Webinars
Series of scientific webinars that provide a forum for discourse on scientific issues.
Live and On-Demand
Case Conferences
Journal Clubs
Grand Rounds
CE Available

Online Courses
Evidence-based online courses on a variety of children's environmental health topics.
Interactive and Self-Paced
CE Available

Resource Catalog
Fact sheets, journal publications, reports, and other resources for parents, community members, patients and healthcare professionals
Topics included: Air Quality, Pesticides, Natural Disasters, BPA, Mold, Lead, Mercury

www.pehsu.net/nationalclassroom.html
School Environmental Health:
Why It Matters and What to Look For

Luke Gard, CIEC, CMC, BOC
Safe and Healthy School Program Manager
Children’s Mercy Hospital – Center for Environmental Health
Objectives

- Identify the connection between school indoor environment, student health and academic performance
- Explain the importance of a facility and district-level indoor environmental health program
- Identify common issues routinely observed in schools
Acknowledgements

CMH-CEH would like to acknowledge the both the Region 7 PEHSU and Region 7 EPA for grant funding that allows CMH-CEH to provide a variety of school trainings throughout Region 7.

We would also like to acknowledge the various local and regional school districts that partner with CMH-CEH to PROACTIVELY assess, monitor, and improve environmental conditions within their facilities.

2014 EPA R7 PEHSU Healthy School Training Funding     Grant #: U6ITS000238
Acknowledgements

This material was supported by the American College of Medical Toxicology (ACMT) and funded (in part) by the cooperative agreement FAIN: U61TS000238-02 from the Agency for Toxic Substances and Disease Registry (ATSDR).

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.
## School Environmental Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>% of Schools</th>
<th># of Schools</th>
<th># of Students</th>
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<tbody>
<tr>
<td>Lighting</td>
<td>15.6</td>
<td>12,200</td>
<td>6,682,000</td>
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<tr>
<td>Heating</td>
<td>18.9</td>
<td>15,000</td>
<td>7,888,000</td>
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<td>Ventilation</td>
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<td>21,100</td>
<td>11,559,000</td>
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<td>Indoor Air Quality</td>
<td>19.2</td>
<td>15,000</td>
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<td>Noise Control</td>
<td>28.1</td>
<td>21,900</td>
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<td>Physical Security</td>
<td>24.2</td>
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</tr>
</tbody>
</table>

This was the last comprehensive survey performed 20 years ago!
School District: Primary Goals

• Manage facilities to optimize student success
• Meet or exceed state’s academic standards
• Provide the safest and healthiest learning environments
Schools Face Inherent & Unique Challenges

- Most densely occupied buildings
- Constantly fluctuating educational needs
- Budget dollars for regular maintenance and renovation forced to a low priority

In other words…deferred maintenance
### Percent of School Staff Training

<table>
<thead>
<tr>
<th>Topic</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposal of hazardous materials</td>
<td>86.8 (82.5-90.1)</td>
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<tr>
<td>Green cleaning products and practices</td>
<td>63.8 (58.0-69.2)</td>
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<tr>
<td>How to address mold problems</td>
<td>62.6 (56.7-68.2)</td>
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<td>How to reduce the use of hazardous materials</td>
<td>77.4 (72.3-81.8)</td>
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<tr>
<td>Indoor air quality</td>
<td>39.2 (33.5-45.1)</td>
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<tr>
<td>Labeling of hazardous materials</td>
<td>85.9 (81.5-89.4)</td>
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<td>Pest management practices that limit the use of pesticides</td>
<td>56.1 (50.5-61.5)</td>
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<tr>
<td>School drinking water quality</td>
<td>25.6 (20.9-30.9)</td>
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<tr>
<td>Storage of hazardous materials</td>
<td>87.9 (83.7-91.1)</td>
</tr>
<tr>
<td>Use of hazardous materials</td>
<td>87.4 (83.2-90.6)</td>
</tr>
</tbody>
</table>

*Results of the School Health Policy & Practices Study 2014, Div. of Adolescent and School Health, 2015 CDC, US HHS.*
Relationship Between IEQ and:

- Student and staff health
- Attendance
- Academic performance
- General cognitive ability

Turunen, et.al. International Journal of Hygiene and Environmental Health, 2014 217(7)
Mohai, et.al. Health Affairs, 30(5)
Cartieaux E, and MA Rzepka, Arch. Pediatrics, 2011 18(7)
Mendell and Heath Indoor Air, 2005 15(1)
Student success influenced by:

- Temperature
- Ventilation adequacy
- Relative humidity
- Carbon dioxide levels
- Amount of daylight
- Presence of noise
- Indoor pollutants and contaminants

US EPA 402-K-03-006, August 2012, Indoor Air Quality & Student Performance
All Children Deserve a Healthy Learning Environment

Children are inherently more vulnerable to environmental hazards because their bodies are still developing. Substandard environmental conditions in schools, such as insufficient cleaning or inadequate ventilation, can cause serious health problems for children. Evidence that indoor air quality (IAQ) directly impacts health and student academic performance continues to mount.\(^1\),\(^2\)

IAQ refers to those characteristics of the air in indoor environments, such as levels of pollutants, humidity, temperature, etc., that impact the occupants’ health, comfort and ability to perform.

**Taking steps to improve the IAQ of schools is critical to bettering student health and academic performance.**

Building the Case with Evidence

Scientific evidence has long demonstrated an association between poor IAQ and respiratory health effects, including asthma. Maintenance issues in schools, such as mold and moisture or excessive use of cleaning chemicals, have been shown to trigger asthma and allergies.

According to the Centers for Disease Control and Prevention (CDC), asthma is one of the leading causes of school absenteeism.\(^3\) Multiple studies have found that children’s overall performance decreases with illnesses or absences from school.\(^4\),\(^5\)

**The Scientific Evidence is Mounting**

Qualitative and quantitative evidence demonstrating the relationship between IAQ and human performance and productivity has become more robust. Studies demonstrate that improved IAQ increases productivity and improves the performance of mental tasks, such as concentration and recall in both adults and children.\(^6\) This strengthens the case for schools to develop IAQ management plans, which include critical maintenance tasks, as a key part of an education development strategy.

Evidence from Scientific Literature

Scientific evidence shows that there are key areas in which schools can take action to improve IAQ in order to advance the health and performance of students and school staff. In fact, a structured maintenance program is a cornerstone of academic performance and IAQ.

**Managing Your School Environment Despite Tight Operating Budgets**

School boards and administrators often consider the maintenance budget as soft money that they can cut without affecting core academic program needs; however, scientific literature demonstrates otherwise:

- Health, attendance and academic performance can improve with increased maintenance.\(^7\),\(^8\)
- Schools with better physical conditions show improved academic performance, while schools with fewer janitorial staff and higher maintenance backlogs show poorer academic performance.\(^9\)

**The Effects of Air Ventilation on Health and Performance**

Most schools’ ventilation rates are below recommended levels.\(^10\) However, ensuring adequate air ventilation rates in all classrooms can:

- Reduce absences and the transmission of infectious diseases.\(^11\)
- Improve the overall health and productivity of teachers.
- Improve test scores and student performance in completing mental tasks.\(^12\),\(^13\),\(^14\),\(^15\),\(^16\),\(^17\)

In one study, students in classrooms with higher outdoor air ventilation rates scored 14 to 15 percent higher on standardized test scores than children in classrooms with lower outdoor air ventilation rates.\(^18\)

In addition, ensuring that heating, ventilation and air conditioning (HVAC) dampers and other components are clean reduces the chance of occupant illnesses.
Impact of Asthma on Schools

- Significant rise in childhood asthma—49% increase since 1982
- #1 chronic illness among children and adolescents in US
- As of 2009, 7.1 million (14%) children have been diagnosed with asthma and asthma is the #1 cause of school absences with 14.7 million missed school days
- In 2011, 4.1 million of children under 18 years of age had an asthma attack.

“Trends in Asthma Morbidity and Mortality, American Lung Association, September 2012”
### One district’s asthma clinic visits

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<tr>
<th>School 1</th>
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<td>2568</td>
<td>8481</td>
<td>8555</td>
<td>9872</td>
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</table>
Legal Requirements

Legal requirements specifically related to students and staff with asthma and allergies are outlined in:

- Individuals with Disabilities Education Act (IDEA)
- Section 504 of the Rehabilitation Act of 1973 requires that schools both promote the health development and achievement of students with asthma while removing disability barriers (including IAQ or environmental issues) that may impede health, participation, and achievement.

Can this lead to litigation?
Safe & Healthy Schools Program Should Be Comprehensive

An Integrated approach that considers:

- People
- Any potential health hazards
- The facility structure itself, including systems
- How facility is cleaned, maintained, operated

Goal is to reduce absenteeism while improving student performance
District should create district-level and building-level teams to discuss and address issues

Communication is Critical!
Why do districts fail?

- Overwhelmed by process
- Interest wanes after an issue has been resolved
- Time and budget constraints
- “Champion” of the program leaves
- Fear of IEQ “Pandora’s Box” and negative publicity
- Believe IEQ issues not important as, or are separate from, student academic performance
HVAC Systems and Ventilation
HVAC Systems and Ventilation
HVAC Systems and Ventilation
HVAC Systems and Ventilation
Cleaning and Allergen Control
Cleaning and Allergen Control
Is this cluttered?
And what about this space?
<table>
<thead>
<tr>
<th>Summary of Findings Regarding Association Between Health Outcomes and Exposure to Damp Indoor Environments</th>
<th>Presence of Mold or Other Agents in Damp Indoor Environments</th>
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<tr>
<td><strong>Sufficient Evidence of a Causal Relationship</strong></td>
<td></td>
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<tr>
<td><strong>Sufficient Evidence of an Association</strong></td>
<td></td>
</tr>
<tr>
<td>• Upper respiratory (nasal and throat) tract symptoms</td>
<td>• Upper respiratory (nasal and throat) tract symptoms</td>
</tr>
<tr>
<td>• Cough</td>
<td>• Cough</td>
</tr>
<tr>
<td>• Wheeze</td>
<td>• Hypersensitivity pneumonitis in susceptible persons</td>
</tr>
<tr>
<td>• Asthma symptoms in sensitized persons</td>
<td>• Wheeze</td>
</tr>
<tr>
<td>• Asthma symptoms in sensitized persons</td>
<td>• Asthma symptoms in sensitized persons</td>
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<td><strong>Limited or Suggestive Evidence of an Association</strong></td>
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<tr>
<td>• Dyspnea (shortness of breath)</td>
<td>• Lower respiratory illness in otherwise healthy children</td>
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<td>• Lower respiratory illness in otherwise healthy children</td>
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<tr>
<td>• Asthma development</td>
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<tr>
<td><strong>Inadequate or Insufficient Evidence to Determine Whether or Not an Association Exists</strong></td>
<td></td>
</tr>
<tr>
<td>• Airflow obstruction (in otherwise healthy persons)</td>
<td>• Dyspnea (shortness of breath)</td>
</tr>
<tr>
<td>• Skin symptoms</td>
<td>• Skin symptoms</td>
</tr>
<tr>
<td>• Mucous membrane irritation syndrome</td>
<td>• Asthma development</td>
</tr>
<tr>
<td>• Gastrointestinal tract problems</td>
<td>• Gastrointestinal tract problems</td>
</tr>
<tr>
<td>• Chronic obstructive pulmonary disease</td>
<td>• Airflow obstruction (in otherwise healthy persons)</td>
</tr>
<tr>
<td>• Fatigue</td>
<td>• Fatigue</td>
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<tr>
<td>• Inhalation fevers (nonoccupational exposures)</td>
<td>• Mucous membrane irritation syndrome</td>
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<td>• Neuropsychiatric symptoms</td>
<td>• Neuropsychiatric symptoms</td>
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<tr>
<td>• Lower respiratory illness in otherwise healthy adults</td>
<td>• Chronic obstructive pulmonary disease</td>
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<td>• Cancer</td>
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Moisture Control / Mold Prevention
Source Control / Room Contents
Source Control / Room Contents
Source Control / Room Contents
Source Control / Room Contents
Source Control / Room Contents
Source Control / Room Contents
Source Control / Room Contents
Safety, Security, and Injury Prevention
Safety, Security, and Injury Prevention
Safety, Security, and Injury Prevention
The Learning Environment
The Learning Environment
This is under the classroom?

Condensation on tunnel walls...   ...a clogged drain in tunnel.
This is outside the classroom?

Idling vehicle exhaust brought into the facility

Air Intakes

Allergens and pest harborage
A clogged roof drain may not seem like a serious issue...
but if it leads to this...
or this, then we may have an issue!
It’s about making informed decisions
January integrity.

"The King & I"
Yul Brynner passed away
Deborah Kerr passed away
Siam 1862

"I Whistle a Happy Tune"
King, Miss Anna
Louis, Tuptim
Lady Chung

"Oklahoma"
"Blue, Bird"
"On the Trail"
"Oh What a Beautiful Morning"

"Oliver"
"Booby"
"Oliver"

"Fiddler on the Roof"
Sabbath 1906

"Suite from Oklahoma"
"Surrey with the Fringe on Top"

"Shenandoah"
" Fist Year Beautiful"
"What a Wonderful World"

"On the Avenue"
"February"

"March"
"When the Wind Blows"
"April"

"May"
"June"

"July"
"August"

"September"
"October"

"November"
"December"
What does that ceiling stain mean?

Is one pest a problem?
The “Healthy Schools” movement is a holistic or comprehensive approach that promotes occupant health.

There is a link between the environment in a school facility and the health of the occupants, attendance, and overall performance of students and staff.

Certain groups (children and other sensitive individuals) are at greater risk for adverse health effects.

“at present, evaluation of good IEQ is based not on specific indoor exposure limits…but on good practices of design, maintenance and operation of buildings that are considered to provide conditions of acceptable IEQ”.

CMH-CEH is able to provide the following:

- Administrative training to get senior buy-in
- Nurses training focused on asthma management in clinic setting and environmental triggers
- Safe and Healthy School Specialist (SHSS) training for custodial, maintenance, and other staff
- Hands-on walkthrough of facilities to identify issues and offer recommendations for improving conditions
- Assist with policy evaluation and development
- Facility investigations for occupant concerns
Thank You!

To PEHSU for allowing us the opportunity to present.

To Dr. Jennifer Lowry, coordinator of Region 7 PEHSU and the Medical Director for the Center of Environmental Health at Children’s Mercy Hospital-Kansas City.

Luke Gard, CIEC, CMC, BOC
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childrensmercy.org/ceh
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