Protecting MU's Health, Safety, and the Environment Fall 2010

notes

ENVIRONMENTAL HEALTH and SAFETY

Laboratory Emergency Preparedness

Disasters and other emergencies can happen suddenly and without warning. During such an event, our immediate safety and prompt recovery depend on our existing level of preparedness. Every department and every laboratory has an important role in maintaining the University's level of emergency preparedness.

MU maintains an overall, campus-level emergency plan. In addition to the campus emergency plan, several major departments have their own plans. At the building level, virtually all of our campus buildings have an emergency action plan. Due to the nature of the work that goes on in them, laboratories should develop and maintain their own emergency plans.

An effective, lab-specific emergency plan will help protect personnel, equipment, and facilities. Plans should contain a description of all safety equipment, including safety showers, eyewashes, spill kits, and other important items. Your plan should also contain procedures for shutting down and securing the laboratory in the event an evacuation becomes necessary. If you rely on frozen or refrigerated materials, your plan should include procedures for protecting them during a prolonged power outage.

For most emergencies, the biggest problem involves communication. Your emergency plan should contain the names and contact information for key laboratory personnel who can assist in the recovery process. All employees are encouraged to sign up for the campus emergency notification system and to keep their contact information current.

Your lab-specific emergency plan should be kept in a conspicuous location and lab personnel should read and understand its contents. We recommend your emergency plan be reviewed at least annually.

The EHS website (http://ehs.missouri.edu/work/emerg-prep.html) provides guidance on emergency planning. Here you will find more specific guidance for the various types of emergencies, plus a link to the EHS Emergency Procedures poster. If you have any questions feel free to contact us for assistance.

Dennis Elmore
Manager, Industrial Hygiene/Occupational Safety

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EHS Director's Desk

Lessons from the Schweitzer Lab Explosion

On the afternoon of June 28, the MU community experienced an explosion in a laboratory in Schweitzer Hall. Four people were taken to the hospital and one was kept overnight before being released the next evening. Damage to the building has been estimated in the mid to upper range of six figures. The injuries and damage could have been much, much worse. What has EHS learned (reminded of) from this incident and what messages do we have for the campus community?

First, laboratories can be dangerous environments. Just because relatively small amounts of hazardous materials are normally used, there are still significant hazards.

Second, hydrogen is nasty stuff. Its flammability and explosive potential are well known. The amount of hydrogen involved in the explosion was only two cubic meters' worth, yet that was enough to severely damage a two-suite laboratory. If you use hydrogen or other flammable gases, I urge you to review your protocols to make sure that you have taken all reasonable steps to prevent an explosive situation.

Third, if you think you are a safe person, think again. The people involved in this incident are good researchers, some with over 25 years of experience, and had a good safety record based upon EHS inspections. However, after the explosion, several actions were identified that could—and should—have been taken that would have prevented the explosion. Of course, these things are much easier to see in hindsight. Since the explosion, the researchers have taken a new look at potential hazards in their laboratory. While these actions have been commendable, they will need to be applied on a continuing basis.

Last, it CAN happen to you. If you haven't conducted a safety review of your procedures for some time, take the time to do so now. We don't want any more incidents at MU. Wear your personal protective equipment—this will minimize injuries to you in the event something does go wrong. Review emergency response procedures—prompt response to the explosion prevented the injuries and property damage from being much worse. Principal Investigators and Supervisors have the primary responsibility for safety in their work areas; however, to be successful, all members of their teams must act safely and hold each other accountable. EHS staff are highly capable and would love to work with you to assess and reduce hazards in your laboratory—use us!

We are devoting this issue to laboratory safety, but many of the principles we discuss are also applicable to non-laboratory environments. Remember, everyone is responsible for safety; please do your part. We want you and those around you to go home as healthy as you are when you come to campus at the beginning of the day.

Peter Ashbrook

Compressed Gases

Cylinders of compressed gas are a common sight in laboratories. They sit quietly and, in many cases, go unnoticed for months or even years. Their quiet and peaceful appearance, however, belies the tremendous potential energy stored inside them.

Compressed gases can be used safely, but there are many things users should know and understand. Cylinders should be stored in an upright position, strapped to a wall, and capped when not in use. They should not be stored in hallways, passageways, or work areas where they could be damaged by people or equipment.

Cylinders must always be used in conjunction with approved regulators. The Compressed Gas Association sets standards for regulators and they should always be used as intended by the manufacturer. Oxygen and other oxidizing gases must be kept separate from flammable or combustible gases; specifically, the required separation is a distance of at least 20 feet or a one-hour fire rated wall.

The hazards related to compressed gases can be put into four categories: pressure, asphyxiation, inhalation, and fire. A ruptured valve on any cylinder—even compressed air—can be dangerous. The contents of such a cylinder can be released at a very high velocity. The resulting stream of air can injure the eyes and skin. In some cases, the cylinder itself can become a projectile.

Asphyxiation can occur when an “inert” gas like nitrogen displaces oxygen from the atmosphere. The risk of asphyxiation is reduced when inert gases are used in large, well ventilated areas. The use of inert gases in small or confined spaces is a serious hazard and gas monitoring should be part of the standard operating procedure.

Toxic gases, like chlorine, ammonia, and carbon monoxide all present their own unique hazards. When used in a pure or concentrated form, these gases are extremely hazardous and require specific engineering controls. Contact EHS for guidance any time you plan to use a toxic gas.

Flammable and pyrophoric gases also deserve special attention. Flammable gases include acetylene, hydrogen, methane, and many others. When using flammable gases, it may be necessary to use a gas monitor to warn the user of dangerous conditions. We also have experience with two pyrophoric gases, silane and digermane. These gases burn on contact with air and require no source of ignition. In order to use such gases safely, careful planning must implemented.

EHS has been working with the two major suppliers of compressed gases and is working to improve our compressed gas safety programs. If you have any questions about the safety of the compressed gases you are using, please contact EHS.

Dennis Elmore
Manager, Industrial Hygiene/Occupational Safety

What Is (Radiological) Safety Culture?

Safety culture is a term often used to describe the way in which safety is managed in the workplace, and often reflects "the attitudes, beliefs, perceptions and values that employees share in relation to safety" (Cox and Cox 1991).

The U.S. Nuclear Regulatory Commission refers to safety culture as "the necessary full attention to safety matters" and the "personal dedication and accountability of all individuals engaged in any activity… A strong safety culture is one that has a strong safety-first focus."

The International Atomic Energy Association (IAEA Safety Standards Safety Series No. 115) defines safety culture as "the assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance". The report goes on to say that a safety culture shall be fostered and maintained to encourage a questioning and learning attitude to safety.

The responsibilities of each individual for safety should be clearly identified, and each individual suitably trained and qualified. Lines of communication should be open for safety information flow.

Appropriate safety systems (technical and procedural) should be provided:

- to reduce likelihood that human error will lead to unintentional exposure;
- to provide means for detecting human errors;
- to facilitate intervention in the event of failure of safety system.

Furthermore;

- Radiation sources shall be kept secure;
- Control of a radiation source shall never be relinquished;
- A radiation source shall not be transferred unless the receiver possesses a valid authorization;
- A periodic inventory of movable radiation sources shall be performed.

Here are some general suggestive event and/or error prevention tools to consider using:

- Use self-checks (Stop, Think, Act, Review);
- Use peer-checks;
- Stop when unsure;
- Have a questioning attitude;
- Use and adhere to procedures or owners/ operators manuals and ensure you are using the correct one;
- Make an effort to provide clear communications and verify receiver as understood your message accurately.

You may also want to consider conducting a dry run or pre-activity/ safety brief before an activity, experiment or job task and take notes for trouble areas so as to be prepared for them.

Jack Crawford
Assistant Director, EHS

Biosafety in the Laboratory

Biohazards within the MU laboratory come in many different sizes, shapes, colors and health risks. Handling those health risks safely requires a complete MU team effort. The MU Biosafety Program of recognition, evaluation and control has been set-up to minimize potential biohazard exposures on campus.

Recognizing potential biohazardous materials prior to use and employee exposure in their work area is the primary responsibility of the Principal Investigator. Biohazardous materials are found in research and teaching activities involving the use of recombinant DNA (rDNA); Risk Group 2 or 3 pathogens; transgenic animals and plants; select agents and toxins; high consequence livestock pathogens and toxins; human blood, tissue and body fluids; and human or non-human primate cell lines or cultures.

Evaluation, after the biohazardous material is recognized, is a collaborative biohazard risk assessment by the Principal Investigator, the research group, and Environmental Health and Safety (EHS). This risk assessment reviews the agent hazards, laboratory procedure hazards, laboratory containment, staff safety proficiency, and biosafety equipment integrity. This collaborative MU team will determine the high risk operations and proper biosafety containment options to minimize exposure and health risk.

Control and containment of the laboratory depends on the specific health risks and may include Biosafety Level 1 (BSL-1) or higher (for rDNA materials); Biosafety Level 2 (BSL-2) or Biosafety Level 3 (BSL-3) standard practices, special practices, safety equipment, and laboratory facilities. Research activities requiring Biosafety Level 4 (BSL-4) containment are not allowed on campus.

The planned acquisition, storage, use and disposal of the biohazardous material must be explained in an application which is reviewed and approved by the MU Institutional Biosafety Committee (IBC). EHS will work with the Principal Investigator for a successful IBC approval. The IBC review will also include the Occupational Health & Safety Program (OHSP) medical monitoring, employee biosafety training and work area biosafety inspection results.

EHS and IBC members are your biosafety resources to help make the laboratory safe by minimizing health risks. If you have any biosafety questions or need a risk assessment, OHSP hazard evaluation or laboratory process review, please call EHS at 882-7018, email biosafety@missouri.edu or review the information on the EHS website at http://ehs.missouri.edu/bio/.

Roger Riddlemoser
Assistant Director, EHS

Accumulation of Unwanted Hazardous Materials

As a reminder, accumulation containers used for the collection of unwanted hazardous materials must comply with the following minimum regulatory requirements:

- "Container Start Date" must be recorded on the Hazardous Unwanted Material label and attached to the collection container when accumulation begins (but not before)
- Must be submitted for collection as soon as the container is full, or when six months have elapsed since the "Container Start Date" regardless of the amount collected in the container
- Chemical contents must be compatible with the container
- Chemical constituents must be written in English on the Hazardous Unwanted Materials label, with the list updated with current contents as needed, and rewritten if compromised or defaced by any material spilled or leaked on it
- Must be tightly closed except when actively adding materials into the container
- Must be in secondary containment if stored on the floor or near a sink or floor drain, or if in the vicinity of other, incompatible materials
- Must have drippage, overflows and spills cleaned up immediately
- Containers must never be overfilled: do not add liquid materials higher than the "shoulder" of bottles or exceed the weight capacity of bags or boxes
- Should never be labeled with the words "Waste" or "Hazardous Waste" unless specifically advised to do so by EHS.

Todd Houts
Assistant Director, EHS

Basic Laboratory Safety Training Requirements

The University of Missouri is anything but a static entity. Each year we are thrilled to see new students join our campus. We are also proud of our graduates but sad when they leave. The same can be said for university employees who come and go. Because of this turnover, EHS training requirements are sometimes forgotten. This article provides an overview of EHS training requirements. Please note that a link to a schedule of upcoming classes, as well as registration for these classes and links to online classes can be found at http://ehs.missouri.edu/train/.

Working with Hazardous Chemicals? The initial requirement is to take Chemical Management for Chemical Worker training. This course is available in class once a month. Every three years all chemical workers are required to refresh this training by either taking the original class again or by taking an online refresher course called Chemical Management Online Refresher.

Working with Radioactive Materials? The initial requirement is to take Introduction to Radiation Safety at MU. This course is available in class once a month. Every three years all radiation workers are required to refresh this training by either taking the original class again or taking a refresher course in class or online. The in class course is called Radiation Safety at MU – Refresher and the online course is called Radiation Safety Refresher (Blackboard).

Working with Biohazardous Materials? The initial requirement is to take Introduction to Biosafety. This course is available in

class once a month. This course must be refreshed every three years. Currently, there is no online refresher course available. The one exception to this requirement is people working with rDNA in a BSL1 containment area. These individuals are not required to take the Introduction to Biosafety course.

Working with Human Blood, Human Cell Lines, or any other Human Pathogens? The requirement is to take Bloodborne Pathogens. This course must be retaken every 12 months. Currently there is no online refresher course available.

If you have any questions about these requirements, please feel free to contact me at 882-7018.

Rebecca Ann Bergfield
Training and Development Coordinator

Personal Protective Equipment

As we discuss throughout this newsletter, serious hazards are present in laboratories on our campus. In addition to the obvious chemical hazards, some procedures produce tremendous amounts of electrical, thermal, and mechanical energy. While the goal of any researcher is to control these hazardous agents, unexpected events can and do occur.

The use of personal protective equipment (PPE) can help reduce injuries when an unexpected event occurs in the workplace. PPE is only effective, however, under two conditions. First, PPE has to be chosen correctly for the specific hazard and secondly, the PPE has to be used appropriately.

Eye protection is frequently the first item we think about with regard to PPE. In fact, you may have seen the poster for Senate Bill 519, a Missouri law that requires protective eyewear in our laboratories. Please take time to select the appropriate eye protection. When using corrosive liquids, a pair of impact resistant safety glasses will not protect your eyes from a significant splash. Goggles are not particularly fashionable, but they do provide better protection from liquids.

Wearing gloves or gauntlets can also minimize exposures to hazardous substances. There are many types of gloves available, but not all gloves are appropriate in all situations. Some gloves degrade very quickly in certain solvents. The EHS website (http://ehs.missouri.edu/ppe/gloves.html) has links to Ansell and North, both of which produce comprehensive guides for the selection of gloves. In addition to chemical compatibility, gloves should be chosen for their durability, comfort, fit, and dexterity. Sometimes it will even be appropriate to wear two kinds of gloves at the same time.

Another important form of PPE is the lab coat. In the event of a spill or fire, lab coats can be removed much more easily than street clothes. Being able to quickly remove your lab coat will minimize contact time with hazardous chemicals or prevent serious burns to your skin. You should also be aware that your choice of street clothes can be important. Natural fiber clothing is usually less flammable than synthetic materials and is recommended especially where flammable materials are used.

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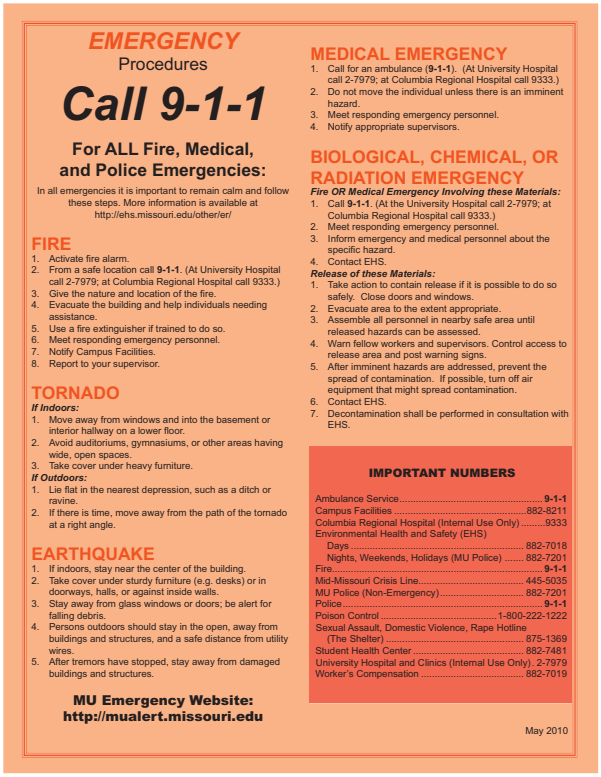
New Emergency Procedure Posters Available

EHS recently updated the campus Emergency Procedure Poster. The new poster has been printed on bright orange paper and is available by calling 882-7018 or sending an email request to ehs@missouri.edu. The new poster emphasizes calling 9-1-1 for all emergencies, plus gives added instructions for specific emergencies.

In order for this poster to be effective we need your help. Please walk around your laboratory, office space, department, or building. If you see an Emergency Procedure Poster that is not printed on orange paper, please replace it with a new poster. And please encourage everyone you work with to review the instructions BEFORE an emergency occurs, as well as making sure everyone knows how to contact emergency services in an emergency.



EMERGENCY
Procedures

Call 9-1-1

For ALL Fire, Medical, and Police Emergencies:

In all emergencies it is important to remain calm and follow these steps. More information is available at http://ehs.missouri.edu/other/er/

FIRE
1. Activate fire alarm.
2. From a safe location call **9-1-1**. (At University Hospital call 2-7979; at Columbia Regional Hospital call 9333.)
3. Give the nature and location of the fire.
4. Evacuate the building and help individuals needing assistance.
5. Use a fire extinguisher if trained to do so.
6. Meet responding emergency personnel.
7. Notify Campus Facilities.
8. Report to your supervisor.

TORNADO
If Indoors:
1. Move away from windows and into the basement or interior hallway on a lower floor.
2. Avoid auditoriums, gymnasiums, or other areas having wide, open spaces.
3. Take cover under heavy furniture.

If Outdoors:
1. Lie flat in the nearest depression, such as a ditch or ravine.
2. If there is time, move away from the path of the tornado at a right angle.

EARTHQUAKE
1. If indoors, stay near the center of the building.
2. Take cover under sturdy furniture (e.g. desks) or in doorways, halls, or against inside walls.
3. Stay away from glass windows or doors; be alert for falling debris.
4. Persons outdoors should stay in the open, away from buildings and structures, and a safe distance from utility wires.
5. After tremors have stopped, stay away from damaged buildings and structures.

MU Emergency Website:
http://mualert.missouri.edu

MEDICAL EMERGENCY
1. Call for an ambulance (**9-1-1**). (At University Hospital call 2-7979; at Columbia Regional Hospital call 9333.)
2. Do not move the individual unless there is an imminent hazard.
3. Meet responding emergency personnel.
4. Notify appropriate supervisors.

BIOLOGICAL, CHEMICAL, OR RADIATION EMERGENCY
Fire OR Medical Emergency Involving these Materials:
1. Call **9-1-1**. (At the University Hospital call 2-7979; at Columbia Regional Hospital call 9333.)
2. Meet responding emergency personnel.
3. Inform emergency and medical personnel about the specific hazard.
4. Contact EHS.

Release of these Materials:
1. Take action to contain release if it is possible to do so safely. Close doors and windows.
2. Evacuate area to the extent appropriate.
3. Assemble all personnel in nearby safe area until released hazards can be assessed.
4. Warn fellow workers and supervisors. Control access to release area and post warning signs.
5. After imminent hazards are addressed, prevent the spread of contamination. If possible, turn off air equipment that might spread contamination.
6. Contact EHS.
7. Decontamination shall be performed in consultation with EHS.

IMPORTANT NUMBERS

Ambulance Service	**9-1-1**
Campus Facilities	882-8211
Columbia Regional Hospital (Internal Use Only)	9333
Environmental Health and Safety (EHS)	
Days	882-7018
Nights, Weekends, Holidays (MU Police)	882-7201
Fire	**9-1-1**
Mid-Missouri Crisis Line	445-5035
MU Police (Non-Emergency)	882-7201
Police	**9-1-1**
Poison Control	1-800-222-1222
Sexual Assault, Domestic Violence, Rape Hotline (The Shelter)	875-1369
Student Health Center	882-7481
University Hospital and Clinics (Internal Use Only)	2-7979
Worker's Compensation	882-7019

May 2010

Finally, EHS will again have the poster translated to the most frequently used second language on campus, Mandarin Chinese. These posters will be available later this fall. You can contact EHS to request this version of the poster as well.

Rebecca Ann Bergfield
Training and Development Coordinator

EHS appreciates campus support of environmental and safety issues. If you have any special needs regarding the format of this publication, or have any comments regarding newsletters, training programs or services, please direct your communications to Rebecca Bergfield, Editor at the above address.