Lab Chatter

ENVIRONMENTAL HEALTH AND SAFETY

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SAFETY SPOTLIGHT:
Hand and Arm Protection

By Ronnie Souza

Why is hand safety so important? It has been estimated that **almost 20% of all disabling accidents on the job involve the hands**. Without your fingers or hands, your ability to work and your quality of life would be severely impacted. Your hands are one of your greatest assets and must be protected. A workplace hazard assessment will help identify potential injury to hands and arms that cannot be eliminated through engineering and work practice controls. Employers must ensure employees wear appropriate protection.

Potential Hand and Arm Hazards

- Abrasion
- Amputations
- Cuts
- Blood-borne pathogens
- Biological
- Chemicals (dry or liquid)
- Chemical burns (acid or base)
- Electrical shock
- Extreme temperatures
- Fractures
- Laceration
- Heat and cold
- Thermal burns
- Radiation
- Vibration and grip

Employers should explore all possible engineering and work practice controls to eliminate hazards and use PPE to provide additional protection against hazards that cannot be completely eliminated through other means. UNE's Environmental Health & Safety Department is available to assist with hazard assessments of the work environment. For example, using appropriate insulated gloves would protect your hands while handling extremely hot or cold hazards.

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Types of Protective Gloves
There are many types of gloves available today to protect against a wide variety of hazards. The nature of the hazard and the operation involved will affect the selection of gloves. The variety of potential occupational hand injuries makes selecting the right pair of gloves challenging. It is essential that employees use gloves specifically designed for the hazards and tasks found in their workplace because gloves designed for one function may not protect against a different function even though they may appear to be an appropriate protective device. The following are examples of some factors that may influence the selection of protective gloves for a workplace:

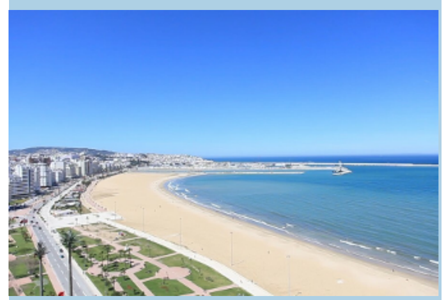
- Type of chemicals handled
- Nature of contact (total immersion, splash, etc.)
- Duration of contact
- Area requiring protection (hand only, forearm, arm)
- Grip requirements (dry, wet, oily)
- Thermal protection
- Size and comfort
- Abrasion/resistance requirements

Gloves made from a wide variety of materials are designed for many types of workplace hazards. In general, gloves fall into four groups:

- Gloves made of leather, canvas or metal mesh
- Fabric and coated fabric gloves
- Chemical- and liquid-resistant gloves
- Insulating rubber gloves

Leather, Canvas or Metal Mesh Gloves
Sturdy gloves made from metal mesh, leather or canvas provide protection against cuts and burns. Leather or canvass gloves also protect against sustained heat:

- **Aluminized gloves** provide reflective and insulating protection against heat and require an insert made of synthetic materials to protect against heat and cold.
- **Aramid fiber gloves** protect against heat and cold, are cut- and abrasive-resistant and wear well.
- **Synthetic gloves** of various materials offer protection against heat and cold, are cut- and abrasive-resistant and may withstand some diluted acids. These materials do not stand up against alkalis and solvents.
- **Leather gloves** protect against sparks, moderate heat, blows, chips and rough objects.



Fabric and Coated Fabric Gloves
Fabric and coated fabric gloves are made of cotton or other fabric to provide varying degrees of protection:

- **Fabric gloves** protect against dirt, slivers, chafing and abrasions. They do not provide sufficient protection for use with rough, sharp or heavy materials. Adding a plastic coating will strengthen some fabric gloves. specific workplace chemicals and conditions.

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Chemical- and Liquid-Resistant Gloves
Chemical-resistant gloves are made with different kinds of rubber: natural, butyl, neoprene, nitrile and fluorocarbon (viton); or various kinds of plastic: polyvinyl chloride (PVC), polyvinyl alcohol and polyethylene. These materials can be blended or laminated for better performance. As a general rule, the thicker the glove material, the greater the chemical resistance but thick gloves may impair grip and dexterity, having a negative impact on safety.
Some examples of chemical-resistant gloves:

- **Butyl gloves** are made of a synthetic rubber and protect against a wide variety of chemicals, such as peroxide, rocket fuels, highly corrosive acids (nitric acid, sulfuric acid, hydrofluoric acid and red-fuming nitric acid), strong bases, alcohols, aldehydes, ketones, esters and nitrocompounds. Butyl gloves also resist oxidation, ozone corrosion and abrasion, and remain flexible at low temperatures. Butyl rubber does not perform well with aliphatic and aromatic hydrocarbons and halogenated solvents.
- **Natural (latex) rubber gloves** are comfortable to wear, which makes them a popular general-purpose glove. They feature outstanding tensile strength, elasticity and temperature resistance. In addition to resisting abrasions caused by grinding and polishing, these gloves protect employees' hands from most water solutions of acids, alkalis, salts and ketones. Latex gloves have caused allergic reactions in some individuals and may not be appropriate for all employees. Hypoallergenic gloves, glove liners and powderless gloves are possible alternatives for employees who are allergic to latex gloves.
- **Neoprene gloves** are made of synthetic rubber and offer good pliability, finger dexterity, high density and tear resistance. They protect against hydraulic fluids, gasoline, alcohols, organic acids and alkalis. They generally have chemical and wear resistance properties superior to those made of natural rubber.
- **Nitrile gloves** are made of a copolymer and provide protection from chlorinated solvents such as trichloroethylene and perchloroethylene. Although intended for jobs requiring dexterity and sensitivity, nitrile gloves stand up to heavy use even after prolonged exposure to substances that cause other gloves to deteriorate. They offer protection when working with oils, greases, acids, caustics and alcohols but are generally not recommended for use with strong oxidizing agents, aromatic solvents, ketones and acetates.

CLIMATE & JUSTICE: ONE-NIGHT TEACH-IN

Climate activist and president/founder of Hip Hop Caucus to give keynote

On March 30th at 5:00pm in Room 205 of the Alfond Center for Health Sciences, Rev. Lennox Yearwood Jr. will give a keynote lecture addressing the dual existential crises of climate and racism.

In addition, the teach-in will feature seven panels comprising 35 faculty and guest speakers from over two dozen programs, centers, and disciplines across UNE. The panels include:

- Our Changing World
- Protecting Public Health
- Climate Justice
- Taking Action
- Navigating Climate Anxiety
- Communicating Climate Change
- Solutions for the Future

The teach-in will also be available on UNE Live and Facebook Live.

The event is part of the worldwide movement to Solve Climate by 2030. Attendees are invited to join the discussion and see how their field contributes to a brighter future.

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Improvements in Academic Lab Safety Still Needed

By Jesse Millen-Johnson

There is good news and bad news when it comes to academic laboratory safety: research indicates it has made progress in the past decade following several high profile accidents at major U.S. universities such as the University of Hawaii, UCLA, and Yale but still needs significant improvement. For example, The Laboratory Safety Institute provided the following concerning statistics in a 2019 article:

- 25-38% of lab personnel surveyed have been involved in an accident or injury in the lab that was not reported to the supervisor or principal investigator.
- 27% of researchers stated that they never conducted any kind of risk assessment before performing laboratory work. Academic researchers were the least likely to assess risk, followed by industry and government.
- Only 40% of researchers surveyed reported wearing PPE at all times when working.
- 25% of researchers had not been trained in the specific hazard with which they worked.
- The institute also stated that articles in chemistry journals seldom mention safety information on chemical reagents. One study looked at journal mentions of 11 hazardous compounds. These compounds were mentioned 107 times in journal articles but only one article provided cautionary information.

An article in the November 2019 issue of *Nature Chemistry* by A. Dana Ménard and John F. Trant pointed out the following challenges and needed improvements:

"There are 432 research intensive (R1, R2 and R3) universities in the United States...As graduate education spreads around the world, and with the exponential growth of programmes in China and India, the number of individuals involved in academic chemical research is set to expand. Currently, we are operating completely in the dark with regards to safety policies in both training and practice. We do not even know how many people are hurt every year and how badly, nor how great the damages are to laboratories, buildings and equipment. We simply have no idea about the scale of the issue...

The benefits of establishing academic lab safety research programmes would be substantial. Ultimately, the goal would be to decrease the rate and severity of accidents in academic labs, ensure that lab personnel stay safe and healthy, and that equipment, laboratory and buildings are protected. This is also likely to have a spillover effect into industry — better-trained, more safety-conscious students would make better industrial employees. Undoubtedly, there would be financial savings related to the cost of accidents, insurance rates and lawsuits. Despite calls for safety studies to form a central part of chemical research including tenure-track positions at major research universities, and an increased understanding and interest in chemical safety studies by experimental research professors, we could not identify any scientist whose principle mandate was the study of chemical safety…If action is not taken soon, academic chemical research may come to be seen as too risky for some institutions from a liability perspective: if we as a discipline do not take action, action may well be taken for us."

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When "Safe" isn't Safe

By Jesse Millen-Johnson

An unfortunate incident involving a veteran researcher at a respected university shows the importance of assessing the entire safety picture. In this case, it might have identified a hidden health condition that can turn a bacterium modified to be "harmless" back into a killer.

Prof. Malcolm Casabadan, a 60 year-old veteran microbiologist at the University of Chicago, was conducting research with an attenuated strain of plague (*Yersinia pestis*) in September, 2009. In order to work with bacteria that killed 45% of the European population as the Black Death in the 14th century, it had been genetically modified to remove proteins that allow it to obtain necessary iron from human cells. This renders plague bacteria incapable of multiplying rapidly and therefore does not lead to illness.

Unbeknownst to Casabadan, he had inherited primary hemochromatosis, a relatively common condition which affects approximately 1 million people in the United States. It causes the body to store too much iron from food and often goes undiagnosed due to slow onset and lack of specific symptoms. White males with Northern European ancestry are at highest risk. Casabadan's condition created a situation where even attenuated plague bacteria could thrive on excessive, easily available iron in his body; it no longer needed the special proteins. Regrettably, this unique risk for certain individuals was not discussed or taken into account when plague research was conducted at that time.

Exactly how the *Yersinia pestis* bacteria entered Casabadan's system is a mystery. However, he was known to frequently perform his research without protective gloves and would also skip certain safety meetings. What is clear is that 3 days after developing a fever, Casabadan was dead from septicemic plague, a type of plague that is nearly 100% fatal without immediate antibiotic administration. Prompt use of antibiotics leads to an 85-96% survival rate, but a delay in treatment of even 24 hours usually leads to death.

Important considerations after this tragic accident include always using personal protective equipment (PPE) and biosafety cabinets when working with potentially pathogenic material. This should be done even when "safe" agents are used. And if there is a possible biological exposure, such as a needle-stick, universal precautions to address the risk of blood-borne pathogen transmission must be observed; even if you think something isn't infectious, act as if it could be. Finally, consider the specific health status of all personnel and what could happen if one of them had a hidden medical condition.

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