CAUT Health and Safety Fact Sheet

Laboratory Safety

ISSUE 10

"Ensuring that laboratories are safe places to work is both an ethical and a legislated requirement," says Gene Shematek, Occupational Health and Safety Consultant to the Canadian Society for Medical Laboratory Science (CSMLS).

In a paper written for CSMLS's Safety Web, he goes on to say "*Safety has sometimes taken the backseat to productivity.…This has increased the potential for incidents, as the inclination to take shortcuts is far too tempting,*" and that "*…experience has proven that we are sometimes too close to the work to objectively understand the risks.*" [1]

These comments underscore the importance for fresh evaluation of work practices in university laboratories, not only for safety purposes for academic staff members, but also for impeccable teaching practices for students to emulate.

CAUT academic members work in varied and complex lab situations, so much so that this fact sheet will only address an overview of several common types of lab scenarios, with national and international suggested best safety practices.

It is imperative that everyone working in or around a laboratory ensure that they are knowledgeable about the safety hazards and practices of the work they are doing, and the pertinent legislation that applies to it.

Joint Health and Safety Committees are a good tool and resource to assist with safety audits and sound safety practices, and should be consulted when concerns or questions arise.

Types of Hazards

Accidents

- Entanglement of clothes, hair, fingers and arms in rotating and other moving equipment such as centrifuges, mixers, blenders, etc.
- "Freeze burns" from contact with very cold surfaces or fluids like liquefied gases
- Electrocution and electric shock
- Acute poisoning by poisonous gases, liquids and solids
- Explosion of elevated-pressure equipment and implosion of vacuum equipment
- Burns and scalds from flames, hot surfaces, hot gases and liquids
- Chemical burns from corrosive fluids
- Flying particles from bursting centrifuges and autoclaves

Do you know ...

- Where emergency exits are?
- Where emergency numbers are posted?
- Who to contact?
- Poison Control Centre numbers?
- Where fire extinguishers are?
- Evacuation procedures?
- First Aid and CPR?
- Where emergency showers and eyewash stations are?
- How to read WHMIS symbols?[2]
- Where the MSDS sheets are?

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Published by the

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CAUT

MARCH 2006

- Damage to eyes from laser beams, splashes of chemicals, corrosive gases and flying particles
- Falls from ladders and elevated platforms
- Falls of heavy objects
- Slips and falls on wet, uneven or damaged floors

Physical

- Ionizing radiation
- Non-ionizing radiation

Chemical

- Corrosives, irritants, toxins, neurotoxins
- Substances that are asphyxiating, allergenic, carcinogenic, mutagenic, teratogenic, radioactive, etc.

Biological

- Viruses, bacteria, fungi, parasites, etc., by way of inhalation, ingestion, skin or eye contact, or transmitted by animal bites or stings, accidental injection, etc.

Ergonomic, psychosocial and organizational

- Musculoskeletal effects from routine work in a fixed position
- Eye strain from optical and electron microscopes, telescopic manipulators, computers, working in dark or semi-dark rooms
- Psychological effect of "getting accustomed" to routinely encountered hazards with the resulting loss of alertness
- Nuisance orders from chemicals and experimental animals
- Unusual working schedules required by the continuity of experiments or the need to tend to animals
- Addiction to drugs, due to easy availability of substances

The Chemical Institute of Canada recommends protocols for issues such as preparation, space and personal management, working alone, training, evacuation, fire prevention, unattended experiments and closing and exiting the laboratory. Their book, "*Laboratory Health and Safety Guidelines*"[4], details some daily housekeeping protocols, such as:

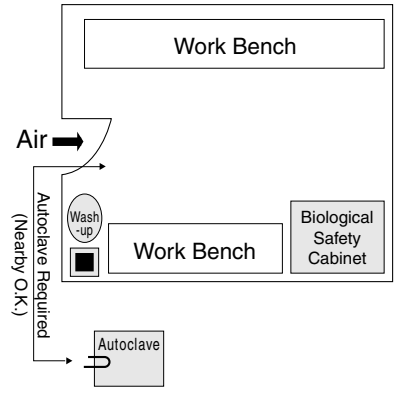
> *Maintain exemplary cleanliness in the entire laboratory. Avoid any clutter.*

- The work bench must be cleaned, decontaminated, and dusted every day.
- Insist that all wear protective clothing in the laboratory. This clothing should not be worn outside the immediate work area.
- Urge everyone to wash their hands frequently to prevent infection.
- Avoid touching your face with your hands while working.
- Cover any skin lesion with a bandage.
- Every contaminated surface must be covered immediately with an approved disinfectant.

A list of *Permissible Exposure Values for Gases, Dusts, Fumes, Vapours or Mists in the Workplace Environment* can be found in the CIC publication.

Sample Spill Control Kit [3]

- Personal Protective Equipment
- Clean-up Equipment
- Clean-up Agents
- Splash goggles
- Bucket/mop/floor sponge
- 5 kg sodium bicarbonate to neutralize common acids
- Face shield
- Spill control pillows
- Lab coats/overalls
- Plastic dust pan
- 2 kg sodium dihydrogen phosphate to neutralize common bases
- Gloves
- Heavy plastic garbage bags
- Rubber boots or safety shoes
- Impermeable containers
- Respirator – work appropriate
- 10 kg mix of soda ash, kitty litter & sand (1:1:1) for acids, solvents and other materials
- Chemical resistant apron



Basic Level 2 [5]

Shaded components indicate minimum physical safety requirements

Additional safety equipment may be required according to risk

Training Protocols

Laboratory training protocols are essential for new academic staff, lab techs and students. Annual protocol reviews are a must as a reminder of good safety practices, and undo bad habits.

General and sector-specific policies will be required to ensure all health and safety requirements are captured. Aspects to include:

- Developed in conjunction with the Joint Health and Safety Committee
- Mandatory
- A designated person to implement training
- A time frame for training, which begins upon commencement of employment
- A new worker safety orientation specific to the work position
- WHMIS – completed prior to commencing work in the laboratory
- Laboratory safety and includes an annual update
- Hazardous Materials Waste Management
- Meets any and all Occupational Health and Safety Legislative and Regulatory requirements
- Maintain and update training records
- Ensures the training needs of students

Safety Audit Checklists

Lab safety audits are a critical and core element to safety in any lab setting. They must be an ongoing process, which augments regular safety inspections. This skill should be honed so that it becomes part of the day-to-day work ethic. Poor attention to proper safety techniques can endanger anyone in the vicinity of lab work.

Safety audits should be specifically developed for each individual laboratory. Here are three common laboratory scenarios, with examples:

Chemical – Is the laboratory free of fire hazards? Are chemicals segregated according to incompatibility? Are storage locations of segregated chemicals identified?

Radioactive – Is the lab licensed by the Canadian Nuclear Safety Commission? Is someone designated as a Radiation Safety Officer (RSO)? Are appropriate hazard symbols posted near lab entrances and on lab equipment?

Biological – Are there emergency response plans for the handling of spills of infectious materials and staff/student contamination? Is protective clothing and equipment available? Are HEPA filters used in vacuum lines?

Safety audit checklists need to be thorough enough to capture every possible hazard, and reference resource information for assessing and prevention purposes. Work with your JHSC and any appropriate regulatory bodies to develop a comprehensive audit for your worksite and your specific work area.

Ensure that these audits are carried out on a regular basis, and posted.

> *Handle unknowns as if they are hazardous. Identify everything!*

Basic Safety Measures[6]

1. Wear safety shoes with non-skid soles
2. Do not wear hair loose or clothing with loose ends
3. Wear heat-insulated or other appropriate gloves
4. Apply chemical safety rules when handling or working with chemicals; read MSDS and consult appropriate resources for specific chemicals
5. Install a metal guard over and around vacuum bell jars
6. Wear appropriate protective clothing and eye protection when required
7. Apply biohazard safety rules when handling or working with biological substances, agents or laboratory animals
8. Never use mouth pipetting
9. Learn and use safe lifting and moving techniques, and use mechanical aids
10. Do not take food or drink in the lab or its storage areas
11. Never work alone when substances or situations put you at risk

Closing and Exiting a Lab

- If equipment must stay on, a response plan should be available to supervisory and security staff
- Turn off all other apparatus, electricity, water, and main gas cylinder valves
- Close fume hood sashes
- Close laboratory doors

Storage and Handling

- Cabinets should be affixed to walls or ceilings. Shelves fitted with a minimum 1 cm edge to prevent bottles falling. Construction should be of corrosion-resistant materials.
- Large bottles should be stored on bottom shelves.
- Never store incompatible substances together or near each other.
- Flammable solvents should be stored in safety containers, which are available commercially.
- Carry large bottles containing acids or corrosives in a rubber bucket.
- Inventories of chemicals should be posted outside the area, so that in the event of a fire, firefighters know the potential risks.
- Never exceed fire code combustible storage limits.[7]

Addressing Hazard Controls

It is vital that a proper safety audit be conducted on an annual basis to ensure that laboratory hazards and their safety controls are kept up-to-date. Controls are typically identified in three main components:

Engineering: substitution, hazard isolation, guarding, ventilation, containment equipment and facility design

Administrative: hazard or process substitution, work scheduling, purchasing, training, inspections, occupational health and hygiene programs, accident reporting, analysis, and follow-up, and policies

Personal & Procedural: lock-out/tag-out, pre-work checklists, protective clothing, and personal protective equipment (PPE) such as eye and face protection, respirators, etc.

Post-SARS

General laboratory practices have not changed in the post-SARS era. As long as they are strictly adhered to, they provide the appropriate safety mechanisms. There are, however, specific new guidelines for work in SARS and Avian Flu. Please consult Health Canada and provincial guidelines.

Resources

Canadian Centre for Occupational Health and Safety (CCOHS)
www.ccohs.ca

Health Canada:
Laboratory BioSafety Guidelines, 3rd Edition 2004; WHMIS
www.hc-sc.gc.ca

Canadian Association of Poison Control Centres
www.capcc.com

Amicus Health, *Safety and Working Environment: Working Safely in the Lab?*
www.amicustheunion.org

The Chemical Institute of Canada: *Laboratory Health and Safety Guidelines, 4th Edition*
www.cheminst.ca

Canadian Society for Medical Laboratory Science (CSMLS)
www.csmls.org

International Labour Organization Occupational Health and Safety Information Centre
www.ilo.org

University of British Columbia
www.ubc.ca

University of Calgary
www.ucalgary.ca

University of Manitoba
www.umanitoba.ca

McGill University
www.mcgill.ca/eso

University of Ottawa
www.uottawa.ca

University of Western Ontario
www.uwo.ca

Endnotes

1 CSMLS, Safety Web, Hazard Identification and Risk Assessment Part One

2 University of Western Ontario, The Warning Sign Booklet

3 Adapted, Laboratory Health and Safety Manual for General Laboratory Practices, University of Western Ontario, Revised October 2003

4 Laboratory Health and Safety Guidelines, 4th Edition, The Chemical Institute of Canada

5 Biosafety Guide, University of Manitoba, March 2005

6 Adapted from the International Hazard Datasheets, International Labour Organization Occupational Health and Safety Information Centre

7 Adapted from Laboratory Health and Safety Guidelines, 4th Edition, The Chemical Institute of Canada