“Safety Comes First ”

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Radon Gas: How to Minimize Your Risks

With the winter months upon us we spend more time indoors. Without proper ventilation, radon gas inhalation may be of greater concern. Radon (222Rn) is a cancer causing radioactive gas. Like carbon monoxide, you can’t see it, smell it, or taste it, but it is present in our subsoil here in northeastern Ohio.

Radon is a radioactive, colorless, odorless, tasteless noble gas, occurring naturally as a byproduct of decaying radium. It is one of the densest substances that remains a gas under normal conditions and is considered to be a health hazard due to its radioactivity. Its most stable isotope, 222Rn, has a half-life of 3.8 days

Radon comes from the natural (radioactive) breakdown or decay of uranium in soil, rock and water and gets into the air you breathe. Uranium has been around since the earth was formed and its most common isotope has a very long half-life (4.5 billion years), which is the amount of time required for one-half of uranium’s radioactivity to break down. Uranium, and thus radon, will continue to be present for millions of years at about the same concentrations as they are now.

Radon can be found all over the U.S. It can get into any type of building—homes, offices, and schools—through cracks and other holes in the foundation and result in a high indoor radon level. You are most likely to get your greatest exposure at home where you spend most of your time. This is particularly the case if you have a poorly ventilated basement area in your home.

Radon gas becomes harmful when it decays into radioactive particles that can get trapped in your lungs when you breathe. As they break down further, these particles release small bursts of energy. This process can damage lung tissue and lead to lung cancer over the course of your lifetime. Of course, not everyone exposed to elevated… (*con. on Page 2*)

Radon Gas: How to Minimize Your Risks (con.)

"There are several proven methods to reduce radon in your home, but the one primarily used is a vent pipe system and fan, which pulls radon from beneath the house and vents it to the outside."

(*con from Page 1*) levels of radon will develop lung cancer, but radon exposure greatly increases the chances of developing cancer. While the amount of time between exposure and the onset of the disease may be many years, it should be noted that there is no known safe level of radon.

Another key factor involved with exposure to radon is smoking. If you smoke and have exposure to radon, you increase your risk of getting lung cancer. According to the United States Environmental Protection Agency, radon is the second most frequent cause of lung cancer, after cigarette smoking, causing 21,000 lung cancer deaths per year in the United States. Having both of these risks present increases your risks exponentially.

Ingesting radon by drinking contaminated water is also a risk, but not as great a risk as inhaling the gas. The risk of developing lung cancer from breathing the contaminated air is greater than that of developing stomach cancer. Ground water poses a greater risk of radon exposure than surface water.

Radon gas levels of 4 picocuries per liter or greater pose the greatest risk. You can use test kits or hire a qualified tester to test your home for radon levels. Short term tests and long term tests are available. Short term tests have a range of 2-90 days depending on the device used. Long term tests (greater than 90 days) or consecutive short term tests will provide a year round average level since levels vary with the seasons.

The average radon concentration in Cuyahoga County is between 2-4 picocuries per liter. Although this number falls just below the risk level, radon gases concentrate indoors, particularly in areas without ventilation. Testing and/or monitoring is recommended for all enclosed structures.

There are several proven methods to reduce radon in your home, but the most common one is a vent pipe system and fan, which pulls radon from beneath the house and vents it to the outside. This system, known as a soil suction radon reduction system, does not require major changes to your home. Sealing foundation cracks and other openings makes this kind of system more effective and cost-efficient. Similar systems can also be installed in houses with crawl spaces. Radon contractors can use other methods that may also work in your home. The right system depends on the design of your home and other factors.

Radon Hotlines:

1-800-SOS-RADON (767-7236)—to purchase radon test kits by phone.

1-800-55RADON (557-2366)—to get live help for your radon questions.

1-800-644-6999* Radon Fix-It Hotline—for general information on fixing or reducing the radon level in your home.

State of Ohio Radon Office: 1-800-523-4439 or 1-614-644-2727

*Back Injuries: A Quick Reminder List**

All occupations require routine lifting form time-to-time. Some occupations, of course, lift with more frequency than others. Regardless of how often your lift containers, you should always pay close attention to your form. Lifting anything the wrong way can result in a serious back injury, requiring weeks to recover and/or possibly causing long-term damage. To keep your back in good shape and keep yourself pain-free, remember to follow these simple guidelines:

- Plan your work (visualize what you have to do BEFORE you do it)
- Gently stretch your muscles to warm up
- Use dollies or other mechanical equipment when possible
- Only lift and carry loads that you can handle safely
- Lift with your legs not your back (see Figure 1)
- Never twist
- Carry the load close to you body
- Lower loads slowly, bending the knees

Figure 1: Proper Lifting Technique Using Legs*

Eight steps to lifting properly and safely

1. Maintain a wide stance and solid footing.
2. Keep back straight while bending at the hips and knees to a squatting position.
3. Tighten stomach muscles
4. Get a good grasp of the load.
5. Keep the load close to your body.
6. Lift steadily with the legs, while looking straight ahead.
7. Keep arms and legs both pointed in the direction of travel.
8. Remember to maintain your spine's natural curves.

**Image Source*: Healthwise, Incorporated

**Source Consulted:* Louisiana State University Environmental Health and Safety

"Lifting anything the wrong way can result in a serious back injury, requiring weeks to recover and/or possibly causing long-term damage."

Acetylene Regulator and Cylinder Safety

"As with any other flammable gas, acetylene should be stored and used in a well-ventilated area away from sources of ignition."

Acetylene is the fuel of choice for repair work and general cutting and welding. However, it is also highly flammable and forms explosive mixtures with air in concentrations ranging from 2-80%. Acetylene gas is also thermodynamically unstable and sensitive to shock and pressure. Therefore, it is shipped in specially designed steel cylinders. The inside of an acetylene cylinder is not hollow but is packed with a porous, inert material (e.g. kapok fiber, diatomaceous earth, or [formerly] asbestos), then filled to around 50% capacity with acetone. The acetylene gas is then pumped into the cylinder and dissolves in the acetone. This method keeps the acetylene stable for transportation and use. It is important to always keep the acetylene cylinder in an upright position during transportation, storage and use to prevent release of the acetone into the regulator.

In general there are two types of regulators, *single stage* and *two-stage*. Acetylene regulators are two-stage and the function of the first stage is to release the gas from the cylinder at a constant intermediate pressure, despite the pressure in the cylinder falling as the gas in the cylinder is used. The adjustable second stage of the regulator controls the pressure reduction from the intermediate pressure to the low outlet pressure. Gaseous acetylene is spontaneously combustible in air at pressures above 15 psi. For this reason all acetylene regulators have their outlet gauge scales marked in red starting at 15 psi. Never manually adjust the second stage regulator above 15 psi.

Acetylene forms highly unstable acetylides with many metals including brass, copper, mercury, potassium, silver and gold. Dry acetylides are sensitive, powerful explosives. For this reason, never allow brass or copper tubing, valves or fittings to come in contact with the gas. Excess acetylene should be vented from reaction flasks, tubing, etc. rather than scrubbed with a strong base to avoid the formation of acetylides. Acetylene may also react violently with halides such as fluorine, chlorine, bromine and iodine and forms explosive compounds on contact with nitric acid.

As with any other flammable gas, acetylene should be stored and used in a well-ventilated area away from sources of ignition. Check all connections regularly for leaks using a solution of soapy water. Typical leak points are the packing nut, the valve threads, the collar, the pressure relief device, the regulator, and other attachments. If a leak is found, tighten the connection from which acetylene is leaking. Remember that the regulator connection is a left-handed thread and must be turned to the left to be tightened. **NOTE: A leaking cylinder without a fire is dangerous because the gas could find an ignition source and explode.** If you cannot stop the leak, shut down all ignition sources if safe to do so and immediately leave the lab. Prevent others from entering the lab and call safety services from a campus phone to obtain emergency assistance.

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Acetylene Regulator and Cylinder Safety (continued from page 4)

(*continued from previous page*) If you have specific questions regarding the safe use of acetylene, contact your compressed gas supplier and ask to speak with someone in technical support. They are familiar with the problems that can arise and are a valuable source of information. Remember to include a standard operating procedure (SOP) to ensure that everyone will know how to safely use acetylene in your lab. For assistance in preparing a SOP refer to the Important Safety and Operation Instructions For Regulators & Cylinders(https://www.case.edu/ehs/LabSafety/cylinder_care.pdf) located in our EHS website under Chemical Safety or contact your Environmental Health and Safety (EHS) representative at ext. 2907.

Sources: Case Environmental Health and Safety and University of Michigan Occupational Safety & Environmental Health

Why Wear a Laboratory Coat?

The answer to this question can of course be found in the DOES Laboratory Safety Manual available online at the DOES website (does.cwru.edu): "Wearing a laboratory coat is required whenever you are in any laboratory on campus." But do you ever wonder why this is the case?

In the simplest of terms, the laboratory coat provides an extra layer of protection from chemical splashes and accidental fires in the laboratory. The coat is intentionally designed to be loose fitting and easily removable so that if an accident does happen, you can quickly take off the laboratory coat and hopefully mitigate any health effects from chemical exposure and/or physical harm from fire. Sometimes, however, even when the policy is clear, people can forget. And forgetting this simple rule can have dire consequences.

For example, on December 29th, 2008, a graduate student was using a syringe to remove a small quantity of t-butyl lithium from a sealed container. T-butyl lithium is a pyrophoric chemical, meaning that it will ignite when exposed to air. This student was wearing rubber gloves (not fire resistant), goggles, and a synthetic sweater (highly flammable) with no laboratory coat. She was using a syringe to obtain the required amount of chemical and pulled the plunger out too far, exposing the chemical to air causing it to flash. Her clothing was set on fire. Sheri Sangji died on January 16th due to 2nd and 3rd degree burns over 43% of her body.

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"[T]he laboratory coat provides an extra layer of protection from chemical splashes and accidental fires in the laboratory."

Why Wear a Laboratory Coat? (continued from page 5)

"Quite simply, follow this simple rule— WHENEVER YOU ARE IN THE LABORATORY, WEAR YOUR LABORATORY COAT."

Unfortunately, Ms. Sangji's case is not an isolated one. A 37-year-old male laboratory technician in a geology laboratory was dissolving sedimentary rocks with 70% hydrofluoric acid (HF). He was wearing two pairs of wrist length rubber gloves and polyvinyl sleeve covers only. He knocked over a small quantity (100-230 ml) ofHF into his lap. He sustained acid burns on 9% of his body surface. When he was admitted to the hospital he was hypothermic and hypocalacaemic (low level of calcium in blood serum). His right leg was amputated 7 days after the incident. He subsequently died from multi-organ failure 15 days after hydrofluoric acid spill.

In another case, a laboratory researcher was pouring chloroform though a gel column. Pressure built up in the column causing the glass to shatter spraying chloroform onto the worker's face, eyes, and clothing. He suffered 2nd degree burns on both arms.

The point of these stories is not to elicit fear, but to address a common misapprehension some laboratory workers believe, i.e., "It can't happen to me." Could wearing a laboratory coat have prevented the deaths and injuries as a result of these accidents? Possibly.

For instance, in the first case, maybe the laboratory coat catches on fire instead of the young woman's sweater and she is able to remove the coat before she is burned too badly.

In the second case, maybe the hydrofluoric acid takes a split second longer to permeate through the laboratory coat, allowing the technician to quickly remove the coat lessening the amount of acid that reaches his epidermis.

In the final case, maybe the laboratory coat absorbs much of the spray from the column, preventing the skin exposure.

It is certainly possible that if laboratory coats were worn in these situations the result would have been better. What is clear is that not wearing a laboratory coat did nothing to prevent these tragic injuries. Quite simply, follow this simple rule—WHENEVER YOU ARE IN THE LABORATORY, WEAR YOUR LABORATORY COAT.

For more information about requirements of PPE in the laboratory please go to DOES website @ does.cwru.edu

NOTE: This story originally ran in our September/October edition of the DOES Newsletter.

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Controlling Laboratory Ergonomic Risk

Ergonomics is a means of adapting the work environment to human capacities and needs. in common terms, it is a way of fitting the task to the person. In our daily lives in the workplace, we use principles of ergonomics to find positions and tools that minimize stress on the body while working. All manual and repetitive work done for long periods of time places stress on certain areas of the body. This includes many laboratory tasks that require painstaking and lengthy procedures, e.g., pipetting, labeling small jars or test tubes, sitting at the microscope, and using the computer. These tasks can contribute to poor posture, repetitive stress injury, and other ailments. This article will provide suggestions for reducing ergonomic risk factors common to the laboratory: awkward posture, high repetition, excessive force, contact stresses, and vibration. By learning how to control laboratory ergonomic risk factors, you can improve employee comfort and productivity while lowering chances for occupational injuries.

Pipetting

Pipetting is one of the most common activities in the laboratory to which repetitive strain injuries (RSIs) can be traced. These tips can help reduce those factors of force, position, and repetitiveness which contribute to the stress this activity places on the body.

To Control Awkward Postures:

- Work with wrists in straight, neutral positions to minimize strain. For example, incline the sample holder or solution flask, for example, to help keep wrists straight.
- Reduce reaching. Use short pipettes, conveniently-sized solution containers, and properly position waste containers for used tips.
- Keep items in use as close to you as possible by positioning them to minimize twisting of the neck and torso.
- Work with elbows as close to your sides as possible.
- Make sure that your chair provides proper lower back and thigh support and that feet are supported.

To Control High Repetition:

- Automate pipetting tasks.
- Use multi-pipetters whenever practical.
- Share workload between right and left sides.
- Vary pipetter types having different activation motions; for example, switch from using a thumb-controlled to a finger-controlled pipetter.
- Take adequate breaks away from pipetting activity. Even short, micro-breaks help.
- Rotate pipetting among several employees.
- Evaluate work processes to identify high-risk tasks (such as repetitive pipetting). These tasks can then be spread throughout the day and provide the worker with some rest from the strain of repetition.
- Add personnel for peak periods.

"All manual and repetitive work done for long periods of time places stress on certain areas of the body."

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