ENVIRONMENTAL HEALTH AND SAFETY

Lab Chatter

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CONTACT EHS

Ronnie Souza
EHS Director
Biological Safety Officer
Radiation Safety Officer
Phone: x2488
Email: rsouza@une.edu

Peter Nagle
EHS Specialist
Phone: x2791
Email: pnagle@une.edu

Jesse Millen-Johnson
EHS Specialist
Phone: x2046
Email: jmillenjohnson@une.edu

SAFETY SPOTLIGHT:
Fume Hood and Biosafety Cabinet BMPs

By Jesse Millen-Johnson

To help save significant amounts of energy, reduce unnecessary utility costs, and improve laboratory safety, all **fume hoods** on both campuses should have their sashes fully closed when not in active use. In addition, if a hood is able to be turned off safely between uses, it should be. This is provided no fumes are being generated inside the hood when it is turned off and that all chemical containers are closed/capped. It is also important to note that fume hoods should not serve as a storage area for a large amount of chemical containers or other large items/devices. These items partially block the flow of air and create dead spaces, which means the hood may no longer function safely. If larger items must be inside the hood during operation, they should be elevated so that air can still pass beneath them relatively unobstructed.

EHS has recently placed "Shut the Sash" stickers on each fume hood. The color gradient moves from green (safest - lowest energy use) to yellow (safe - moderate energy use) to red (unsafe - high energy use). Do NOT use a fume hood if the sash is in the red zone above 18 inches. That height is the maximum safe operating level to ensure potentially hazardous vapors and particles are properly vented through the hood and do not leak back toward the operator. Open chemical containers, vials, beakers, and other materials should always be placed at least 6 inches back from the plane of the front sash when being handled. Please disregard any old markings on fume hoods showing a "safe" or "preferred" height that may have been written on them with permanent markers, etc. Make sure to only follow the markings on the new stickers.

The lower the sash, the greater the safety and energy conservation. Even in older models with constant flow as opposed to newer variable-flow hoods, shutting the sash means less heated (or air conditioned) air is escaping the building via the hood exhaust. Therefore, HVAC costs are reduced. *Just 1 open hood uses the same daily energy as about 2 residential homes.*

A **biosafety cabinet** (BSC) uses laminar air flow and high efficiency particulate air (HEPA) filtration to contain aerosols generated during work with biological material. When used properly, it protects the operator, laboratory area, and sample from contamination.

- Before working in a BSC, make sure you are properly trained in its use and that the certification is current
- Do not use the BSC if any alarms are activated.
- Do not use hazardous chemicals or open flames in the BSC.
- Do not use the BSC as a storage area. Overcrowding the BSC with unnecessary items can affect airflow and containment.
- When working in the BSC, proper PPE is required. At minimum a lab coat and gloves should be worn.
- Decontaminate BSC interior before and after each use with an approved disinfectant.
- Always open sash to correct working height.
- Always use proper aseptic technique.

At least daily, or each time the cabinet is operated, the operator or user should observe the magnahelic gauge and note its relative position. Magnahelic gauges measure the pressure drop across the outlet HEPA filter and are important indicators of filter integrity and loading. The gauge will typically indicate the same measurement over a long period of time. A significant change in the reading over a short period of time may indicate clogging or a leaking filter. In such cases, the hood should not be used until the problem is identified and resolved. *If the BSC located within a laboratory does not have a magnahelic gauge, users must understand the operation of the airflow monitor, controls, and alarm settings.*

Note: BSC information courtesy of GW Office of Laboratory Safety

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Tick-borne Illness: A Surprising Year-Round Hazard

By Jesse Millen-Johnson

Although ticks are typically associated with spring and summer, blacklegged ticks (Latin name Ixodes scapularis, commonly referred to as deer ticks) can be active whenever the temperature is above 32F. In fact, adult blacklegged ticks are most active in October and November in the northeastern U.S., with nymphs most common during the summer.

It's important to watch where you walk on campus, as well as when doing outdoor research and fieldwork at all times of year. Depending on the season, cutting through a patch of un-mowed grass or brushing by vegetation on the edge of the woods at UNE can put you at risk for small hitchhikers like blacklegged, American dog, lone star, brown dog, and groundhog ticks and potentially serious diseases like Lyme, babesiosis, anaplasmosis, powassan disease, southern tick associated rash illness, ehrlichiosis, and even Rocky Mountain spotted fever, which surprisingly is more common in the southern and eastern U.S. than it is in western states. While some cause only mild or moderate illness, others such as Lyme can become serious and chronic. Powassan, although very rare with only 10 Maine cases since 2010, can cause severe neurological damage and death.

Blacklegged ticks are now found throughout Maine and are especially prevalent in southern and coastal areas, including the UNE campus. They thrive in brush, grass, and swampy spots, and prefer edge habitat where forests and other vegetation meet open spaces such as fields or lawns. Blacklegged tick nymphs prefer to hide in leaf litter on the ground in summer months. They most commonly attach to shoes that are in contact with this leaf litter, which is why it's especially important to treat shoes with a proper insecticide and/or repellent.

The life cycle of Lyme

Lyme disease is the most notorious tick-borne illness but a human vaccine is not currently available. Overall deer populations significantly affect blacklegged tick numbers (and therefore Lyme disease numbers) because adult blacklegged ticks feed mostly on large mammals such as deer. However, the disease is not passed from adult ticks to their offspring. Instead, ticks become infected with Lyme via small mammals such as chipmunks, birds, and certain mice when they first feed on these animals as larvae and then nymphs. The disease is most frequently passed to humans from tiny nymphs that can go undetected for the approximately 36 hours it takes to transmit the bacterium after attaching to a person and feeding on their blood. Other diseases like Powassan can be transmitted in just several hours after a tick attaches.

Reducing the risk

If you'll be in prime tick habitat, including in the fall or winter when the temperature is above freezing, you can reduce risk by wearing light-colored clothing treated with the insecticide permethrin, which can actually kill ticks AND repel them. But permethrin is only effective when applied to clothing; not skin. It also needs to be at the right concentration and can wear off after repeated washing of clothes. Insect repellent containing 15-30% DEET is very effective at repelling ticks. Unscented products containing DEET are available. Both permethrin and DEET have been extensively studied and show no health risks to humans when used properly. Unfortunately, oils like citronella, eucalyptus, and lemon leaf do not have the ability to mask human CO2 production like DEET does, and are therefore not considered effective for ticks.

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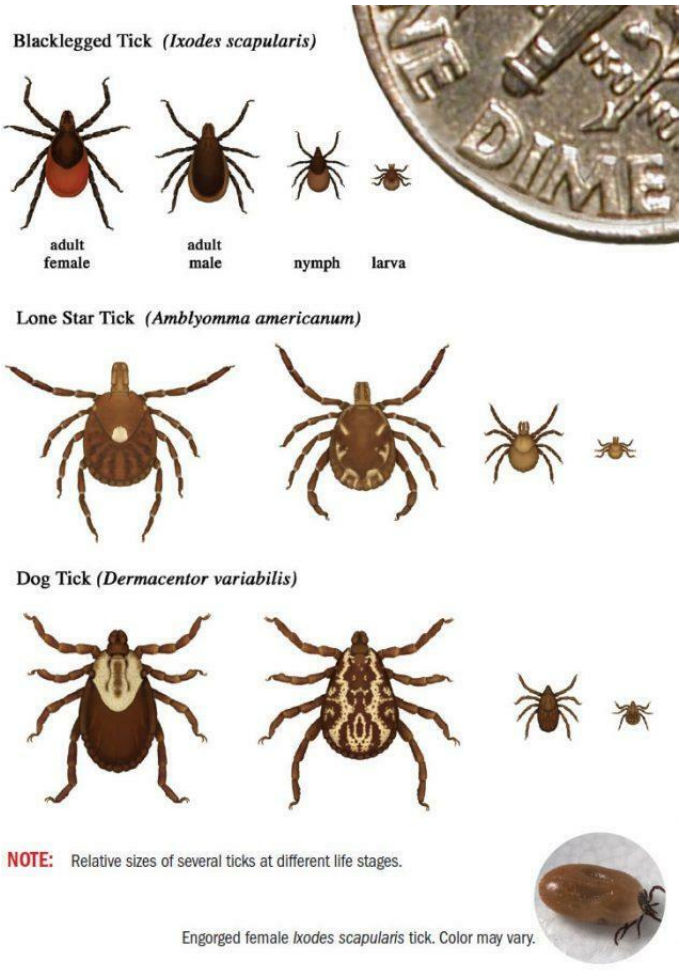
However, these natural oils can still provide some repellent effects against insects like mosquitoes. Doing a thorough head-to-toe tick check after showering (as soon as possible after being in tick habitat) is also quite important.

If you do find a tick attached to your skin, remove it very carefully with either tweezers applied to its head only or via a specialized tick remover. Do not squeeze the tick body or use other methods, which can actually cause the tick to transmit more bacteria into your blood. The tick should be identified and then killed with alcohol or by flushing down the toilet. If a rash or any type of flu-like or other unusual symptoms occur within 30 days after a bite, medical attention should be sought. A 2-week course of antibiotics is often required, with up to 4 weeks of IV antibiotics necessary for some cases that involve the nervous system. In certain individuals, some symptoms can remain after treatment and become chronic. More research is needed, but it is possible that some people develop an autoimmune response to the initial infection, which leads to potentially lifelong post-treatment Lyme disease syndrome.

Ticks can be extremely small. See the U.S. dime at top right for scale:



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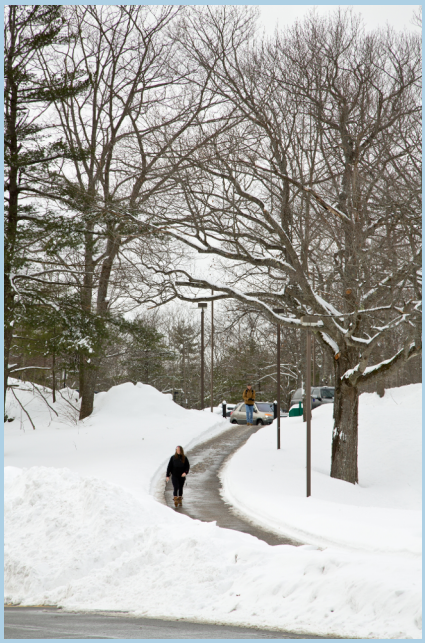
What's that tick?

*Some of the tick species that can be found in Maine, clockwise from top left: *Blacklegged tick, American dog tick, groundhog tick, and lone star tick.*

*The blacklegged tick is responsible for the majority of serious tick-borne disease in Maine



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Ductless Fume Hood Safety: Protecting People and Processes

From Erica Tennenhouse's 1/19/2018 Article in Lab Manager Magazine

A ductless fume hood is a self-contained laboratory enclosure that passes contaminated air through filters before returning the air directly back to the laboratory. Ductless fume hoods are not connected to an exhaust system, and they usually feature activated carbon filters. These systems are often selected for use in locations where outside ventilation cannot be achieved. In addition to removing a large amount of hazardous fumes, vapors, and particles from the laboratory, ductless fume hoods also result in energy and cost savings, offer mobility, and are convenient to use due to the lack of complex duct work and infrastructure requirements.

Considerations for protecting operators

The primary function of a ductless fume hood is to protect the individuals working within it. Exposure to the fumes, vapors, and particles emanating from chemicals being used in experiments can result in injuries and, in extreme cases, death. Inward airflow must be within a specific range in order to safely remove hazardous materials; if airflow falls below a minimum value, these materials may flow out of the fume hood and pose hazards to laboratory staff. The effectiveness of a fume hood also relies on filters that are capable of removing the hazardous materials in question. It is essential that fume hood users have a means of monitoring both the airflow and filter conditions so that they may respond immediately if the fume hoods safety is compromised. The customer and ductless manufacturer must work together to ensure proper selection of the correct hood too meet the laboratory application demand.

Considerations for protecting processes

In addition to protecting users, a ductless fume hood can help to protect precious samples. Optimal airflow prevents samples from being contaminated by either the user or any materials floating around in the lab. The risk of background or cross-contamination of samples can also be avoided with appropriate filtration. Once again, a monitoring system is required to ensure that conditions in the fume hood remain safe for samples and experiments.

Features of a safe ductless fume hood

Blower capable of maintaining face velocity at a safe opening per relevant standard. Face velocity is the pull at the opening of the fume hood that moves air from the laboratory room into the hood. The fume hood must maintain optimum face velocity for adequate fume containment.

- Vapor-proof illumination adequate for work area. Vapor-proof illuminators help meet safety requirements in applications involving flammable dust or vapor, while providing the operator with adequate lighting.
- Work area access. Users should have free and easy access to the fume hoods work area through an adequate opening in order to set up and run experiments.
- Integral spill base. An integral spill base can effectively contain any accidental spills that may occur during chemical manipulation in the fume hood.

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- Integral spill base. An integral spill base can effectively contain any accidental spills that may occur during chemical manipulation in the fume hood.
- Reliable method to monitor carbon filter bed saturation per ANSI Z9.5. This set of criteria for laboratory ventilation states that carbon filters must be monitored for saturation.
- Reliable airflow measurement device per 29 CFR 1910.1450. This standard states that fume hoods must maintain an airflow capable of drawing air from the laboratory and preventing or minimizing the escape of air contaminants into the laboratory.
- Constructed from application appropriate materials to prevent hood deterioration.
- To ensure fume hood longevity, the interior materials must resist attack from the acid fumes, vapors, and the range of temperatures they will be exposed to.
- Rear baffle to promote even airflow. Baffles are moveable partitions used to create slotted openings along the back of the fume hood that help to maintain even airflow.

Safety Tips

Selecting a ductless fume hood with safety features is key, but laboratory staff must also be trained to use the fume hood correctly. The Occupational Health and Safety Administration offers the following tips for staying safe while working with a fume hood:

- Make sure that you understand how the fume hood works and are trained to use it properly.
- If you are unsure about the hazards of any of the chemicals you are working with, refer to the appropriate Safety Data Sheet.
- Ensure that the fume hood is on.
- Open the sash to the proper operating level, which is usually indicated by arrows on the frame.
- Make sure that the air flow is within the required range.
- Never allow your head to enter the plane of the hood opening.
- Always wear appropriate eye protection.
- Make sure nothing blocks the airflow through the baffles or the baffle exhaust slots.
- Keep large equipment elevated at least 2 inches off the base of the fume hood.
- Keep all materials inside hood at least 6 inches away from sash opening.
- When not working in the hood, keep the sash closed.
- Do not permanently store any chemicals inside the hood.

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Eyewash Refresher

Eyewashes are important safety features in any laboratory and are always viewed by EHS personnel during biannual lab inspections at UNE. Eyewashes are designed to flush hazardous chemicals and debris out of the eyes in an emergency. There are two types of eyewashes: sink mounted/plumbed eyewashes and bottle eyewashes. Sink mounted eyewashes or free standing eyewashes are connected to a building's water supply and offer a continuous flow. They need to be run and inspected **weekly** (every 7 days) to ensure plumbing is functioning properly and there is no sediment on the eyewash or in the water supply. After inspection, the eyewash tag should be filled out with the inspector's initials and the date.

The eyewash inspection should focus on the following items:

- Is the eyewash location marked with a sign?
- Is the eyewash control device readily accessible and highly visible?
- Are the caps in place over the water nozzles to protect them from contaminants?
- Is the area around the nozzles clear from obstructions and sharp objects?
- Do the nozzle covers come off when the eyewash is activated?
- Does water flow from the eyewash within one second of activation?
- When the water is running, is it clear? Are the jets working properly? Is the unit leaking?

In an emergency, when using the eyewash, you need to let it run in the affected eye (s) for at least 15 minutes. The mistake many people make when using an eyewash station is not letting it run for the full recommended duration. A nearby staff member should clean up any excess water on the floor after the emergency is under control to prevent any slips or falls.

Bottle eyewashes have expiration dates and should be checked on a monthly basis to see if the bottles need to be replaced. The entire contents of the bottle should be used to rinse the eyes. After the unit has been used, you will need to order new bottles for the station to replace what is missing as soon as possible. Bottle eyewashes are ideal in situations where plumbed eyewashes are not feasible. Some first aid kits also contain small bottles of eyewash solution and will need to be checked for expiration dates as well.

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