Safe School Environments - Chemical Safety

Friday, October 16, 2015
National Conference of State Legislatures
For audio, 1 (415) 930-5321; access code 829-816-602
Presenters

Ayana Anderson
MPH
ATSDR

Ana Pomales-Schickli
Health Educator

Dwight Peavey, PhD
U.S. EPA, Region 1
Presenters

Ayana Anderson, MPH
CDR, US Public Health Service
Agency for Toxic Substances and Disease Registry (ATSDR)
Division of Toxicology and Human Health Sciences

“A Review of Acute Chemical Releases in School Settings”
BACKGROUND
Agency for Toxic Substances and Disease Registry (ATSDR)

- A federal agency of the U.S. Department of Health and Human Services
- Sister agency of the CDC, responsible for environmental health-related issues
- Co-located in Atlanta with CDC
Interstate Chemical Threats Workgroup (ICTW) webinars

• ICTW is a local, state, and federal health agencies network for sharing of knowledge, materials, and resources to define the role of state and local health agencies in a chemical terrorism event.

• Joint ATSDR/ICTW series of webinars about policies/strategies to reduce chemical exposure in school settings
  ▪ Mercury
  ▪ Cleaning products
  ▪ Pesticides
  ▪ Chemicals in school labs
KEY MESSAGES FROM THE WEBINARS

MERCURY AND SCHOOLS
A RISKY COMBINATION

This is a true story. It could happen in your school or your community.

A 4-year-old student was intrigued by a mercury demonstration during science class. Without the teacher's knowledge, she took the jar of silver liquid and shared it with her friends, who played with the mercury in school hallways and classrooms...
Mercury

- A shiny, odorless liquid found in thermometers, barometers, batteries
- Good operating practices
  - Brochures-New York State Department of Health
  - Don’t Mess with Mercury-ATSDR
  - State Laws

Cleaning Products

- Some products have asthmagens (e.g. bleach, ammonia, acids, etc)
- Good operating practices
  - California Dept. of Public Health: Cleaning for Asthma Safe Schools
  - Green cleaning product school act
  - State green cleaning policies

Pesticides

- Use to keep environments free of unwanted pest
- Some can be a health risk to students and school personnel
- Pesticide drift
- Good operating practices
  - Integrated Pest Management (IPM)
  - California County Agricultural Commissioners

School Labs

- Mercury – most commonly released in labs
- Other chemicals can be corrosive and cause respiratory, skin, and eye irritation
- Good operating practice
  - Integrated Chemical Management Program (ICM)

ASTDR FINDINGS

Hazardous Substance Emergency Events Surveillance (HSEES)/ National Toxic Substance Incidents Program (NTSIP)
HSEES to NTSIP

• HSEES existed from 1990-2009
  ▪ Cooperative agreements with 14 states
  ▪ Collect public health data for acute non-petroleum chemical releases (=<72 hours)
  ▪ Entered in a web-based database

• NTSIP began in 2010
  ▪ State partners
  ▪ National database
  ▪ Incident investigations: Assessment of Chemical Exposure

## Summary of Evacuations Comparing School Chemical Incidents With Non-School Incidents, HSEES/NTSIP, 2008-2013

<table>
<thead>
<tr>
<th>Category</th>
<th>School Chemical Incidents</th>
<th>Non-School Incidents</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total incidents</td>
<td>335</td>
<td>24,413</td>
<td>24,748</td>
</tr>
<tr>
<td>Evacuations ordered</td>
<td>192 (57.3%)</td>
<td>3,172 (13.0%)</td>
<td>3,364 (13.6%)</td>
</tr>
<tr>
<td>Total people evacuated</td>
<td>47,433</td>
<td>104,985</td>
<td>152,418</td>
</tr>
<tr>
<td>Average number of people</td>
<td>516 (2-3,000 evacuees/incident)</td>
<td>80 (1-15,000 evacuees/incident)</td>
<td>108 (1-15,000 evacuees/incident)</td>
</tr>
<tr>
<td>evacuated (range)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total evacuation hours</td>
<td>2,689</td>
<td>27,145</td>
<td>29,834</td>
</tr>
<tr>
<td>Average evacuation hours (range)</td>
<td>19 (15 min-1,392 hours)</td>
<td>7.1 (15 min-720 hours)</td>
<td>13.3 (15 min-1,392 hours)</td>
</tr>
</tbody>
</table>
1,362 Evacuation hours; What happened?

- In New York, 2009: 56 days and 18 hours
- Elementary school
- Beaker instrument fell from student and teacher’s hand, released mercury
- Students moved to another room
- HAZMAT team restricted room and section of hallway, ventilation shut down
- No injuries
- Classroom reopened 11/11/ 2009
### Summary of Injured Persons Comparing School Chemical Incidents With Non-School Incidents, HSEES/NTSIP, 2008-2013

<table>
<thead>
<tr>
<th>Category</th>
<th>School Chemical Incidents</th>
<th>Non-School Incidents</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total incidents</td>
<td>335</td>
<td>24,413</td>
<td>24,748</td>
</tr>
<tr>
<td>Incidents with injured persons</td>
<td>119 (35.5%)</td>
<td>3,173 (13.0%)</td>
<td>3,292 (13.3%)</td>
</tr>
<tr>
<td>Injured persons</td>
<td>712</td>
<td>7,644</td>
<td>8,356</td>
</tr>
<tr>
<td>Average number of injured persons</td>
<td>6 (1-61 injured persons/incident)</td>
<td>5 (1-54 injured persons/incident)</td>
<td>3 (1-61 injured persons/incident)</td>
</tr>
</tbody>
</table>
61 Injured Persons; What happened?

- Tennessee 1/14/2013 (Monday)
- Carbon monoxide released at a private school
- Evacuation ordered
- Students suffered from carbon monoxide poisoning
- Students and staff returned to school Friday
### Top 5 Chemicals Released in School Settings, HSEES/NTSIP, 2008-2013, N=335

<table>
<thead>
<tr>
<th>Substance</th>
<th>Incidents</th>
<th>Incidents with evacuations</th>
<th>Total people evacuated</th>
<th>Incidents with injured persons</th>
<th>Injured persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas</td>
<td>73</td>
<td>66</td>
<td>13,738</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Mercury</td>
<td>61</td>
<td>32</td>
<td>7,362</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>21</td>
<td>16</td>
<td>6,754</td>
<td>7</td>
<td>143</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>14</td>
<td>4</td>
<td>650</td>
<td>11</td>
<td>43</td>
</tr>
<tr>
<td>Pepper spray</td>
<td>13</td>
<td>8</td>
<td>2,950</td>
<td>10</td>
<td>78</td>
</tr>
</tbody>
</table>
## Other Noteworthy Areas in School Settings, HSEES/NTSIP 2008-2013

<table>
<thead>
<tr>
<th>Substance</th>
<th>Incidents</th>
<th>Incidents with evacuations</th>
<th>Total people evacuated</th>
<th>Incidents with injured persons</th>
<th>Injured persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>School lab</td>
<td>41</td>
<td>20</td>
<td>2,160</td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td>Cleaning products/disinfectants</td>
<td>14</td>
<td>7</td>
<td>4,850</td>
<td>13</td>
<td>48</td>
</tr>
<tr>
<td>Pool chemicals</td>
<td>12</td>
<td>7</td>
<td>4,627</td>
<td>6</td>
<td>31</td>
</tr>
</tbody>
</table>
# Injured Person Disposition Comparing Students vs. Non-Students, HSEES/NTSIP, 2008-2013

<table>
<thead>
<tr>
<th>Disposition</th>
<th>Students # (%)</th>
<th>Non-Students # (%)</th>
<th>Total # (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treated at hospital (not admitted)</td>
<td>282 (63.8)</td>
<td>126 (46.7)</td>
<td>408 (57.3)</td>
</tr>
<tr>
<td>Treated on scene</td>
<td>62 (14.0)</td>
<td>27 (10.0)</td>
<td>89 (12.5)</td>
</tr>
<tr>
<td>Observation at hospital, no treat</td>
<td>47 (10.6)</td>
<td>4 (1.5)</td>
<td>51 (7.2)</td>
</tr>
<tr>
<td>Treated at hospital (admitted)</td>
<td>22 (5.0)</td>
<td>40 (14.8)</td>
<td>62 (8.7)</td>
</tr>
<tr>
<td>Treated at hospital (unk. admittance)</td>
<td>17 (3.9)</td>
<td>55 (20.4)</td>
<td>72 (10.1)</td>
</tr>
<tr>
<td>Seen by private physician</td>
<td>8 (1.8)</td>
<td>10 (3.7)</td>
<td>18 (2.5)</td>
</tr>
<tr>
<td>Injury reported by officials</td>
<td>4 (0.9)</td>
<td>8 (2.9)</td>
<td>12 (1.7)</td>
</tr>
<tr>
<td>Total</td>
<td>442 (100.0)</td>
<td>270 (100.0)</td>
<td>712 (100.0)</td>
</tr>
</tbody>
</table>
# Top Injuries/Symptoms Reported Comparing Students vs. Non-Students, HSEES/NTSIP, 2008-2013

<table>
<thead>
<tr>
<th>Injury/symptom type</th>
<th>Students # (%)</th>
<th>Non-Student # (%)</th>
<th>Total # (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory irritation</td>
<td>174 (27.8)</td>
<td>155 (39.9)</td>
<td>329 (32.5)</td>
</tr>
<tr>
<td>Gastrointestinal issues</td>
<td>107 (17.1)</td>
<td>21 (5.4)</td>
<td>128 (12.6)</td>
</tr>
<tr>
<td>Eye irritation</td>
<td>98 (15.7)</td>
<td>67 (17.3)</td>
<td>165 (16.3)</td>
</tr>
<tr>
<td>Headache</td>
<td>56 (9.4)</td>
<td>33 (8.5)</td>
<td>89 (8.8)</td>
</tr>
<tr>
<td>Dizziness/ central nervous issues</td>
<td>54 (8.6)</td>
<td>31 (8.0)</td>
<td>85 (8.4)</td>
</tr>
<tr>
<td>Burns</td>
<td>29 (4.6)</td>
<td>23 (5.9)</td>
<td>52 (5.1)</td>
</tr>
</tbody>
</table>
ATSDR FUTURE STEPS TO MITIGATING CHEMICAL RELEASES IN SCHOOLS
Raise Awareness Opportunities

- Webinar proceedings report
- Acute school chemical release manuscript
  - Summarize National Toxic Substance Incidents Program (NTSIP) data about acute chemical releases in school settings
- Commentary
  - Effective strategies to prevent acute chemical release in school settings
- Workgroup possibility?
- White paper?
For more information please contact Agency for Toxic Substances and Disease Registry

4770 Buford Highway NE, Chamblee, GA  30341
Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
e-mail: cdcinfo@cdc.gov    Web: http://www.atsdr.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Agency for Toxic Substances and Disease Registry.
Presenters

Ana Pomales-Schickli
Health Educator

“Don’t Mess With Mercury”
Don’t Mess With Mercury

Ana Pomales-Schickli
Health Educator

National Conference of State Legislators
October 16, 2015
Presentation Objectives

After this presentation, the participant should be able to discuss:

– Elemental mercury
  • Properties
  • Where mercury can be found
  • Public health issues
– Mercury spill response in a school
– Don’t Mess With Mercury Website
  • School mercury policies
WHAT DO YOU KNOW ABOUT MERCURY?
Elemental mercury

- Heavy metal, liquid at room temperature
- Evaporates into a colorless, odorless vapor
- Toxic to the brain, kidneys, and other organs
- More toxic to children than adults

(National Geographic Society, 1972)
WHERE IS MERCURY FOUND?
Where is elemental mercury found?

- Thermometers
- Sphygmomanometers (blood pressure machines)
- Thermostats
- Barometers
- Electrical switches
- Flow meters
- Mercury gauges
- Batteries
- Science labs
- High pressure sodium lamps
- Compact fluorescent light bulbs
MERCURY HEALTH EFFECTS
Elemental Mercury Exposure

- **Inhalation**
  - Easily inhaled
  - Crosses blood/brain barrier
  - Crosses placental barriers
  - Enters breast milk

- **Dermal**
  - Little absorbed

- **Ingestion**
  - Little absorbed
4 Year Old Who Drank Mercury

Mercury in Intestines

Mercury in Lungs
Symptoms of Short Term High Level Exposure

- Cough
- Sore throat
- Shortness of breath
- Nausea and vomiting
- Diarrhea

- Fast heart rate
- Headache
- Vision problems
- Metallic taste in mouth
Symptoms of long term exposure

- Anxiety
- Excessive shyness
- Insomnia
- Loss of appetite
- Irritability
- Fatigue
- Forgetfulness
- Tremors
- Changes in vision and hearing
WHAT I HAVE LEARNED RESPONDING TO MERCURY SPILLS IN SCHOOLS
Mercury Spills in Schools

• Most frequent chemical in school incidents
• Exposure to mercury vapors
• Other consequences:
  – Expensive clean-ups
  – Evacuations
  – School closures
• Contamination
  – School
  – School buses
  – Houses
Ballou High School Mercury Spill

- 1 cup of mercury spilled
- Contamination
  - School
  - School buses
  - Houses
- School closed 35 days
- Cleanup cost $1,500,000
Mercury contaminated school bus
Kitchen contaminated with mercury

Before Cleanup

After Cleanup
DON’T MESS WITH MERCURY WEBSITE
Mercury Free School Policies

- Mercury audit
- Mercury-free alternatives
- Disposal

**Mercury Audit and Follow-Up Checklist**

Find possible sources of mercury in your school and decide how to manage them safely.

**School Name:**

**Auditor Name:**

**Audit Date:**

**Instructions**

1. If you find sources of mercury, write down the location, the number of items, and if they are in use.
2. Label sources of mercury with a tag that says "Danger: Do Not Touch." If you think an item has mercury in it but you aren't sure, treat it like a source of mercury.
3. Contact your local health department to learn how to get rid of products that contain mercury safely. Specific steps must be followed to ensure safe disposal of mercury, and they vary depending on the source. If you don't follow them, you risk doing more harm than good.

**Make your audit easier:**

Before your walk-through, ask school nurses, janitors, and science teachers about possible sources of mercury.

<table>
<thead>
<tr>
<th>Science Rooms and Labs, Home Economics, and Art Classrooms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Items to look for</strong></td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>Barometers</td>
</tr>
<tr>
<td>Elemental mercury</td>
</tr>
<tr>
<td>Hydrometer</td>
</tr>
<tr>
<td>Hygrometer</td>
</tr>
<tr>
<td>Inorganic Mercury Compounds:</td>
</tr>
<tr>
<td>- Mercury chloride</td>
</tr>
<tr>
<td>- Mercury iodine</td>
</tr>
</tbody>
</table>
For Students Page
www.atsdr.cdc.gov/dontmesswithmercury/students

- Designed for 6-8 grade
- Interactive
- Social media links
Brain & Nervous System

Mercury may cause damage to the nervous system, especially the brain. Brain damage from mercury poisoning can cause people to have:

- Trouble remembering things
- Difficulty sleeping
- Changes in mood, like feeling cranky, nervous, tired, or shy
- Numbness in the hands and feet
- Trembling (shaking)
- Problems with muscle coordination (tripping, dropping things, falling down)
Video Game

DON'T MESS WITH MERCURY

LEVEL 1

AVOID MERCURY
POISON
TOUCHING STUFF
Teachers DMWM Lesson Plans

- Teacher-led learning
  - student public service announcements

- Computer-based learning
  - Student PowerPoint presentations
  - Student public service announcements

- Standards
  - Next Generation Science Standard
  - Common Core Language Arts Standards
  - Grades 6-8
DMWM Contact information

Ana Pomales-Schickli
apomales@cdc.gov

Dr. Michelle Watters
aax6@cdc.gov

http://www.atsdr.cdc.gov/dontmesswithmercury/
Presenters

Dwight Peavey, PhD
U.S. EPA, Region 1

“Successful Chemical Management in High School Science Departments”
Safe School Environments – Chemical Safety

Dwight Peavey, PhD
Senior Scientist
US EPA, Region 1 – New England
Integrated Chemical Management (ICM):

• A **systematic program** to safe manage chemical resources.
• ICM is a “**cradle to grave**” chemical management program.
• **Ownership** of the ICM program is paramount.
• **Continuous improvement** is critical.
• Moves schools to a **safer & healthier** environment.

• Protocol, Training, Oversight, & Accountability
EPA Region 1’s ICM Program: Partnership

• Started small, went viral (12 years old)
• 120 Communities, 250,000+ students
• Provide FREE on-site assistance during the summers
• Collect, screen, inventory & properly store all chemicals
• Separate unwanted, extremely hazardous & toxic, outdated, contaminated & inappropriate chemicals
• Further separated “waste” chemicals into solid/liquid waste & RCRA Hazardous Waste (for removal)

• Now you know what you have & do not need = Realtime
Region1 IMC Program:

• Few trained practitioners of safe chemical management
• The chemical storage is schools is a real problem.
• The program has more customers than capacity.
• EJ communities & state/federal referral given primacy.
• ICM team are EPA volunteers & college interns
• I am the Lead Chemist & always present.

• Little to no funding except Supplemental Environmental Projects (SEPs)
Over the Counter (OTC) Products
ICM Chemical Inventory Spreadsheet (Excel):

- Every “stock” chemical container
- Chemical Name
- Solid/Liquid/Gas
- CAS# (77-09-8)
- Supplier
- Amount (Max)
- Type (Plastic/Glass...)
- Hazardous Waste (Yes/NO)
- RCRA HW Code (D001...)
- NFPA/HMIS ranking:
  - Health
  - Flammability
  - Reactivity
- Personal Protective Equipment
Has Global Harmonization Helped? **NO/YES**

- **HazCom GHS** is not being translated to school labs & demos
- Does the **Signal Word** “**DANGER**” cause the teacher to review the **Pictograms**?
- Are any of the **9 Pictograms** readily displayed in the classroom/labs?
- Does **GHS 1** translate to **NFPA 4**?
- Are the **“Hazard Statements” & “Precautionary Statements”** found in the lab instructions?
ICM Chemical Inventory GHSeD:

- **Signal Word:** DANGER, Warning & NONE (Non-Hazardous)

<table>
<thead>
<tr>
<th>Health Hazard</th>
<th>Flame</th>
<th>Exclamation Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Carcinogen</td>
<td>- Flammables</td>
<td>- Irritant (skin and eye)</td>
</tr>
<tr>
<td>- Mutagenicity</td>
<td>- Pyrophorics</td>
<td>- Skin Sensitizer</td>
</tr>
<tr>
<td>- Reproductive Toxicity</td>
<td>- Self-Heating</td>
<td>- Acute Toxicity (harmful)</td>
</tr>
<tr>
<td>- Respiratory Sensitizer</td>
<td>- Emits Flammable Gas</td>
<td>- Narcotic Effects</td>
</tr>
<tr>
<td>- Target Organ Toxicity</td>
<td>- Self-Reactives</td>
<td>- Respiratory Tract Irritant</td>
</tr>
<tr>
<td>- Aspiration Toxicity</td>
<td>- Organic Peroxides</td>
<td>- Hazardous to Ozone Layer (Non MANDATORY)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gas Cylinder</th>
<th>Corrosion</th>
<th>Exploding Bomb</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Gases under Pressure</td>
<td>- Skin Corrosion/burns</td>
<td>- Explosives</td>
</tr>
<tr>
<td></td>
<td>- Eye Damage</td>
<td>- Self-Reactives</td>
</tr>
<tr>
<td></td>
<td>- Corrosive to Metals</td>
<td>- Organic Peroxides</td>
</tr>
<tr>
<td>Flame over Circle</td>
<td>Environment</td>
<td>Skull and Crossbones</td>
</tr>
<tr>
<td></td>
<td>- Oxidizers</td>
<td>- Acute Toxicity (fatal or toxic)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Hazard Class (1, 1A, 2 ...
New/Old Chemical Problem:

- Lab Kits & Demonstrations ---
- Purchased & **Never Used**
- Used but **Not Consumed**
- Storage: **Everywhere, on side, unsecured & leaking**
- **Kit solutions do contained Hazardous waste!**
- **Solution**: Transfer to tray
  - **Breakdown** old kits
  - **Refill** frequently used kits
  - **Evaluate** Hazards associated with all kits
WHY? (Root Causes)

• No Functional Safety/Hygiene Plan or EHS Staff
• RISK = Chemical Hazards
• No Waste Management Program
• Lack of Training
• No Accountability & Control
Chemical Management Recommendations:

- **Oversight & control** of chemical procurements
- **Prohibit or authorize** high hazard chemicals
- **Audits**: Teacher team walk-thru & evaluate chemical management
- **Require Risk Assessment** of every lab & demo
- **Support & Fund** Chemical Safety & Toxicology Training
- **Science Lab/Chemical Safety manual/protocol:**
  - Revised yearly
  - Read and signed off by teachers at beginning of each year
Archived Webinar

Slides and a recording of today's event will be made available within 5 business days at http://www.ncsl.org/default.aspx?tabid=29288.

Register for additional webinars at the address above.

Questions or Comments?

Contact Gretchen DuBois, NCSL
Gretchen.dubois@ncsl.org, 303-856-1390