

HEALTH CONSULTATION
SAFE CHEMICAL STORAGE IN SCHOOLS
PILOT PROJECT

July 13, 2000

Prepared by:

Illinois Department of Public Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Background and Statement of Issues

The Illinois Department of Public Health (IDPH) has been involved in several mercury spills that have occurred in Illinois schools over the past few years. Students, teachers, and other school employees have been exposed to hazardous mercury vapor because of these spills. Mercury spills in Illinois schools occurred when

-A student stole a significant amount of mercury from a chemical storage room, spread it in the hallways and on lockers, and spilled it in multiple classrooms. Areas of the school were closed for approximately two weeks, and cleanup costs exceeded \$250,000.

-A student brought a vial of mercury to school. The student spread the mercury on a desk and spilled some on the carpet. School was canceled for the rest of the day, and the contaminated items were placed in drums.

-A student had a vial of mercury, divided it into ziploc bags, and distributed it to friends. Some was spilled on other students and in the school music room.

To address the increasing number of mercury and other chemical spills in Illinois, IDPH piloted a project in a central Illinois school district to examine how chemicals were being stored and used. Mercury and its related compounds were specifically targeted in every school. This health consultation documents the finding of the pilot project and contains recommendations to reduce mercury and other chemical exposure in schools.

Mercury

Mercury is a shiny, silver-white, liquid metal at room temperature. Because it is a liquid at room temperature, some of it evaporates into the air as colorless, odorless mercury vapor. Mercury vapor is toxic when it is inhaled. It can cause adverse health effects, including personality changes (irritability, shyness, nervousness), tremors, kidney damage, changes in vision or hearing, and memory difficulties [1].

Pilot Project

IDPH offered a central Illinois school district the opportunity to participate in a voluntary project to examine their chemical storage rooms and to look for mercury, hazardous chemicals, and unsafe storage practices. The school district agreed to allow IDPH personnel to visit all of the elementary, middle, and high schools in the district. The elementary schools were included in the project because several schools had been converted from one grade level to another, so old laboratory chemicals were possibly present. The district also has a district science center (DSC) that stores supplies for kindergarten through sixth grade. The DSC is in an elementary school.

IDPH personnel explained the project at a district meeting attended by all of the school principals. Forms were supplied to the principals to solicit their participation and to schedule a time to have their school chemical storage rooms inspected.

The district has 26 elementary schools (grades K-4; 5-6), 3 middle schools (grades 7-8), and 3 high schools (grades 9-12). A total of 19 elementary schools responded to our request. Of those, 3 schools had no hazardous chemicals, and inspections were not necessary. All of the middle and high schools volunteered to participate in the pilot project.

From October 1999 to January 2000, IDPH staff visited all of the participating schools. IDPH developed a risk inventory sheet to facilitate uniform evaluation of the storage rooms (Attachment 1). Other comments and observations about the storage room, or practices that could pose a safety problem, were noted on the risk inventory sheets.

High Schools

Three high schools participated in the pilot project. Among the high schools, IDPH observed several problems. The most common storage hazards were

- All of the high schools had elemental mercury or mercury-containing compounds on storage room shelves in glass containers. Amounts of mercury found ranged from about 140 grams to 1 kilogram (about 10 to 75 milliliters).
- All schools were storing many chemicals they never used and did not need.
- Two of the schools had several bottles of unlabeled, unknown chemicals and solutions.

Middle Schools

In the middle schools, additional storage problems were found. The most common problem in the middle schools was storage of chemicals in the classroom where they were readily accessible to students. One middle school had its entire chemical inventory stored alphabetically in unlocked cabinets above a row of sinks in the classroom. Common problems included

- Alphabetical or random chemical storage that can place incompatible chemicals in contact with each other.
- No separation of acids, bases, and flammable chemicals.
- No, or very few, Material Safety Data Sheets (MSDSs) for the chemicals stored at the schools. MSDS are required for chemicals used in workplaces in event of accidents.

The chemicals were not well organized and were accessible to students in the middle schools. Small amounts of elemental mercury were found in all of the middle schools. In one school, about

15 milliliters of mercury were being stored in a glass test tube near the edge of a shelf. Mercury-containing compounds were also found in all of the middle schools.

Elementary Schools

In the elementary schools, IDPH personnel spoke with custodians and other personnel to determine if they knew of any stored laboratory chemicals. Many school employees indicated that chemicals had been stored in the elementary schools, but that all of them had been removed about two years ago when the district performed a chemical cleanup. No laboratory chemicals were found in any of the elementary schools IDPH visited.

District Science Center (DSC)

The DSC was in a large general storage area of an elementary school. The room was unlocked most of the time, and several children were seen passing by the door while IDPH personnel were conducting the inspection.

Approximately 200 bottles of chemicals were found stored in old, metal gym lockers. The chemicals were all stored alphabetically (ammonia was found next to hydrochloric acid), which allows incompatible chemicals to be stored next to each other. Crystals were present on the outside of the hydrochloric acid bottle. Several bottles were corroded, and some were leaking material onto the shelves. Iodine had leaked from a bottle and had corroded a large hole through a shelf.

The individual responsible for maintaining the chemical inventory had no training on how to safely store laboratory chemicals. The chemicals are no longer used by any of the schools because the grade schools are now using purchased kits for science education.

CONCLUSIONS

The pilot project demonstrated a need for education and chemical removal activities in middle schools and high schools. Elemental mercury, which has been the source of many chemical accidents, continues to be stored in schools. The largest quantity of mercury found was about 75 milliliters in one high school. The school district had conducted a cleanup and chemicals removal project about two years before the pilot project. Therefore, the results obtained by the pilot project may underestimate the amount of elemental mercury and chemicals stored in the typical Illinois school.

Overall, the high school storage rooms had fewer potential hazards than middle schools or the DSC. Most of the problems at the high schools involved storing large quantities of mercury and other hazardous chemicals. The middle schools and the DSC had a greater number of unsafe storage practices than the high schools.

The results of the pilot project suggest a need for education about ways to correctly store laboratory chemicals. Although the teachers at the schools are well trained in science education, most indicated they had little knowledge about the dangers associated with storing laboratory chemicals. The teachers expressed an interest in disposing of unwanted chemicals and in obtaining further education in proper ways to store chemicals.

Several potentially hazardous storage conditions were found at many of the schools. Most of the individuals responsible for storage of the schools chemical supplies did not know what chemicals they had or the potential health effects that could result from exposure to those chemicals.

Recommendations and Public Health Action Plan

As a result of the pilot project, several common storage problems that could lead to exposure were identified in middle and high schools. IDPH recommends the following actions to address these problems:

1. Locate funding for additional chemical disposal projects to enable schools who have mercury and other excess or unnecessary chemicals to dispose of them properly. IDPH will contact the Agency for Toxic Substances and Disease Registry and the U.S. Environmental Protection Agency to explore funding opportunities.
2. IDPH will discuss the problem found with the school district and schools and will develop educational materials addressing the following topics –
 1. Hazards of storing elemental mercury
 2. Chemical storage strategies
 3. Chemical hygiene plan (written plan to manage purchasing and storing hazardous chemicals)
 4. Importance of a current and appropriate chemical inventory

REFERENCES

2. Agency for Toxic Substances and Disease Registry. Toxicological profile for mercury. Atlanta: US Department of Health and Human Services; 1994 May. Report No.: TP-93/10.

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ADDITIONAL SOURCES OF INFORMATION

Mercury in Schools Homepage
<http://www.mercury-k12.org>

Flinn Scientific Homepage
<http://www.flinnsci.com>

The Laboratory Safety Institute
<http://www.labsafety.org>

A Chemical Health and Safety Resource for Schools
<http://www.cheminfonet.org>

ATTACHMENT 1

Chemical Storeroom Potential Risk Inventory

School: _____

Contact Person: _____

Date of Inventory: _____

Location and Use:

- | | | |
|--|---|---|
| 1) Is there more than one location where chemicals are stored?
If so, list the other locations: | Y | N |
| 2) Is the storeroom used for any other purpose besides chemical storage?
If so, what other purpose? | Y | N |
| 3) Does the school use all of the chemicals it is storing? | Y | N |
| 4) Are there any chemicals the school would like to get rid of?
If so, what are they? | Y | N |

Accessibility:

- | | | |
|---|---|---|
| 1) Is the storeroom easily accessible to students? | Y | N |
| 2) Is the storeroom locked at all times? | Y | N |
| 3) Are chemicals routinely stored in the classrooms or in the fume hoods?
If so what types of chemicals are these? | Y | N |

Physical Safety:

- | | | | |
|---|-------|------|-------|
| 1) Are chemicals stored above eye level? | Y | N | |
| 2) Are chemicals stored in an organized manner?
If organized, is it alphabetically or by chemical group? | Y | N | |
| 3) What kind of shelving is used?
If other, describe. | Metal | Wood | Other |
- What is its condition?

4) Is a water source present in the storeroom? Y N
If yes, where is it located in proximity to the chemicals?

5) Are any chemicals being stored on the floor? Y N
If so what are they?

6) Are any materials stored in refrigerators? Y N
If so is it explosion proof?

Chemical Safety:

1) Are Material Safety Data Sheets available for the chemicals? Y N

2) Are appropriate signs for hazardous chemical storage present? Y N

3) Are excessive amounts of chemicals stored on the shelves? Y N

4) Are chemicals being stored in cracked or leaking containers? Y N
If so what are they?

5) Are chemicals stored without caps on them? Y N
If so what are they?

6) Are unlabeled containers on the shelves? Y N
How many?

7) Is any elemental mercury present? Y N
If so, approximate amount:

8) Are mercury containing compounds present? Y N
If so, what are they?

9) Is picric acid present? Y N
If so, approximate amount:

10) Where are flammable chemicals stored?

11) Where are acids and bases stored?

11) Are the acids stored away from other chemicals in a separate cabinet?	Y	N
Is nitric acid present?	Y	N
Where is it stored?		

12) Are water-reactive substances present? (Such as sodium metal, acetic anhydride, etc.) If so, what is the condition of the container?	Y	N
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13) What, if any, organic solvents are present?

14) How are they stored?

15) Is Carbon Tetrachloride (CCl ₄) present? If so, approximate amount:	Y	N
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16) Is Carbon Disulfide (CS ₂) present? If so, approximate amount:	Y	N
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17) Are bottles of ether past the expiration date or do they appear to be very old?	Y	N
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18) Has a spill ever occurred? If so, what chemical was it?	Y	N
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19) Is there a spill response plan in place?	Y	N
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Any other comments or observations about the chemical storeroom:

Certification

This Safe Chemical Storage in Schools Health Consultation was prepared by the Illinois Department of Health under Cooperative Agreement with the Agency for Toxic Substances and Disease Registry. It is in accordance with approved methodology and procedures existing at the time the Health Consultation was initiated.

Technical Project Officer
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The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this Health Consultation and concurs with its findings.

Chief, SPS, SSAB, DHAC, ATSDR