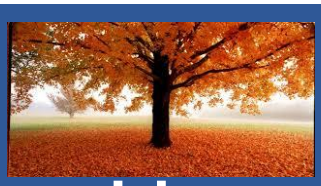

Lab Chatter

UNIVERSITY OF NEW ENGLAND
INNOVATION FOR A HEALTHIER PLANET

Volume 4, Issue 1, September 2017

Table of contents:

Safety Spotlight

New EHS Website

EHS is very excited to announce that the new and improved Environmental Health and Safety website is now online and ready to be used as a safety resource!

New items on the EHS website include:

-access to PDF versions of safety training modules
-easy to find EHS written programs
-more links related to safety, health and environmental agencies
-a comprehensive section of EHS forms
-a Publications section where you can find the safety manual, chemical hygiene plan, EHS Lab Chatter, and other important information

And much more!

Visit: http://www.une.edu/campus/ehs today to see it all!

Lab training requirements for all lab staff and lab volunteers

By Ronnie Souza

There are two questions that Human Resources and the EHS Department address every semester and prior to the summer break in regards to lab safety training:

1. What are the training requirements for employees and volunteers working in UNE laboratories?

2. When is a laboratory worker an employee or a volunteer?

Answers:

Employees and volunteers working in the UNE labs are required by federal law to complete **Lab Training Modules on Blackboard** in the same way you complete annual training. If you are a PI or lab manager in charge of a lab, you need to report (to Human Resources) **all new and returning students receiving compensation including federal work study, temporary and part-time employees, adjunct faculty and student and non-student volunteers working in your lab.**

If you have laboratory employees and/or volunteers in the categories below you are required to register them for Blackboard Training:

- Full and Half-time Salaried
- Full and Half-time hourly
- 9, 10, 11, or 12-month Faculty
- Adjunct Faculty
- Temp Salaried
- Temp Hourly
- Student Paid
- Student Unpaid (volunteer)
- Non-student Unpaid (volunteer)
- Graduate Assistant

Contact Tammy Louko in Human Resources at extension 4256 to request a training registration form or go to V:\UNEDocs\HUMAN RESOURCES\Training. Once you have populated the training registration form with all the information requested, forward the form to Tammy Louko and she will set up the individual to gain access to the training on Blackboard.

A Lab Manager's Guide to Sustainable Lab Practices

Scientists often overlook some of the intuitive but less-obvious ways to reduce energy use in the lab.

By Allison Paradise | April 03, 2017 via LabManager.com (contributed by Jessica Tyre)

Opportunities for conservation in research laboratories are varied and abundant, yet scientists often focus their attention on the most visible form of lab waste—plastic—and overlook one of the largest contributors to greenhouse gas emissions: electricity. Laboratories consume three to five times more energy per square foot than do typical offices due to round-the-clock operation of energy-intensive equipment, 100 percent outside air requirements, and high airflow rates. A report published in 2015 by My Green Lab and the Center for Energy Efficient Labs (CEEL) found that loads from a dozen categories of commonly used lab equipment consumed 8–32 TWh annually in the United States. This is equivalent to the energy consumption of over four million homes, just over three percent of the total homes in the United States. This article will explore some intuitive, as well as some less apparent, ways to reduce energy use in labs.

Freezer challenge

A single ultra-low temperature (ULT, -80°C) freezer draws as much energy as an average domestic household. The 2015 CEEL report estimated that the United States contains at least 580,000 ULT freezers, consuming 4 billion kWh/year. There are a further estimated 750,000 -20°C freezers and 960,000 laboratory refrigerators in the United States, which collectively consume nearly the same amount. Fortunately, it is easy to significantly reduce the energy consumption of these units. Defrosting freezers not only optimizes performance, but in many cases also reduces energy consumption by at least 10 percent. Taking the time to inventory samples can reduce the number of samples relegated to long-term storage, in turn reducing overall refrigeration requirements. Another easy win is to increase the temperature set point of ULT freezers to -70°C from -80°C, also known as My Green Lab's "-70 is the new -80" initiative. This small change has been shown to reduce energy consumption of ULT freezers by an average of 37 percent, while concomitantly prolonging freezer life by reducing compressor strain.

These and other best practices for cold storage management are summarized in the North American Laboratory Freezer Challenge, a competition launched in the fall of 2016 by My Green Lab and the International Institute for Sustainable Laboratories. Labs that have participated in the challenge previously have not only realized energy savings upward of 3,600 kWh/year, but have also found that these best practices lead to safer, more efficient ways of managing samples.

ENERGY STAR®

Though a staple in the residential and commercial sectors, ENERGY STAR has been largely absent from the laboratory market until very recently. Nearly ten years ago, recognizing the widespread use of energy-intensive equipment in laboratories, and in particular the large number of cold storage units consuming 10–30 kWh/day, a pioneering group engaged with the Environmental Protection Agency and ENERGY STAR to establish standards for laboratory cold storage. This process involved multiple stakeholders, including manufacturers, building owners and operators, scientists, and nonprofit advocates for energy efficiency. Together, the team worked for a decade to establish specifications for laboratory refrigeration, including ULT freezers, -20°C freezers, and refrigerators.

Outlet timers

Although refrigeration units consume an outsized proportion of the energy used in labs, other categories of equipment, such as water baths, heating blocks, temperature-controlled centrifuges, lasers, ovens, and even computers, consume more than many scientists realize. Due to the wide variety of products in each category and the nascent state of the field, it has been difficult to gather definitive consumption data. However, the chart below, taken from the 2015 CEEL report, demonstrates the extent of the opportunity.

The simplest way to sustainably operate equipment that has a heating or cooling element is to turn it off when it's not in use. However, the urgency of experiments makes this challenging, as equipment needs to be ready to use at a moment's notice. Enter outlet timers. Outlet timers have been employed in labs across the country to turn off equipment, usually at night, and, perhaps more important, to turn it on in the morning. With properly set timers, water baths and heating blocks will always be at their correct temperatures when the first person enters the lab. And since equipment has not been left on overnight, the lab will see reduced energy use and decreased risk of fire. A $10 investment in an outlet timer can save a lab over $100 annually in electricity costs and reduce carbon emissions by more than 2.5 tons over the lifetime of most equipment.

Estimated Annual Nationwide Energy Consumption.

Instrument	Estimated Annual Nationwide Energy Consumption (GWh)
-20°C Freezer	2,045
-80°C Freezer	3,315
Autoclave	2,785
Centrifuge	1,163
Fluorescence Microscope	55
Fume Hood	8,250
Heating Block	120
Incubator	2,645
PCR Machine	320
Refrigerator	1,160
Shaker	480
Tissue Culture Hood	1,390
Vacuum Pump	471
Water Bath	1,350

Closed fume hood sashes

Chemical fume hoods are found in chemistry and biology labs. A single chemical fume hood can consume as much energy as 3.5 households every day due to the large volume of air that must be moved through the hood by the ventilation system. Ventilation systems and fume hoods can be broadly classified into two categories: Constant Air Volume (CAV) and Variable Air Volume (VAV). As these names suggest, in a CAV fume hood the volume of air flowing through the hood is constant, whereas in a VAV fume hood the amount of air flowing through the hood is adjustable. Because energy consumption of fume hoods is proportionate to the volume of air flowing through them, reducing the airflow volume in a VAV hood results in energy savings.

Airflow volume in a fume hood is manipulated by adjusting the height of a movable sash, which acts as a barrier between the inside of the hood and the rest of the lab. The sash should be raised when working in the hood and, in most cases, should be lowered when work in the hood is complete to ensure the safety of laboratory personnel. In a VAV fume hood, lowering the sash also reduces the speed of the exhaust fan and the volume of air being exhausted by the VAV ventilation system, reducing energy intensity by upward of 40 percent.

Green chemistry

On the surface, the practice of green chemistry—the design of chemical processes and products that reduce the generation of hazardous waste—seems to have little to do with energy consumption. However, the two are in fact intrinsically linked.

The 12 Principles of Green Chemistry comprise specific guidelines to follow when choosing chemicals. These principles are applicable across disciplines, relevant to biologists, experimental physicists, and chemists alike. The principles recommend using microchemistry, for example, and the selection of benign alternatives whenever possible. These commonsense approaches to reducing hazardous waste also reduce unnecessary exposure of personnel to hazardous materials. MIT created a Green Chemical Alternatives Purchasing Wizard that can be used to select benign alternatives, and MilliporeSigma's website (formerly EMD Millipore and Sigma-Aldrich) lists over 700 green alternatives for commonly used chemicals and reagents.

As suggested earlier, laboratories have strict ventilation requirements. One of the primary reasons laboratories consume vastly more energy than office spaces is that they are ventilated more frequently using 100 percent outside air. These ventilation requirements are commonly referred to as "air exchange rates" or "air changes per hour." It is not uncommon to find standard laboratory spaces with air exchange rates of 10–12 per hour in an effort to reduce the risk of exposure of personnel to noxious and toxic chemicals. A recent movement, pioneered by the University of California, Irvine's (UCI's) Smart Labs Program, has called for facilities to rethink air exchange rates in their laboratories. By actively sampling the air in its labs, UCI has been able to align the number of air exchanges with chemical exposure risks. This has reduced energy consumption by as much as 50 percent in some instances, leading to millions of dollars in annual energy savings. How does this relate to green chemistry? Labs that practice the Principles of Green Chemistry have less exposure to hazardous materials and, thus, require fewer air changes per hour.

The work done at UCI inspired the Department of Energy to launch a Smart Labs Accelerator Program in 2017. This program challenges institutions to reduce laboratory energy consumption by 20 percent over the next ten years. By taking the simple steps outlined above scientists can help their organizations meet this goal.

Conclusion

Laboratories are the largest and most intensive consumers of energy on university campuses, accounting for up to 60 percent of total energy use despite occupying less than 30 percent of total space. Nonacademic institutions also find that laboratories consume a similarly disproportionate amount of energy. Fortunately, scientists have a great deal of control over how much energy they use. By employing best practices for cold storage management, purchasing ENERGY STAR–rated equipment whenever possible, turning off equipment at night, and closing fume hood sashes, scientists have the ability to reduce the energy consumption in labs by more than 10 TWh/year nationwide. Moreover, by working with facilities management and choosing benign alternatives over known hazardous substances, scientists can affect a substantial change in the overall energy consumption in their buildings.

Conserving natural resources through energy reduction not only benefits the environment, but in a few pilot programs it also benefits scientists. Two well-known universities in the United States have already begun piloting programs in which overhead costs are reduced for labs that reduce their energy consumption. What a beautiful way for scientists to work toward mitigating climate change while simultaneously increasing funding for their research!

Why do we have a lab dress code?

By Jessica Tyre

You have likely all seen the articles in previous issues of EHS Lab Chatter, the signs on lab doors, the policies in our safety manuals, all addressing the issue of dressing appropriately in laboratories. There is a reason that we try to communicate to the lab community about this issue so heavily: you! We are trying very hard to keep all lab workers safe on our campuses. We want you to leave the lab as healthy and happy as you came in. It can be hotter and less comfortable in the summer to work in the lab environment and it is very tempting to wear shorts, capris, sandals, etc., but the hazards in the laboratory do not change with the seasons. The hazards remain the same all throughout the year, so it is important to adhere to lab dress code policies at all times. When a chemical or biological agent is spilled, it most commonly ends up on your pants or feet. If you have long pants and proper footwear you have a protective barrier between the spilled agent and your skin. Clothing can be easily removed and replaced, your skin cannot. Please remember the following requirements for working in UNE laboratories with chemical or biological hazards:

- Long pants (no capris, skirts, dresses, etc.)
- Closed shoes (no sandals, flip flops, ballet flats, etc.)
- Long hair pulled back
- Lab coats/gowns

- Proper PPE depending on what you are working with. This includes but is not limited to: gloves, goggles, safety glasses, respiratory protection, hearing protection, etc.

If you have any questions regarding these policies feel free to contact EHS anytime.

Human Salmonella Typhimurium Infections Linked to Exposure in Clinical and Teaching Microbiology Laboratories

Information provided by: www.cdc.gov (submitted by Ronnie Souza)

At A Glance

- Case Count: 24
- States: 16 (including Maine)
- Deaths: 0
- Hospitalizations: 6

Highlights

- Read the Advice to Students and Employees Working in Laboratories at: https://www.cdc.gov/salmonella/typhimurium-07-17/advice.html

- CDC and public health officials in several states have identified a multistate outbreak of Salmonella Typhimurium infections linked to various clinical, commercial, and teaching microbiology laboratories.
    - Twenty-four people infected with the outbreak strain of Salmonella Typhimurium were reported from 16 states.
    - Six ill people were hospitalized. No deaths were reported.
- This strain of Salmonella Typhimurium has previously been associated with infections linked to microbiology laboratory exposure in 2011 and 2014.
- Laboratory-associated salmonellosis continues to be a public health problem. This outbreak is a reminder that bacteria used in microbiology laboratories can sicken people who work in labs. Others who live in their households can also get sick, even if the household members never visited the laboratory.
- Guidance documents for work with Salmonella and other similar human pathogens can be found on the Key Resources page.

July 19, 2017:

CDC and public health officials in several states have identified a multistate outbreak of Salmonella Typhimurium infections linked to various clinical, commercial, and college and university teaching microbiology laboratories.

Public health investigators used the PulseNet system to identify illnesses that may be part of this outbreak. PulseNet, coordinated by CDC, is the national subtyping network of public health and food regulatory agency laboratories. PulseNet performs DNA fingerprinting on Salmonella bacteria isolated from ill people by using techniques called pulsed-field gel electrophoresis (PFGE) and whole genome sequencing (WGS). CDC PulseNet manages a national database of these DNA fingerprints to identify possible outbreaks.

Twenty-four people infected with the outbreak strain of Salmonella Typhimurium have been reported from 16 states, including California, Colorado, Florida, Georgia, Iowa, Maine, Michigan, Missouri, North Carolina, New Hampshire, New Jersey, New Mexico, New York, Oklahoma, Texas, and Washington.

(Continued…)

WGS showed that the strain of Salmonella Typhimurium causing illness in this outbreak is closely related genetically to a strain from an outbreak in 2014 and an outbreak in 2011, both of which were linked to microbiology laboratories. As a result of the 2011 outbreak, several laboratory professionals across the country developed a set of guidelines for handling microorganisms safely in a teaching laboratory.

Among people for whom information was available, illnesses started on dates ranging from March 17, 2017 to June 22, 2017. Ill people ranged in age from less than one year to 57 years, with a median age of 24. Seventy-five percent of ill people were female. Among 21 people with available information, six (29%) were hospitalized. No deaths were reported.

In interviews, ill people answered questions about different exposures in the week before they became ill. Nine (69%) of 13 ill people had laboratory exposures. Ill people in this outbreak reported behaviors while working in the laboratory that could increase the risk of Salmonella infection. These included not wearing gloves or lab coats, not washing hands, and using the same writing utensils and notebooks outside of the laboratory.

This outbreak highlights the potential risk of Salmonella infection associated with working in microbiology laboratories.

All students and staff in clinical and teaching microbiology laboratories should receive laboratory safety training. Either nonpathogenic or attenuated bacterial strains should be used when possible, especially in teaching laboratories. This practice will help reduce the risk of students and their family members becoming ill. More information is available on the Advice to Students and Employees in Microbiology Laboratories page (https://www.cdc.gov/salmonella/typhimurium-07-17/advice.html).

What are the signs and symptoms of Salmonella infection?

Most people infected with Salmonella develop the following signs and symptoms 12-72 hours after being exposed to the bacteria:

- Diarrhea
- Fever
- Abdominal cramps

How long does the illness last?

- The illness usually lasts 4 to 7 days, and most people recover without treatment.
- In some people, the diarrhea may be so severe that the patient needs to be hospitalized. Salmonella infection may spread from the intestines to the bloodstream and then to other places in the body.
- In rare cases, Salmonella infection can cause death unless the person is treated promptly with antibiotics.

Who is more likely to have a severe illness?

- Children younger than 5 years
- Adults older than 65
- People with weakened immune systems

More information about Salmonella and steps people can take to reduce their risk of infection with Salmonella in general can be found on the CDC Salmonella website.

Equipment Sharing

By Peter Nagle

The Environmental Health and Safety Department is initiating a lab equipment sharing/donation program at the university. Similar to the chemical sharing program, lab PIs can advertise any equipment no longer in use or needed in EHS Lab Chatter. The advertisement would run for one issue of EHS Lab Chatter with the equipment available for anyone in the UNE community to claim. If the equipment is not claimed after one month, then it will be sent to eWaste Alternatives as electronic waste for recycling.

Our department hopes this program can reduce the amount of electronic waste sent out from both campuses and help the university save money on equipment purchases. Many times new equipment is purchased when there are similar or identical instruments on campus not in use but still in good shape and not outdated. This can be problematic as idle equipment sits in spaces that could be utilized for other purposes. An equipment sharing program will also further align the research and academic communities with the sustainability culture at UNE.

If you have any equipment you would like to donate to the program please contact either Peter Nagle pnagle@une.edu or Jessica Tyre jtyre@une.edu in the EHS Department. Any donations made will be advertised in the following edition of EHS Lab Chatter.

UNE Chemical Sharing Program

The UNE Chemical Sharing Program is a great way to reduce hazardous waste, reduce costs for your department, and have a positive environmental impact on campus. If you have any commonly used lab chemicals that you are thinking of disposing, please contact EHS so they can be listed in the next issues of EHS Lab Chatter as available for the UNE Chemical Sharing Program.

Chemicals currently available due to a professor's retirement:

Azure B	Gold Chloride	Succinic Acid
Aniline Blue	Hydroquinone	Sodium Phosphate x2
Alizarin sodium sulfonate	Magnesium Chloride	Sucrose
Cobalt Chloride	Methyl Blue Chloride	Sodium Borate
Chromium Potassium Sulfate	iodine	Sodium Acetate
Cedar Wood Oil	Malonic Acid	Sodium Bicarbonate
Drierite 3	Menadione	Sodium Citrate
Citric Acid	Potassium Chloride x 3	Sodium Sulfate
Agar	Oxalic Acid	Sodium Succinate
Cupric Sulfate	Potassium Permanganate	Sudan Black
Aluminum Ammonium Sulfate	Parafin Oil	Strong Silver Protein
Glycine	Silver Nitrate	Sodium Oxalate
Gum Tragacanth	Permount	Tris Amino Methane
Gelatin	Netural Red	Urea
Glycerophosphate	Saffron O x2	Tris Hydroxy Methyl
	Potassium Iodide	Trimethylamine N Oxide
	Paraformaldehyde	Tionin x3
	Ponceau Xylidine	Triethylphosphine

Please email: **jtyre@une.edu** by November 1st if you are interested in any of the listed substances. EHS will gladly do the transfer to your laboratory.

Contact us

Ronnie Souza,
Director of EHS
UNE Extension:
2488
Cell:
207-391-3491
Email:
rsouza@une.edu

Peter Nagle,
EHS Specialist
UNE Extension:
2791
Cell:
207-468-1786
Email:
pnagle@une.edu

Jessica Tyre,
EHS Specialist
UNE Extension:
2046
Cell:
603-244-0081
Email:
jtyre@une.edu

Alethea Cariddi,
Sustainability Coordinator
UNE Extension:
2507
Email:
acariddi@une.edu

www.une.edu/campus/ehs