

Safety Matters

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Working Safe and Smart in Machine Shops by James Kaznosky

A tragic recent incident at Yale University serves as a powerful reminder that personal safety must be your top priority when working in laboratories or shops at Columbia. The Yale student, reported to have been working alone in a machine shop, died as a result of her injuries when her hair was caught and pulled into a lathe, a machine that has powerful rotating mechanical parts integral to its function of shaping metal or wood. .

While further investigations into the specific circumstances of this incident are ongoing, please always remember that power tools and machinery can be dangerous when not used properly. Working safely is the first thing a user or operator should learn - the safe way is the correct and only way to work. Always follow these general safety measures when working with machine shop tools/equipment:

- Equipment or machinery should never be used until the user is trained and familiar with its safe operation. Consult the shop or lab manager and manufacturer's manual BEFORE working with unfamiliar equipment for specific operating and safety procedures. If there is something you do not understand, ask questions. If you do not get it, chances are some of your colleagues would also benefit from a more detailed explanation.
- Never work alone. Always use the "buddy system" when working in any machine shop.
- Restrain hair & loose fitting clothing and secure or remove dangling ID badges & jewelry (watches, rings, bracelets). Keep this in mind when working around open containers of any type of hazardous materials.
- Always wear the appropriate personal protective equipment (PPE) for the task at hand, such as eye, ear, hand, and foot protection.
- Always use the equipment's shields, guards, or other engineering controls. Never remove or disable shields, machine guards, or safety devices.
- Keep hands and body clear when operating or working near machines with moving parts.
- Never power-up equipment that is not or may not be working properly. Check with a shop manager or your supervisor if you are uncertain.

Controlled Substances Program – Update by Christopher Pitoscia

On February 1, 2011, new University Purchasing requirements went into effect for the procurement of controlled substances. Controlled substance orders will not be processed unless accompanied by a copy of the purchaser's DEA registration, NYSDOH license and a current copy of the purchaser's training certificate for RASCAL course code TC0502. Users of controlled substances are responsible for compliance with all applicable state and federal regulations, as well as University policies, including proper recordkeeping (receipt, inventory and use logs), training, storage and security, and proper disposal of unused materials. Please see the link below for further information, including recordkeeping templates and procurement resources.

<https://www1.columbia.edu/sec/cu/ehrs/PolicyOfControlledSubstances.html>

Tracking Chemical Lecture Bottles:

In our continuing effort to maintain an accurate inventory of all hazardous materials used in the laboratories, EH&S has added lecture bottles to the list of items that must be tracked and bar-coded using our Chemical Tracking System. EH&S will also retroactively bar-code all existing lecture bottles, so if you have them present in your laboratory or need additional information, please email chemtracker@columbia.edu.

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Vacation Fire & Emergency Safety Tips by Harry J. Oster

With summer upon us, a vacation is on the minds of many. Your destination may be to a camping site, a motel at the shore or another summertime hotspot. Wherever your destination, when packing for your summer vacation, don't forget to include a short fire and life safety checklist.

Let's review the "Top 10" basic fire and emergency safety tips and considerations to take with us on our summer getaways:

- Before leaving your office and home: Shut down and secure all portable utilities (gas burners, electronics, etc.)
- Once you arrive, how will you report a fire or emergency? Is a telephone, fire alarm pull box or other means available?
- Develop an escape plan with your travel companions should a fire or emergency occur.
- Know the location of at least two exits in your new surroundings.
- Establish a meeting place in the event of a fire or emergency (good examples include a large tree outside the motel or a business across the street).
- Pack a first aid kit and flashlight.
- If your clothing catches fire, remember to Stop, Drop and Rock (side to side).
- If cooking over an open flame, tie back hair, long sleeve shirts, and other loose clothing.
- Never use a barbeque grill indoors - this includes garages!
- Enjoying your favorite summer cuisine? Do you know what to do for someone who is choking? Learn basic first aid and CPR; consider visiting www.redcross.org/en/takeaclass

In closing, remember;

- A fire is fast, dark and deadly;
- An emergency can strike at a moment's notice;
- Be prepared. Practice fire and emergency safety all year long.

A safe vacation means no vacation from fire and emergency prevention and safety!

Working with Recombinant DNA by Paul Rubock

While the "NIH Guidelines for Research Involving Recombinant DNA Molecules" have been in effect for over thirty years, it is only within the past few years that the NIH has been vigorously monitoring academic facilities for compliance. Their oversight has taken the form of site visits that include documentation review and interviews with investigators and administrators charged with compliance oversight. EH&S constantly enhances and modifies programs for compliance in many areas, including rDNA use. For the latest guidance updates on rDNA use, please see <http://www.ehs.columbia.edu/recombdna.html>. While the full scope of the program can not be thoroughly captured in a short Safety Matters column, a few critical items deserve emphasis:

- The NIH Guidelines apply to all uses of recombinant DNA (rDNA) at institutions where NIH funding is used for any rDNA work.
- All rDNA work must be described in a submission to the University's Institutional Biosafety Committee (IBC); the link above provides the process details and instructions for such submissions.
- The use of replication deficient vectors does not eliminate the need for IBC submittal.
- All users of rDNA must be trained. In the next few months, a training module will be posted on RASCAL and successful completion will be a pre-requisite for IBC approval.
- Accidents, potential exposures, and incidents of non-compliance with the NIH Guidelines must be reported to the IBC and NIH. Please refer to the NIH [link](#) to requirements and reporting criteria

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Some Clarity on Aldehydes Used as Biological Fixatives by Courtney Drayer

Aldehydes are carbonyl groups (C = O) that are bonded to either 2 hydrogen atoms (formaldehyde) or a hydrogen and an alkyl or phenol group (higher aldehydes). Aldehydes are known for their pungent smells but also include some culinary favorites such as vanilla, cinnamon, and spearmint oil. In the biological sciences, certain aldehyde solutions are used to fix tissue samples for analysis. Chemical fixatives preserve biological specimens by halting enzymatic degradation, preventing microbial colonization, and increasing cellular strength. Common aldehydes used in chemical fixation include formaldehyde and glutaraldehyde.

There are many misconceptions surrounding the definitions of these chemicals. Formaldehyde (HCHO) is a gas that hydrates when dissolved in water forming methylene hydrate (HOCH₂OH). The maximum solubility of formaldehyde in water is 37% by weight and 40% by volume. Solutions that contain the maximum amount of formaldehyde dissolved in water are defined as 100% formalin. A 10% formalin solution is 10% of a 37-40% formaldehyde solution or 3.7-4% formaldehyde solution.

As formalin solutions age, the methylene hydrate can polymerize. Precipitation of these polymers can form a flammable white powder, paraformaldehyde. Likewise, the dissolution of 4g of paraformaldehyde into 100ml of water will form a 10% formalin solution. Many researchers add methanol (usually 10%) to their formalin solutions to stabilize the solution and prevent polymerization. Additionally, monobasic sodium phosphate monohydrate and dibasic sodium phosphate anhydrate can be added to formalin solutions to buffer the low pH caused mainly by the oxidation of formaldehyde to formic acid.

Glutaraldehyde (OHCCH₂CH₂CH₂CHO) is also a fixative used for preservation in preparations for electron microscopy and other applications. Glutaraldehyde solutions fix samples more quickly than formalin solutions due to the dialdehyde structure of the molecule, but its larger molecular structure causes penetration of the fixative to slow.

While formalin solutions without significant alcohol, and thus higher flash points, are not regulated by the EPA, the characteristic that make formalin a useful fixative, namely the ability to kill the useful bacteria used in sewage treatment plants make it unsuitable for drain disposal in sewer systems. Other reasons for the collection of formalin are the toxic and carcinogenic effects caused by the off-gassing of formaldehyde from the solution. This is the rationale for OSHA regulations that apply to regular use of formalin, including the requirement that all users be properly trained. See <http://www.ehs.columbia.edu/RascalRules.html>. Glutaraldehyde is not regulated in this manner but the same operational mandates apply due to its acute health effects. Fortunately there are many aldehyde-free fixation alternatives available on the market today. EH&S can provide consultation in selecting appropriate substitutes for an array of toxic substances. Additional information on fixative alternatives can be found by searching www.sustainablehospitals.org.

Health and Safety Manual is Online by Kevin McGhee

The newest edition of the Columbia University Health and Safety Manual for laboratories has been posted on the EH&S website at <http://ehs.columbia.edu/HManual.html>. EH&S chose to publish this edition online rather than in print to save paper and to allow for the flexibility of referring users to abundant online resources. The Manual serves as a central reference point for Columbia University laboratory policies and procedures, and should be primary safety resource for those working in University laboratories, whether new or experienced.

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Extra! Extra! Inspectors Are Coming to a Waste Container Near You by Rebecca Lonergan

Is your lab compliant and ready for inspection? Columbia University, like many hospitals and universities, is subject to announced and unannounced NYS Department of Environmental Conservation (NYSDEC) and Environmental Protection Agency (EPA) inspections. All waste collection areas should be maintained in “inspection ready” condition at all times. How do you know if you’re in compliance? All you need to remember are the 5 Ls of hazardous waste management! The 5 Ls are a tool to ensure environmental compliance for the proper storage and management of hazardous waste. The L’s include: CoLLect, Label, Lid, Locate and Leaks.

CoLLect

- CoLLect all of your hazardous chemical wastes and submit an online chemical pick-up request form to arrange for proper disposal. Please consult EH&S if you are unsure if your chemical waste is a hazardous waste.
- Evaluate your chemical inventory regularly and coLLect chemicals for disposal that are unwanted, expired or have no intended use.
- DO NOT dispose of hazardous waste by neutralization, treatment, evaporation, or dilution.

Label

- Affix a Hazardous Waste Label to the container as soon as the first drop of material is collected.
- List all of the components and their percentages on the Label.
- DO NOT use chemical formulae, abbreviations, symbols or generic names (ex: “solvents”, “halogenated chemicals”, etc.) on Labels.

Lids

- Keep Hazardous Waste containers closed at all times, except when adding or removing waste.
- Use a closeable Lid that will prevent the hazardous waste from spilling should the container be knocked over.
- Ensure process waste containers, such as those to collect HPLC solvents, are set up with a tight fitting cap - no foil or parafilm.
- DO NOT leave a funnel in a Hazardous Waste container.

Locate

- Locate hazardous waste containers at or near the point of the Hazardous Waste’s generation (a.k.a. the Satellite Accumulation Areas).
- DO NOT locate or move hazardous waste containers outside of the room in which the waste was generated.

Leaks

- Inspect Satellite Accumulation Areas weekly for Leaks.
- DO NOT allow Leaking containers to remain in Satellite Accumulation Areas. Contact EH&S upon discovering any leak or potential release of material.

Don’t forget: Unauthorized drain disposal of chemicals is strictly forbidden. Improper management of Hazardous Waste is not only a violation of regulations and punishable by a fine, it also poses a significant threat to human health and the environment. To ensure compliance and address any questions or concerns regarding hazardous waste management, EH&S regularly visits laboratory hazardous waste Satellite Accumulation Areas (SAAs) throughout the University.

To dispose of hazardous waste and unwanted chemicals, or to request waste containers, caps or labels, please submit a “Chemical/Hazardous Waste Pick up Request” at: <http://vesta.cumc.columbia.edu/ehs/wastepickup/>. Need a copy of the 5Ls to post in your laboratory? Visit <http://www.ehs.columbia.edu/5L.html> to print a copy.

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Waste Pickup Service Schedule Change, Morningside Campus by Roman Tarasyuk

Starting Monday May 2nd 2011, the EH&S will implement a new, more efficient schedule for radioactive, hazardous and mixed waste collection services at the Morningside Campus.

All waste pickups and services are provided on the following days:

- Monday: CEPSR, Engineering Terrace, Fairchild, Mudd, Pupin, Schermerhorn, Schermerhorn Extension
- Tuesday: Chandler, Dodge and Havemeyer
- Wednesday: All radioactive and mixed waste pickups and services for the whole campus
- Thursday: Northwest Corner
- Friday: Chandler and Havemeyer

Please submit an online radioactive waste pickup request or hazardous waste pickup request. Then ensure that your waste is prepared as follows:

- An appropriate waste label is affixed to each container to be collected by EH&S for disposal
 - All waste labels list the proper chemical names of all constituents in each container (no generic names, abbreviations or chemical formulas please)
 - All hazardous waste containers must remain in the laboratory/room in which the waste was generated (i.e., at or near the point of generation). Please do not move hazardous waste containers into the corridor or into any other room
 - All waste containers are tightly closed
- If wastes are not prepared as specified, the waste cannot be removed by EH&S. The improved service schedule is one of the many ways we continue to look for ways to streamline our operations without compromising the quality of service that lab personnel expect from us. Should you have any questions please feel free to contact EH&S office at 212-854-8749 and ask for a Hazardous Materials Officer.

Alcohol + Flame = Trouble by Paul Rubock

The practice of keeping flammables in proximity to a Bunsen burner poses an obvious fire hazard, especially in biological safety cabinets (tissue culture hoods). The burner can be eliminated if sterile, single-use, disposable inoculating and transfer devices are used. Remember, the air inside the cabinet's work space is microbiologically sterile and the perceived need to flame 'everything' is a by-product of an era when most work was conducted on the open bench.

In combination with the Bunsen burner, the use of flammable ethanol for disinfection inside of the BSC creates a hazardous environment, as illustrated by a recent incident at the University. An investigator, working inside a biosafety cabinet, was sterilizing cover slips by dipping them in ethanol and flaming them with a Bunsen burner. The work came to an abrupt halt when some flaming alcohol dripped off the cover slip igniting other materials within the cabinet. Fortunately, personnel in the laboratory were knowledgeable about response procedures and put out the fire with an extinguisher. (Do you know where your laboratory's extinguisher is and how to use it?)

Refer to "Fire Prevention and Biological Safety", <http://ehs.columbia.edu/Policy2.4.html#two.4.2> in the Biosafety section of Columbia's Health and Safety Manual for additional fire safety prevention information relevant to laboratory activities. For additional information on how flames actually disrupt the sterile environment of a BSC, please see <http://www.ehs.columbia.edu/Policy2.3d.html#two.3.1>.

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How to Read a Radiation Dosimetry Report by Thomas Morgan

Radiation dose reports are a rich source of information about your current and past radiation exposure. Reports include information about the current monitoring period, accumulated quarterly exposure, year to date, and lifetime doses. Each individual is assigned a unique participant number when first issued a dosimeter, which is assigned based on the type of radiation expected to be encountered. For example, in the USE column, a “Pa” indicates a dosimeter sensitive to x-rays, as well as gamma rays, such as those from Cs-137, Tc-99m, F-18, or Tl-201 and betas, including P-32 or P-33. These dosimeters include a series of filters to assist in determining the penetrating power of the radiation. A “Ja” dosimeter is also sensitive to neutrons.

Radiation doses are reported as dose equivalent “DEEP,” “EYE,” and “SHALLOW.” DEEP is the dose expected at 1 cm depth in tissue. EYE applies to external exposure to the lens of the eye, which is at a depth of approximately 0.3 cm. SHALLOW represents the dose to top 0.07 mm of the skin.

Doses below certain minimum measurable quantities are recorded as “M.” The minimum reporting levels vary according to the dosimeter type and radiation quality:

- Photon (x or gamma ray): 1 mrem
- Beta: 10 mrem
- Neutron: 20 mrem (fast), 10 mrem (thermal)
- Fetal: 10 mrem
- Ring: 30 mrem


For reference, annual limits on exposure are as follows: whole body DEEP – 5,000 mrem; EYE – 15,000 mrem; SHALLOW – 50,000 mrem. Individuals who receive more than 2.5% of these doses (i.e. 125 mrem DEEP, 375 mrem EYE, or 1,275 mrem SHALLOW) in a calendar quarter are notified in writing by Radiation Safety. Please feel free to contact Radiation Safety should you have any questions about your dose report.

Columbia Hosts Emergency Preparedness Exercise by Kathleen Crowley

On March 25, 2011, EH&S was proud to host a second Symposium sponsored by the New York City Department of Health and Mental Hygiene (NYC DOHMH) Bureau of Environmental Emergency Response and Preparedness and the New York City Medical Reserve Corps (MRC) – “Operating a Community Reception Center: A Workshop for the NYC Radiological Reserve Corps.” Historically, emergencies are handled first at the local level. This workshop was held at the Russ Berrie Building and focused on development, deployment, and operation of task force to screen potentially contaminated victims of a nuclear or radiological incident in New York City. Senior DOHMH members attended and briefed participants from a wide variety of emergency response agencies – FDNY and NYPD, municipal and volunteer ambulance corps, and hospitals. Attendees had the opportunity to experience various stations in the reception center – screening, decontamination, dose assessment and registration.

This Symposium followed the one hosted in October 2010 at the Morningside campus, designed for Radiation Safety Officers and preparing for radiological emergencies. Recent events in Japan underscore the importance of preparedness, planning and exercising such plans.

The Summer 2011 edition of *SafetyMatters* is the last for Paul Rubock, Chief Editor and Director of Biological Safety, who, after 11 years at EH&S and over 17 total with the University, has retired from Columbia. Please join us in wishing Paul the very best as we say “Thank You” and “Goodbye.” Best wishes, Paul!

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Do you have a suggestion for a future *Safety Matters* article? Do you have a comment on something you just read? Please share it with us at , newsfeedback@columbia.edu