

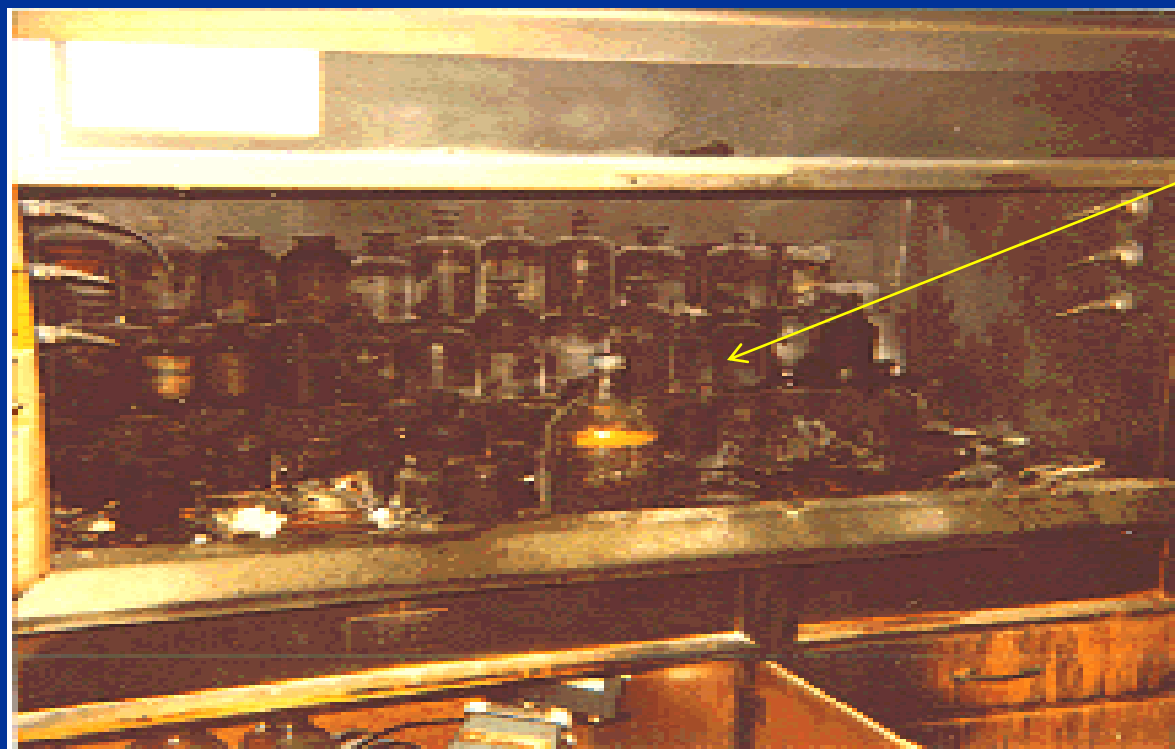
Keeping Your Lab Safe: A Guide to Maintaining a Safe and Healthy Laboratory

Presenter: Jeff Rogers

April, 2009

U. Kentucky Accident Figure 1

- View of the fume hood where the accident occurred. Notice the large number of chemicals involved in the fire and the broken/melted chemical containers. Notice the large number which *did not* shatter or break, but could have detonated while the fire was being extinguished.



Chemical Storage

U. Kentucky Accident Figure 2

- A second view of the fume hood involved in the fire. Notice the severe charring of the cabinetry.



U. Kentucky Accident Figure 3

- **Shrapnel damage.**

The hood involved in the fire is in the rear of the photo (notice the soot/char above the hood). The white material on this benchtop (3 hoods away) is the remains of the overhead fluorescent lights which were shattered by flying debris.



Good work habits and monthly lab inspections ensure everyone's health & safety.

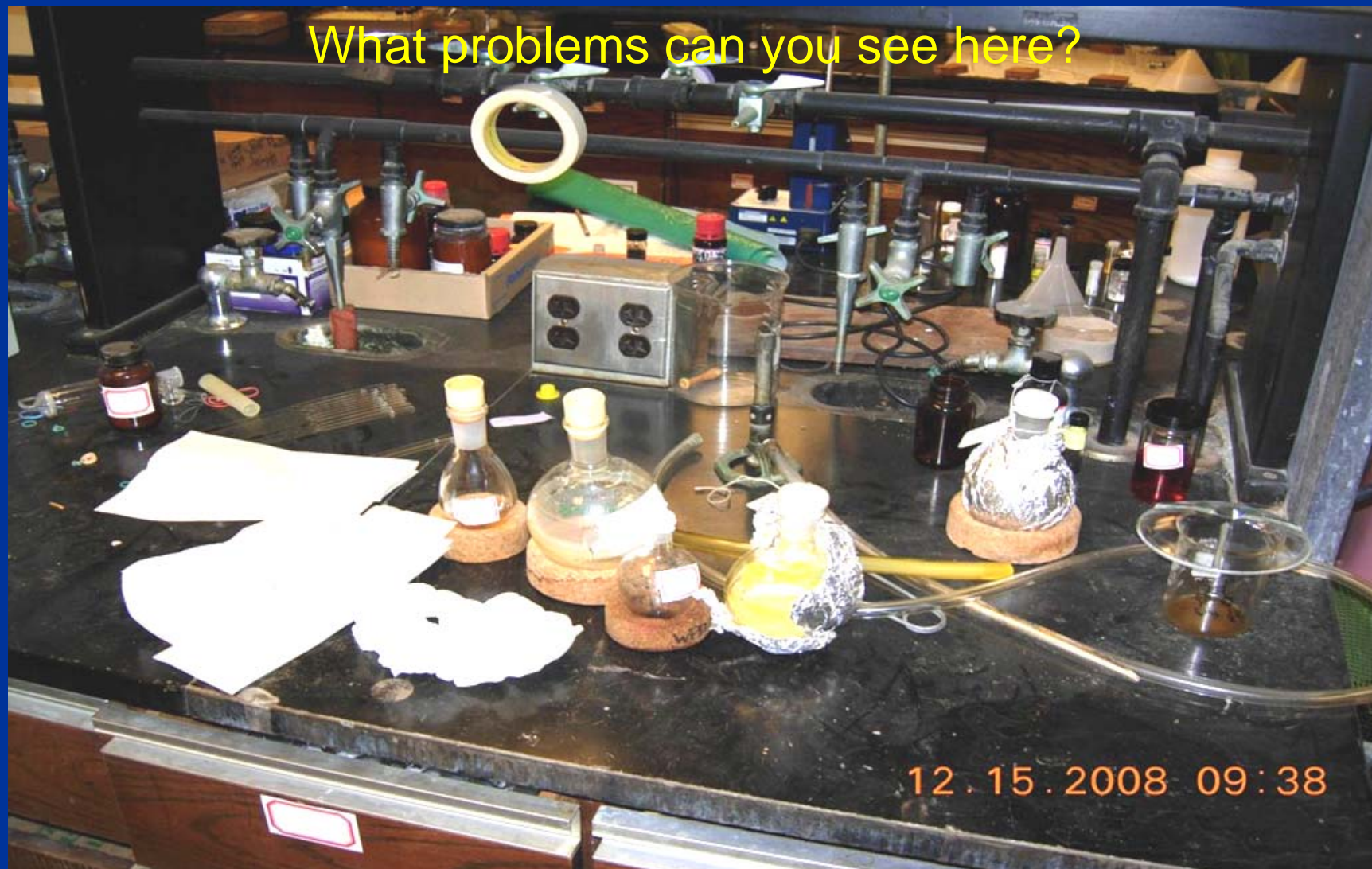


UVM's Laboratory Safety Program has 7 areas of concern:

1. Housekeeping
2. Chemical Labeling
3. Chemical Storage
4. Emergency preparedness
5. Training and information
6. Waste handling
7. Biosafety – *Not discussed today.*

1. Housekeeping

Goal: Maintaining a clean and organized work environment for everyone.



The importance of housekeeping is often underestimated.

- “chemical accidents stemming from improper storage make up **almost 25%** of all chemical accidents.” (Chemical Storage: Myths vs. reality. J Chem Health Safety, 15 (#2), 23-30 (2008))
- “At least **45.8% of the accidents** studied involved violation of the fundamental principles of housekeeping.” (Monitoring of Accidents and Risk Events in Industrial Plants: Krzysztof SWAT. Nofer Institute of Occupational Medicine)
- “The benefits of clutter control extend far beyond injury reduction. **Productivity, quality and morale** are also likely linked to working conditions.”
(Housekeeping & injury rate: A correlation study. Professional Safety, December 1, 1997, McCon, Patric E)

Daily habits that support effective housekeeping.

- Keep your work area uncluttered.
- Put away chemicals and equipment that are not in use.
- Clean up drips and spills as they happen.
- Wipe down your work area at the end of the day.

Keeping things clean and organized minimizes the potential for accidents and the consequences of accidents that do occur.



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Sink areas are notoriously difficult. This space has good organization.

Good management of daily production.



Remember that fume hoods and glove boxes count too...



2. Chemical Labeling

Our System of Communication

- Signage on cabinets
- Labels on Hazardous Chemicals: English name, hazard warnings, date received and responsible party
- High hazard and time sensitive materials should have date opened marked as well.



When you grab a container, grab a label.



Labeling Experimental Materials or Samples

Groups of samples can be stored together in a secondary container (providing the individual materials are compatible). The secondary container needs to be labeled with:

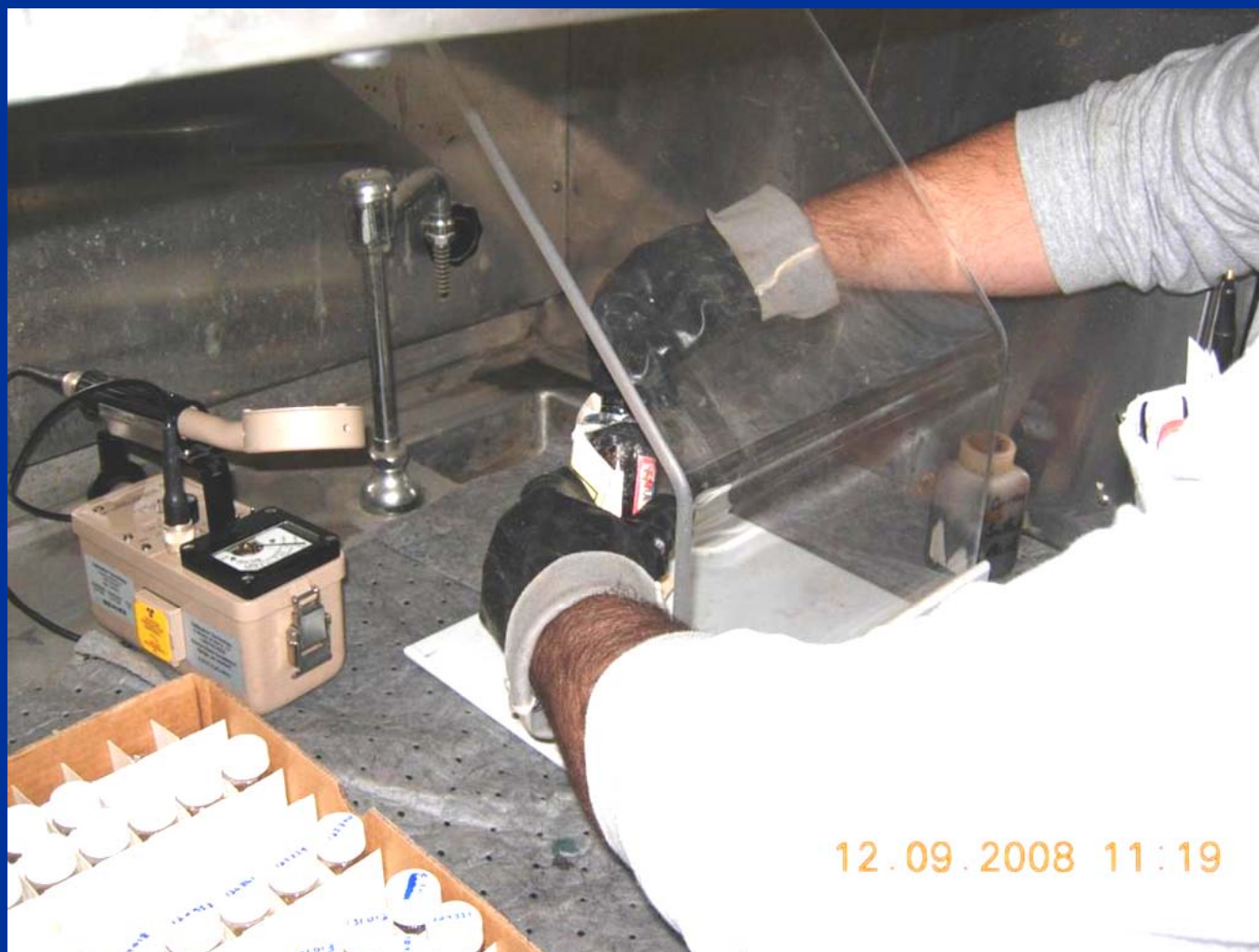
- Originator: the name and department of the person to contact for information about safe handling and disposal.
- Identification: include, at least, the laboratory notebook reference and primary components that are known to be hazardous
- Identify known hazards
- Date the material is made.



If it is not labeled it will
eventually become an unknown.



Unknown chemicals pose unpredictable hazards to those who handle the material, and higher costs for disposal.



3. Chemical Storage & Compatibility

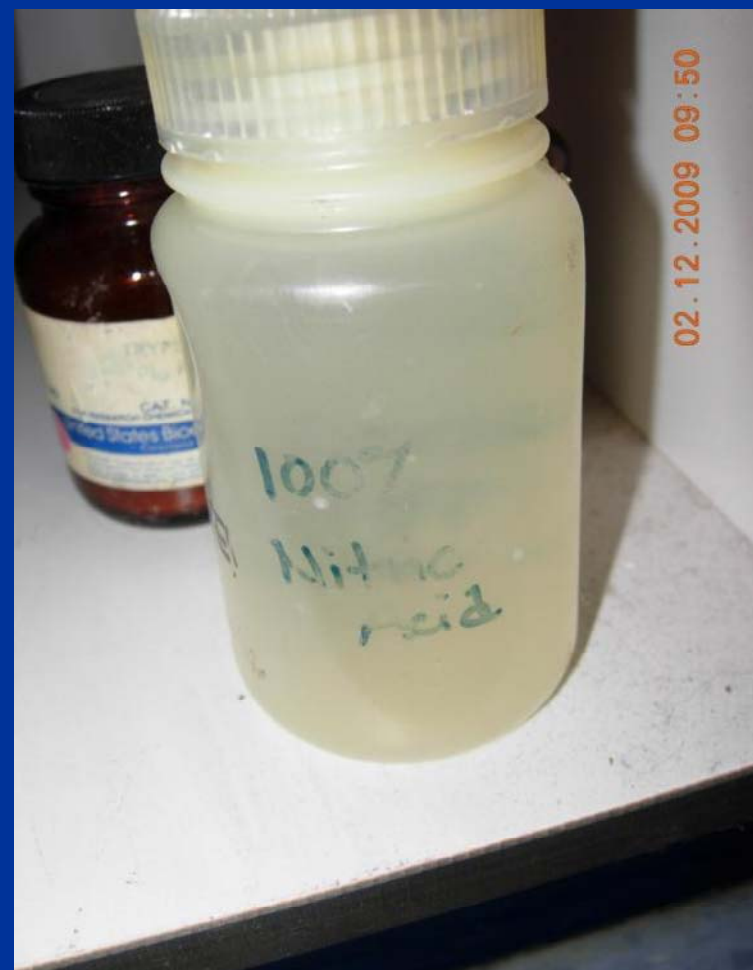
Birds of a Feather Should Flock Together.

The alphabet doesn't help, for example:

- Ammonium nitrate + acetic acid mixture = ignition, especially if acid is concentrated
- Aluminum metal + ammonium nitrate = potential explosion



Careless chemical storage can create high risk situations



Places to go for help with storage questions

- Chemical Compatibility Chart
- Product Labels & MSDS
- Chemical Use Planning form
- ES Website and FAQ's

Example Chart

Chemical Name	1) Hazard	2) pH Value	3) Inorganic / Organic	4) Solid / Liquid
<i>Ammonium Hydroxide</i>	<i>Corrosive</i>	<i>Base</i>	<i>Inorganic</i>	<i>Liquid</i>
<i>Sulfuric Acid</i>	<i>Corrosive</i>	<i>Acid</i>	<i>Inorganic</i>	<i>Liquid</i>
<i>Isopropanol</i>	<i>Flammable</i>	<i>Neutral</i>	<i>Organic</i>	<i>Liquid</i>
<i>Acetic Acid</i>	<i>Corrosive</i>	<i>Acid</i>	<i>Organic</i>	<i>Liquid</i>
<i>Nitric Acid</i>	<i>Corrosive, Oxidizer</i>	<i>Acid</i>	<i>Inorganic</i>	<i>Liquid</i>
<i>Ethyl Alcohol</i>	<i>Flammable</i>	<i>Neutral</i>	<i>Organic</i>	<i>Liquid</i>
<i>Formalin</i>	<i>Toxic</i>	<i>Neutral</i>	<i>Organic</i>	<i>Liquid</i>

Notice: In the above example only Isopropanol and Ethyl Alcohol can be stored together in the same secondary containment.

Storage Tidbits...



- All Hazardous Liquids need to be in a secondary container.
- Fume hoods are not storage spaces.
- Flammable liquids need to be stored in an approved cabinet, or a flammable materials refrigerator/freezer.
- Compressed gas cylinders need to be secured



More Chemical Storage Tidbits

- Solid oxidizers need to be in secondary containers.
 - e.g. Potassium permanganate
- Securely close all chemical containers when not in use.
- Keep chemicals off the floor.

Appliances also need attention...



Working together makes it safer for everyone.



And be on the look out for old unused chemicals...



These should be marked for disposal and picked up by Environmental Safety.

4. Emergency Preparedness

For when the unexpected happens.



Minimize an accident with:

- Personal Protective Equipment
- Eye wash and shower units flushed weekly
- Emergency Door Notification Sign
- Spill kit
- Keep stock chemicals and waste volumes at a minimum level



5. Training and Documentation

Because knowledge is?

- Key Elements:
 - Lab Safety Notebook
 - Self Inspection Cards
 - On line and Classroom Training



Where can you find additional information?



THE UNIVERSITY
OF VERMONT

directory

search

uvm a-z



ENVIRONMENTAL SAFETY

Your Lab Safety Partners

HOME

NEWS

SERVICES

MSDS

FORMS

CONTACT US

SEARCH

ENVIRONMENTAL SAFETY

TRAINING

CHEMICAL SAFETY

BIOSAFETY

ORDERING CHEMICALS

WASTE DISPOSAL

COMPLIANCE SUPPORT

CHANGING LABS

ABOUT US

EMERGENCY PLANNING

EMERGENCY-DIAL 911

ES Phone- 656-5400



*ES Mascot-
Louie Lizard*

Welcome to the UVM Environmental Safety Website!

The left side menu is the best way to access ALL our information, especially for people new to the site, while the top menu items ("Home", "News", etc.) are shortcuts to pages we think you'll want to visit regularly.

If there is anything you don't see on our new page, please let us know so we can add it or make it easier to find. Contact us at esf@uvm.edu with questions or comments.



Environmental Safety training

Our Laboratory Safety Priorities

- Safety
- Partnership
- Productivity
- Education

Laboratory Safety News from UVMLABSAFE

- [Biosafety in Microbiological and Biomedical Laboratories \(BMBL\) 5th Edition available online](#)
- [2007 Laboratory Safety Training schedule](#)
- [Food in labs](#)

The Environmental Safety staff use the UVMLABSAFE e-mail list to keep UVM laboratory workers up to date on important information for their health and safety. Traffic on this list is limited to 2 or 3 messages per month. We add people who take laboratory safety training to this list automatically.

6. Chemical Waste Handling

Environmental Stewardship & Personal Responsibility

Improper Sink / Trash Disposal / Evaporation =
Environmental Degradation



CENV0590



CENV0273



CENV0084



CENV0099



CENV0662



CENV0365

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Poorly Labeled / Tagged Waste =
Hazards for Handlers

Waste Container Selection

- Threaded screw caps only that match the container
- Caps should be secured
- Chemical container compatible w/ contents
- Chemical contents compatible with each other
- Containers free of gross contamination (watch for overfilling).

Laboratory Waste Accumulation Sticker

- Complete in full as soon as you begin accumulating waste.
- If chemicals are added to the container that are not listed, please add them.
 - Ex. Acetone used for rinsing
- Tag accumulation container for disposal after one year.

Laboratory Waste Accumulation Container

Contents (chemical names): PYRIDINE - 12
ETHYL ACETATE - 99 HEXANES - 70%
ETHYL ETHER - 20%

Date waste accumulation started: 7/15/06

Hazard class (circle all that apply)

☒ flammable ☐ corrosive ☐ oxidizer ☒ toxic ☐ non-hazardous

When this container is full, complete a UVM laboratory waste tag, and send the white copy of the tag to the Environmental Safety Facility to have the waste picked up. If you have any questions, call 656-5400.

Laboratory Waste Tag: Steps for Proper Completion

- Complete all sections
- Attach Only when ready for disposal
- Include chemical names with percentages
- Enter online see “Chemical Waste”
http://esf.uvm.edu/tags_entry/
- Leave all 4 copies intact

114037 Laboratory Waste	
Lab Supervisor/Generator SMITH	Building/Room COOK 555
Department CHEMISTRY	Phone Number 6-3321
Date 8/1/06	Physical State (circle) Solid <u>Liquid</u> Gas
Amount 2.5 LITERS	Waste Hazard Classification <u>Physical</u> <u>Health</u> Acute
Chemical	%
PYRIDINE	1
ETHYL ACETATE	9
ETHYL ETHER	20
HEXANES	70
uvm The University of Vermont Burlington, Vermont 05405	
Instructions on Back	

Where Does Your Waste Go?

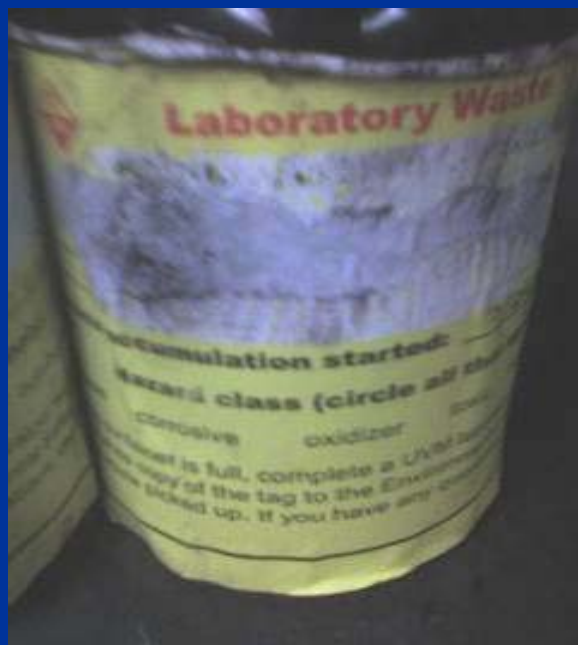
- At the ESF, 60 - 70% of the material that comes from campus is co-mingled into 55 gallon drums in the mixing room.
- Other materials are grouped by DOT requirements and sent out “as is.”



Hazardous Waste End Disposal...



So What is Wrong with These?

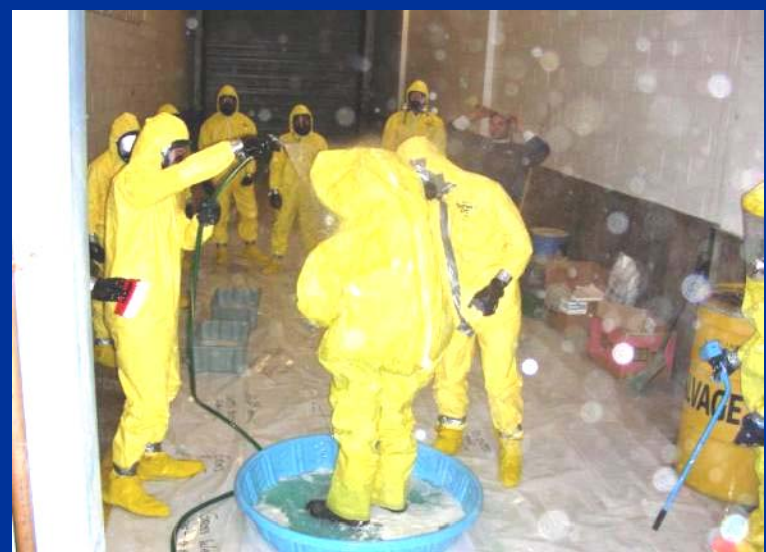


Remember - the keys to laboratory safety are:

1. Housekeeping
2. Chemical Labeling
3. Chemical Storage & Compatibility
4. Emergency Preparedness
5. Training & Documentation
6. Chemical Waste Handling

To Learn More:

- Take a Tour
 - ESF Facility
- Hazwoper Course
 - Spring 2010
- American Chemical Society
 - CHAS division
- National Research Council
 - “Prudent Practices in the Laboratory”



Remember to locate the card
set in your laboratory.

Thank you!!

*Environmental Safety –
Your Lab Safety Partners*

