Simple Steps
To Promote Healthy School Environments

Maida Galvez, MD, MPH
Lauren Zajac, MD, MPH
No disclosures.
Objectives

• Review general principles of children’s environmental health.

• Discuss school cases of environmental health issues from Region 2 PEHSU.

• Describe resources on children’s environmental health and schools.
• A resource for health care providers, public health officials, school personnel, parents and others to get questions answered about children’s health and the environment.

PEHSU Team:
• Environmental Pediatricians
• Fellows
• EOM Physicians
• PEHSU Coordinator
• Social Worker
• Industrial Hygienists
Pediatric Environmental Health Specialty Units (PEHSU) In North America

- **Boston**: New England PEHSU
- **New York City**: Mount Sinai PEHSU
- **Chicago**: Great Lakes Centers PEHSU
- **Atlanta**: Southeast PEHSU
- **Washington DC**: Mid-Atlantic Center for Children’s Health & the Environment PEHSU
- **San Francisco**: University of California PEHSU
- **Edmonton, Canada**: PEHSU
- **Tyler**: Southwest Center PEHSU
- **Denver**: Rocky Mountain Region PEHSU
- **Kansas City**: Mid-America PEHSU
- **Guadalajara, Mexico**: PEHSU
- **Irvine**: University of California PEHSU
- **Seattle**: Northwest PEHSU
- **Alaska**: PEHSU
- **Hawaii**: PEHSU
- **Virgin Islands**: PEHSU
- **Puerto Rico**: PEHSU
What Kinds of Concerns do PEHSUs Deal With?

- Lead
- Mercury
- Mold
- Pesticides
- Asbestos
- Endocrine Disruptors
- Plasticizers
- Schools

- Water pollution
- Air pollution
- Asthma triggers
- VOCs/solvents
- Hazardous waste sites
- Agricultural pollutants
- Arsenic
- Carbon monoxide
- Job exposures in teens
Children’s Environmental Health

Basic Principles
Thanks to Cappy Collins, MD for these wonderful graphics.
Most chemicals to which children are exposed have not been tested for toxicity.
80,000 Chemicals
3,000 Chemicals are High Production Volume
43% of these chemicals lack basic toxicity data
Information on developmental toxicity is publicly available for fewer than 20% of chemicals

EPA: Chemical Hazard Data Availability Study
Centers for Disease Control (CDC)
4th Report on Human Exposures

Fourth National Report on Human Exposure to Environmental Chemicals
Updated Tables, August, 2014
### Geometric Means of Phthalates (ug/g creatinine) by age

<table>
<thead>
<tr>
<th>PHTHALATE</th>
<th>6-11yo</th>
<th>12-19yo</th>
<th>20yo+</th>
</tr>
</thead>
<tbody>
<tr>
<td>mBzP</td>
<td>35.8</td>
<td>16.6</td>
<td>11</td>
</tr>
<tr>
<td>mEHP</td>
<td>3</td>
<td>2.07</td>
<td>2.14</td>
</tr>
<tr>
<td>mEOHP</td>
<td>26.6</td>
<td>14.6</td>
<td>12.4</td>
</tr>
<tr>
<td>mEHHP</td>
<td>39</td>
<td>21.2</td>
<td>18.8</td>
</tr>
<tr>
<td>mEP</td>
<td>96.9</td>
<td>168</td>
<td>197</td>
</tr>
<tr>
<td>mBP</td>
<td>6.94</td>
<td>3.4</td>
<td>3.3</td>
</tr>
<tr>
<td>Pregnzancy</td>
<td>Birth</td>
<td>Infancy</td>
<td>Childhood</td>
</tr>
<tr>
<td>-----------</td>
<td>-------</td>
<td>---------</td>
<td>-----------</td>
</tr>
</tbody>
</table>

Risk Factors through the Lifespan
Disproportionate Burden?

- Environmental and health disparities
- Social determinants of health
Poor Housing and Asthma

Percent of Residents Who Rated Conditions of Residential Structures Fair or Poor (2011, Community Districts)

Asthma Hospitalizations per 1,000 Children* (2010, United Health Fund Districts)

* Children under age 15.
Source: Citizens’ Committee for Children of New York (2013), Keeping Track of New York City’s Children, Tenth Edition; Figure 3.12 and Figure 4.15.
Case Presentation

A NJ day care that formerly housed a mercury thermometer manufacturing company was closed when air and surface testing revealed elevated mercury levels.

Since 2004, there were 162 children in the program, ages 8 months to 13 years old.
1984-2006

- Mercury thermometer manufacturer opened in ~1984
- Manufacturing plant closed in 1994
- 1996 EPA report sites no immediate human threat
- Deemed ineligible for federal cleanup
- Sold without hazardous waste cleanup in 2001
1984-2006

- Rezoned
- Certificate of Occupancy obtained
- Renovated
- Licensed for daycare, opened in 2004
- Low priority contamination sites inspected by DEP in 2006
- Indoor air testing for mercury
- Permanently closed July 2006
Elemental Mercury

- Vapor at room temperature
- Inhalation
- Urine testing
  - Acrodynia or Pink’s disease
Investigative Team

- NJ Department of Health and Senior Services
- Centers for Disease Control and Prevention
- Agency for Toxic Substances and Disease Registry
- Environmental Protection Agency
- Pediatric Environmental Health Specialty Unit
Methods

• Environmental testing was performed

• Environmental Protection Agency
  – 22 homes of former staff and students

• Urinary mercury screening was conducted
  – children present within 60 days of closing
  – urine mercury >5ug/g of creatinine, retested monthly

• Chart review of 21 individuals
Urinary Mercury

August 2006
• 72 children mean **3.95** ug/g (0.3-17.5)

September 2006: only children Hg>5ug/g
• 22 children mean **4.70** ug/g (0.8-8.7)

October 2006: only children Hg>5ug/g
• 4 children mean **5.50** ug/g (2.7-9.4)

December 2006
• all children mean **1.28** ug/g (0.19-4.66) of 68 total
Trend in Children's Urine Mercury Level After Exposure Stopped

43 children with multiple urine mercury tests, Hg biological half life = 60 days
Mercury Testing

Children attending the daycare within 2 weeks of initial urinary testing had significantly higher levels than children who were at the daycare > 2 weeks

OR 17.8 (95% CI 3.5-167.3)
Joint Risk Communication

• Community Meetings
• Fact Sheets
• Periodic Updates
• Website
• Telephone Calls
• Media
Joint Risk Communication

PEHSU calls per day

Community Meeting 1, 2 and 3
Joint Risk Communication

• Removal from source

• Urine Testing
  ▪ 20 ug/g renal effects
  ▪ 50 ug/g acute symptoms

• Results reassuring

• Limited evidence on long term effects from low level exposures

• Consultations with specialists as indicated
Conclusion

• Urine mercury tests indicate children were exposed though levels declined with time spent away from the daycare.

• Coordinated response is critical in developing risk communication messages with respect to community level exposures to environmental toxins.
Implications

• Kiddie Kollege Legislation (A-3529 and S-2261)
  – evaluation and assessment of the interior of buildings to be used for day care centers or education
  – establish maximum contaminant levels for building interiors that are protective of public health and safety
  – construction permits will not be issued if proposed DHSS maximum contaminant standards are not met
  – A “No Further Action” letter is required from DEP prior to issuance of Certificate of Occupancy
TCE Exposure at a Bronx School
Trichloroethylene (TCE) Air Concentration Values (mg/m³)

Note order of magnitude differences between guidance value, peak value and MRL.
Key Risk Communication Lessons

• It is important to craft clear and concise messages in advance using straightforward language.

• Develop 3 key messages maximum with 3 supporting facts for each key message
  – Define the Exposure
  – Explain What is Known About Potential Health Effects
  – Provide Action Items for Families
Message Map

**Trichloroethylene (TCE) at Bronx New School (PS 51)**

**Issue**
- Testing for re-leasing of the school building in 2011 revealed elevated indoor air levels of TCE, a chemical commonly used to de-grease metal parts.
- TCE is also found in consumer products such as adhesives, spot removers, paint removers and scented candles.
- The levels measured in the school were higher than the current NYS indoor air guidance level but dropped below this level after the school was ventilated.

**Health Risk**
- Children were exposed to TCE by breathing it in the indoor air, but the total amount of exposure is not known.
- Breathing high levels of TCE can cause headaches, dizziness and ear, nose and throat irritation; these symptoms go away quickly once the exposure is removed.
- Long-term exposure can affect the liver, heart, kidneys and nervous system. Animals exposed to levels much higher than found in the school developed some forms of cancer.
- Short-term effects are reversed with removal of the exposure in a matter of hours to days. The risk of long-term effects is not certain in adults and less so in children.

**Response**
- The most important treatment is removal from any further exposure.
- School spaces used by children were successfully ventilated in May, 2011 to levels below NYSDOH guidelines.
- Faculty and children are no longer present in the building and the school’s lease will not be renewed.
- There are urine and blood tests for TCE but they are not very useful because they cannot tell us how high the exposure was or what health effects may occur.
Construction at Schools
Every school building needs regular maintenance to keep the school safe for the people inside.

But work on the building can create a lot of DUST.

While the work is going on it’s important to stay healthy by washing dust off your hands...

...Especially before you eat and after you’ve been playing outside.
School construction efforts are essential to maintain the physical integrity of the school building, fix and prevent water damage from leaks, and ensure proper function of the facilities. However, the process can generate significant amounts of dust. Dust can be irritating to the lungs, and the dust may contain toxins that can be inhaled or swallowed.

Minimizing exposure to dust is the key intervention to promote good health. Proper construction procedures and techniques can greatly reduce the amount of dust, but it can also be useful to explain to children how they can help. Hand washing, especially before eating and after playing outside, further reduces the amount of dust the child may inhale or swallow.*

If you have any specific concerns or questions about environmental health risks for children, the Mount Sinai Pediatric Environmental Health Specialty Unit (PEHSU) is a free resource for the public.

Toll Free: (866) 265-6201
Email: pehsu@mountsinai.org

*Hand washing is also important in preventing transmission of infectious disease.

Acknowledgement: The U.S. Environmental Protection Agency (EPA) supports the PEHSU by providing funds to ATSDR under Inter-Agency Agreement number OW-7-S-92/201. Neither EPA nor ATSDR endorses the purchase of any commercial products or services mentioned in PEHSU publications.
Construction Near Schools

P.S. 163 Task Force for a Safe School
La Fuerza Especial de P.S. 163 para una Escuela Segura

Proposed site
West 97th St.

JHL rendering of proposed nursing home
P.S. 163
Summing Up

• Special knowledge is important
  – Unique vulnerabilities of children
  – Risk communication theory
  – Specifics of case

• Craft Messages in Advance
  – Short and simple
  – Consider unique features of case that affect public perception of risk

• Pediatric providers are great risk communicators, their high level of trust is transferable
Lessons Learned

• Communicate early and often
• Transparency is key
• Create timeline of events in real time
• Anticipate concerns: FAQs, media
• Keep messages consistent
• Debrief
EPA Model School Program

Model Program

A school environmental health program is a holistic, comprehensive, and actionable strategy that integrates preventative measures and addresses environmental health issues by fostering well-maintained school buildings and grounds. Sustainable school environmental health programs promote environments that are conducive to learning and protect the health of building occupants. Successful school environmental health programs are best implemented and maintained by promoting awareness and participation among teachers, staff, and students.

Model School Environmental Health Program

- Component 1: Practice Effective Cleaning & Maintenance
- Component 2: Prevent Mold & Moisture
- Component 3: Reduce Chemical & Environmental Contaminant Hazards
- Component 4: Ensure Good Ventilation
- Component 5: Prevent Pests & Reduce Pesticide Exposure

Schools can also take actions to improve the health of the school environment by conducting construction & renovation projects; improving classroom comfort (e.g., lighting, acoustics, ventilation, & temperature control); and becoming more energy & water efficient.
EPA Tools for Schools
EPA Healthy School Environments

Welcome to the United States Environmental Protection Agency’s Healthy Schools Website. This website provides a host of resources and information to help support healthy and productive school environments for our nation’s children. Whether you are a state, school district, school, school official, teacher, parent, student, or supporter of healthy schools, this website can put you on the path to providing clean, green, and healthy school environments for students and staff.

School environments play an important role in the health and academic success of children. Children spend 90% of their time indoors and much of that time is spent in school. Unhealthy school environments can affect children’s health, attendance, concentration, and performance, as well as lead to expensive, time-consuming cleanup and remediation activities (PDF) (30p. 440K. About PDF). To foster children’s health and academic achievement, healthy school environments should be addressed and integrated within the education system.

State School Environmental Health Guidelines

EPA’s Voluntary Guidelines for States: Development and Implementation of a School Environmental Health Program will help states establish and sustain environmental health programs for K–12 schools. The guidelines present recommendations, case studies, and resources that will help states build or enhance school environmental health programs.

EPA Schools Programs

School Siting Guidelines

State School Environmental Health Guidelines
Asthma Free School Zone

Asthma Free School Zone (AFSZ) is a project of Real-World Foundation, a NYC 501(c)(3) non-profit organization since 2003. The AFSZ serves nearly 150 NYC schools and their surrounding communities by designating school zones with special signage, conducting environmental assessments and ambient air sampling; providing asthma and environmental health information to school and community members. Learn about joining the NYC program. The program won the top Excellence award in Children’s Environmental Health from the US EPA in 2005. Learn about AFSZ history.

The AFSZ Difference
AFSZ is not just another asthma program, rather than just management of existing asthma, it aims for prevention of asthma by identifying and acting on health risks in the school microenvironment.

AFSZ Activities
Education: Underpinning the AFSZ program is the idea that education is key to all behavioral change, and with the right changes in knowledge, and in turn, attitude and practice, a school can manage asthma.

Research: When setting out to solve a public health problem there are three questions to ask: Is there a problem? Will it affect me or someone near me? What can be done about it? AFSZ air quality (AQ) research aims to answer the first question. Is there a problem?

Advocacy: Rather than reinvent the role of school-by-school, AFSZ has been instrumental in pushing for and helping shape NYC and NYS idling policy where there was previously none and/or where it was on-the-books but routinely ignored. Our policy focus this year will be Point-of-Sale reducing marketing and access to tobacco products near schools—a serious problem since 9/30 addicted adult smokers started before their 15th Birthday.
Clinical Resources

Pediatric Environmental Health
Welcome to the Pediatric Environmental Health Specialty Units

The Pediatric Environmental Health Specialty Units (PEHSU) form a respected network of experts in children's environmental health. The PEHSU were created to ensure that children and communities have access to, usually at no cost, special medical knowledge and resources for children faced with a health risk due to a natural or human-made environmental hazard. Read more about the Pediatric Environmental Health Specialty Units.

Located throughout the U.S., Canada, and Mexico, PEHSU professionals provide quality medical consultation for health professionals, parents, caregivers, and patients. The PEHSU are also dedicated to increasing environmental medicine knowledge among healthcare professionals around children's environmental health by providing consultation and training. Finally, the PEHSU provide information and resources to school and community groups to help increase the public's understanding of children's environmental health.

The PEHSU Mission:
Improve the environmental health of children by:

- Enhancing educational and consultative services to clinicians, health professionals and the community.
- Providing evidence-based information from a network of experts in environmental health.

The PEHSU Vision:
The PEHSU network is the globally recognized GO TO resource for Pediatric Environmental Health expertise for clinicians, health professionals and communities.

Why is this Work Important?
This work is important because children are uniquely vulnerable to environmental toxins, such as lead, mold, pesticides, and many other sources. Children's environmental health is the study, prevention, and treatment of the effects of these toxins on the health and development of children. Read more about children's environmental health. It is also important because most healthcare professionals do not receive training to prevent, recognize, and treat environmentally-related conditions.

A Network of Experts in Children's Environmental Health
Through this website you have access to experts who can provide advice and care in the area of children's environmental health. This website connects you to specialists, resources, and information that will assist you in helping the children you care for and care about.
PSR: Environmental Health Toolkit

Pediatric Environmental Health Toolkit

Safe and Healthy Children curriculum addresses environmental health in farmworker children

The children of migrant farmworkers are at risk for toxic chemical exposures and other environmental hazards. PSR has released a new train-the-trainer curriculum and education packet on preventing harm to this vulnerable population. Targeting staff and community health workers of the Head Start Seasonal and Migrant Farmworker program, the curriculum augments PSR’s Pediatric Environmental Health Toolkit. It includes hands-on activities for parents, brief anecdotes about chemical exposures, information on chemical policy, and principles of participatory education.

Funded by a grant from the W.K. Kellogg Foundation, PSR worked with partner organizations of the Academy for Educational Development and Health Outreach Partners to provide training for Migrant and Seasonal Head Start workers on the unique vulnerability of children, exposures to environmental hazards, and prevention strategies.

View the Safe and Healthy Children curriculum

What is the Toolkit?

The Toolkit is a combination of easy-to-use reference guides for health providers and user-friendly health education materials on preventing exposures to toxic chemicals and other substances that affect infant and child health. The materials are visually appealing, practical and easy to use. The Toolkit is endorsed by the American Academy of Pediatrics (AAP).

The Toolkit fills the need for environmental health education and information. The Greater Boston (GBPSR) and San Francisco Bay Area chapters of Physicians for Social Responsibility, in partnership with the Pediatric Environmental Health Specialty Unit at the University of California, San Francisco, and a team of pediatricians from around the country, developed the Pediatric Environmental Health Toolkit.
Children's Environmental Health Faculty Champions Initiative:
PowerPoint Presentations and Resources

NEEF's health care provider tools and resources provided below are intended for use by healthcare professionals to train their colleagues and students on pediatric environmental health.

Developed by leading experts in the field of pediatric environmental health education, the following PowerPoint presentations were originally used for the Children's Environmental Health Faculty Champions Initiative train-the-trainer workshop held on July 14, 2006 in Washington, D.C.

While the materials do not cover every aspect of environmental health, they focus on environmental health issues most frequently encountered by pediatric health care providers.

PowerPoint Presentations:

1. **Environmental Health History for Pediatrics** (PPT, 3.61MB)
   Sophie Balk, MD, Albert Einstein College of Medicine, The Children's Hospital at Montefiore

2. **Taking an Environmental History to Address Children's Unique Vulnerabilities to Environmental Health Risks** (PPT, 964KB)
   Joel Forman, MD, Mount Sinai Medical Center

3. **Environmental Management of Pediatric Asthma** (PPT, 1.04MB)
   James Roberts, MD, MPH, Medical University of South Carolina

4. **Environmental Tobacco Smoke** (PPT, 309KB)
   Cara Krulwich, CNM, PhD, University of Maryland School of Nursing
Simple Steps To Promote Healthy School Environments

- Hand-washing
- Wet mopping and wet dusting
- Ventilation
- Regularly clean classrooms
- Fix source of moisture/humidity to prevent mold

- Use of less toxic cleaning and pest control methods
- Choose low “VOC” paints, floor stains
- Seal off construction areas from kids
- Conduct work while children are not in school
- Greening Committee
- Map your local resources
What YOU Can do

• Advocate for healthy school environments
• Parent involvement is key
• Identify local resources
• Promote exposure to nature
• Support legislation
  – Share your greening ideas
  – Join/support a School PTA Committee
  – Join the Community Board
Questions?
ACKNOWLEDGEMENT

This publication was supported by the cooperative agreement award number 1U61TS000118-01 from the Agency for Toxic Substances and Disease Registry (ATSDR). The U.S. Environmental Protection Agency (EPA) supports the Pediatric Environmental Health Specialty Unit (PEHSU) by providing funds to ATSDR under Inter-Agency Agreement number DW-75-92301301-0.

DISCLAIMER

Contents of this commentary are the responsibility of the authors and do not necessarily represent the official views of the Agency for Toxic Substances and Disease Registry (ATSDR). Neither EPA nor ATSDR endorse the purchase of any commercial products or services mentioned in PEHSU publications.