Exposure Assessments and Risk of Disease in Multiple Settings

Wanda Phipatanakul, M.D., M.S.
Associate Professor of Pediatrics
Boston Children’s Hospital
Harvard Medical School
Pediatric Allergy and Immunology
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wanda.phipatanakul@childrens.harvard.edu
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Objectives

• Review Exposure Assessment Strategies in Multiple Settings
• Describe the most common indoor air quality issues that cause negative health effects
• Review unique exposure and health effects in unique settings and call for future research
The Environment and Asthma in *US Inner Cities*

**Environmental exposure model.**

Eggleston, 2007
Environment in Inner City Asthma

• NCICAS & ICAS
  – Inner City Environment focused on the Home
    » Maybe only half the story

• SICAS (School Inner City Asthma Study-NIAID)
  – Children spend 6-10 hours/day at school- nearly every child’s required “occupation”
  – Important venue to examine potential triggers of asthma, likely different from home
  – Ultimately, may lead to a cost effective environmental intervention
Classroom Mold Sampling- Burkard Samplers
Air Pollution Sampling

- Fastened to Air Samplers to collect pollutants passively
- Particulate Matter black boxes correlated with area samplers NIEHS
School Vs. Home Allergen Levels

Geometric Means (µg/g)

- **Bla g 2** (Cockroach)
- *Fel d 1* (Cat)
- *Can f 1* (Dog)
- *Der f 1* (Dust Mite)
- *Der p 1* (Dust Mite)
- MUP (Mouse)

<table>
<thead>
<tr>
<th></th>
<th>School</th>
<th>Home</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bla g 2</strong></td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td><em>Fel d 1</em></td>
<td>0.56</td>
<td>1.38</td>
</tr>
<tr>
<td><em>Can f 1</em></td>
<td>0.2</td>
<td>0.47</td>
</tr>
<tr>
<td><em>Der f 1</em></td>
<td>0.05</td>
<td>0.66</td>
</tr>
<tr>
<td><em>Der p 1</em></td>
<td>0.04</td>
<td>0.08</td>
</tr>
<tr>
<td>MUP</td>
<td>1.66</td>
<td>0.41</td>
</tr>
</tbody>
</table>

- **p < 0.001
- **p < 0.001
- ***p < 0.001

Classroom vs. Bedroom Endotoxin Levels for Children with Asthma

### Distribution of molds in classrooms

<table>
<thead>
<tr>
<th>Mold Grouping</th>
<th>Geomean ± Geostd (spores/m³)</th>
<th>Detectable</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Mold</td>
<td>175.6 ± 4.2</td>
<td>100%</td>
<td>11</td>
<td>16,288.5</td>
</tr>
<tr>
<td>Unidentifiable spores</td>
<td>31.2 ± 2.8</td>
<td>98%</td>
<td>0</td>
<td>448.8</td>
</tr>
<tr>
<td><em>Cladosporium</em></td>
<td>29.3 ± 4.2</td>
<td>97%</td>
<td>0</td>
<td>1,525.7</td>
</tr>
<tr>
<td>Smut spores (Ustilaginomycetes)</td>
<td>12.6 ± 4.0</td>
<td>89%</td>
<td>0</td>
<td>639.4</td>
</tr>
<tr>
<td><em>Penicillium/Aspergillus</em></td>
<td>15.0 ± 5.4</td>
<td>88%</td>
<td>0</td>
<td>8,586.0</td>
</tr>
<tr>
<td>Other Basidiospores*</td>
<td>6.6 ± 7.1</td>
<td>67%</td>
<td>0</td>
<td>2,445.5</td>
</tr>
<tr>
<td>Basidiospores small hyaline*</td>
<td>4.9 ± 9.6</td>
<td>54%</td>
<td>0</td>
<td>11,173.1</td>
</tr>
</tbody>
</table>

• Baxi SN, Phipatanakul W, Pediatric Allergy & Immunol 2013 24: 697-703
Photograph of Boston Skyline taken at 10 a.m. on in January

PM$_{2.5}$ concentration at this time in the 55-65 $\mu$g/m$^3$ range

Photograph from CAMNET web site (http://hazecam.net)
SKC UMEX 100 Passive Formaldehyde Sampler

Polytetrafluoroethylene (Teflon) filter and Single-stage Personal Modular Impactor

Portable sampling pump (SKI, Inc., Eighty Four, PA)

Chemiluminescent analyzer Exhaled NO (NIOX TM System, Aerocrine, Sweden)
Passive nicotine badges

Passive VOC badges

Real-time sampling/measurement devices
Passive air sampling

e.g., VOCs, aldehydes
Passive air sampling

e.g., nicotine

From Hammond and Leaderer (1987)
Grab sampling for VOCs
Integrated Sampling

Integrated air sampling
Other monitors
Other devices – data loggers

Common uses: temperature, RH, CO$_2$

TEMP and RH logger

CO$_2$ monitor
Conclusions- Future Directions

• Home, school settings pose a unique set of environmental and sociologic factors leading to increased asthma morbidity

• Allergens, mold, and indoor air pollution influence asthma morbidity, and different exposures may be more prevalent in different environments

• The classroom and school based exposures, independent of home exposure, may play an important role in asthma morbidity, suggesting further work in day, occupational, work environments may be important and interventions targeted towards these exposures may be important

• Monitoring/exposure assessment technology evolving and effective personalized monitoring encountering comprehensive exposure assessment and guide targeted interventions may be on the horizon
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SICAS References


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