Improving Management of Chemicals in Ohio Schools

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Objectives: You will learn

- To recognize problems with management of chemicals in schools
- About model solutions and innovative approaches
- About informational resources

NOTE : References on slides keyed to "Creating Healthy School Environments, Step by Step; Voluntary Guidelines for Ohio Schools"

Overview of Problem, Example 1

- Spring 2005
- Unknown employees accidentally disposed lab chemicals in regular trash
- Fire……
- Lab clean out and resulting fire and cleanup cost was ~$80,000

Overview of Problem, Example 2

- Winter, 2006
- Fire started in a high school lab following ignition of methanol vapors during a chemistry experiment
- Six students and a teacher were seriously injured

Similar incidents in NY (1/14) and CO (9/14)

Overview of Problem, Example 3

- Custodian entered a MS science storage area and became unconscious
- A teacher had spilled a solution of 37% formaldehyde in the room and failed to tell anyone
- Fortunately the custodian was rescued

Where Do You Find Chemicals?

- **Facilities**
  - Maintenance Areas
  - Custodial Storage
  - Lawn Care Sheds
- **Curriculum**
  - Science Labs
  - Vocational / Industrial Arts
  - Art Classes
- **Admin / Other**
  - Offices
  - Health Unit

Which Checklists Provide Primary Information about Chemical Management in these Areas?

• Maintenance Areas	Checklist 7
• Vocational Shops	Checklist 4
• Science Laboratories	Checklist 4
• Art Classrooms	Checklist 4
• Health Unit	Checklist 6
• Offices	Checklist 7

Why Be Concerned About Chemical Management?

- **Health hazards:** immediate & long-term, especially for children
- **Safety hazards:** stability of shelves, storage methods and incompatibility
- **Environmental harm:** groundwater, discharges to streams/rivers, air pollution
- **Hidden costs/liabilities:** lawsuits, fines, paperwork/fees, insurance premiums, etc.

General Chemical Safety

Section 3.16

Chemicals and cleaning products used in the classrooms are <u>inaccessible to all students</u> with the exception of chemicals used during classroom instruction.

Teachers and staff are discouraged from bringing in cleaning chemicals and air freshener products- <u>only school supplied products are used</u>.

Types of Chemicals Posing Hazards in Schools

- Extremely flammable
- Corrosive
- Poisonous
- Carcinogenic
- Anything stored improperly
- Reactive: explosive, heat generating, fume/vapor generating
- Unknowns
- Anything in a "compromised" container
- Anything stored in student-accessible location

Examples : Poor Storage Practices

- Water reactives near / under sink
- Heavy containers on high shelves
- Corrosives on (corroded) metal shelves
- Crystals forming on caps, bottle necks, threads
- Flammables stored on wood
- Alphabetical storage (incompatible?)
- Unlabeled / ”mystery” contents
- Chemicals next to food
- Unlocked, accessible storage areas

Why are there problems with chemical management in schools?

- Lack of awareness
- Lack of environmental management system
- Lack of “somebody in charge” (add-on duty)
- Discount warehouse store effect
- Spend it or lose it monies

Why are there chemical management problems in schools? (cont'd)

- Stockpiles from the 1950's – era of Sputnik and technology race
- Often little communication across Academic, Administrative, & Facilities departments
- Facilities often not built for handling chemicals (ventilation, storage problems)

Recognizing the Problem

Examples of what you shouldn’t be seeing in schools…

Incompatible Storage

<u>Imminent Risk</u> : Arsenic Trioxide + Sulfuric Acid

Stockpiling/Overpurchasing and Underestimating Hazards

See 4.29, 4.30

Stockpiling/Overpurchasing and Underestimating Hazards

Metal shelving deterioration

See 4.20

Poor Choice of Chemicals (high flammability material)

Excess Chemicals in Storage

Special Case : Mercury

See 4.6

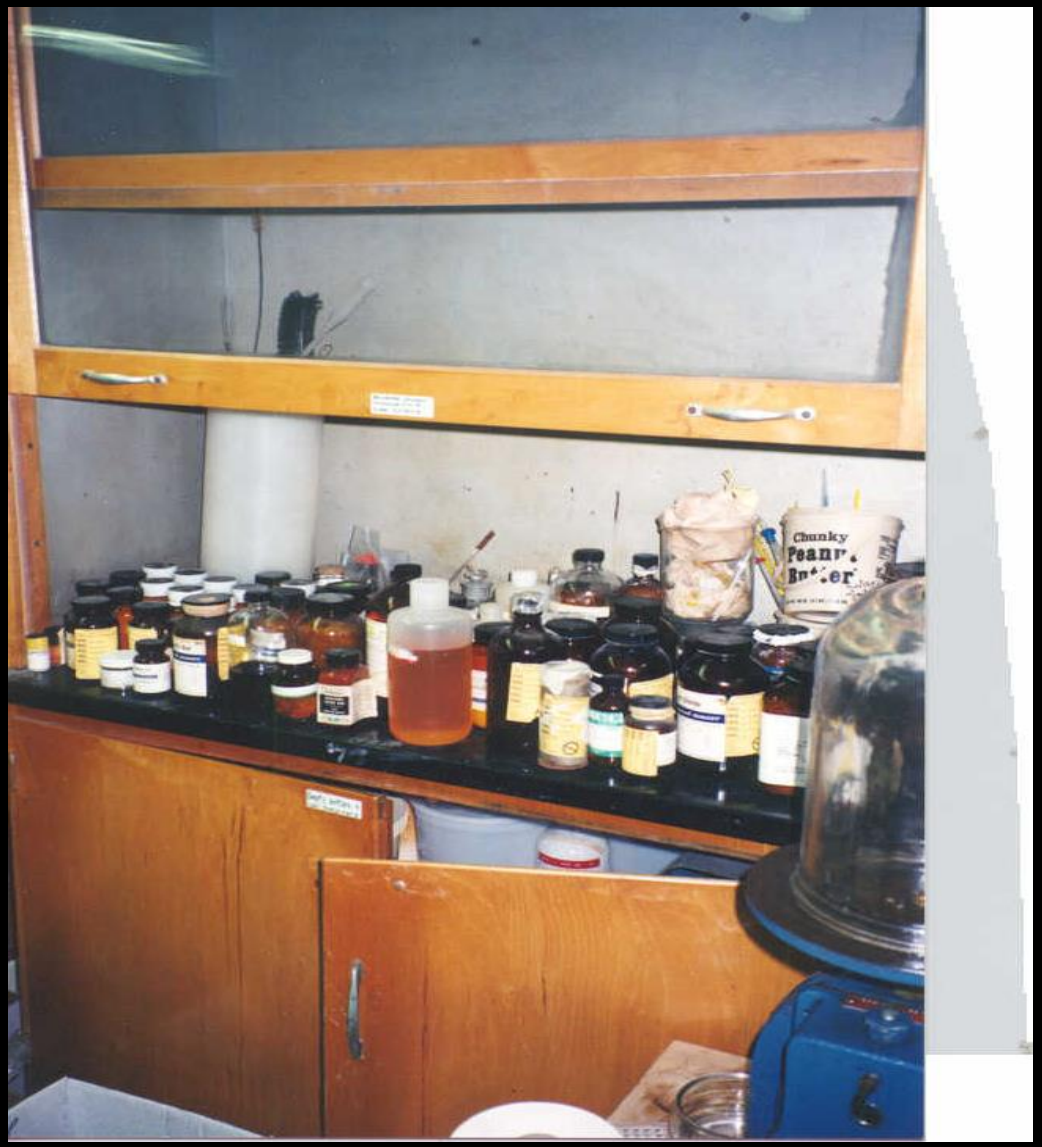
Special Case : Acutely Toxic

<u>Imminent Risk</u> **Nitric Acid + Cyanide**

Incompatible Chemical Storage

See 4.21

Dysfunctional Fume Hood



See 4.21

Nitric
“Sombrero”

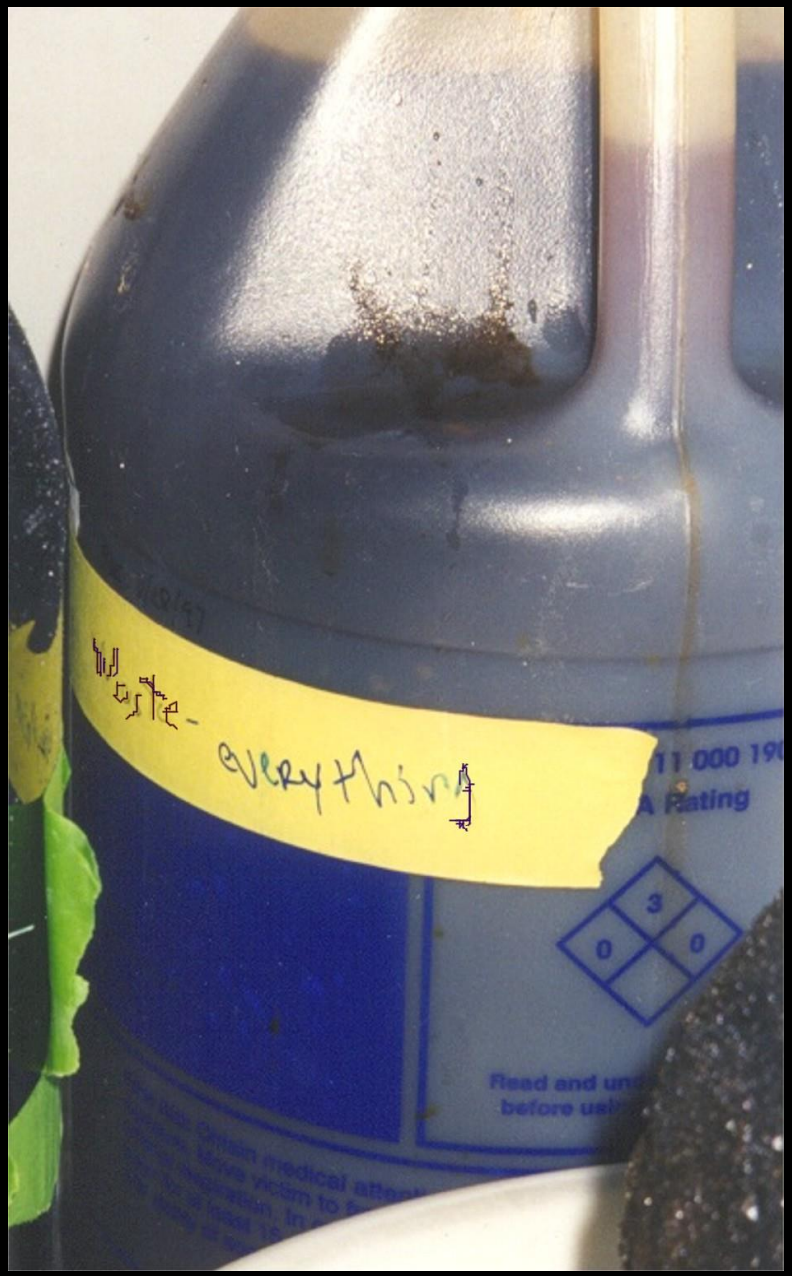
or…

Nitric
“Gnome”

Improper storage of water reactive

At least we know it’s organic….

What IS it????



Recognizing the Problem

- Re-familiarize yourself with
  - Chemical hazard classes
  - Labeling

- Assess “system” used for chemical storage
  - Chemically compatible families
  - Properly labeled
  - Flammables and corrosives separately in approved cabinets

See 4.10, 4.15, 4.18

Hazard Communication Standard

Pictograms and Hazards

Health Hazard	Flame	Exclamation Mark
▪ Carcinogen ▪ Mutagenicity ▪ Reproductive Toxicity ▪ Respiratory Sensitizer ▪ Target Organ Toxicity ▪ Aspiration Toxicity	▪ Flammables ▪ Pyrophorics ▪ Self-Heating ▪ Emits Flammable Gas ▪ Self-Reactives ▪ Organic Peroxides	▪ Irritant (skin and eye) ▪ Skin Sensitizer ▪ Acute Toxicity ▪ Narcotic Effects ▪ Respiratory Tract Irritant ▪ Hazardous to Ozone Layer (Non-Mandatory)
Gas Cylinder	**Corrosion**	**Exploding Bomb**
▪ Gases Under Pressure	▪ Skin Corrosion/Burns ▪ Eye Damage ▪ Corrosive to Metals	▪ Explosives ▪ Self-Reactives ▪ Organic Peroxides
Flame Over Circle	**Environment**	**Skull and Crossbones**
	(Non-Mandatory) 	
▪ Oxidizers	▪ Aquatic Toxicity	▪ Acute Toxicity (fatal or toxic)

NFPA Hazard Labels

Example: Shelf Storage Pattern

Compatibility Group	Group Name
Group A	Inorganic Acids, Salts
Group B	Inorganic Basics
Group C	Organics
Group D	Flammables, Combustibles
Group E	Inorganic Oxidizers
Group F	Organic Peroxides & Explosives
Group G	Reactives
Group H	Cyanides, sulfides
Group I	Highly Toxics, Carcinogens, Reproductive Toxins

Recognizing the Problem

- Ensure locations where chemicals are stored are locked / not accessible to students

- Be mindful of
  - Pass-throughs
  - Double-sided hoods
  - Creative locations for make-up tests

See 3.16, 4.12, 7.27

Recognizing the Problem

- **Ensure inventory list (X2) and disposal log present**
  - **Inventory should include name, quantity, date received, *where stored***

- **Inventory should be updated at least annually**
  - **Three dot method *(for 3 year purchase review)***
  - **Budget at least 3X cost of purchase for disposal of chemical**

See 4.13, 4.14

Recognizing the Problem

- **Ensure Safety Data Sheets (SDSs*) available and accessible**

*** Formerly known as**
Material Safety Data Sheets

See 4.11, 7.28

Fixing the Problem - Short Term Actions

- Work with schools to identify hazards
- Help them get rid of the Stockpiles
  - Prescreen
  - Inventory
  - Remove chemicals
    - Hazardous
    - Outdated
    - Excess quantities
    - No longer needed

Fixing the Problem - Short Term Actions

- For inventory remaining
  - Obtain and Maintain Safety Data Sheets
    - Keep 1 set in lab
    - Keep 1 set in office

No-cost or Low-cost Solutions including Personal Behaviors

- Smart Purchasing – <u>BULK isn't Best</u>
- Secondary Containment for Liquids
- Flammable & Acid Storage Cabinet
- Don't Store Alphabetically
- Have an Inventory X2 – Have SDS's
- Lips and Ridges
- Eye Wash Stations – Maintenance
- Signs / access

Fixing the Problem
Medium Term Actions

- Develop a Chemical Hygiene Plan (CHP)
  - Required by OSHA
  - Applicable to Laboratory employees
- Develop a Hazard Communication Plan
  - Required by OSHA
  - Applicable to all employees

See 8.1, 8.3

Chemical Hygiene Plan Elements

1. SOPs for hazardous chemicals used
2. Criteria to determine & implement control measures to reduce employee exposures
3. Means to insure lab hoods and other protective equipment perform properly
4. Periodic training
5. Requirements for “Prior Approval” for particular lab operations, procedures, or activities before implementation

Chemical Hygiene Plan Elements

6. Provisions for medical consultations and medical examinations as required

7. Roles/Responsibilities
   - Chemical Hygiene Officer
   - Chemical Hygiene Committee, if appropriate

8. Provisions for work with “Particularly Hazardous Substances”

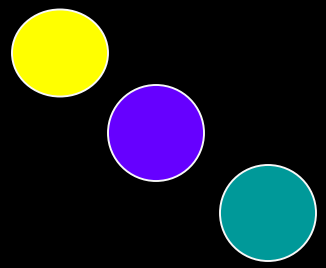
9. Review at least annually for effectiveness

Fixing the Problem : Longer Term Goals

- School / district develops a Chemical Management Plan (CMP)

Fixing the Problem : Longer Term Goals

- **Use safer chemicals & less too**
  - **Order min quantities, consistent with use**
  - **Try to keep only 1-2 year's worth stock**



- **Prohibit certain chemicals period**
  (for curriculum / instruction chemicals, consider whether hazard potential outweighs educational potential)

Selected Resources to Help ID Chemicals Whose Hazard Potential Outweighs Educational Potential

- School Chemistry Laboratory Safety Guide, Consumer Product Safety Commission, http://www.cpsc.gov/CPSCPUB/PUBS/NIOSH2007107.pdf

- King County, Seattle, WA, On-Line School Chemical Use Tool http://www.hazwastehelp.org/educators/schoolchemicallist.aspx

Longer Term Goals

- Explore / Order “safer” alternatives, packaging, dilutions, kits
  - Green chemistry
  - Micro-scale approaches (e.g. spot plates instead of test tubes)
- Centralize inventory/purchasing

Longer Term Goals

- Regularly budget for removals (Cradle to grave)
- Coordinate across “stovepipes”
- Address chemical issues in context with other environmental concerns
  - Poor IAQ
  - Pests /pesticide use
  - Mold
  - Deferral of maintenance
  - Funding
- Environmental Management Systems (EMS) - puts issues in context & addresses continuous improvement

Need To See "The Big Picture"

- Chemical management can affect
  - Safety
  - Health
  - Indoor Air Quality
- Chemical mismanagement can affect
  - Drinking Water Quality
  - Stormwater Quality
- Environmental stewardship

Why Be Involved?
Chemical Management Program

- **Protect** the health and safety of children and school personnel
- Demonstrate **community leadership**
- **Improve** your local **schools**
- **Protect** the environment
- **Prevent** fires and spills

"Non-Traditional" Partners

- **Chemical Suppliers**
  - Provide technical assistance
  - Provide chemical management services
- **Waste Handlers**
  - Offer cost-effective waste analysis and handling solutions
- **Fire, Police, and Emergency Response**
  - Learn about chemical risks in schools
  - Assist schools in developing emergency response plans
  - Establish effective communication
- **Colleges and Universities**
  - Help schools assess chemical cleanout, management and disposal issues
  - Offer courses and training in EHS for teachers and school district employees
- **Environment, Health, and Education Agencies**
  - Fund school chemical cleanout and prevention programs
  - Provide technical assistance to schools in conducting chemical inventories and cleanouts

Region 5 Center for Children's Environmental Health 866-967-7337, 312-864-5526

- Co-funded by EPA and ATSDR
- Serves as a Regional resource to:
  - evaluate, treat and prevent environmental illness in children
  - train pediatricians and others in environmental health issues
  - promote children's environmental health in communities

Satellite: Cincinnati Children's Hospital & Medical Center

OH: (513) 803-3688

Chemical Use & Management

Chemicals are used throughout schools from building maintenance to the classroom. High schools (including vocational schools) usually have larger inventories and more hazardous chemicals than middle and elementary schools, but it is important to recognize the presence of chemicals in these schools as well. Hazardous chemicals can be found in:

- science classes and labs (e.g., mercury),
- art classes (e.g., photography, painting, or ceramics),
- shop classes, and
- store rooms.

Thoughtful chemical purchasing and management contributes to a healthy school environment, so consider the possible health, safety and environmental implications before buying a particular chemical. Proper chemical use and

Toolkit for Safe Chemical Management

http://www.epa.gov/schools/chemicals/