Safer Disinfectant Use in Schools During the COVID-19 Pandemic

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Funding for this presentation was made possible (in part) by the cooperative agreement award number 1 NU61TS000296-01-00 from the Agency for Toxic Substances and Disease Registry (ATSDR). The views expressed in written conference materials or publications and by speakers and moderators do not necessarily reflect the official policies of the Department of Health and Human Services; nor does mention of trade names, commercial practices, or organizations imply endorsement by the U.S. Government.

Acknowledgement: The U.S. Environmental Protection Agency (EPA) supports the PEHSU by providing partial funding to ATSDR under Inter-Agency Agreement number DW-75-95877701. Neither EPA nor ATSDR endorse the purchase of any commercial products or services mentioned in PEHSU publications.
Why worry about Cleaning and Disinfecting Products?

- Those who do cleaning work have highest rates of work-related asthma\textsuperscript{1,2}
- Increased risk of asthma in anyone whose job involves cleaning product exposure, especially those preparing disinfectants\textsuperscript{3}
- People who clean their own homes have higher rates of lower respiratory symptoms if they use bleach or multiple kinds of sprays\textsuperscript{4,5}
- Children whose homes have higher VOCs are more likely to have asthma\textsuperscript{6}
- Increased risk of subclinical airways inflammation with increased cleaning spray use in the home\textsuperscript{7}
- Children exposed to more cleaning products in infancy are more likely to wheeze when they’re older\textsuperscript{8}

\textsuperscript{1}Reinisch et al 2001, \textsuperscript{2}Dumas 2019, \textsuperscript{3}Gonzalez et al 2014, \textsuperscript{4}Zock et al 2009, \textsuperscript{5}Bedard et al 2014, \textsuperscript{6}Mendell 2007, \textsuperscript{7}Casas et al 2013, \textsuperscript{8}Parks et al 2020
Bleach (Sodium hypochlorite)

- Most common disinfectant used
- Mechanism thought to be by protein aggregation
- Dwell time usually 5-10 min
- Large acute exposures clearly cause respiratory effects
- Chronic low-level bleach exposure associated with asthma in animal studies and custodial workers\textsuperscript{1,2}
- Designated asthmagen
- Responsible for 62% of the increase in poison center calls\textsuperscript{3}

\textsuperscript{1}Kim et al 2014, \textsuperscript{2}Mirabelli et al 2007, \textsuperscript{3}MMWR
Quaternary Ammonium Compounds (QACs)

- Cationic detergents
- Disinfect via multiple routes:
  - disruption of cellular membranes
  - possible intracellular effects
- Usual dwell times: 4-10 minutes
- Ammonia released during cleaning
- Known asthmagens, higher odds ratio after exposure than bleach
- Evidence of mutagenicity and possible reproductive toxicity in animal studies\(^1\)
- Chloramine gas released if mixed with bleach, see https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3793292.pdf

\(^1\)Ferk et al 2007, Hrubec et al 2017
Advocating for Safer Products
Safer Cleaning Products
EPA’s Design for the Environment Antimicrobial Pilot Project

<table>
<thead>
<tr>
<th>Active Ingredients</th>
<th>Year Approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citric acid</td>
<td>2009</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>2009</td>
</tr>
<tr>
<td>L-lactic acid</td>
<td>2009</td>
</tr>
<tr>
<td>Ethanol</td>
<td>2012</td>
</tr>
<tr>
<td>Isopropanol</td>
<td>2012</td>
</tr>
<tr>
<td>Peroxyacetic acid</td>
<td>2015</td>
</tr>
<tr>
<td>Sodium Bisulfate</td>
<td>2015</td>
</tr>
</tbody>
</table>
Look for DfE Products on the N list

List N Tool: COVID–19 Disinfectants
References

- https://wspehsu.ucsf.edu/main-resources/fact-sheets/
- https://www.epa.gov/pesticide-labels/design-environment-logo-antimicrobial-pesticide-products
- https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2
- https://www.cdc.gov/mmwr/volumes/69/wr/mm6916e1.htm?s_cid=mm6916e1_w