Decontamination of High-Touch Environmental Surfaces in Healthcare

Prof. Syed A Sattar, Centre for Research on Environmental Microbiology, University of Ottawa, Canada

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**Definitions**

- **Microbicide**: Any physical/chemical agent to kill microbes
- Includes ‘disinfectants’ & ‘antiseptics’
  - Also called ‘germicide’ in North America & ‘biocide’ in Europe
  - Neither term is suitable
- **Decontamination**: Combined outcome of removal & killing
- Focus here on chemicals to decontaminate high-touch, non-porous environmental surfaces

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**The Main Issue**

- Wider appreciation of high-touch environmental surfaces in spread of healthcare-associated infections (HAI)
- Corresponding upsurge in marketing of products & technologies to combat such spread
- Mounting concerns on testing, claims of activity & safety of what is being marketed and used
- A critical look at current situation & a look ahead

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**Disclosure**

- CREM funding from public & private sources
- Advisor/consultant to numerous companies, governments & international agencies
- Member, Board of Directors for Virox Tech.

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**Acknowledgements**

- WHO
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- Ms. Tina Bradley & staff, Univ. Hospitals, Birmingham, England
- Staff & students, CREM, Univ. of Ottawa, Ottawa, Canada

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**What Are ‘High-Touch’ Environmental Surfaces?**

- Observed 50 interactions between staff & patients & list “high-touch” as:
  - Bed rails
  - Bed surface
  - Supply cart
  - Over-bed table
  - Intravenous pump

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WIPING HIGH-TOUCH SURFACES WITH PRE-SOAKED WIPES

**PROS:**
- Combines chemical/mechanical action with convenience
- Short contact times & smaller disinfectant volumes
- Surface orientation/geometry less relevant
- Reduces resuspension of dust
- Reduces respiratory exposure to chemicals

**CONS:**
- May spread contamination over a wider area
- Applicator has its disinfectant demand
- Adds to solid-waste stream
- Higher cost?

CAN WE PROPERLY TEST DISINFECTING WIPES?
- Two standard methods (ASTM & AOAC) & one guide (EPA)
- Semi-quantitative at best & also do not reflect field use
- EPA’s petri plate method for bacteria
- One peer-reviewed method from Cardiff, Wales
  - Uses drill-bit-mounted wipes to test decontamination of hard, non-porous surfaces; several publications
  - Showed spread of localized contamination over a wider area with use of ineffective disinfectants
- A general & field-relevant method needed for:
  - R&D, international standardization & product registration

WIPERATOR®
- Invented at Crem with Dr. T. Sharpe
- Can test towelettes at set pressure, time, type & number of wiping motions
- 10 µL dried inoculum on disk (1 cm dia.), wiped for 5-10 sec, eluates assayed
- Works with all major pathogen types
- Can be used with inanimate or animate surfaces & also to test pathogen transfer between them
- An international collaborative just completed

SURROGATES FOR TESTING DISINFECTANT WIPES (SATTAR & MAILLARD 2013)

<table>
<thead>
<tr>
<th>ORGANISM (ATCC #)</th>
<th>CATEGORY</th>
<th>NOSOCOMIAL PATHOGEN?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACINETOBACTER BAUMANNI (19659)</td>
<td>GRAM- BACILLUS</td>
<td>YES</td>
</tr>
<tr>
<td>ASPERGILLUS NIGER (64558)</td>
<td>FILAMENTOUS FUNGUS</td>
<td>YES</td>
</tr>
<tr>
<td>BACILLUS SUBTILIS (19659)</td>
<td>AEROBIC SPORE-FORMER</td>
<td>NO</td>
</tr>
<tr>
<td>FELINE CALICIVIRUS (VR-732)</td>
<td>SMALL, NON-ENVELOPED</td>
<td>NO</td>
</tr>
</tbody>
</table>

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Changes Underway

- Major changes in test methodology afoot
  - Organization for Economic Co-operation & Development (OECD)
    - Guidance document on four unified/harmonized quantitative carrier test methods for use in 34 member states published in July 2013
  - ASTM: wipe test standard to be proposed soon
  - AOAC: recent work on testing against spores of C. difficile
  - U.S. EPA’s petri plate-based method for testing disinfectant wipes
  - European Union
  - Health Canada guidelines now under update

Where Should We Be Going?

- Discourage claims against ‘bug-of-the-month’ (fear-factor!!)
- Incorporate suitable surrogates in realistic tests
- Test microbicides with wiping action
- Encourage use of safer & better microbicides
- Harmonize testing/registration globally
- Train & recognize house-keeping staff better

Conclusions

- Environmental surface disinfectants need review
- Many formulations have limited microbicidal activity
- The contact time on labels too long!
- Many such chemicals potentially toxic & damaging
- Wipe testing to be refined & promoted
- Sub-lethal exposures to microbicides may increase potential for microbicide & antibiotic resistance
- Infection preventionists need better awareness

Further Reading

- ASTM E2362. Standard practice for evaluation of pre-saturated or impregnated towelettes for hard surface disinfection. ASTM, W. CONSHOHOCKEN, PA.
- ASTM E2896. New test method for quantitative petri plate method (QPM) for testing antimicrobial towelette products. ASTM, W. CONSHOHOCKEN, PA.
- CEN (2011). Quantitative test method for the evaluation of bactericidal activity on non-porous surfaces with mechanical action employing wipes or mops in the medical area. Test method and requirements (Phase 2, Step 2). CEN TC 216. BRUSSELS, BELGIUM.
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2013
WHO Teleclass Schedule

February 6
Improving the Patient Safety Culture as a Successful Component of Infection Control Strategies, Dr. B. Al-Megri

March 6
Patient Participation in Hand Hygiene Promotion and Improvement, Dr. T. Langton

April 9
Innovation and New Indicators in Hand Hygiene Monitoring, Prof. J. Boyce

May 6
Special Lecture for May, Prof. D. Pittet

July 10
Risk Assessment and Priority Setting in Infection Control in Low to Middle Income Countries, Prof. N. Danis

August 7

September 3
Preventing Central Line-Associated Bloodstream Infections: The Matching Michigan Approach Applied in the USA and Other Countries, Prof. G. Pronovost

October 9
Implementing Infection Control Through a Patient Safety Partnership Approach in Africa at Your

November 11
Antimicrobial Resistance Issues Worldwide and the WHO Approach to Combat It, Dr. C. Pessoa da Silva

December 4
Control of Multi-Drug Resistant Organisms in the Nursing Home Setting, Prof. A. Voss

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