

Risk Assessment and Crisis Management in A Research laboratory

Shailendra Singh*, PhD, Chemical Hygiene Officer,
University of Delaware, Newark, DE



&

Neelam Bharti, PhD, Assistant University Librarian
University of Florida, Gainesville, FL





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Agenda

- Background
- Why Risk & Crisis Management
- Available Resources for Risk Management
- Crisis/Accident Preparation
- Case Study



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Education:
PhD & MBA

Background

Research:
8 years at **UF**



Safety:
5 years at **UF** & **UD**



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Why Risk Assessment and Crisis Management ?

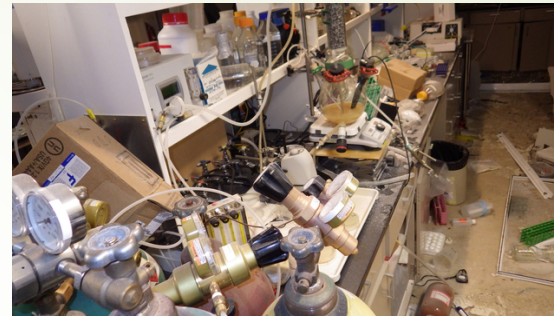


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Accidents in Academic Research Labs



Sheri Sangji Case, UCLA 2009



University of Hawaii lab explosion 2016

**Texas A&M
Q 2014**



**Texas A&M
LN2 2005**





Risk Assessment : 4 Steps

IDENTIFY the hazards and problems



ASSESS the risk of exposure to the hazard



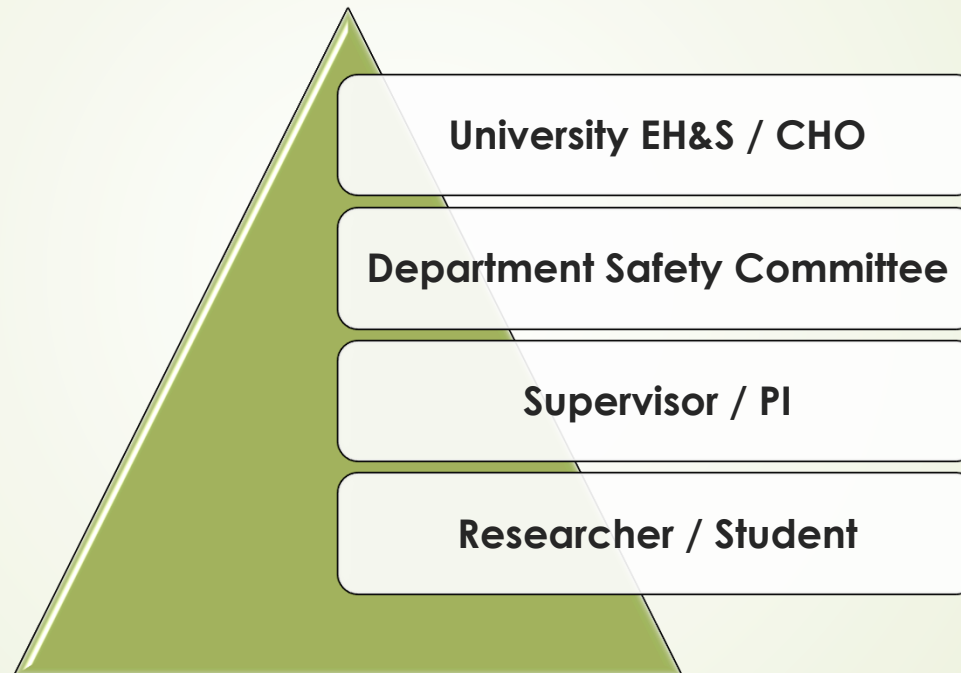
MANAGE the risk by Implementing the measures



PLAN for emergencies



Responsibilities





Resources available for Risk Assessment

- Safety Data Sheet (SDS)
- Job Hazard Analysis (JHA)
- Standard Operating Procedures (SOP)
- Laboratory Scale Risk Assessment
- Chemical Hygiene Plans
- Laboratory Safety Trainings

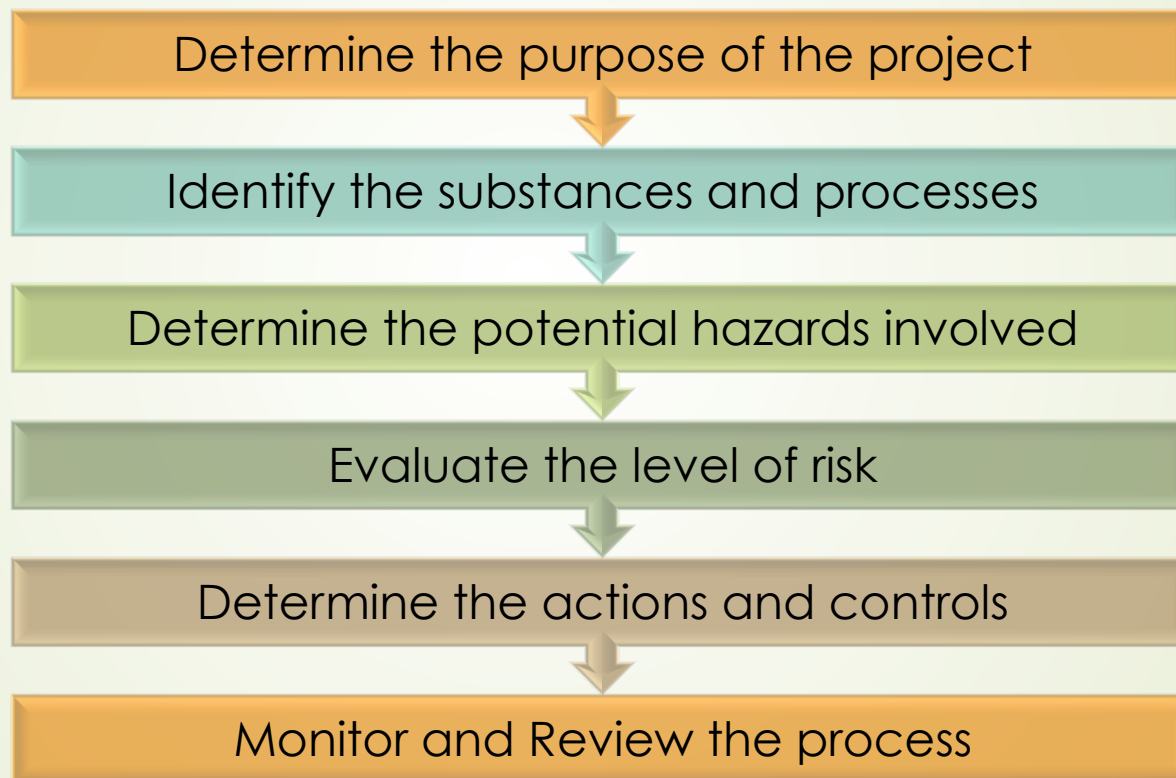


Safety Data Sheet (SDS)

- S1: Product & Company Identification
- S2: Hazard(s) identification** → Hazard classification, GHS rating, Pictogram, Signal word, Hazard & Precautionary statement
- S3: Composition/information on ingredients
- S4: First-aid measures
- S5: Fire-fighting measures
- S6: Accidental release measures
- S7: Handling and storage** → Safe handling & storage, Incompatibilities, specific use
- S8: Exposure controls/personal protection** → Exposure (Eng.) controls & PPE
- S9: Physical and chemical properties** → Basic Phy. & Chem. Properties
- S10: Stability and reactivity** → Reactivity, stability, condition to avoid, Incompatible materials etc.
- S11: Toxicological information** → LC50
- S12: Ecological information
- S13: Disposal considerations
- S14: Transport information
- S15: Regulatory information
- S16: Other information



Job Hazard Analysis:





Standard Operating Procedure (SOP)

- Purchase and storage
- Training requirements
- Personal Protective Equipment
- Safe work practices in the lab
- Personal decontamination and Exposure
- Spill control, Waste disposal, Emergency plan
- Detailed synopsis for the material use in the lab

Chemical Hygiene Plan (CHP)



UDEL CHP

- Ch. 1: Purpose, Scope and Responsibilities
- Ch. 2: General Safety Guidelines
- Ch. 3: Exposure Control Methods
- Ch. 4: Engineering Controls and Laboratory Ventilation Program
- Ch. 5: Employee Training Program
- Ch. 6: Operations Requiring Prior Approval
- Ch. 7: Highly Toxic, Carcinogen, Reproductive Toxin Permit Process
- Ch. 8: Medical Consultation
- Ch. 9: Emergency Response
- Ch. 10: Chemical waste Management Guidelines
- Ch. 11: Chemical Spills
- Ch. 12: Injury, Illness, Personal Contamination, Minor First Aid
- Ch. 13: Transporting Hazardous Materials
- Ch. 14: Decontamination, Close Out and Decommissioning Procedures
- Ch. 15: Special Precautions for Working with Compressed Gases.
- Ch. 16: Shipping Research Samples, Products and Chemicals



Resources for Lab Scale Risk Assessment

Examples

- Handling and Storage of Air-Sensitive Chemicals (Aldrich Technical Bulletins)
- Working with Hydrofluoric acid (Honeywell)
- Working with Compressed Gases (Safetygram)



Fig. 8 Filling syringe using nitrogen pressure



Fig. 9 Removing gas bubbles and returning excess reagent to the Sure/Seal bottle

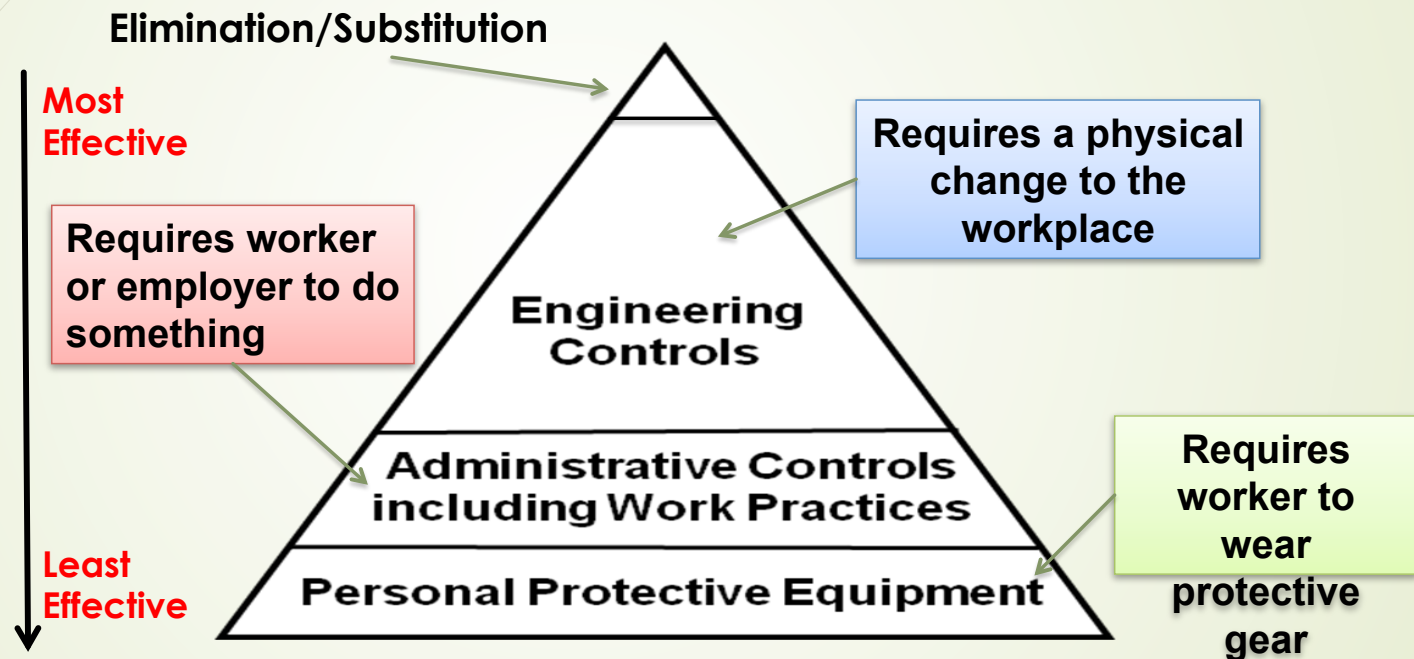




Laboratory Safety Trainings

Right-to-know	Chemical Hygiene Plan	Toxic Chemical Safety	Compressed Gas safety
Corrosive Chemical safety	Hazardous waste management	Biological Safety	Radiation Safety
Laser Safety	X-ray Safety	Bloodborne pathogen	Proper PPE

Protective Measures



Hierarchy of Hazard control is a system used in industry to minimize or eliminate exposure to hazards.



Crisis Management

Crisis Preparation

Emergency
Equipment

- First-aid kit
- Chemical spill kit
- Safety shower / eye wash station
- Fire extinguisher
- Emergency contact list & plan

Training

- Emergency procedure, gas cylinders
- Waste management etc.



Crisis Management

Crisis Scenario

Accident
Drills

- How to respond to various incidents; fire, explosion, chemical exposures, laser injuries, gas cylinder mishaps, and electrical
- Fire safety and extinguisher trainings
- Where to find spill control
- Location of emergency equipment
- Proper PPEs
- Medical help

Free online resources

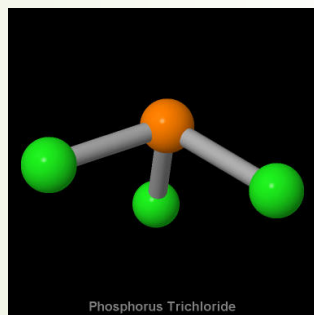
- ▶ (Material) Safety Data Sheet from the manufacturer website (ex. Aldrich)
<http://www.sigmaaldrich.com/safety-center.html>
- ▶ Chemical Hygiene Plan from Institutional Website
<http://www1.udel.edu/ehs/training/downloads/chemhygieneplan.pdf>
- ▶ OSHA lab and safety resources
<https://www.osha.gov/Publications/laboratory/OSHA3404laboratory-safety-guidance.pdf>
- ▶ ACS Chemical Safety resources
<http://dchas.org/chemical-safety-resources/>
- ▶ Lab worker resources from NIH
<http://www.ors.od.nih.gov/sr/dohs/Resources/lab/Pages/default.aspx>
- ▶ Chemical and Toxic resources, EPA
<https://www.epa.gov/learn-issues/chemicals-and-toxics-resources>



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Case 1

Use of PCl_3 and Grignard Reagents in the lab

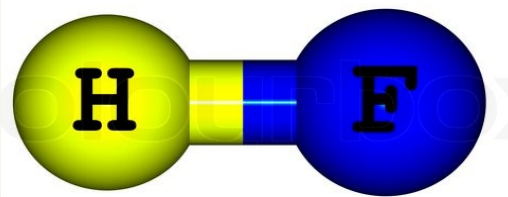


- Responsibility
- Review SOP
- SDS
- Detailed procedure
- Meet with PI / researcher
- Proper training
- Proper set-up
- Dry run
- Emergency

Case 2



Use of Hydrofluoric acid by a visiting fellow



- Training
- Review SOP
- SDS
- Detailed procedure
- Meet with researcher
- Dry run
- Meet with PI
- Proper set-up
- Emergency



Important Points to Remember

- Do a proper hazard assessment
- Review Safety data sheet (SDS)
- Develop a proper SOP
- Use available resources
- Attend necessary trainings
- Prepare for an emergency



SAFETY FIRST!

