Chapter 6: Medical Program and Exposure Control

Measures

Employee Chemical Exposure Determination
At UIC, chemical exposures are scientifically tracked and monitored through industrial hygiene practices. Monitoring assesses the effectiveness of procedures and equipment used to prevent chemical exposures. A workplace-monitoring program is conducted by EHSO to provide objective data on potential hazardous chemical exposures or the degree of contamination in the laboratory area.

When a researcher reasonably anticipates that an experiment could result in personal exposure levels that exceed relevant health standards, an industrial hygiene evaluation should be requested. In cases where employees exhibit signs or symptoms of overexposure to a chemical, the lab group should contact EHSO immediately at health-safety@uic.edu. If an individual is exhibiting signs and symptoms of a chemical exposure, the person should report to the UIC Hospital Emergency Department (ED). Otherwise, report to University Health Services at 835 S. Wolcott Ave.

Typical industrial hygiene monitoring requests range are the following: arsenic, asbestos, carbon monoxide, combustion products, lead, mercury, nitrogen oxides, organic vapors, volatile organic solvents, humidity, noise, radio frequency energy, and molds.

Right to Industrial Hygiene and Medical Records

- Employees and their representatives have the right to access occupational health exposure and medical records.
- Exposure records include: area and personal sampling data, Safety Data Sheets, and industrial hygiene analyses.
- Medical records include: physical examinations, biological monitoring, diagnoses, x-ray and laboratory reports.
- Information requests shall be in writing to the EHSO, M/C 645 or University Health Service, M/C 684.
- A copy of the OSHA Standard (29 CFR 1910.1200) pertaining to employee access to Exposure and Medical Records is also available through EHSO or the OSHA website, http://www.osha.gov.

Medical Evaluation

Contact University Health Services for a medical evaluation when any of the following circumstances arise while working with hazardous chemicals.

- Experience signs or symptoms associated with either a chemical exposure or significant changes in health.
- Routine EHSO monitoring reveals an exposure above the PEL or action level.
• A spill, leak, explosion or another incident occurs where an acute exposure may be likely.

• If you plan to work with OSHA regulated substances or activities, such as highly toxic carcinogens and reproductive toxins, please contact EHSO.

**Medical examinations and consultations:** Typically performed by a medical professional under a physician's direct supervision. Such services are provided without cost to the employee, without loss of pay, at the University Health Services. The employee must provide the physician with the following required information:

- Identity and characteristics of the chemicals they may have been exposed (e.g., MSDS or other reference material).
- Conditions under which there is a potential for exposure to occur.
- Description of the signs and symptoms of exposure, if any.

**General Guidelines for Injuries**

When severely injured on campus, seek medical assistance at UIC Hospital Emergency Department, 1740 W. Taylor St. The following work day report to the University Health Services (6-7420), for a follow-up visit.

- If this is a chemical injury bring the SDS. Enlist another lab employee to help so you can focus on getting medical assistance.
- When the trauma is life threatening or an ambulance is required, call UIC Police at 5-5555 to arrange for emergency assistance and transportation to the UI Health Systems Emergency Room at 1740 W. Taylor St. Chicago, IL.
- All campus injuries must be promptly reported to the lab supervisor.
- The supervisor must complete the “Supervisor’s First Report of Injury Form” and notify University Health Services for guidance on the accident.

**Chemicals Splashed in the Eyes**

- Take victim immediately to the nearest eyewash station.
- Flush the eyes for at least 15 minutes.
- Hold eyelids open while victim rolls the eyeballs around for optimum flushing.
- Immediately after, seek medical attention during normal business hours at University Health Services and if severely injured go to UIC Hospital Emergency Department.

**Ingestion of Chemicals**

- Call the Poison Control Hotline at 1-800-222-1222.
- Seek immediate medical attention at UI Health Systems Emergency Room.
- Do not induce vomiting unless specifically instructed to do so.

**Chemicals splashed on Skin over a Large Part of the Body**

- Help the injured person to the safety shower, and flush for at least 15 minutes.
- Remove all layers of contaminated clothing, shoes and jewelry.
- If leather articles have been contaminated with a strong acid, discard.
- If clothing or jewelry adheres to a chemically burned area of skin, do not pull it away.
- Seek medical attention at UIH Emergency Services immediately.
Inhalation of Chemical Vapors or Smoke

- Relocate to an area of fresh uncontaminated air.
- Remember: hot gases rise, but most chemical vapors are heavier than air so the vapor could be near the ground level.
- Seek medical attention at UI Health Systems Emergency Room.

Industrial Hygiene Monitoring

Exposure monitoring:
All monitoring is performed under the supervision of EHSO by an Industrial Hygienist or Occupational Safety Specialist.

Initial monitoring: Shall be performed for any substance regulated by a standard that requires monitoring if there is a reason to believe that the exposure levels routinely exceed the action level or the PEL.

Periodic monitoring: If the initial monitoring results are over the action level or PEL, a routine monitoring program shall be set up. In the meantime, measures must be taken to decrease or eliminate the exposure level.

Termination of monitoring: Monitoring might be terminated when the exposure level is initially found to be below the action level or if two subsequently monitoring results are below the action level.

Notification of monitoring results: The employee shall receive, in writing, the monitoring results within 15 working days after the University receives the results. Monitoring samples are analyzed by independent laboratories approved using OSHA and NIOSH-approved analytical methods.

Definitions for Industrial Hygiene Exposure Thresholds:

OSHA Permissible Exposure Limits (PEL's) are regulatory limits on the amount or concentration of a substance in the air that is safe for an eight-hour day. Federal and State regulations enforce PELs. OSHA PELs are based on an 8-hour time-weighted average (TWA) exposure.

Threshold Limit Values (TLV's) are the recommended airborne concentrations of chemical substances representing conditions under which it is believed that nearly all workers may repeatedly be exposed, day after day, over a working lifetime, without adverse effects.

TLV-Time Weighted Average (TWA) is the concentration for a conventional 8-hour workday, 40-hour workweek, to which it is believed nearly all workers may repeatedly be exposed, day after day, for a working lifetime without adverse effects.

TLV-Ceiling (C) is the concentration that should not be exceeded during any part of the working exposure.
Short Term Exposure Limits (STEL's) are the level an employee can be exposed to over 15-30 minutes during a single work shift. Situations when a personal exposure level may exceed a short-term limit: Performing repetitive work with significant quantities of easily volatilized chemicals, a chemical spill, or performing work without the proper engineering controls (e.g. laboratory fume hood).

Signs and Symptoms of Overexposure to Hazardous Chemicals

Certain signs and symptoms may also be associated with conditions not even related to contact with chemicals. Thus, the presence of a given sign or symptom need not indicate overexposure to a chemical. Conversely, the absence of a particular sign or symptom may not be meaningful since individuals react differently to chemical exposures. An accurate diagnosis must be made by trained medical personnel.

- Consult the SDS for signs and symptoms of overexposure before working with a compound.
- Any deviation from an individual's normal state of health, especially if an employee suspects or knows of chemical overexposure, must be reported immediately to a supervisor and attending physician.

Some examples of scenarios, which can result in overexposure to hazardous chemicals, are:

- Not wearing gloves when continually handling carcinogens
- Ingesting toxic chemicals on a regular basis when pouring liquids on the open lab bench
- Working with hazardous solvents inside a non-working fume hood

Determinants of Toxic Effects:

Route of Exposure:
In occupational settings, the major exposure routes of concern are inhalation, ingestion, injection and skin/eye contact. Although the skin may be affected by contact, it does provide a somewhat effective barrier against many toxic chemicals, particularly those that are water-soluble. A rule of thumb: the greater the fat solubility of a chemical, the greater the possibility that the chemical will be absorbed through the layers of the skin and reach the bloodstream. Contact of the eyes with chemicals is of particular concern because the eyes are so sensitive to irritants and corrosives.

Frequency and Duration of Exposure:
The frequency and length of exposure to toxic chemicals play a major role in the ensuing toxic effects. For many chemicals, the adverse health effects associated with a single exposure are different from those for repeated exposures. For example, a single exposure to a high concentration of benzene may cause central nervous system depression, while many repeated low-level exposures may cause leukemia. Decreasing the duration of exposure and increasing the time between exposures may reduce toxicity because of the ability of the body to detoxify and discharge foreign substances. When the frequency or duration of exposure is too high, these protective mechanisms may be overwhelmed. Length of
exposure is also important for substances such as corrosives, where the severity of the injury is a function of the time of contact.

**Magnitude of Exposure:**
Exposure magnitude is determined by the duration and intensity of exposure. For inhalation exposures, the intensity is measured by the concentration of the toxic substances present in the air (e.g., milligrams per cubic meter in air). For skin contact, the intensity is determined by the concentration of the substance in solution (e.g., parts per million (ppm) in water). Exposure magnitude is the main determinant of toxic responses, which form a spectrum ranging from no detectable effects, through perceptible injury to death.

**Target Organs:**

**Skin:**
Toxic skin response reactions may appear as irritation or allergic reactions.

**Eyes:**
Chemical contact of the eye is severe because of its extreme sensitivity to almost all chemicals. Most substances cause irritation and pain when they come in contact with the eye. A considerable number of substances are capable of causing damage to the cornea and loss of vision.

**Liver:**
Chemicals that cause liver injury are called hepatotoxins. The liver is a common target organ because many chemicals are metabolized or chemically converted by it. Some forms of liver injury have been found to be reversible, while others are permanent. Chemicals causing liver injury include solvents, carbon tetrachloride, chloroform, nitrosamines, and beryllium.

**Kidney:**
Chemicals causing kidney injury are called nephrotoxins. The kidney is a target organ because it provides the major route of excretion for many chemicals or their metabolic products. The kidney has a very high blood flow, and as a result, any chemical in the blood will be delivered in large amounts to this organ. Toxic chemicals may also be concentrated in the kidney. Most heavy metals (mercury, chromium, lead, cadmium, and others) are potent nephrotoxins. Nephrotoxicity has been observed following the absorption of chlorinated hydrocarbons such as carbon tetrachloride, chloroform, and trichloroethane.

**Respiratory System:**
Chemicals can enter the respiratory tract as gases and vapors, or as solid or liquid aerosols. Respirable chemical agents need not be absorbed to produce disease, as exemplified by minerals such as asbestos and silica, which produce pulmonary fibrosis. Some types of respiratory system injury and their causative agents are below.
### Chemicals and Associated Injuries

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Associated Injury</th>
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<tbody>
<tr>
<td>Ammonia, Sulfur Dioxide, Chlorine</td>
<td>Nose/Throat Irritation</td>
</tr>
<tr>
<td>Nitrogen dioxide, Ozone, Phosgene</td>
<td>Damage to lower airways</td>
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<tr>
<td>Toluene, diisocyanate (TDI)</td>
<td>Allergic response</td>
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<tr>
<td>Polycyclic aromatics, Nickel</td>
<td>Lung tumors</td>
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### Nervous System:
Some chemicals have an effect on the peripheral nerves and the brain. Examples include mercury, lead, carbon disulfide, aromatic hydrocarbons and some organophosphorus compounds.

### Blood:
In addition to chemicals that act directly on the blood and blood-forming organs, this category also includes chemicals, which decreased hemoglobin function or reduce the ability of cells to utilize oxygen. Carbon monoxide forms carboxyhemoglobin that reduces the oxygen transport capability of the blood. Sodium nitrite, aniline, and some aminophenols produce methemoglobin, which also decreases the availability of oxygen from the blood. Cyanides affect enzyme systems that reduce the ability of cells to utilize oxygen. Benzene can cause anemia, as well as leukemia.

### Laboratory Guidelines for Asbestos
Asbestos is a common name given to a group of naturally occurring mineral fibers that have been incorporated into a variety of construction products such as wall plaster, floor tile, pipe insulation and asphalt roofing. The presence of asbestos-containing building materials is not uncommon in older campus buildings. In fact, the Environmental Protection Agency (EPA) estimates that approximately 90% of commercial buildings constructed before 1980 contain some asbestos.

### Health Hazards Associated with Asbestos
Asbestos materials pose little or no risk to health unless they are disturbed in such a way that asbestos fibers become airborne and are inhaled and deposited in the lungs. Increased incidence of several illnesses including asbestosis, lung cancer, and mesothelioma have been observed in individuals who were persistently exposed to high levels of airborne asbestos in work environments such as mining, milling, shipbuilding, construction and manufacturing.

### Asbestos Surveillance at UIC
EHSO conducts on-going building surveys to identify and safely manage previously installed asbestos-containing products. Furthermore, all renovation of campus buildings must be reviewed in advance by EHSO to ensure that no Asbestos-Containing Materials are disturbed without proper safeguards. Work that requires removal or repair of Asbestos-Containing Materials is restricted to trained and qualified persons only.
How to Handle Asbestos Containing Materials in the Laboratory
To ensure the safe management of Asbestos-Containing Materials within our facilities, it is important that all lab occupants abide by the following requirements:

- Presume all building materials contain asbestos until determined otherwise by the EHSO Asbestos Program Coordinator and or representative from EHSO.
- Do not remove, cut, drill, sand, grind or otherwise, disturb any material that may contain asbestos.
- Do not go above ceilings, behind walls or into building spaces such as attics and crawlspaces unless these areas have been inspected and cleared by the EHSO Asbestos Program Coordinator.
- Do not install screws, pins, nails or hangers into asbestos ceiling wraps or wall plasters.
- Be careful not to damage walls, ceilings or floors when moving furniture or equipment.
- Do not brush, sweep, or vacuum textured asbestos ceiling plaster or plaster debris.

How to Respond To Suspected Damaged Asbestos in the Laboratory

- Do not ever ignore any material that is suspected to be Asbestos. Remember, asbestos is a carcinogen.
- Immediately report any observed damage or deterioration of suspect asbestos materials to the lab’s supervisor, the EHSO Asbestos Coordinator, or EHSO’s 24 Hour Safety Phone at (312) 996-7233.

For More Information
Asbestos surveys contain results listing specific locations at UIC where Asbestos-Containing Materials may be encountered within UIC buildings. For more information, contact the EHSO Asbestos Program Coordinator.