

CHICA CONFERENCE, VANCOUVER, MAY-JUNE 2010

CREM
Centre for Research on
Environmental Microbiology
Designing a safer tomorrow



CRME
Centre de recherche en
microbiologie environnementale
Pour un futur plus sain

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

SYED A. SATTAR, Ph.D.

CENTRE FOR RESEARCH ON ENVIRON. MICROBIOLOGY (CREM)
UNIVERSITY OF OTTAWA, OTTAWA, ONTARIO, CANADA



ACKNOWLEDGEMENTS

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

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER

2

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

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER

3

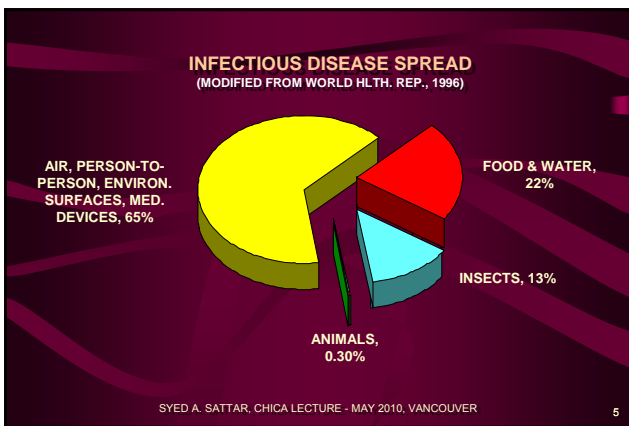
SYED A. SATTAR

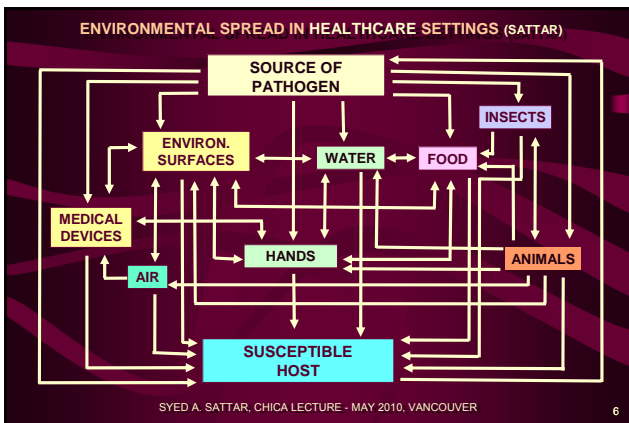
OBJECTIVES

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

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER

4

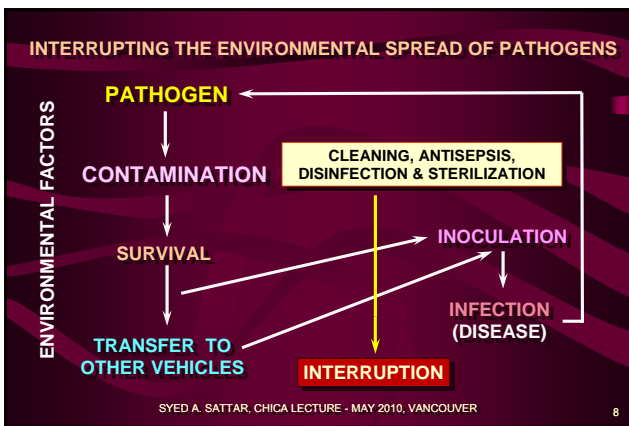




INTERRUPTING SPREAD OF PATHOGENS

- 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

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER 7



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
OTHER	21.4
PERACETIC ACID	6.2
PHENOLIC	3.0

- >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

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER 9

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

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER

10

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

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER

11

CONTAMINATED SURFACES IN U.S. HOSPITALS*

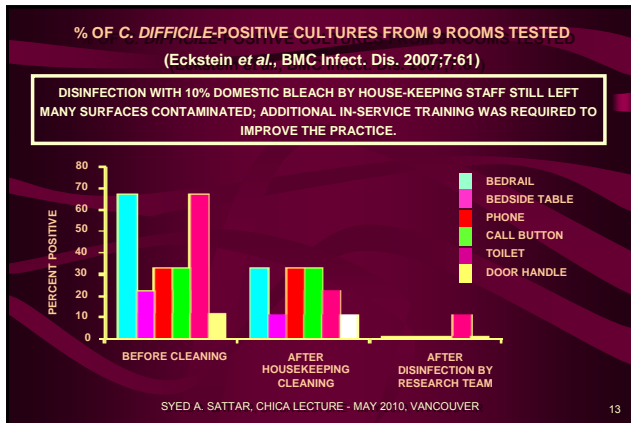
(P. CARLING, MAY 2008)

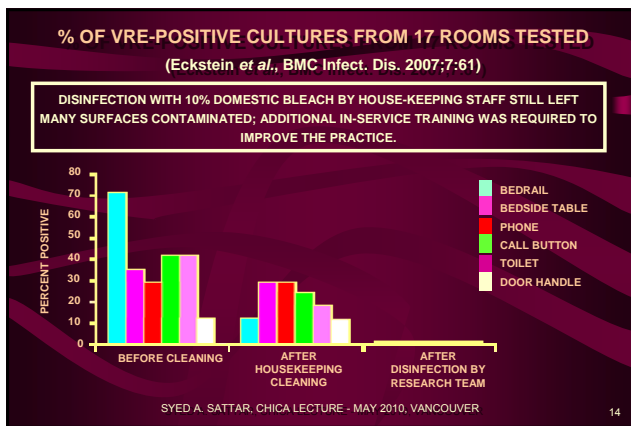
	VRE	MRSA	C. DIFFICILE
BED RAILS	++++++	+	+++
BED TABLE	+++++	+	-
DOOR KNOB	++	++	+
DOORS	+++	+	-
CALL BUTTON	+++	+	++
CHAIR	+++	+	++
TRAY TABLE	+++	++	-
TOILET SURFACE	+	-	++++
SINK SURFACE	+	+	+++
BEDPAN CLEANER	-	-	+

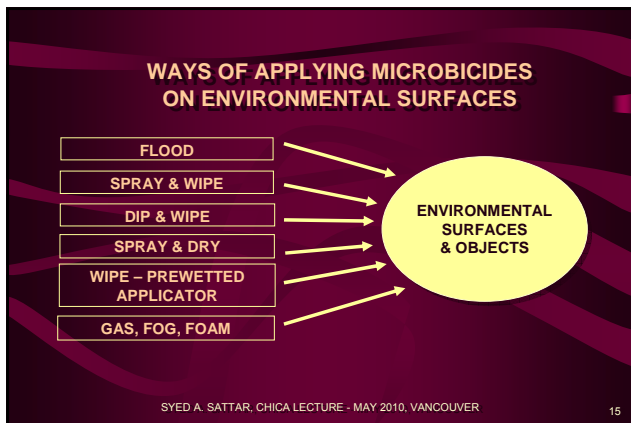
*DATA FROM 23 SEPARATE STUDIES

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER

12







WIPING & VOLUME OF LIQUID TRANSFERRED*

VERY WET (DRAINED, NOT DRIPPING, NOT SQUEEZED)	SQUEEZED AT NORMAL PRESSURE
1.78 ± 0.29 µL/cm ²	0.26 ± 0.03 µL/cm ²
14.9 – 20.7 mL/m ²	2.3 – 2.9 mL/m ²

*SATTAR ET AL., UNPUBLISHED DATA

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER 16

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

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER 17

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!

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER 18

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**

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER

19

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)**

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER

20

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**

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER

21

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

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER

22

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

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER

23

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

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER

24

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

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER 25

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

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER 26

THANK YOU!

SYED A. SATTAR, CHICA LECTURE - MAY 2010, VANCOUVER 27
