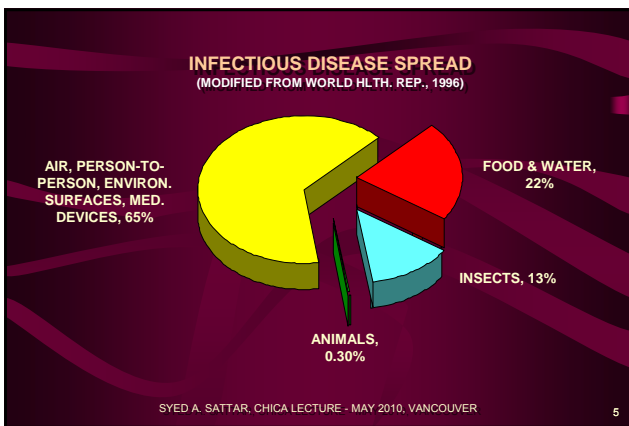
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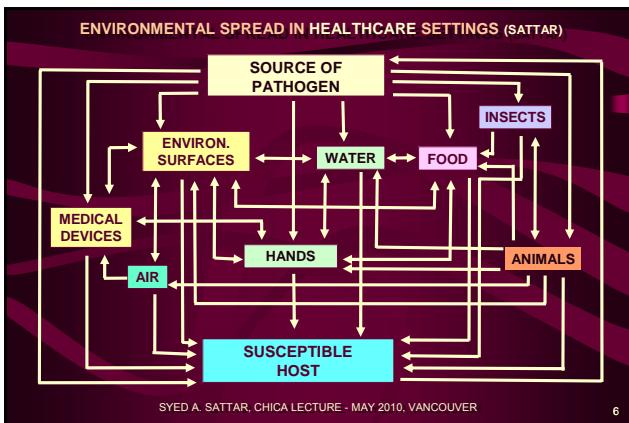
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### INTERRUPTING SPREAD OF PATHOGENS

- GENERAL MEANS
  - VACCINATION OF HUMANS (Polio) & ANIMALS (Rabies)
  - CHEMOTHERAPY (Antibiotics)
  - DISEASE SURVEILLANCE (TB), QUARANTINE (Rabies), BARRIER PROTECTION (AIDS), SCREENING OF BLOOD & TISSUES (Hep. B), EDUCATION (TOXOPLASMOSSIS)
- ENVIRONMENTAL MEANS
  - CLEANING
  - ANTISEPSIS
  - DISINFECTION
  - STERILIZATION

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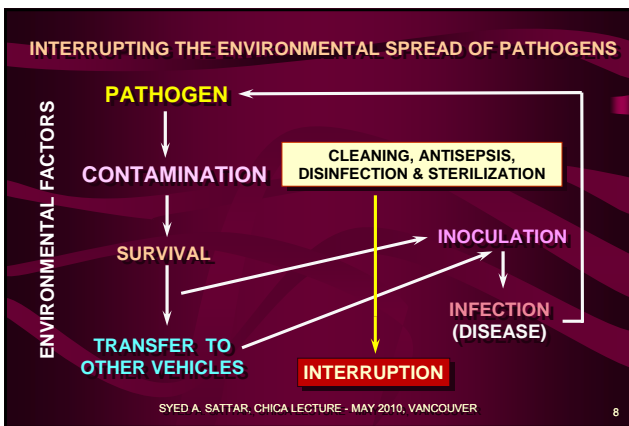
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### DISINFECTANT USE

- >5,000 REGISTERED DISINFECTANTS IN U.S.
- >60% FOR USE AGAINST HUMAN PATHOGENS
- ABOUT 275 DIFFERENT TYPES OF ACTIVES
- ANNUAL SALES OF >BILLION DOLLARS & INCREASING
- DIFFERENCES IN REGISTRATION REQUIREMENTS

#### DISINFECTANTS USED IN I&I IN THE U.S. (MODIFIED FROM FU ET AL. 2007)

Disinfectant Type	Percentage
QUATS	38.2
HYPOCHLORITE & OTHER CHLORINES	29.7
ALCOHOL	4.2
ACIDS	2.8
PEROXIDES	1.3
ISONE-BANES	1.8
ALDEHYDES	1.4
OTHER	21.4
PERACETIC ACID	6.2
PHENOLIC	3.0

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**IS THERE ANY SCIENTIFIC BASIS FOR ENVIRONMENTAL DECONTAMINATION FOR HIGH-PROFILE PATHOGENS?**

- FREQUENTLY, LABEL CLAIMS MADE FOR ACTIVITY AGAINST PATHOGENS SUCH AS HIV, SARS VIRUS & AVIAN FLU
- LACK OF EVIDENCE FOR THEIR SPREAD VIA CONTAMINATED ENVIRONMENTAL SURFACES
- THEREFORE, CAUTION RECOMMENDED IN REQUIRING & ACCEPTING SUCH CLAIMS
- REQUESTS FOR SUCH CLAIMS FROM ICP CREATE UNDUE PRESSURE FOR MANUFACTURERS & TESTING LABS

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**DOES HOUSE-KEEPING STAFF HAVE SKILLS & TRAINING FOR OPTIMAL DISINFECTION OF ENVIRONMENTAL SURFACES?**

- A CRUCIAL BUT WEAK-LINK IN THE CHAIN
- LEAST SKILLED & TRAINED WITH FAST TURN-OVER
- DIRECTIONS FOR STORAGE, DILUTION, APPLICATION & DISPOSAL MAY BE DIFFICULT TO INTERPRET
- LANGUAGE OFTEN A BARRIER
- IN-SERVICE TRAINING COULD BE BETTER
- URGENT NEED TO ADDRESS THESE ISSUES

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**CONTAMINATED SURFACES IN U.S. HOSPITALS\***

(P. CARLING, MAY 2008)

	VRE	MRSA	C. DIFFICILE
BED RAILS	++++++	+	+++
BED TABLE	+++++	+	-
DOOR KNOB	++	++	+
DOORS	+++	+	-
CALL BUTTON	+++	+	++
CHAIR	+++	+	++
TRAY TABLE	+++	++	-
TOILET SURFACE	+	-	++++
SINK SURFACE	+	+	+++
BEDPAN CLEANER	-	-	+

\*DATA FROM 23 SEPARATE STUDIES

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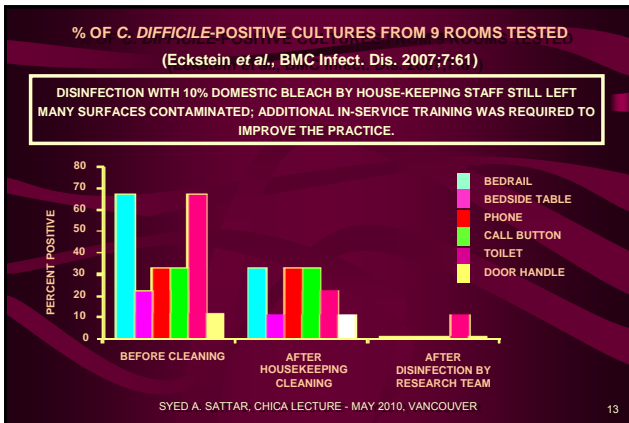
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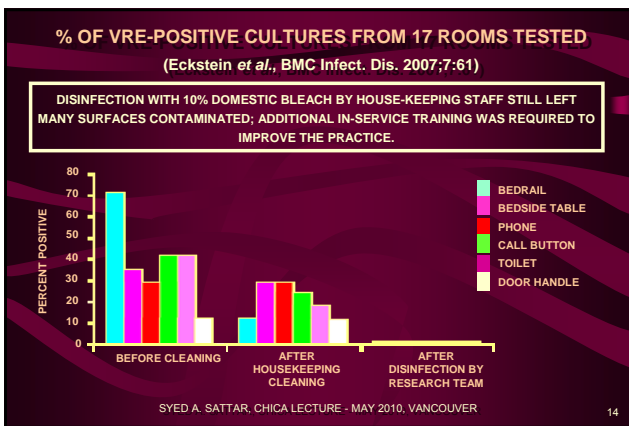
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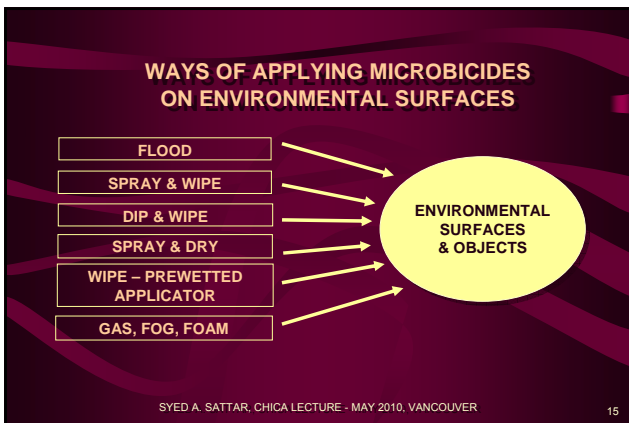
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**WIPING & VOLUME OF LIQUID TRANSFERRED\***

VERY WET (DRAINED, NOT DRIPPING, NOT SQUEEZED)	SQUEEZED AT NORMAL PRESSURE
$1.78 \pm 0.29 \mu\text{L}/\text{cm}^2$	$0.26 \pm 0.03 \mu\text{L}/\text{cm}^2$
14.9 – 20.7 mL/m <sup>2</sup>	2.3 – 2.9 mL/m <sup>2</sup>

\*SATTAR ET AL., UNPUBLISHED DATA

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**WHICH ENVIRONMENTAL SURFACES SHOULD BE TARGETS FOR REGULAR DECONTAMINATION?**

- PRINCIPAL CONSIDERATION IS *POTENTIAL* OF A GIVEN SURFACE TO HARBOR & DONATE PATHOGENS DURING ROUTINE CONTACT
- MUST INCLUDE:
  - PROBABILITY OF CONTAMINATION WITH PATHOGENS
  - ABILITY TO ALLOW FOR PATHOGEN SURVIVAL
  - EASE OF PATHOGEN RELEASE
  - LOCATION & FREQUENCY OF DIRECT CONTACT WITH HANDS OR MUCOUS SURFACES

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**ARE CURRENT ENVIRONMENTAL SURFACE DISINFECTANTS & THEIR APPLICATION OPTIMAL FOR INFECTION PREVENTION?**

- MANY COMMON PRODUCTS ARE NO MORE THAN WEAK BACTERICIDES (LOW-LEVEL DISINFECTANTS)
- THEIR FIELD APPLICATION FURTHER COMPROMISES THEIR ACTIVITY DUE TO:
  - MUCH SHORTER CONTACT TIMES
  - OFTEN MINUTE VOLUMES APPLIED TO SURFACES
  - HIGH SOIL LOAD
- THIS GENERATES A FALSE SENSE OF SECURITY
- MAY IN FACT INCREASE RISK OF PATHOGEN SPREAD!

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**CAN OTHER MEANS HELP REDUCE RISK OF PATHOGEN SPREAD FROM ENVIRONMENTAL SURFACE?**

- **USE OF MICROFIBER-BASED FABRICS IN DISINFECTION OF ENVIRONMENTAL SURFACES SHOWS MUCH PROMISE**
- **UV LIGHT WITH OR WITHOUT H.E.P.A. FILTRATION**
- **USE OF GASEOUS CHEMICALS & FOGGING**
- **TITANIUM OXIDE & UV LIGHT**

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**ARE DETERGENTS ALONE A BETTER ALTERNATIVE TO DISINFECTANTS?**

- **THEY ARE WEAK MICROBICIDES & CAN SPREAD MICROBIAL CONTAMINATION OVER A WIDER AREA DURING CLEANING**
- **BACTERIA CAN ALSO GROW IN IN-USE DILUTIONS OF MANY DETERGENTS & THIS MAY LEAD TO INADVERTENT & WIDER SPREAD OF MICROBIAL CONTAMINATION**
- **MANY SYNTHETIC DETERGENTS MAY NOT BE AS SAFE FOR AQUATIC LIFE AS PREVIOUSLY THOUGHT**
- **LACK OF COMPATIBILITY BETWEEN DETERGENTS & DISINFECTANTS (E.G., ANIONIC DETERGENTS & QUATS)**

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**IS GOVERNMENT REGISTRATION ENOUGH TO CONSIDER A GIVEN PRODUCT EFFECTIVE?**

- **NOT WHEN IT COMES TO MOST ENVIRONMENTAL SURFACE DISINFECTANTS!**
- **THIS IS BECAUSE OF OUTDATED REGISTRATION REQUIREMENTS & FLAWED TEST METHODS**
- **ANOTHER WEAK-LINK**
- **MATERIALS MANAGERS & ICPs MAY NOT BE TRAINED ENOUGH TO EXERCISE JUDGMENT HERE**
- **A REVIEW OF THIS ISSUE IS URGENTLY NEEDED**

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**MICROBICIDES ARE A DOUBLE-EDGED SWORD**

- NO CHEMICAL THAT CAN KILL MICROBES CAN BE TOTALLY SAFE FOR OTHER LIFE FORMS
- HOWEVER, SOME MICROBICIDAL CHEMICALS CAN BE MORE TOXIC THAN OTHERS
- CHALLENGE IS TO PROMOTE DEVELOPMENT & APPLICATION OF SAFER ONES
- USE MORE HARMFUL ONES IN WAYS TO OPTIMIZE THEIR DESIRABLE ATTRIBUTES WHILE MINIMIZING THEIR UNDESIRABLE TRAITS

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**THE 'ALARA' PRINCIPLE**

- ADOPT THE ALARA (AS LOW AS REASONABLY ACHIEVABLE) PRINCIPLE FROM RADIATION SAFETY IN DEALING WITH MICROBICIDES
- ENTAILS MAKING EVERY REASONABLE EFFORT TO MAINTAIN WORKER & PATIENT EXPOSURES TO HARMFUL CHEMICALS AS LOW AS POSSIBLE
- WOULD REQUIRE:
  - BETTER EDUCATION & TRAINING OF END-USERS
  - INTRODUCTION OF SAFER PRODUCTS & PROCEDURES
  - A MORE REASONED APPROACH TO USING MICROBICIDES IN INFECTION CONTROL

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**WHAT IS 'GREEN' OR SUSTAINABLE CHEMISTRY?**

- ENVIRONMENTALLY-FRIENDLY CHEMICALS/PROCESSES THAT REDUCE WASTE WHILE PRODUCING SAFER PRODUCTS WITH LESS USE OF ENERGY
- PROMOTES RENEWABLE STARTING MATERIALS FOR A BIO-BASED ECONOMY

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**THE 'GREEN' MOVEMENT**

- HOUSE-HOLD CHEMICALS AS CLEANERS
- DISINFECTANT ACTIVITY TOO SLOW & LIMITED
- POTENTIAL TOXICITY OF BOTANICALS
- CRITERIA FOR 'GREEN' CHEMISTRY (TABLE)
- PERSISTENT CHEMICALS TO BE DISCOURAGED

**PRINCIPLES OF 'GREEN CHEMISTRY'**  
(ANASTAS & WARNER, 1998)

1. DESIGN SAFER CHEMICALS & PRODUCTS THAT ARE FULLY EFFECTIVE WITH LITTLE OR NO TOXICITY
2. USE SAFER SOLVENTS & REACTION CONDITIONS
3. DESIGN CHEMICALS & PRODUCTS TO DEGRADE AFTER USE SO THAT THEY DO NOT ACCUMULATE
4. MINIMIZE POTENTIAL FOR ACCIDENTS SUCH AS EXPLOSIONS, FIRES & RELEASES TO THE ENVIRONMENT

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**CONCLUSIONS**

- PRODUCTS/PROCEDURES IN USE FOR DISINFECTION OF ENVIRONMENTAL SURFACES NEED REVIEW
  - MANY FORMULATIONS HAVE LIMITED MICROBICIDAL ACTIVITY
  - THE CONTACT TIME ON LABELS TOO LONG!
  - SUCH CHEMICALS POTENTIALLY TOXIC & DAMAGING
- BETTER, FASTER-ACTING & SAFER MICROBICIDES NEEDED
- WIPE TESTING TO BE REFINED & PROMOTED
- SUB-LETHAL EXPOSURES TO MICROBICIDES UNWISE – POTENTIAL FOR MICROBICIDE & ANTIBIOTIC RESISTANCE

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**THANK YOU!**

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