"Safety Comes First"

Case Western Reserve University Environmental Health and Safety

2220 Circle Drive, Service Building, 1st Floor
Phone: (216) 368-2906/2907
FAX: (216) 368-2236
Website: case.edu/ehs

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Director's Corner: Never Sacrifice Safety

I'd like to welcome all of the new students, staff, and faculty that have joined us for this school year. You have all been chosen specially because of your promising backgrounds and talents to study at the University. Each of you has the potential to be a real contributor to your chosen field of study and to advance the state of science during your careers. Science is an exciting thought provoking activity with enormous rewards and challenges. Working on the cutting edge of science by definition means that you are working in the realms of the known and the unknown simultaneously. That means that there is the potential for danger as well as achievement and the satisfaction of discovery.

Working safely does not require sacrifice in quality of work or that the types of explorations you wish to ender take will be limited. Safety requires planning and dedication to detail. When preparing to embark on a trip, the first item of address beyond the destination is selection of the items required while away from home. This includes looking forward to see what your needs might be and to plan for your needs. Likewise, when embarking on a journey of discovery you also need to set your destination and plan ahead to understand as best you can what your needs will be along the way. Preplanning and dry running an experiment are the best ways to determine what is required to do an experiment safely. You should determine what chemicals, glassware or other equipment will be needed. Will the experiment involve hydrogenation with high pressure hydrogen or will a cryogenic liquid be involved that is near absolute zero? Is there a chemical that is so toxic a picogram of it can turn your hair white? All of these factors should be worked out ahead of the experiment. Once the extremes are known you can then systematically look at the safety requirements of the experiment.

Revised HAZCOM Standard

The first compliance date of the revised Hazard Communication Standard (HCS) is December 1, 2013. By that time employers must have trained their workers on the new label elements and the Safety Data Sheet (SDS) format. This training is needed early in the transition process since workers are already beginning to see the new labels and SDSs on the chemicals in their workplace. To ensure employees have the information they need to better protect themselves from chemical hazards in the workplace during the transition period, it is critical that employees understand the new label and SDS formats.

The list below contains the minimum required topics for the training that must be completed by December 1, 2013.

Training on label elements must include:

- Type of information the employee would expect to see on the new labels, including the
  - **Product identifier:** how the hazardous chemical is identified. This can be (but is not limited to) the chemical name, code number or batch number. The manufacturer, importer or distributor can decide the appropriate product identifier. The same product identifier must be both on the label and in Section 1 of the SDS (Identification).
  - **Signal word:** used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. There are only two signal words, ''Danger'' and ''Warning.'' Within a specific hazard class, ''Danger'' is used for the more severe hazards and ''Warning'' is used for the less severe hazards. There will only be one signal word on the label no matter how many hazards a chemical may have. If one of the hazards warrants a ''Danger'' signal word and another warrants the signal word ''Warning,'' then only ''Danger'' should appear on the label.
  - **Pictogram:** OSHA's required pictograms must be in the shape of a square set at a point and include a black hazard symbol on a white background with a red frame sufficiently wide enough to be clearly visible. A square red frame set at a point without a hazard symbol is not a pictogram and is not permitted on the label. OSHA has designated eight pictograms under this standard for application to a hazard category.
  - **Hazard statement(s):** describe the nature of the hazard(s) of a chemical, including, where appropriate, the degree of hazard. For example: ''Causes damage to kidneys through prolonged or repeated exposure when absorbed through the skin.'' All of the applicable hazard statements must appear on the label. Hazard statements may be combined where appropriate to reduce redundancies and improve readability. The hazard statements are specific to

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"...it is critical that employees understand the new label and SDS formats."

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the hazard classification categories, and chemical users should always see the same statement for the same hazards, no matter what the chemical is or who produces it.

- **Precautionary statement(s):** means a phrase that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous chemical or improper storage or handling.
- **Name, address and phone number of the chemical manufacturer, distributor, or Importer**

- How an employee might use the labels in the workplace. For example,
  - Explain how information on the label can be used to ensure proper storage of hazardous chemicals.
  - Explain how the information on the label might be used to quickly locate information on first aid when needed by employees or emergency personnel.
- General understanding of how the elements work together on a label. For example,
  - Explain that where a chemical has multiple hazards, different pictograms are used to identify the various hazards. The employee should expect to see the appropriate pictogram for the corresponding hazard class.
  - Explain that when there are similar precautionary statements, the one providing the most protective information will be included on the label.

Training on the format of the SDS must include information on:

- Standardized 16-section format, including the type of information found in the various sections
  - For example, the employee should be instructed that with the new format, Section 8 (Exposure Controls/Personal Protection) will always contain information about exposure limits, engineering controls and ways to protect yourself, including personal protective equipment.
- How the information on the label is related to the SDS. For example,
  - Explain that the precautionary statements would be the same on the label and on the SDS.

As referenced in Dr. Michaels' OSHA Training Standards Policy Statement (April 28, 2010). – with all training, OSHA requires employers to present information in a

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"The employee should expect to see the appropriate pictogram for the correspond-ing hazard class."

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Fall Injury Prevention in the Workplace

Falls are a persistent hazard found in all occupational settings. A fall can occur during the simple acts of walking or climbing a ladder to change a light fixture or as a result of a complex series of events affecting an ironworker 80 feet above the ground. According to the 2011 data from the Bureau of Labor Statistics, 681 workers were killed by falls to the same or lower level.

The highest frequency of fall-related fatalities was experienced by the construction industry, while the highest counts of nonfatal fall injuries continue to be associated with the health services and the wholesale and retail industries. Healthcare support, building cleaning and maintenance, transportation and material moving, and construction and extraction occupations are particularly at risk of fall injuries.

Circumstances associated with fall incidents in the work environment frequently involve slippery, cluttered, or unstable walking/working surfaces; unprotected edges; floor holes and wall openings; unsafely positioned ladders; and misused fall protection. Federal regulations and industry consensus standards provide specific measures and performance-based recommendations for fall prevention and protection. However, persistent unsafe practices and low safety culture across many industries define steady fall injury rates year after year.

"Fall injuries constitute a considerable financial burden."

Fall injuries constitute a considerable financial burden on workers' compensation and medical costs associated with occupational fall incidents United States. Many countries are facing the same challenges as the United States on fall injury in the workplace. The international public health community has a strong interest in developing strategies to reduce the toll of fall injuries. Successful reduction of fall injury and fatality rates requires continued concerted efforts of regulators and industry leaders, professional associations and labor unions, employers and employees, safety professionals and researchers in enhancing the work environment, implementing new effective fall prevention and protection technologies, and improving the work safety culture through continuous education of the workforce. NIOSH, as the leader in occupational safety research, plays a key role in these complex fall-injury prevention efforts.

Reference:
NSC [2002]. Report on injuries in America 2002. Itasca, IL: National Safety Council.

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Biosafety Bulletin: Risk Group vs. Biosafety Level, Part I

Many researchers will use the terms Risk Group (RG) and Biosafety Level (BSL) interchangeably, while some researchers aren't aware of the term Risk Group at all. So what do these words mean and how are they different?

A Risk Group is a term used to identify and categorize the danger a given pathogen poses to human health (and/or animal health, depending on the defining agency). Pathogens fall into one of four Risk Groups. As defined by the National Institutes of Health, these groups are[1]:

(1) Risk Group 1 (RG1) agents are not associated with disease in healthy adult humans.

(2) Risk Group 2 (RG2) agents are associated with human disease which is rarely serious and for which preventive or therapeutic interventions are *often* available.

(3) Risk Group 3 (RG3) agents are associated with serious or lethal human disease for which preventive or therapeutic interventions *may be* available.

(4) Risk Group 4 (RG4) agents are likely to cause serious or lethal human disease for which preventive or therapeutic interventions are *not usually* available.

In contrast, Biosafety Level refers to the biosafety containment under which a person will work with a given pathogen. Like Risk Groups, there are four categories of laboratory containment. According the Center for Disease Control, these are[2]:

Biosafety Level 1 is suitable for work involving well-characterized agents not known to consistently cause disease in immunocompetent adult humans, and present minimal potential hazard to laboratory personnel and the environment.

- BSL-1 laboratories are not necessarily separated from the general traffic patterns in the building;
- Work is typically conducted on open bench tops using standard microbiological practices;
- Special containment equipment or facility design is not required, but

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"A Risk Group is a term used to identify and categorize the danger a given pathogen poses to human health...."

Electron Microscopes

"The radiation safety concerns are related to the electrons that are backscattered from the sample, as well as X-rays produced in the process."

Source of Radiation from an Electron Microscope

X-rays are produced in the electron microscope whenever the primary electron beam or back scattered electrons strike metal parts with sufficient energy to excite continuous and/or characteristic X-rays.

When we study X-rays from a target it is observed to be continuous spectrum with intense lines. These intense lines depend on the metal used as a target and are called characteristic X-rays. The continuous spectrum depends on applied potential difference, current flowing in the filament and atomic number of the target.
In terms of X-ray hazards, two aspects are important: the composition of the parts which are struck and their efficiency as X-ray sources and the effectiveness/integrity of the shielding provided by the metal casing of the microscope.

The higher the voltage and atomic number of the "parts", the greater the efficiency of X-ray production.

Potential sources of X-Ray leakage:

- High voltage cable
- Electron gun and condenser lens
- Viewing window

Radiation Leakage Industry Standard

0.5 mR/hr at 5 cm from any exterior surface
The degree of X-ray "**leakage**" also depends on the shielding provided by the metal casing. A poorly designed microscope may have weak points where X-rays can escape, for example, between the gasket sealed junction of two sections of the column.

What are the radiation safety concerns?

The radiation safety concerns are related to the **electrons that are backscattered** from the sample, as well as **X-rays produced** in the process. Most modern electron microscopes are extremely well shielded and do not produce exposure rates greater than background. However, electron microscopes are radiation-generating devices and should be at least inventoried. It is also important that the integrity of the shielding is maintained, that all existing interlocks are functioning, and that workers are aware of radiation safety considerations.

Equipment Labeling

"Caution – High Intensity X-Ray Beam" on the X-Ray housing source

"Caution – This Equipment Produces Radiation When Energized" near any switch that energizes an X-Ray tube. All labels can be obtained at the RSOF

Biosafety Bulletin: Risk Group vs. Biosafety Level, cont.

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may be used as determined by appropriate risk assessment;

- Laboratory personnel must have specific training in the procedures conducted in the laboratory and must be supervised by a scientist with training in microbiology or a related science.

Biosafety Level 2 builds upon BSL-1. BSL-2 is suitable for work involving agents that pose moderate hazards to personnel and the environment. It differs from BSL-1 in that:

- Laboratory personnel have specific training in handling pathogenic agents and are supervised by scientists competent in handling infectious agents and associated procedures;
- Access to the laboratory is restricted when work is being conducted;
- All procedures in which infectious aerosols or splashes may be created are conducted in BSCs or other physical containment equipment.

Biosafety Level 3 is applicable to clinical, diagnostic, teaching, research, or production facilities where work is performed with indigenous or exotic agents that may cause serious or potentially lethal disease through the inhalation route of exposure.

- Laboratory personnel must receive specific training in handling pathogenic and potentially lethal agents;
- Laboratory personnel must be supervised by scientists competent in handling infectious agents and associated procedures;
- All procedures involving the manipulation of infectious materials must be conducted within BSCs or other physical containment devices; and
- A BSL-3 laboratory has special engineering and design features

Biosafety Level 4 is required for work with dangerous and exotic agents that pose a high individual risk of aerosol-transmitted laboratory infections and life -threatening disease that is frequently fatal, for which there are no vaccines or treatments, or a related agent with unknown risk of transmission. Agents with a close or identical antigenic relationship to agents requiring BSL-4 containment must be handled at this level until sufficient data are obtained

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"Biosafety Level 4 is required for work with dangerous and exotic agents……. for which there are no vaccines or treatments …."

Biosafety Bulletin: Risk Group vs. Biosafety Level, cont.

"All laboratory staff and supervisors must be competent in handling agents and procedures requiring BSL-4 containment."

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either to confirm continued work at this level, or re-designate the level.

- Laboratory staff must have specific and thorough training in handling extremely hazardous infectious agents;
- Laboratory staff must understand the primary and secondary containment functions of standard and special practices, containment equipment, and laboratory design characteristics;
- All laboratory staff and supervisors must be competent in handling agents and procedures requiring BSL-4 containment;
- The laboratory supervisor in accordance with institutional policies controls access to the laboratory; and

There are two models for BSL-4 laboratories:

1. Cabinet Laboratory— Manipulation of agents must be performed in a Class III BSC; and
2. Suit Laboratory—Personnel must wear a positive pressure supplied air protective suit. BSL-4 cabinet and suit laboratories have special engineering and design features to prevent microorganisms from being disseminated into the environment.

To put this nuance in better perspective, an investigator works with a certain RG agent under certain BSL conditions.

While a pathogen's Risk Group is a starting point for biosafety containment determination, there are many other factors involved in determining under what containment level your work should be performed.

Next time… When Risk Group and Biosafety containment don't match. How to know and what to do about it.

References:

NIH Guideline for Research Involving Recombinant or Synthetic Nucleic Acid Molecules (2013) http://oba.od.nih.gov/oba/rac/Guidelines/NIH_Guidelines.htm#_Toc351276224

Biosafety in Microbiological and Biomedical Laboratories, 5th Edition, Centers for Disease Control (2009)
Biosafety Levels 1-4 Defined

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manner and language that their employees can understand. If employers customarily need to communicate work instructions or other workplace information to employees in a language other than English, they will also need to provide safety and health training to employees in the same manner. Similarly, if the employee's vocabulary is limited, the training must account for that limitation. By the same token, if employees are not literate, telling them to read training materials will not satisfy the employer's training obligation.

OSHA's Hazard Communication has the following QuickCards and OSHA Briefs to assist employers with the required training.

- Label QuickCard (English/Spanish)
- Pictogram QuickCard (English/Spanish)
- Safety Data Sheet QuickCard (English) (Spanish
- Safety Data Sheet OSHA Brief
- NFPA-GHS Comparison QuickCard

Visit Our website link to see our latest flash module on the new Globally Harmonized System (GHS) at case.edu/ehs/ghs

NIOSH Ladder Safety app for mobile devices

The National Institute for Occupational Safety and Health (NIOSH) announces the availability of a new Ladder Safety smart phone application (app). This new app uses visual and audio signals to make it easier for workers using extension ladders to check the angle the ladder is positioned at, as well as access useful tips for using extension ladders safely. The app is available for free download for both iPhone and Android devices.

Download the FREE app on your iPhone/iPad powered mobile devices

Download the FREE app on Android powered devices

The Ladder Safety App User's Manual is also available

iOS Android

"The app is available for free download for both iPhone and Android devices."

Environmental Health and Safety Staff

Victoria COOK (vcook), Health Physics Specialist II
Gwendolyn COX-JOHNSON (gwendolyn.cox-johnson), Department Assistant II
Bill DEPETRO (william.depetro), Safety Services Specialist II
Anna DUBNISHEVA (anna.dubnisheva), Safety Services Specialist II
Roy EVANS (roy.evans2), Fire and Life Safety Services Specialist I
Charles GREATHOUSE (charles.greathouse), Analyst Programmer II
Brandon KIRK (brandon.kirk), Safety Services Specialist I
Kumudu KULASEKERE (kumudu), Health Physics Specialist I
Robert LATSCH (robert.latsch), Safety Services Specialist II, CHMM
Tom MERK (tom.merk), Assistant Director of Safety Services
Yelena NEYMAN (yelena.neyman), Health Physics Specialist II
Joe NIKSTENAS (joenik), Operations Manager Specialist II, RRPT
Heidi PAGE (heidi.page), Biosafety Officer; Specialist II
Marc RUBIN (marc.rubin), Director of Safety Services,
Zach SCHWEIKART (zachary.schweikart), Industrial Hygiene Specialist II, CSP, CIH
Dr. Mary Ellen SCOTT (maryellen.scott), Safety Services Specialist II
Dr. W. David SEDWICK (w.sedwick), Director of Radiation Safety and RSO
Felice THORNTON-PORTER (felice.porter), Assistant Director of Radiation Safety, ARSO

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Environmental Health and Safety
Case Western Reserve University
(216) 368-2906/2907 FAX: (216) 368-2236