Reducing Chemical Accidents Involving Pesticides, Mercury, Cleaning Products, and Science Labs in Schools

Proceedings from the Interstate Chemical Threats Workgroup webinars.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

ICTW | INTERSTATE CHEMICAL THREATS WORKGROUP

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Introduction

Elementary and secondary schools often contain chemicals that can cause adverse health effects. For example, science laboratories, automotive repair areas, and maintenance facilities often contain potentially hazardous substances [1]. Each year, students and school faculty and staff are exposed to these substances as a result of intentional and unintentional releases. Media reports and growing concerns from childhood health groups have increased attention to these incidents. Despite local, state, and federal laws, as well as voluntary activities to prevent chemical accidents in schools, they still occur [2].

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency within the U.S. Department of Health and Human Services. ATSDR's goal is to prevent harmful exposures and adverse health outcomes related to toxic substances through scientific practice, public health action, and evidence-based health information. The safety of children is a high priority for the agency.

ATSDR has been conducting state surveillance of acute chemical incidents since 1990. From 2002–2011, ATSDR's public health surveillance system tracked 68,138 single chemical incidents. Approximately 1.0% of these occurred in schools, a small percentage of the total chemical incidents captured by ATSDR's system. However, certain characteristics specific to school-related events compel further investigation. For example, the average number of victims was slightly more than two times greater for school-related chemical release events than for non-school-related events[2, 3].

A deeper understanding of the factors that influence school-related chemical incidents will help identify methods to reduce the incidence of such events. ATSDR collaborated with the Interstate Chemical Threats Workgroup (ICTW) to sponsor a series of webinars on reducing exposures to pesticides, mercury, cleaning products, and science lab chemicals to deepen this understanding. The selection of these targeted areas was based on frequency of occurrence in HSEES/NTSIP data, along with media attention. The webinars can be found at http://ictw.net/. This document stems from the webinar series and provides additional input from experts in environmental health, industrial hygiene, health education, and hazardous materials. It includes recommendations to reduce chemical accidents in schools. In addition, a white paper will be developed that will address other sources of chemical accidents in schools. This paper will include recommendations for reducing these incidents based on best practices from successful communities across the United States.

Organization of this document

The ATSDR chemical release surveillance system overview is provided to describe the data on chemical releases in schools in 17 states, which is the basis for the webinars. Sections for each webinar follow the overview. Each section includes:

- an overview of the health effects from exposure and examples (e.g., newspaper excerpts of exposure incidents, data reported to the ATSDR surveillance system)
- a discussion of good operating practices implemented to reduce exposure
- a state "success story" example and/or policy change resulting in exposure reduction

- quotes from experts on the problem

Problem statement

Children are considered a sensitive population for hazardous chemicals for several reasons. Children's developing organ systems and unsafe behaviors, such as more time spent crawling on the floor and more hand-to-mouth contact than adults, are more likely to put them in direct contact with hazardous chemicals [4, 5]. Young people are more susceptible to effects of environmental contaminants because of specific and sensitive windows of development that occur during childhood and adolescence [6]. People exposed to hazardous chemicals as children also have a longer window of potential exposure, which can lead to a variety of adverse health effects in adulthood [4, 6]. All of these factors have created a growing concern for children's environmental health.

Many issues remain regarding children's environmental health in the United States. First, no nationwide system exists for gathering data on school-related environmental health problems. As a result, no national baseline data exist on illnesses, chemicals, injuries, or exposures in schools related to chemical spills [7, 8] . No federal agency has primary responsibility for ensuring children's health in schools [7]. Many states and localities have developed their own policies and laws to protect children from chemical exposures at school; however, this effort is not uniform, and not all localities are covered. These issues demonstrate a need for standard best practices and policies that can decrease unintentional chemical release events in schools. Lessons learned from communities and school districts that have successfully reduced school-related events can be modified and applied in other states.

National Toxic Substance Incidents Program (NTSIP) [9]

ATSDR's National Toxic Substance Incidents Program (NTSIP) collects and combines data pertaining to acute toxic substance releases. NTSIP, partially modeled after the Hazardous Substance Emergency Events Surveillance (HSEES) Program (1990–2009), comprises three components: a national database, state partnerships, and a response team. In NTSIP, state health departments collect information about acute chemical incidents to determine what caused the incident, how a toxic substance was released, where the incident occurred, and whether any persons were harmed. State health departments map not only the locations of nearby sensitive populations, such as schools, nursing homes, and hospitals, but also where toxic substances are made, stored, used, and transported. Federal and state agencies use this combined NTSIP data to find ways to reduce harm caused by acute toxic substance incidents. NTSIP data are included in this report when available.

HSEES/NTSIP Data, 2002–2011*
Number of school incidents = 663
Number of states participating in surveillance N = 14

Incidence of webinar chemicals

Mercury	n=176	(26.5%)
School lab chemicals	n=89	(13.4%)
Cleaning chemicals	n=39	(5.7%)
Pesticides	n=10	(1.5%)

Immediate injury

Incidents with injury	n=215 (32.4%)
Injured Persons	n=1,369 (range 1–88 victims/incident)

Evacuation

Incidents with an ordered evacuation	n =315 (47.5%)
Average number of people evacuated	300.7 (range 2–3000 evacuees/incident)
Average duration of evacuation	22.5 hours

*Unpublished data

Reducing exposures to pesticides in schools

Pesticides are a group of substances, including disinfectants, insecticides, and herbicides, that are used to keep environments free from unwanted pests [10]. While antimicrobial pesticides are often used to maintain cleanliness, exposure to some pesticides in the school environment can be a health risk for children and school employees [11]. Among the health effects associated with long-term pesticide exposure were poorer mental development, increased pervasive developmental disorder, inattention, and attention-deficit/hyperactivity disorder [12].12 Pesticides can differ greatly in their toxicity profile:

- Some chemical insecticides, like organophosphates and pyrethroids, are toxic to the nervous system.
- The U.S. EPA has classified some pesticides as "probable human carcinogen[s]."[10]
- The American Academy of Pediatrics (AAP) linked early-life exposure to organophosphates and organochlorine pesticides (primarily DDT) with adverse effects on neurodevelopment and behavior.

Reducing exposure to harmful pesticides in schools will require using safer alternative pest control methods when appropriate (such as biopesticides [10]) and limiting use of pesticides with greater toxicity. The National Institute of Occupational Safety and Health, EPA, and many other groups support the use of less toxic substances for pest control and cleanliness[13]. Similarly, AAP recommended in 2012 that pediatricians "work with schools and government agencies to advocate for the least toxic methods of pest control and inform communities when pesticides are being used in the area" [12].

Another problem is pesticide drift, which can result when environmental conditions (wind and rain) spread chemicals away from the intended target after pesticide application. When pesticide drift occurs, school children and employees may be exposed to chemicals. Specific investigations into drift events, particularly in schools near agricultural sites, have been performed in the state of California with preliminary success: the state has permit requirements for using restricted materials (pesticides that can be dangerous to human health if used incorrectly)near schools and has educated bus drivers about the importance of recognizing and responding to drift.

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) was established in 1996 to provide "federal regulation of pesticide distribution, sale, and use" [14]. FIFRA requires registration of pesticides sold within the United States.[14] Some state and local governments and school districts have attempted to reduce risk and exposure to harmful pesticides by adopting techniques that reduced the number of potentially toxic substances used for pest control.

In the news: Exposure to pesticides in schools

Humid air, breeze led to chemical bothering Edgewood students: Middle school evacuated Tuesday after 47 kids report symptoms.
October 12, 2011

"'A pest-control and weed-killing chemical sprayed Tuesday onto fields behind Edgewood Middle School is likely what caused the evacuation of the building and several students being taken to the hospital,' officials said. 'Forty-seven kids were affected—21 were treated, with some taken to area hospitals and most released to parents,' said Jeff Galloway, director of Butler

County Emergency Management. 'The odor was first detected in the fifth- and sixth-grade wing, where students started complaining of headaches and coughing at 10:30 a.m.,' said John Thomas, a spokesman for the district. Students were allowed back in the school about 1:30 p.m. after officials were told that the building was clear."
— *Today's Pulse*, St. Clair Township, OH

Good operating practices

Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. IPM programs use current, comprehensive information on pests' life cycles and interaction with the environment. This information is used in combination with available pest control methods to manage pest damage by the most economical means and with the least possible hazard to people, property, and the environment [15]. Through IPM, toxic pesticides are used as a last resort and are usually the least toxic. Some schools require integrated pest management strategies and/or pesticide application restrictions; however, many schools have not adopted IPM.

In the mid-1990's the Monroe County Community School Corporation (MCCSC) in Indiana developed a school IPM program. Indian University conducted a study of MCCSC pest management practices in 1994 which led to a pilot IPM program at three MCCSC elementary schools. The pilot program was successful and led to a district –wide expansion. With the IPM model in place, MCCSC had a 90% reduction in pesticide use, pest problems and pest control cost. Also money saved from reduced pesticide use enabled MCCSC to hire a district-wide pest management coordinator. MCCSC IPM has become a model for the nation impacting over 1 million children nationwide [16].

Texas, which has one of the oldest and most comprehensive school IPM laws in the nation, mandates that each public school district has:

- an IPM policy
- a licensed pesticide applicator to apply any pesticide in a public school
- a trained coordinator in charge of the pest management program
- two-day notification of pesticide use
- re-entry restrictions for different pesticides

School IPM regulations also provide pesticide classification systems that encourage schools to use certain least-hazardous materials. A three-level (Green, Yellow, Red) system allows schools to use any pesticide needed, but requires written justification for higher-risk (Yellow and Red) products. In 2007, the IPM law became even more comprehensive, requiring districts to have written IPM plans for key pests (including monitoring plans, thresholds, and recommended treatment strategies), educational plans for staff, and continuing education for IPM coordinators [17].

Student exposure to pesticides can also occur off campus because of drift from neighboring areas. In Ventura County California, the County Agricultural Commissioners (CAC) office developed the following permit conditions for use of chloropyrifos adjacent to schools:

- CAC must be notified of intent to use chloropyrifos 48 hours prior to use
- Chloropyrifos may not be applied between 6am and 6pm, when school is in session
- Property owners or their employees must be certified to apply chlorpyrifos

Drift can also expose students on school buses to pesticides. In Fresno, CA, drivers have been educated about what to do if a drift occurs, how to respond, and whom to contact. Also, CAC advises bus drivers to be aware of their surroundings at all times.

In California, Assembly Bill 947, enacted to prevent pesticide exposure resulting from drift, authorized the CAC to regulate the agricultural use of any pesticides within ¼ mile of school. It also increased the civil penalty from not more than $1000 to no more than $5000 for each violation determined to be serious.

Expert testimony

"Experts in the field recommend mandating Integrated Pest Management (with staff training), prohibitions on pesticide use, posting notification signs (both pre and post), prior written notification, and re-entry requirements."

— Janet Hurley, Extension Program Specialist II, School IPM Texas AgriLife Extension Service Southwest Technical Resource Center

Reducing exposures to mercury in schools

Metallic mercury is a shiny, odorless liquid found in thermometers, barometers, and batteries. When heated, metallic mercury becomes a colorless, odorless, poisonous gas. Most school mercury spills occur in science classrooms, nurse's offices, and storage areas and are caused by students, nurses, and teachers. Mercury spills result from mishaps during science lab class (broken thermometers or barometers), metallic mercury being brought to school, off-gassing from damaged flooring, and other unknown sources. The greatest concerns with mercury spills are the safety of the students and the time and cost of cleanup. Improper removal of mercury can render the cleanup ineffective and lead to residual contamination and potential human exposure. Therefore, people must be knowledgeable about proper handling [18-20].

Acute exposure to vapors from metallic mercury can result in respiratory distress, increased blood pressure, and gastrointestinal effects (e.g., nausea, vomiting, and diarrhea). Some long-term effects may include brain and nervous system issues, causing irritability, tremors, and/or memory problems. Very young children are even more susceptible to the effects of mercury. Exposure to high levels of mercury can result in damage to the brain, kidneys, and developing fetus [21]. "Based on animal and human epidemiological studies, the EPA has classified some forms of mercury (both organic and inorganic) as "possible human carcinogens."[22]

In the News: Exposure to Mercury in Schools

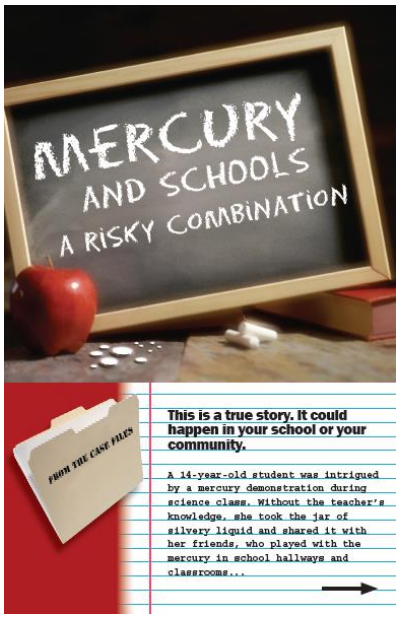
Mercury spill contained at Abingdon School
March 8, 2012
"A Hazmat team was dispatched to an Abingdon elementary school Thursday morning for a report of a chemical spill. School officials confirmed the chemical was a small amount of metallic mercury. No classes were disrupted. A sink was being removed in the nurse's suite at William S. James Elementary School in Abingdon and there was a 'minor chemical spill,' according to Harford County Public Schools Manager of Communications. The Hazmat team deemed it safe for students to enter the building because the amount was small and enclosed in water."
— *The Baltimore Sun*, exploreharford.com (Abingdon, MD)

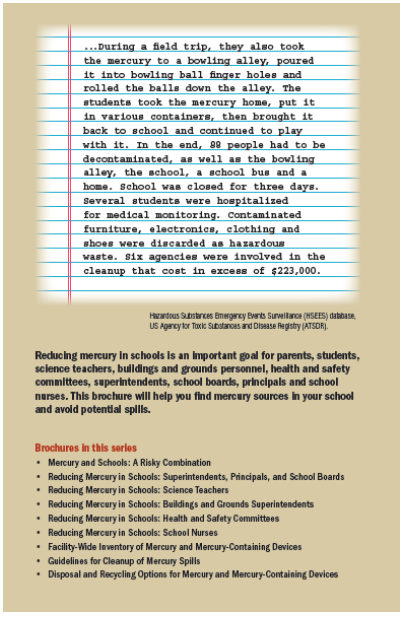
Officials: School closed Thursday after mercury spill
May 16, 2012
"School officials announced Wednesday evening that Whitnel Elementary School would be closed Thursday after a mercury spill on the campus. Four children were taken to a hospital after being exposed to mercury Wednesday at the school, officials said. Students at Whitnel Elementary School were evacuated from the school after the mercury exposure. Officials said a child brought a vial of mercury to the school and it spilled on the floor of a fifth grade classroom. The student brought it in to show her friends after her brother found it in a junkyard, one classmate said."
— WSOCTV (Charlotte, NC)

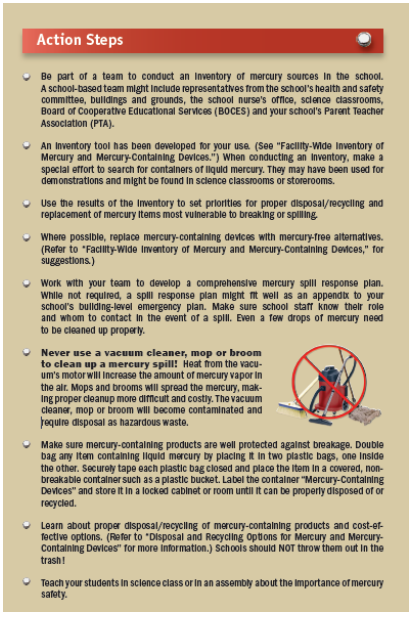
Good operating practices

Don't Mess With Mercury
ATSDR developed the "Don't Mess with Mercury" website as an educational tool to raise awareness among teachers and students about the dangers of mercury exposure in schools. The website includes information about how to prevent and respond to mercury releases in schools and an interactive section for students that includes games and videos about the dangers of mercury [23].

Brochures
The New York State Department of Health HSEES/NTSIP program developed nine brochures to support implementation of the NYS Mercury-Added Consumer Products Law. The program designed these brochures to help school personnel identify mercury sources and take the steps necessary to reduce or eliminate the risk of a mercury spill[24].







Mercury-Added Consumer Products Law
New York State
"The Mercury-Added Consumer Products Law bans the sale of mercury-added novelty products, mercury-fever thermometers, mercury thermostats (effective January 2012) and other mercury containing products (effective July 2004) in NY State. Sale of elemental mercury is banned, except for certain scientific, dental, and manufacturing uses. [25]
The law sets labeling requirements for products containing mercury, and requires proper disposal or recycling of mercury-added consumer products, which includes items such as thermostats, thermometers, switches, medical or scientific instruments, electrical relays, lamps (i.e. bulbs) and batteries (excluding button batteries), according to hazardous waste or universal waste standards. Incineration of waste containing mercury is banned. The law also prohibits primary and secondary schools from purchasing or using mercury-added products." However, building mechanical systems that may contain mercury such as switches, thermostats, fluorescent bulbs,

and electrical relays may remain in schools. When they need to be replaced, they must be disposed properly and replacements must be labeled by the manufacturer indicating mercury is present. [26]

Mercury Free Zone Program
MN HSEES/NTSIP in partnership with Minnesota Pollution Control Agency developed the Mercury Free Zone (MFZ) education program and public awareness campaign. The Mercury Free Zone (MFZ) program offered building assessments, equipment exchanges, and education. In some of the participating schools, MFZ staff searched for mercury spills, stored mercury, and mercury-containing equipment. The assessments used a mercury-detecting dog, Clancy, and a real time mercury-analyzing instrument, the Lumex. At the time, Clancy was one of only three mercury-detecting dogs in the world. School officials, who were given written guidance on cleaning and proper disposal of mercury and items, were ultimately responsible for cleaning spills or removing items, at the schools' expense. Schools were given mercury-free instruments in exchange for mercury-containing instruments. MFZ staff conducted educational presentations and provided educational materials to students and school staff about mercury during most site visits. Clancy was retired in December 2009, and most aspects of the MFZ program ended following legislation that prohibited the use and storage of free-flowing elemental mercury or mercury instruments. During the program, MFZ staff assessed 335 schools and removed 2.2 tons of mercury from schools [27].

State Laws
In Michigan, a law implemented during 2000 required all schools K–12 to eliminate elemental mercury and mercury-containing instruments by December 31, 2004. Eighteen other states have similar laws that prohibit or limit the use and/or purchase of mercury in schools. Some states have laws that require education programs to be implemented by districts and/or health departments to reduce mercury in the schools.

Expert testimony
"Even with the growing awareness concerning mercury, it's not unusual to find it in schools. Last year, I inspected a middle school and found a 500mL flask nearly full of mercury. The flask was sealed with a piece of duct tape. In addition, we also found about 100 mercury thermometers."
— Dr. Ryan Kuhn, *Director of Industrial Hygiene Services, Dominion Environmental Consultants*

Reducing exposures to cleaning products in schools

Cleaning chemicals can be very reactive when not properly handled. If exposed, school staff and students have the potential to suffer long-term, deleterious health effects.

About 1 in 10 children in the United States has asthma. [28] Asthmagens are substances that can cause asthma in people who have never had asthma before. [28, 29] Specific asthmagens include ingredients found in many cleaning and disinfecting products. These products include acid cleansers, disinfectants, carpet cleaners, floor strippers, ammonia, and graffiti removers. Cleaning and disinfecting product ingredients that are asthmagens include bleach, quaternary ammonium compounds, ethanolamines, ammonia, acids, etc. [29]Other substances can exacerbate or "trigger" asthma in people who already have asthma. The California Department of Public Health's Work-related Asthma Prevention Program found that 80% of work-related asthma cases associated with cleaning products were workers who did not clean but who worked in areas where cleaning products had been used. This demonstrates how students in a school can be exposed[30]. To minimize harm, many schools throughout the United States are requiring training for their cleaning staff and are switching to asthma-safer and greener cleaning products[31].

In the news: Exposure to cleaning products in schools

Toxic Cleaner Fumes Could Contaminate California Classrooms
November 3, 2009
"Air pollution testing conducted for the Environmental Working Group (EWG) reveals that cleaning supplies used in 13 key California school districts can cloud classroom air with more than 450 distinct toxic contaminants, including chemical agents linked to asthma and cancer. EWG released its findings in Santa Monica during a news conference where attendees, again, called on the State legislature to adopt a measure that would encourage school districts across California to use less toxic cleaning supplies. The 13 school districts included in the study were chosen for their geographic diversity and diversity of size. Several districts have already begun moving to green cleaners, while others have pilot programs underway at various stages."
— EWG Public Affairs (Santa Monica, CA).

Hazmat team handles small chemical spill at school
October 2, 2012
"A janitor at Rolling Acres Middle School accidentally mixed toilet cleaner with what was believed to be chlorine residue, prompting a response by the Peoria Fire Department's Hazardous Materials Response Team. Firefighters responded just before 3 p.m. as children were being let out for the day and had the spill cleaned up within an hour. The janitor suffered minor injuries and was taken to a nearby hospital, according to Battalion Chief Tom Carr, but no students or faculty were harmed. The janitor suffered shortness of breath and eye irritation as a result of the chemical reaction. Two firefighters in protective suits entered the school at 3:40 p.m. and neutralized the chemicals. The school was returned to the authority of faculty by 4 p.m."
— JournalStar (Peoria, IL)

Good operating practices

Training Programs — Cleaning for Asthma Safe Schools (CLASS)

The California Department of Public Health's Occupational Health Branch created the CLASS project to help California schools protect workers and students from developing asthma as a result of cleaning product exposure and to prevent asthma exacerbations resulting from exposure to cleaning products. CLASS provides technical support and training to California school districts to switch to asthma-safer cleaning products and practices; creates and distributes educational materials about safer cleaning methods and products; raises awareness about the importance of asthma-safer cleaning via newsletter articles, webinars, and presentations; and in 2014 will be releasing "Healthy Cleaning & Asthma-Safer Schools a How-To Guide" along with training slides to help schools switch to safer cleaning.

Green Cleaning Products Schools Act, Connecticut
Connecticut's Green Cleaning Products Schools Act (Conn. General Statutes §§ 10–231g, 10–220) requires using environmentally preferable cleaning products for schools, with the exception of disinfectants. This Act also prohibits staff/parents from bringing cleaning products into the school and requires the school district or board of education to post the green cleaning policy and Indoor Air Quality information from a required survey. The school district must also supply a written copy of policy to staff and parents [32].

State policies and certified green cleaning products
Ten states have green cleaning policies for schools: Connecticut, Hawaii, Iowa, Illinois, Maine, Maryland, Minnesota, New York, Nevada, Vermont. Not all of these policies require or mandate green cleaning; some just have recommendations. Each also varies on its definition of green cleaning. Whether green cleaning is voluntary or not, all of these states use Green Certification to define green chemicals.

Green Certification helps consumers identify cleaning products that have a preferred environmental safety and health profile. Green certifications can vary, and each has different requirements. Each school or school district can identify which certification works best for use in its facilities. Below are examples of certification labels consumers will find on products tested by the certifying agency:

Design for the Environment (DfE) by the U.S. EPA

UL ECOLOGO®

Green Seal™

Expert testimony
"Green cleaning products have been found to work as well as conventional products, and green cleaning does not increase maintenance costs."
— Elizabeth Meer, Special Assistant and Commissioner's Designee to Co-Chair the EO 4 Interagency, Committee on Sustainability and Environmental Stewardship

"The best cleaning products legislation is developed with input from an inclusive stakeholder group."
— Carol Westinghouse, President, Informed Green Solutions

Reducing exposures to science lab chemicals in schools

Data from ATSDR's national surveillance systems reveal that the most common hazardous substance released in science laboratories is mercury. Mercury is contained in many scientific instruments, such as thermometers and barometers. Many other lab chemicals are corrosive and can harm the respiratory tract, skin, and eyes. Being exposed to toxic substances is not the only danger of school labs; dangerous chemical reactions occur and result in fires and explosions. ATSDR data showed that incidents involving hydrochloric acid and chemical reactions of various substances resulted in the most injuries per release incident. Human error was the primary cause of an incident in a science lab; equipment failure and improper mixing of laboratory chemicals also contributed to incidents. Students were the most commonly injured people at the scene, with injuries including respiratory irritation, skin irritation, and burns[33] .

In the news: School science labs
Science lab flash fire ignites student's face
December 2, 2011
"A 15-year old Maple Grove student received second degree burns to his face after a classroom science experiment exploded. He was rushed to the hospital, along with three other students who suffered minor injuries. The student said the flash fire not only ignited his face, but burned his neck and right hand. School officials say the explosion occurred when the teacher was working with flammable gas and a match."
— *Brainerd Dispatch (Maple Grove, MN)*

East Valley H.S. Evacuated After Chemistry Lab Mishap
June 11, 2012
"The local fire department was called to the high school to investigate the accidental release of chemical fumes from a third-story science classroom. A science teacher was demonstrating an experiment, when noxious fumes were released. The classroom, and subsequently, the school were evacuated. Two adults and two students suffered minor medical issues, and were treated by ambulance."

— LAFD News & Information (N. Hollywood, CA)

Good operating practices

Partnership Programs
US EPA Region 1 has partnered with area schools to develop the Integrated Chemical Management (ICM) program, a free on-site assistance program that aims to reduce risk and exposure, prevent accidents, ensure safety to students, minimize waste/pollution, and save money[34]. ICM includes a chemical inventory database to keep facilities aware of the chemicals stored and/or used.

Beyond Benign
Beyond Benign is a non-profit organization specializing in curriculum development, outreach, education, and training for the next generation of scientists. Beyond Benign focuses on the concepts of green chemistry and sustainability in the following areas: K–12 Curriculum and Training, Community Outreach and Communications, and Workforce Development. More information can be found at http://www.beyondbenign.org/.

Certified Unified Program Agencies (CUPA)
California legislation (Senate Bill 1082) requires a unified approach to managing hazardous waste/materials programs across the state. This bill provides information to first responders and requires safe handling and storage of hazardous materials for the safety of the public and businesses. A county or city environmental health department manages local CUPAs, which are consolidations of multiple environmental organizations. Any facility that stores, maintains, or ships hazardous waste, including schools, must report to CUPA. Schools that generate hazardous waste, store it in above-ground or underground tanks, or generate medical waste must report to their local CUPA. CUPA has the authority to take samples, inspect training and injury/release records, document any violations of the law found during inspection, and perform comprehensive site visits every 18 months (Calderon, Ch. 418, §§ Statutes of 1993) [35].

Expert testimony
"Proper training and supervision of participants and teachers is a way to avoid chemical accidents (as most are caused by human error)."
— Maureen Orr, Surveillance Team Lead, ATSDR, Division of Toxicology & Human Health Sciences

"ICM is beneficial, it can reduce risk of accidents, decrease chemical exposures, ensure chemical security, provide accurate inventory, allow for proper solid and hazardous waste disposal, control chemical purchasing, minimize liability, save money, prevent pollution, and promote safer, healthier, and sustainable science."
— Dwight Peavey, PhD, US EPA Region 1

"Solutions to eliminate unnecessary risks and reduce the number of chemicals found on campuses include: developing a written chemical hygiene program; inspecting each school to inventory all lab chemicals and separate for disposal; ensure that each school has proper storage; ensure that MSDS sheets are maintained in chemical stock rooms; develop a training programs

for all faculty members that use lab chemicals; develop a purchasing protocol that has to go through a committee chair; develop a waste disposal program; develop a chemical database; and work to develop a curriculum that requires experiments that call for small amounts of chemicals."
— Dr. Ryan Kuhn, Director of Industrial Hygiene Services, Dominion Environmental Consultants

Summary

Schools are intended to be healthy environments in which students can gain meaningful experiences in education and culture. However, a harmful physical school environment can negatively affect students' development. Surveillance data from ATSDR's NTSIP and other systems are essential for monitoring deleterious chemical incidents at schools. Data and documented success stories can show the efficacy of prevention strategies and help identify best practices.

Although the aforementioned laws, policies, and voluntary practices have reduced chemical exposures among school children and employees, a more thorough analysis of the data is needed to determine which laws, policies, and voluntary practices are most effective and work best in specific communities. A white paper that expands on the topics presented in this report, including more in-depth data analysis, is underway at ATSDR with the assistance of a workgroup of experts. This report and the subsequent white paper will be shared with stakeholders and policy makers, providing information they need to improve the safety of the school environment for children and school employees across the nation.

WEBINAR CONTRIBUTORS

Carol Westinghouse	*President,* Informed Green Solutions
Debbie Shrem	Cleaning for Asthma Safe Schools (CLASS), Work-Related Asthma Prevention Program, California Department of Public Health
Dwight Peavey, PhD	U.S. EPA Region 1
Elizabeth E. Meer	*NYS Department of Environmental Conservation, Special Assistant and Commissioner's Designee to Co-Chair the EO 4 Interagency,* Committee on Sustainability and Environmental Stewardship
Janet A. Hurley, MPA	*Extension Program Specialist II,* School IPM Texas AgriLife Extension Service Southwest Technical Resource Center
Jay Feldman	*Executive Director,* Beyond Pesticides
Jenny Wu, MS	*Statistician,* Division of Toxicology and Human Health Science, ATSDR
Mark Bishop	*Vice President,* Policy + Communications, Healthy Schools Campaign (Chicago)
Martha Stanbury, MSPH	*State Administrative Manager,* Michigan Department of Community Health (MDCH), Division of Environmental Health
Maureen Orr, MS	*Surveillance Team Lead,* Division of Toxicology and Human Health Science, ATSDR
Michel Oriel	*Research Scientist,* CalEPA Department of Pesticide Regulation Worker Health & Safety Branch, Pesticide Illness Surveillance Program Pesticide Regulation in California Counties
Michelle Watters, MD, PhD, MPH	*Medical Officer,* ATSDR, Division of Community Health Investigations
Robin Lee, PhD, MPH	*Epidemiologist and Research Activities Team Lead,* Division of Toxicology and Human Health Sciences, ATSDR
Shelley DuTeaux, PhD, MPH	Office of Emergency Response, California Air Resources Board
Sherry Glick	Office of Pesticide Programs, BPPD/ESB, US EPA

Wanda Lizak Welles, PhD	*Chief*, Hazardous Substance Events Surveillance Section, New York State Department of Health, Center for Environmental Health

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