


SELECTING MICROBICIDAL CHEMICALS FOR INFECTION CONTROL: BUYER BEWARE!
Prof. Syed A. Sattar, Centre for Research on Environmental Microbiology, University of Ottawa
A Webber Training Teleclass

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**SELECTING MICROBICIDAL CHEMICALS FOR
INFECTION CONTROL: BUYER BEWARE!**

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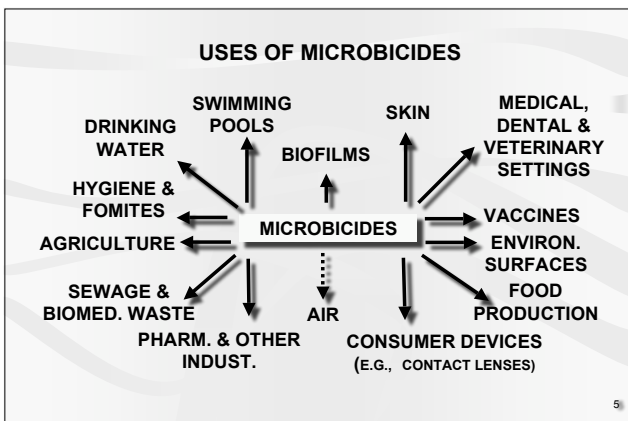
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INTRODUCTION & CONTEXT

- LIFE-STYLE/DEMOGRAPHIC CHANGES & INCREASED EXPOSURE & VULNERABILITY TO PATHOGENS
 - FASTER TRAVEL, LONGER LIFE, IMMUNOSUPPRESSION
- REVIVAL OF INTEREST IN ENVIRON. CONTROL
- MICROBICIDES BACKBONE OF ENVIRON. CONTROL
- INCREASING CONCERNS OVER MICROBICIDES
 - HUMAN & ENVIRONMENTAL SAFETY OF CHEMICALS
 - TESTING & LABEL CLAIMS OF MARKETED PRODUCTS
 - REGULATORY PROCESS

ISSUES TO BE ADDRESSED

- WHY THE NEED FOR MICROBICIDES?
- WHAT SAFETY CONCERNS DO THEY POSE?
- ARE THERE CONCERNS WITH THEIR TESTING & LABEL CLAIMS?
- WHAT TRAITS SHOULD A BUYER/USER LOOK FOR IN A MICROBICIDE?
- WHAT CAN BE DONE TO DEAL WITH IDENTIFIED CONCERNS?



MICROBICIDES IN INFECTION CONTROL

- EVIDENCE FOR EFFECTIVENESS MAINLY CIRCUMSTANTIAL
- VERY FEW FIELD STUDIES WITH UNEQUIVOCAL RESULTS
- FIELD STUDIES DIFFICULT & EXPENSIVE
- MISTAKES & MISUSE HAVE PRODUCED EVIDENCE FOR CRUCIAL ROLE OF MICROBICIDES IN INFECTION CONTROL
- MORE DIRECT EVIDENCE OF BENEFIT IN PREVENTING SPREAD OF CONTAMINANTS IN MANUFACTURING
- LAB-BASED DATA SHOWS SUCCESS IN INFECTION CONTROL

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WHAT ARE THE CONCERNS?

- FOCUS ON THE FOLLOWING QUESTIONS:
 - HOW SAFE ARE CURRENTLY USED MICROBICIDAL CHEMICALS?
 - WHAT IS BEING DONE TO ADDRESS SAFETY CONCERNS?
 - HOW GOOD ARE COMMONLY USED METHODS FOR TESTING MICROBICIDAL ACTIVITY OF CHEMICALS?
 - WHAT IMPACT DOES SUCH TESTING HAVE ON RELEVANCE & RELIABILITY OF LABEL CLAIMS?
 - DO TEST METHODS REFLECT FIELD USE OF MICROBICIDES?
 - WHAT SHOULD A BUYER/USER LOOK FOR IN PRODUCTS?
 - WHAT CAN INFECTION CONTROL PRACTITIONERS DO TO ALLEVIATE THE CONCERNS?

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SAFETY OF MICROBICIDES

- ANYTHING THAT CAN KILL MICROBES CAN BE POTENTIALLY HARMFUL TO OTHER LIFE FORMS!
- TOXICITY TO HUMANS & WORKPLACE SAFETY
- ECO-TOXICOLOGY IS ALSO A MOUNTING CONCERN
 - PERSISTENT CHEMICALS
 - GENDER-BENDER CHEMICALS
 - SUBLETHAL LEVELS IN WASTE STREAMS
 - 'CHEMBIOACTION' – DELETERIOUS OUTCOME OF COMBINED EFFECTS OF CHEMICALS & MICROBES

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HOW SAFE ARE MICROBICIDAL CHEMICALS?

- "OUR STOLEN FUTURE" BY THEO COLBORN ET AL. (1997)
- MAJOR EFFORTS UNDERWAY TO DEAL WITH IT
 - CANADIAN & U.S. STRATEGIES ON ENDOCRINE DISRUPTERS
 - EUROPEAN COMMISSION'S DIRECTIVE ON BIOCIDES FOR PROTECTING HUMAN & ENVIRONMENTAL HEALTH
 - UNEP'S STRATEGY ON CHEMICAL SAFETY LAUNCHED IN NOV. 2003 & CONVENTION ON PERSISTENT ORGANIC POLLUTANTS (POP) IN 2004

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'GREENING' OF MICROBICIDES!

- MOUNTING CONCERNS ON SAFETY OF DISINFECTANTS
- USE OF ONCE COMMON ACTIVES NOW RESTRICTED
- ADDITIONAL ACTIVES ARE UNDER REVIEW
- INCREASING EMPHASIS ON OXIDIZERS AS DISINFECTANTS
 - CHLORINE DIOXIDE
 - PERACETIC ACID
 - SODIUM DICHOROISOCYANURATE (NaDCC)
 - FORMULATED HYDROGEN PEROXIDE
- ISSUES OF COMPATIBILITY, PUNGENT SMELL, ETC.

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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

'ALL NATURAL' MAY NOT BE ALL THAT GOOD AS A MICROBICIDE!

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FOUR OF TWELVE PRINCIPLES OF GREEN CHEMISTRY

(Anastas & Warner, *Green Chemistry: Theory & Practice* (Oxford Univ. Press: N.Y., 1998))

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

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BODIES PROMOTING 'GREEN' CHEMISTRY (EXAMPLES)

- ECOLOGO: LAUNCHED IN CANADA IN 1988, IS NOW GLOBAL
- EU ECOLABEL: A SCHEME LAUNCHED IN EUROPE TO PROMOTE MAKING & MARKETING OF GREEN PRODUCTS
- ENVIRODESIC: EMPHASIS ON INDOOR AIR QUALITY
- SIERRA CLUB: PROMOTES ENVIRONMENTAL PROTECTION
- GREENGUARD INSTITUTE: THIRD-PARTY CERTIFICATION TO PROMOTE INDOOR AIR QUALITY
- GREEN SEAL: PROVIDES SCIENCE-BASED ENVIRONMENTAL CERTIFICATION STANDARDS

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STATE OF MASSACHUSETTS ACT #2246 (2007)

- REQUIRES ENVIRONMENTALLY SAFE ALTERNATIVES TO HARMFUL CLEANING PRODUCTS
 - TO REDUCE ASTHMA & OTHER HEALTH THREATS FROM EMISSIONS OF TOXIC CHEMICALS FROM CLEANING PRODUCTS USED IN SCHOOLS, HEALTHCARE FACILITIES, DAY CARE CENTERS, PUBLIC BUILDINGS & PUBLIC HOUSING
- CLEANING PRODUCT INCLUDE GENERAL PURPOSE CLEANERS, BATHROOM CLEANERS, GLASS CLEANERS, CARPET CLEANERS, DISINFECTANTS, FLOOR CARE PRODUCTS & HAND SOAPS

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TESTING OF MICROBICIDES

- LABEL CLAIMS FOR MICROBICIDAL ACTIVITY ARE ONLY AS GOOD AS THE METHODS USED TO GENERATE THEM!
- MANY CURRENT METHODS ARE TECHNICALLY FLAWED & OFTEN FAVOR TESTED FORMULATIONS
- CONSTRAINED BY WHAT REGULATORS ACCEPT FOR DATA
- IDENTIFIED DEFICIENCIES IN TEST METHODS ARE:
 - INAPPROPRIATE SURROGATES & PRODUCT DILUENT
 - NO OR UNSUITABLE SOIL LOAD
 - CONTACT TIME OFTEN TOO LONG
 - CARRIER MATERIALS/DESIGN UNSUITABLE
- NO HARMONIZATION BETWEEN JURISDICTIONS

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INAPPROPRIATE OR EXAGGERATED LABEL CLAIMS

- UNDUE FOCUS ON BUG-OF-THE-WEEK WITH NO EVIDENCE FOR SPREAD VIA ANIMATE/INANIMATE SURFACES
- MANY ENVIRONMENTAL SURFACE DISINFECTANTS CLAIM ACTIVITY AGAINST *CLOSTRIDIUM DIFFICILE*
 - CLAIMS BASED ON TESTS WITH VEGETATIVE CELLS WHICH SURVIVE POORLY IN THE ENVIRONMENT
 - SUCH FORMULATIONS INEFFECTIVE AGAINST THE SPORES
 - INADVERTENT SPREADING OF CONTAMINATION OVER A WIDER AREA DURING CLEANING/DISINFECTION
 - RECENT RECALL OF CLAIMS BY U.S. ENVIRON. PROTECTION AGENCY

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SPECTRUM OF MICROBICIDAL ACTIVITY

- IN MOST SITUATIONS, TARGET PATHOGEN(S) IS NOT KNOWN
- THEREFORE, PRODUCTS WITH LIMITED MICROBICIDAL ACTIVITY MAY NOT PRODUCE DESIRED BENEFIT
 - THEY MAY INDEED BE MORE HARMFUL
- FASTER-ACTING FORMULATIONS WITH A BROADER SPECTRUM OF ACTIVITY MORE DESIRABLE
- HISTORICAL BASIS FOR FOCUS ON CLAIMS WITH BACTERICIDAL ACTIVITY
 - BACTERIA AT ONE TIME MORE COMMON & EASIER TO WORK WITH
 - VIRUSES, MORE DEMANDING TO HANDLE, NOW OF MAJOR CONCERN
 - FUNGI ARE ALSO AMONG EMERGING PATHOGENS

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FIELD APPLICATION OF MICROBICIDES

- LAB TESTING DOES NOT REFLECT FIELD USE
- WIPING OF SURFACES ENTAILS VERY SHORT CONTACT TIMES WITH MINISCULE VOLUMES OF PRODUCT (TABLE)
- MAY IMPACT MICROBICIDAL ACTIVITY

VOLUMES OF LIQUID AS $\mu\text{L}/\text{CM}^2$ LEFT AFTER WIPING OF HARD SURFACES*

| | FORMICA | STAINLESS STEEL |
|------------------------|------------|-----------------|
| DISTILLED WATER | | |
| NOT SQUEEZED | 2.065±0.62 | 1.548±0.13 |
| SQUEEZED | 0.29±0.03 | 0.305±0.02 |
| DISINFECTANT | | |
| NOT SQUEEZED | 1.765±0.12 | 1.735±0.06 |
| SQUEEZED | 0.24±0.03 | 0.26±0.01 |

*SATTAR ET AL., UNPUBLISHED DATA

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DESIRED TRAITS IN A MICROBICIDE

- AS SAFE AS POSSIBLE FOR HUMANS & ENVIRONMENT
- NON-ALLERGENIC & NON-SENSITIZING
- FAST-ACTING, NON-STAINING, PERFUME-FREE
- FREE OF VOLATILE ORGANICS (VOC'S)
- SAFE TO TRANSPORT & STORE
- NON-CORROSIVE & MATERIALS COMPATIBLE
- WORK IN SMALL VOLUMES/UNIT SURFACE AREA
- COST-EFFECTIVE WITH CLEAR USE DIRECTIONS

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EMERGING ISSUES

- INCREASING DEMAND FOR MICROBICIDES
 - EMERGING & RE-EMERGING PATHOGENS
 - SOCIETAL CHANGES & INCREASED VULNERABILITY
 - POST-ANTIBIOTIC ERA(?)
- PRESSURE FOR REGIONAL/GLOBAL HARMONIZATION
- IS INCREASING USE OF TREATED ARTICLES A GOOD THING?
- DISINFECTANTS & ANTIBIOTIC RESISTANCE (?)
- BETTER METHODS OF MICROBICIDE TESTING/APPLICATION

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RECOMMENDATIONS

- INFECTION CONTROL PRACTITIONERS MUST:
 - STOP ASKING FOR IRRELEVANT PRODUCT CLAIMS
 - DEMAND SAFER PRODUCTS & BETTER LABELS
 - STORE, USE & DISPOSE OF MICROBICIDES PROPERLY
 - CONVINCING MANAGERS TO THINK BEYOND COST
 - REPORT PROBLEMS & FAILURES
 - ENSURE PROPER TRAINING OF HOUSE-KEEPING STAFF
 - URGE REGULATORS TO UPDATE REGISTRATION RULES

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CONCLUDING REMARKS

- UNREALISTIC EXPECTATIONS FROM MICROBICIDES
- MICROBICIDAL CHEMICALS WILL BE SUBJECTED TO GREATER & GREATER SCRUTINY
- ANTIMICROBIAL ACTIVITY WILL BE ONLY ONE COMPONENT IN THEIR ACCEPTANCE & USE
- A MAJOR REVIEW OF ISSUES NEEDED TO COME UP WITH SAFER YET EFFECTIVE MICROBICIDES
- END-USERS MUST TAKE A LEAD BECAUSE THEY REPRESENT THE TRUE CONSUMER POWER!

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| THE NEXT FEW TELECLASSES | |
|--------------------------|---|
| 15 May 08 | <i>Adverse Events in Dialysis</i> Speaker: Dr. Matthew Arduino, CDC |
| 22 May 08 | <i>Bedpan Decontamination - Manual vs. Mechanical</i> Speaker: Gerlie van Knippenberg Gordebekke, International Consultant Infection Prevention and Hygiene, The Netherlands |
| 19 Jun. 08 | <i>Environmental Sampling - Methods and Strategies</i> Speaker: Dr. Lynne Sehulster, CDC |
| 25 Jun. 08 | <i>(South Pacific Teleclass) Peripheral Line Sepsis</i> Speaker: Dr. Steve McBride, Auckland District Health Board |
| 26 Jun. 08 | <i>CBIC Teleclass 3 - The CIC Examination Process: Computer Based Testing</i> Speaker: CBIC Board Members & Guests |
| 17 Jul. 08 | <i>(Free Teleclass) Community-Associated MRSA - What's Up & What's Next</i> Speaker: Dr. Rachel Gorwitz, CDC |
| 22 Jul. 08 | <i>(Free British Teleclass) Progress Report from the Chief Nursing Officer</i> Speaker: Christine Beasley, British Department of Health |

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