Florida State University
Environmental Health and Safety
LAB GUARDIAN

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Regulations and Safety — are FSU research labs in compliance?

FSU has been inspected by a number of external agencies who regulate the proper handling of hazardous materials and hazardous waste:

So far this fiscal year, there have been eight inspections performed by external regulatory agencies for which Environmental Health & Safety (EH&S) Research Support section personnel have served as primary points of contact. These are briefly summarized below:

Agency	Program
United States Drug Enforcement Agency	Controlled Substance
Florida Department of Health (DOH)	Controlled Substance
DOH	Biohazardous Waste
DOH	Radiation Protection
Dept. of Environmental Protection (DEP)	Hazardous Waste

These inspections largely resulted in no citations for deficiencies or non-compliance items. This is a testament to the cooperation of research faculty, staff and students, and personnel from Facilities and Maintenance in university safety and compliance programs.

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Safe Handling of Organic Solvents

Organic Solvents are used in FSU laboratories for a variety of purposes. While general laboratory safety guidelines apply to solvent use, special considerations should be taken, due to the nature of these chemicals.

Most organic solvents are extremely flammable and often highly volatile chemicals that should always be handled with care. Some solvents produce vapors which are heavier than air. These may move on the floor or ground to a distant ignition source, such as a spark from welding or caused by static electricity. The vapors may also explode from contact with a cigarette ember. Vapors of solvents can also accumulate in confined places and stay there for a long time, presenting risks for health and property. EH&S recommends that solvents be used in a fume hood for these reasons.

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Germicidal Use of UV Light in Biological Safety Cabinets

The Centers for Disease Control (CDC) and the National Institute of Health (NIH) agree that UV lamps are not recommended nor required in biological safety cabinets. The activity of UV lights for sterilization/decontamination purposes is limited by a number of factors including:

- Penetration - In a dynamic air stream (e.g. biological safety cabinet): UV light is not penetrating. Microorganisms beneath dust particles or beneath the work surface are not affected by the UV irradiation. UV irradiation can cause erythema that may damage both the skin and eyes of laboratory workers. Eyes and skin are primarily involved because UV does not penetrate deeply into tissue. These effects are generally not permanent but can be quite painful.
- Relative Humidity - Humidity adversely affects the effectiveness of UV. Above 70% relatively humidity, the germicidal effects drops off precipitously.
- Temperature and Air Movement - Optimum temperature for output is 77-80°F. Temperatures below this optimum temperature result in reduced output of the germicidal wavelength. Moving air tends to cool the lamp below its optimum operating temperature and therefore results in reduced output.
- Cleanliness - UV lights should be cleaned weekly with an alcohol and water mixture as dust and dirt can block the germicidal effectiveness of the UV lights.
- Age – UV lamps should be checked periodically (approximately every six months) to ensure the appropriate intensity of UV light is being emitted for germicidal activity (UV C). The amount of germicidal wavelength light emitted from these bulbs decreases with age and bulb ratings (hours of use) may vary by manufacturer.

Because UV light overexposure may result in adverse health effects, and the beneficial use of UV to the research may be diminished by the factors listed above, the use of UV in BSC's should be carefully considered. . Biological effects from UV radiation vary with wavelength, exposure level, and duration of exposure. In general, adverse effects are limited to the skin and eyes, but chronic exposure to UV radiation may accelerate the skin aging process and increase the risk of developing skin cancer. UV radiation exposure rarely results in permanent ocular injury, although cataracts have been produced in animals by exposure to UV radiation. Due to the short time for UV overexposure to occur, it is recommended that neither laboratory nor maintenance personnel work in a room where UV lights are on. *Adapted from the America Biological Safety Association (ABSA)Position Paper on the Use of Ultraviolet Lights in Biological Safety Cabinets. Contact EH&S to obtain a copy of the article or for more information.*

Regulations and Safety—are FSU labs in compliance?

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However, university personnel should be advised that training will continue to be, an area of special concern for regulatory compliance inspections that may result in citations and fines. DEP has issued two citations to FSU for failure to comply with annual Hazardous Waste Awareness training requirements over the past few years, and this year we received a verbal reinforcement of the importance of this issue. Repeat violations in these areas may incur exponentially escalating penalties, that are currently on the verge of $30,000 per instance.

Another area of concern that arose in recent regulatory visits is the need for improved physical security and restricted access to laboratories with harmful agents. State Legislators have sent fact-finding teams to review this issue at State of Florida universities, and tighter controls have already been mandated at universities in other parts of the country. No generally applicable mandates have affected FSU facilities to date, but the concerns regarding university security issues should be noted and factored into facilities plans.

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Regulations and Safety—are FSU labs in Compliance?

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Safety and Compliance Inspections were also performed by EH&S staff to identify areas of concern.

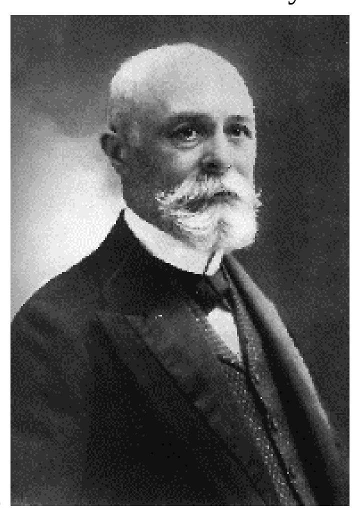
EH&S Research Support and NHMFL safety personnel have also conducted formal internal inspections of laboratory areas and research department shops, as follows:

Comprehensive Laboratory Inspections	**360+**	**2.1% deficiencies noted**
Radiation and Contamination Surveys	**560 (2200 samples assayed)**	**1.3% failed**
Fume Hood Tests	**364**	**8.8% failed**
Biosafety Cabinet Certifications	**25**	**4.0% failed**
Safety Shower Tests	**147**	**4.1% failed**
Emergency Eyewash Tests	**169**	**8.3% failed**

Positive trends noted in all of these areas are indicative of safety improvements being made in research areas. Recent deficiencies noted generally have been more minor in scope and fewer in quantity for most areas. Please contact EH&S to address special needs in order to improve safety or compliance conditions in your research areas.

Antoine Henri Becquerel (1852-1908)

Antoine Henri Becquerel is universally recognized as the discoverer of the phenomenon of "radioactivity". This discovery occurred in February 1896 while he was experimenting with potassium uranyl sulfate in order to determine if the "x-ray" radiation discovered by Wilhelm Röntgen in November 1895 could be involved in the process of phosphorescence. Professor Becquerel's interests and expertise were in the areas of light polarization, light absorption by crystalline structures, phosphorescence and terrestrial magnetism. He had been involved with scientific research throughout his life as his father (also a Professor of Physics with an expertise in solar radiation and phosphorescence) and grandfather (an inventor and Fellow of The Royal Society) had also been very active scientists. In fact, Becquerel's father was the one who gave him the uranium salts that he used for this discovery.



The experiment that he conducted consisted of exposing these uranium salts to sunlight, which he believed might later release trapped solar energy as x-rays. To test this theory he would place these stimulated crystals on photographic plates wrapped in an opaque material. The realization that the exposure of the photographic plates was due to the uranium itself and not from the typical phosphorescence process observed with this material came to him after overcast weather delayed his intended experiment. During this period, Becquerel stored a sample of unexposed uranium salt in a drawer alongside a wrapped photographic plate and later observed that there was an image created on this plate without any external stimulation or observed phosphorescence of the salt material. Upon further investigation of this radioactivity, he noted that the radiation responsible for this image was different from x-ray radiation in that it could be deflected by a strong magnetic field. Subsequent experimentation to determine the source and mechanisms for these mystery emissions were successfully done by Pierre and Marie Curie (with whom he shared the 1903 Nobel Prize) and Sir Ernest Rutherford (a 1908 Nobel Prize recipient).

Personal Radiation Monitoring

In the past few months, the Radiation Safety Office has had a number of dosimeters misplaced, misused, and/or damaged. In order to prevent future mishaps, a friendly reminder about personal dosimeter use:

1. All personnel entering areas where a whole body personal dosimeter has been deemed appropriate shall wear the device in the position that will likely indicate your highest whole body dose (between waist and neck on the outside of clothing).
2. Personnel working with radioactive materials who are issued an extremity dosimeter (finger badge or ring) shall wear the dosimeter on a finger with the detector portion of the dosimeter facing down (closest to the source of radiation so that the finger does not shield the dosimeter). Those working with x-ray diffraction units shall wear the extremity dosimeter with the detector portion facing the source of radiation. These dosimeters should be worn under gloves when necessary to prevent device contamination. Be extra careful when removing gloves so that the dosimeter is not accidentally discarded.
3. Radiation workers issued any type of dosimeter must not allow their assigned device to be worn by any other person. If a dose is recorded, the Radiation Safety Office will notify the radiation worker with the assigned badge and that dose becomes part of his/her permanent record.
4. Radiation workers will be issued a ring dosimeter on the following basis:
   a. the individual regularly handles millicurie amounts of high energy beta emitters or gamma/x-ray emitters
   b. the Principal Investigator or radiation worker requests that a ring dosimeter be assigned, as long as the radiation source is detectable by the dosimeter
   c. the Radiation Safety Office feels that extremity monitoring is warranted
5. Personnel monitoring badges must be worn by anyone who may exceed 10% of the annual dose limits. Badges are not issued to persons who are exposed strictly to low energy beta radiation. Monitoring badges cannot detect low energy betas (about 0.25 MeV or less) from isotopes such as ^{3}H, ^{14}C, ^{35}S, and ^{63}Ni.

When the dosimeter is not in use, please be sure that is kept in a place away from radiation sources and in a designated badge storage area, if available. A dosimeter is only an indicator of exposure. It is not an exposure prevention device.

Each individual who applies for a radiation monitoring badge must complete the Radiation Dosimeter Registration Form, and will need to complete one Past Exposure History Release Letter for all previous institutions (other than Florida State University) where he or she was monitored for radiation. These forms are available on the web at www.safety.fsu.edu. The Radiation Safety Office is ultimately responsible for lost badges so please keep up with their location (i.e. they cost money!).

If you have any questions please call the Radiation Safety Office at 644-8801.



Safe Handling of Organic Solvents

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Solvents enter the body by inhalation, by swallowing and through the skin. The effect depends on several factors, such as:

- how easily the solvent evaporates at the ambient temperature
- the characteristics of that solvent; is it water soluble or able to dissolve fats?
- the concentration of the solvent in the air at the place of work
- the type of work involved, light or heavy (Panting increases the amount inhaled.)
- length of exposure

Solvents vapors and mists have various effects on human health. Solvents irritate the eyes and the respiratory tract and many of them have a narcotic effect, causing fatigue, dizziness and intoxication. High doses may lead to unconsciousness and death. Work with solvents should be done within a fume hood for these reasons.

Solvents may damage the skin by removing the fat. This is a very common cause of skin disorders and dermatitis. Some solvents penetrate the skin and enter the blood circulation. Solvents may damage the liver, kidneys, heart, blood vessels, bone marrow and the nervous system. Certain solvents, such as benzene, are also carcinogens.

Personal Protective Equipment

If gloves, goggles, or other protective clothing are needed to keep solvents away from skin, eyes, and clothing, make sure gloves are made of material that is not permeable to the solvents you are using. A basic web search for "glove selection chart" will result in many helpful hits or go the links provided on the EH&S Chemical Safety web page.

Personal protective equipment such as aprons, gloves, and respirators should be available where needed, and they should be used according to the recommendations. Contact EH&S for information on respirator use. Personal protective equipment should be stored in a clean place away from possible contact with solvent vapors. Workers must know safe work methods and emergency procedures (fire, spill, first aid) for the specific chemicals they use.

Equipment (fire extinguishers, absorbent material, etc.) should be provided for situations such as spillage or emergency.

Containers

Each container must have a label showing the chemical name and hazard warnings. This also includes any waste containers used. If chemicals must be transferred from the original containers, the new containers must be labeled with the chemical name and hazard warnings. Containers must be closed or covered when not in use.

Disposal

EH&S will provide containers to dispose of solvents on request. Once you have filled a waste container, contact EH&S and we will transfer the waste to our waste storage facility and return your waste receptacle.

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Lab, Chemical & NHMFL Safety Personnel Changes

Carl Green, formerly in the Chemical Safety Section on the FSU campus, accepted a position as Coordinator of Safety at the NHMFL. Andrew Davis, Sr. Environmental Health and Safety Specialist, moved from Lab Safety to Chemical Safety. Andy Jaap was added to the Lab Safety section as a new Sr. Environmental Health and Safety Specialist. Andy graduated in the Spring 2005 from Florida A & M, where he received a Masters of Public Health degree.

Lab Safety Resource Team

Assistant Director	Paul Burress	644-8800	pburress@admin.fsu.edu
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CAPS Safety	David Knoll	645-1181	knoll@caps.fsu.edu

www.safety.fsu.edu

Lab Safety Reminders

- Safety supplies—Researchers in need of safety items—shielding, special gloves, special containers—should contact EH&S. We may be able to supply some non-routine safety supplies
- Required training—Researchers should be aware of training requirements: Annual training is required for all researchers working with chemicals or biohazards. Periodic training is also required for researchers working with radioactive materials. Please contact our EH&S staff at the numbers listed above for information.
- Optional training—**The Fundamentals of Laboratory Safety, Lab Manager Safety Training, and Hazard Specific Training** are new training courses that can be presented or developed, upon request, to your department or lab groups. Please contact Janice Dodge for more information.
- Chemical inventories—Chemical inventories for every area where chemicals are stored is required by law, and must be updated periodically. If you have not submitted a chemical inventory to EH&S, please contact Janice Dodge for assistance.
- Chemical storage—Incompatible chemical storage creates a potential for adverse lab events. Please contact Renee Murray for guidance on chemical storage issues.
- Understanding chemical labels—A link to Sigma's "Understanding Chemical Labels" can be found at the EH&S website in the Chemical Safety and Lab Safety pages. Go to www.safety.fsu.edu , then Lab Safety, Tools and Information.
- Hydrofluoric Acid—Labs where hydrofluoric acid is used should have an HF emergency response protocol for posting and should inform all users of HF hazards and emergency response procedures. If you possess or will acquire HF, please contact Janice Dodge to obtain this information.
- MSDS database now online—For quick access to Material Safety Data Sheets (MSDS), visit www.safety.fsu.edu and follow the link in the Chemical Safety web page.
- Non-infectious waste disposal—**non-infectious waste**, such as non-pathogenic bacteria, should be autoclaved in a **clear, non-labeled autoclave bag** and be disposed of as regular trash. Uncontaminated glassware and glass sharps, such as fixed slides, pipettes, broken and empty rinsed laboratory glassware, must be collected in a cardboard box labeled "Broken Glass" or "Sharps Trash". When the box is full, tape shut, label the outside and discard as regular trash. For a biohazard waste pickup, call the Biological Safety Office or request a pickup on line at http://www.safety.fsu.edu/biopic_form.html
- Chemical solution labeling—Please remember to label all chemical solutions, including buffers, wash solutions, and even deionized water in squeeze bottles, carboys, beakers, etc.