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Campus Safety Health and
Environmental Management Association

Risk Assessment:
Working Safely in Labs

Contact Chapman University EH&S
with any questions on university-specific practices

SAFETY
FIRST

Objectives

- Define risk assessment
- Perform a risk assessment
- Evaluate data and determine acceptable risk

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Working Safely – Risk Assessment

- To work safely with chemicals, you have to identify the hazards and how to control them.
- Any experiment involving chemicals requires prior planning:
  - Helps to determine potential risks
  - Aids in selecting safe working practices
- This process is called Risk Assessment.

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Lab Risk Assessment

- A Lab Risk Assessment is nothing more than a careful examination of what in your lab or operation could cause harm to:
  - People in the immediate area
  - To the facility
  - To the environment

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What you need to know to get started:

- Knowledge of the materials being used and their properties
- Understanding the principles and requirements of the safety programs and procedures already in place
- Knowledge of the safety features of your facility (administrative and engineering controls, etc.)

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What you need to know to get started: *(Continued…)*

- Knowledge of the medical surveillance and medical response procedures for each job
- Knowledge of institutional requirements (including federal, state and local laws)

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Knowledge of Materials

- Possible routes of exposure specific for the materials being used, to include:
  - Ingestion, injection, inhalation, absorption
- Chemical hazards:
  - Carcinogen, teratogen, poison
- Physical hazards:
  - Explosive, flammable, corrosive

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Knowledge of Materials *(Continued…)*

- Hazard Controls required for the materials being used:
  - Engineering, Administrative, PPE
- Exposure Limits
  - Permissible Exposure Limits, Threshold Limit Values

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Risk Assessment: 5 Steps

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Step 1 – Identify Materials in Use

- Look for hazards in the process; In this case, identifying the chemicals to be used
- Consult references/sources for safety information, including:
  - Safety Data Sheet/Material Safety Data Sheets
  - Prudent Practices
  - Manufacturer
  - Safety Professionals

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Step 2 - Assess Hazards and Potential Harm

- Decide what harm exists from each hazard, both from the chemicals and from the conditions of their use
- Evaluate the properties of the materials themselves and under the conditions of use
  - Do the hazards change in different states or conditions?
- Evaluate possible routes of exposure under these conditions

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Step 3 – Evaluate Risk

- This step is generally the most involved
- Evaluate the risk, the existing precautions and existing safety requirements:
  - Acknowledge ‘zero risk’ is not possible
  - Many times existing programs or requirements will adequately address safety concerns, but these should be verified
- How do we evaluate risk?

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Consider the Worst Case Scenario

- What is the severity of the worst possible situation?
  - Death or permanent disability (catastrophic)
  - Long term illness or serious injury (major)
  - Medical attention or time lost from work (moderate)
  - First aid needed (minor)

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Consider the Worst Case Scenario *(Continued…)*

- How likely is it to happen?
  - Rare
  - Unlikely
  - Possible
  - Likely
  - Almost certain

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Risk Rating Matirx

	Likelihood				
Impact	**Rare**	**Unlikely**	**Possible**	**Likely**	**Almost certain**
Catastrophic	moderate	moderate	high	critical	critical
Major	low	moderate	moderate	high	critical
Moderate	low	moderate	moderate	moderate	high
Minor	very low	low	moderate	moderate	moderate
Insignificant	very low	very low	low	low	moderate

Identify 'Acceptable Risk'

- Define 'acceptable risk' – different things to different people/groups
- 'Acceptable risk' is an amount of risk that is accepted for an expected 'reward'
- GOAL: Reduce Risk, Maximize Benefit
  - Eliminate unnecessary exposure
- Striving to reach ALARA - As Low As Reasonably Achievable

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For Existing Procedures, Ask…

- Can you eliminate the hazard?
- Can you substitute something less hazardous?
- Can you change the way the task is done?
- Do you have or can you get Engineering Controls?
- Will you have to use PPE? Do you have it available? Are you requiring it?

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Existing Hazard Requirements

- Consider all existing requirements:
  - Lab Safety Plan
  - University Safety Plans
  - Local Laws, Codes, Standards
  - State Laws, Codes, Standards
  - Federal Laws, Codes, Standards
- Involve local safety professionals for thorough review.

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Additional Hazardous Influences

- Room ventilation
- Availability of containment equipment or PPE
- Severity of exposure consequences
- Nature of exposure
- Availability of medical intervention strategies

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Consider Persons at Special Risk

- Inexperienced workers
- Visitors
- Minors
- Women who are pregnant or breastfeeding
- Certain medical conditions
- People with mobility issues
- People with hearing or vision problems

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Step 4 – Document Findings

- Include signs and symptoms of exposure to materials
- Create emergency plans for the material hazards and train personnel on how to respond
- Use this to write Standard Operating Procedures
- The RA and the SOP will provide the content for lab specific training of personnel

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Step 5 - Review and Revise

- Review and Revise any time experiments, chemicals, or procedures change
- Review and Revise when personnel change
- Review and Revise when regulations or codes change
- Review and Revise when new hazards are discovered about chemicals, equipment or processes
- Review and Revise annually

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Example Risk Assessment

- Basic titration experiment – titrate NaOH and HCl to completion.

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(1) Identify Materials

- 6M HCl diluted to 0.1M
- 6M NaOH diluted to 0.1M

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(2) Assess Hazards and Potential Harm

- NaOH (Sodium Hydroxide)
  - Corrosive
  - Noncombustible Solid, but when in contact with water, may generate sufficient heat to ignite combustible materials
  - Strong Base
- HCl (Hydrochloric Acid)
  - Corrosive
  - Strong Acid
- Both require gloves, eye protection, ventilation

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(3) Evaluate Risk

- Identify places in the experiment where there could be splashes, spills, inhalation:
  - Mixing, dilution solutions
  - Preparing the buret
  - Carrying solutions around the room
  - Titration
- Gloves, safety glasses, lab coat and secondary containment should address these concerns

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(4) Document Findings

- This can be a separate write up or a completed form, showing which hazards were identified and how they were addressed

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(5) Review and Revise

- Basic procedure for titration may need to be updated to address different solutions or different concentrations.

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Summary

- Risk Assessments are required for all processes, to determine what, if any, hazards are present and how to control them.

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Summary *(Continued…)*

- Risk Assessment is a five step process:
  - Identify materials in use
  - Assess the hazard and possible harm
  - Evaluate the risk versus benefit from the hazard or harm in its worst case
  - Document the assessment, the needed controls, and the evaluation
  - Review and revise regularly and when things change

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