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Environmental Health & Safety

SafetyMatters

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Environmental Health & Safety

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Thank You, Dr. Purdy!

Columbia's Executive VP For Research to Retire Following Distinguished 50-year Career

by Kathleen Crowley, Associate Vice President, EH&S

Following a 50-year career in research, government, and academic leadership, G. Michael Purdy, PhD, is set to retire effective January 1, 2020. Dr. Purdy was appointed Columbia University's Executive Vice President for Research (EVPR) on February 1, 2011, where his responsibilities have included serving as EH&S' head executive administrator. During this time, as President Bollinger stated, Dr. Purdy's "determination to mitigate the burden our researchers face in meeting ever-expanding regulatory requirements" has also been a hallmark of his guidance to ensure that EH&S serve the University's research community with the technical safety support it has needed, with a minimal burden on research function.

G. Michael Purdy, PhD,
Executive Vice President for Research,
Professor of Earth and Environmental Sciences

Dr. Purdy himself has long been a strong advocate for safety in research, extending to his background working at sea while negotiating hazards ranging from extreme weather to experimental explosives. Drawing on this experience, he has always kept the safety of the Columbia research community in mind, whether reviewing safety performance reports of on behalf of the Institutional Health and Safety Council, or serving as spokesperson for the University's safety culture initiative.

In his message to the Columbia community announcing Dr. Purdy's retirement President Bollinger noted several signature advancements of Columbia's research programming under "Mike", including the establishment of the Mortimer B. Zuckerman Mind Brain Behavior Institute, the Precision Medicine Initiative, and the nanotechnology and quantum science and engineering initiatives. Each of these projects included Mike's unwavering commitment that they be completed with safety as a top priority, ensuring that where appropriate, they incorporate state of the art engineering controls, administrative support, and technical input from EH&S and other experts. As a result, with many thanks to Mike himself, these facilities demonstrate Columbia's commitment to not only world-class science, but world-class safety.

Dr. Purdy will be missed; his leadership has been greatly appreciated. Thank you Dr. Purdy for your service to Columbia University research and beyond. May you enjoy *fair winds and following seas* on the next leg of your life's journey!

For more on Dr. Purdy's distinguished career, follow the link here – https://president.columbia.edu/news/mike-purdy-step-down.

Introduction to the New Compressed Gas Cylinder Program

by Sunipa Pramanik, Senior Safety Advisor

A compressed gas is any gaseous element, compound or mixture which exerts in the packaging an absolute pressure of 280 kPa (40.6 psia), or greater, at 20°C. The primary hazard associated with any compressed gas is its potential energy by virtue of this high pressure, and asphyxiation hazards, via the displacement of oxygen. Certain compressed gases exhibit hazardous characteristics such as flammability, toxicity, corrosivity, reactivity, and cryogenicity.

The handling, storage and disposal of compressed gas cylinders are regulated by numerous regulatory agencies, including the National Fire Protection Association (NFPA), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), US Department of Transportation (USDOT), and the New York City Fire Department (FDNY). Additional best practices and guidelines have also been established by the International Mechanical Equipment Code, Compressed Gas Association (CGA), and National Institute for Occupational Safety and Health (NIOSH), among others.

As with any hazardous material, laboratories working with compressed gas cylinders should incorporate appropriate administrative and engineering controls, and wear personal protective equipment (PPE). To support development of proper safety measures, EH&S has developed a compressed gas safety program, including a comprehensive manual and online training module.

The compressed gas manual contains information on proper gas cylinder usage and maintenance, ordering and procurement, storage and ventilation considerations and requirements, and cylinder transport and disposal methods. Chapters on emergency preparedness and response, operation and implementation of the Laboratory Assessment Tool and Chemical Hygiene Plan (LATCH), as well as general safety and critical thinking are also included.

The new training program will require that all laboratory users of compressed gas cylinders complete an online training module on Rascal. EH&S will announce when the course is live.

For any questions about the new compressed gas safety initiative, reach out to EH&S at labsafety@columbia.edu.

Fire Safety Minute

Fire Safety Tips for the Holiday Season:

- Keep holiday trees well watered and at least 3 feet away from any heat source
- Dispose of any tree or wreath after the holidays or when they become dry
- Never leave an open flame unattended
- Keep candles at least 12 inches away from anything that burns
- Turn off all decorative lights when leaving the home or sleeping
- Do not overload home circuits by plugging in too many electrical devices
- Refer to manufacturers recommendations for using holiday decorations

More info can be found at:

https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Seasonal-fire-causes/Winter-holidays

Shield Yourself

by Clinical Radiation Safety Team — Health Physicists MacKenzie Hill and Tri Nguyen

The ALARA principle is the guiding philosophy of working with radioactive isotopes, to prevent potential damage to DNA from ionizing radiation. ALARA is an acronym for As Low As Reasonably Achievable and refers to the minimization of radiation exposure. The ALARA principles consist of three simple methods: time, distance and shielding. A decrease in time spent around radiation decreases radiation exposure. Increasing distance from a radiation source decreases radiation exposure in accordance with the inverse square principle - doubling the distance from a source decreases exposure by a factor of 4! Shielding can also be used to decrease exposure, but requires more considered decision-making based on the radioactive material being utilized. Let's take a look.

First and foremost, all forms of radiation are not one in the same. There are different quantities, energies, and types. The biggest factor that determines appropriate shielding/attenuating material is particle type. Researchers should consider what type of shielding is appropriate for which radiation carrier particle, because **lead shielding is not always the answer!** Four common particles utilized in research are summarized in the table below, and shielding is illustrated in Figure 1.

Common Ionizing Radiation Carrier Particles

Particle Type	Particle Constituents	Charges	Example of Sources
Alpha	2 protons + 2 neutrons	+2	Ra-223, Am-241, Pu-238
Beta	1 electron or 1 positron	-1 or +1	H-3, C-14, P-32, F-18
X-ray/Gamma	Photon	N/A	Tc-99m, X-ray tubes
Neutron	Neutron	N/A	AmBe, Particle accelerator

The particle's charge and mass determine its interactions with other materials on an atomic level. Neutrons do not have a charge, therefore the mass of a neutron bouncing off other atoms <u>**is**</u> the method of shielding. Neutrons act like billiard balls and therefore engage in elastic scattering. Due to this effect, the best materials for shielding neutrons are very low atomic number (Z) materials like water, boron, and concrete. For every neutron interaction with low Z matter, the momentum and energy of the neutron is reduced; similar to a billiard ball colliding with other balls on a pool table.

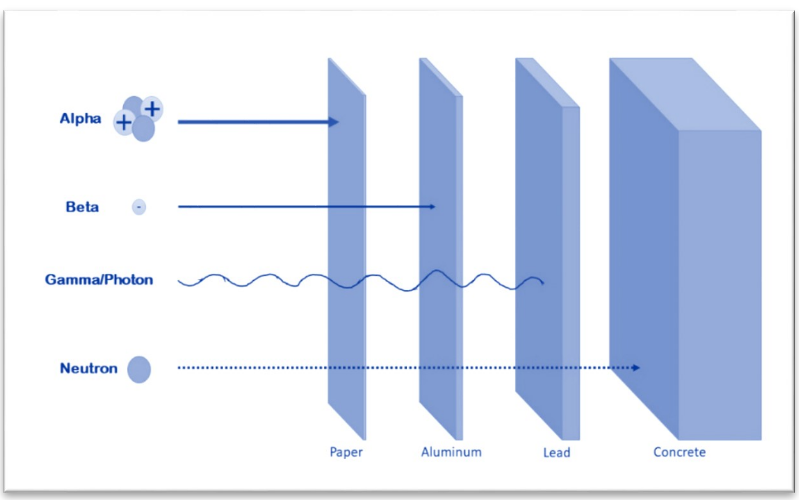

Figure 1 Shielding Radiation by Particle Type

X-ray and gamma rays are photons. Photons have neither mass nor charge, and therefore do not readily interact with matter. The most effective photon attenuators are high Z materials like lead (Z=82). Lead is dense, readily available, and offers several atoms for the photon to interact with. The thickness of lead needed can vary, depending on the photon's energy. Simply, higher photon energy results in the need for thicker lead shielding. Occasionally, for shielding very high energy photons > 8 MeV, a variety of materials sandwiched together can be necessary due to neutron production from photon-nuclear reactions. However, for most photons produced in a laboratory setting, lead shielding is sufficient.

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Shield Yourself Continued from Page 3

For electrons, as in Beta particles, shielding can be as simple as using a single low Z material such as plastic, acrylic or aluminum. Using high Z materials like lead, tungsten, or molybdenum **are not recommended** for Beta shielding because the interaction of these energetic particles with atoms can result in secondary photons. For positrons, an additional layer of lead should be added to minimize the 511 keV gamma ray radiation. Overall, in laboratory settings, plastic and aluminum are the best shielding for radioactive material with beta-decays, but a layer of lead can be added to shield secondary 511 keV gamma rays from the positron's interactions.

Alpha particles are large in size and consist of +2 charge. Alpha particles interact with other materials very readily. In fact, typical alpha particles used in laboratory benches only travel approximately 5 cm in the air without any shielding or barrier in place. In practical terms, this means that very little material is needed to attenuate alpha particles: a piece of paper, a pair of gloves or a laboratory coat provides sufficient shielding.

When working with radiation know your radiation device or isotope well. This knowledge allows for the best decisions when choosing appropriate shielding. For questions about ALARA principles, reach out to the Radiation Safety Office at rsocumc@columbia.edu.

2019 FDNY Fire Extinguisher Tag Update

by Ryan El Naggar, Safety Advisor

As of November 15, 2019, standardized New York City Fire Department (FDNY) issued tags must be affixed to all fire extinguishers that require an annual inspection, including those that are installed in Columbia University campus buildings. The tags have been redesigned to prevent counterfeiting and falsification of inspection records, and include the following enhancements:

- Tags are identical in size, shape, color, and material.
- A hologram to eliminate fraudulent tagging.
- A barcode with a unique serial number.
- A QR code that provides access to the FDNY's list of approved vendors.
- A Certificate of Fitness Stamp of the Vendor performing the annual inspection. This includes their full name, Certificate of Fitness number, company name, and company ID.

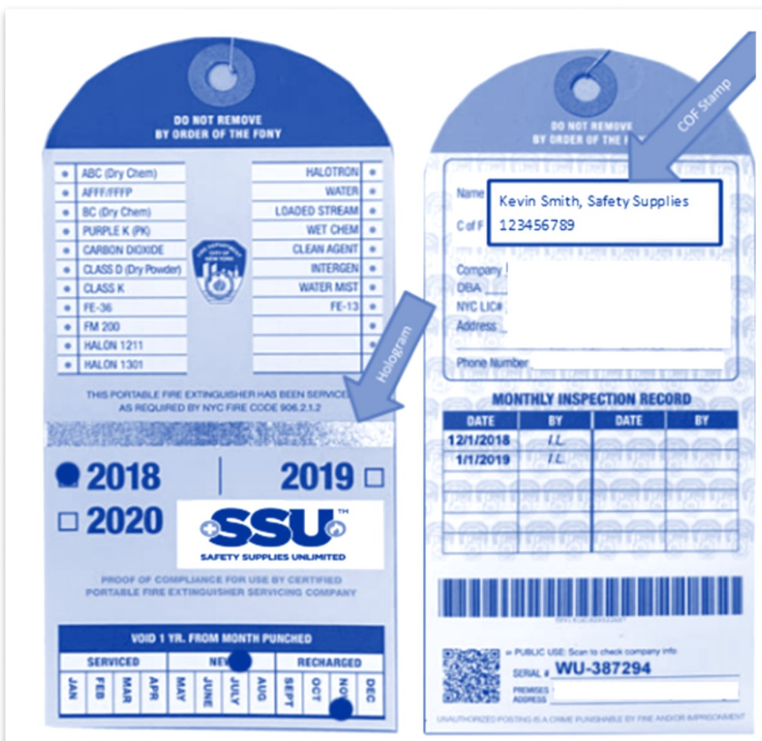

Figure 1. Front and back of new tag

Since these tags can only be purchased directly from the FDNY, and only by companies that are approved Portable Fire Extinguisher inspection companies, Columbia's vendor or EH&S will perform the tag changes during the extinguisher's annual inspection. The FDNY Inspector will issue violations if the fire extinguishers do not have this new tag affixed. If you believe your laboratory or space is need of this new tag, please reach out to fire-life@columbia.edu.

When working in the laboratory: eating, drinking or applying cosmetics is prohibited.

Proper work attire (e.g., long pants, closed toe shoes) and PPE (e.g., laboratory coat, gloves and eye protection) must be worn when working in the laboratory.

Remember to periodically flush your laboratory cup sinks and floor drains with water to prevent odors from migrating into your laboratory.

Have you seen our new and improved website? https://research.columbia.edu/content/environmental-health-safety

For Lab Fire Safety Prevention tips, check out FDN(wh)Y Me https://research.columbia.edu/content/fdnwhy-me

Breathe Easy

by Stavros Fanourakis, Associate Manager, Research Safety Programs

Personal Protective Equipment (PPE) is typically considered the last line of defense for protection against hazards in research laboratories. In the case of inhalation hazards, respiratory PPE is generally not necessary when working in a Columbia laboratory space. Research activities that create a risk of exposure to respiratory hazards must be conducted in an environment that provides sufficient engineering controls to mitigate the hazard. Volatile hazardous chemicals, for example, can be used within certified ducted chemical fume hoods. Fume hoods create an airflow that removes airborne particulates, vapors, and gases away from the user's breathing zone and out of the building.

Figure 1. Surgical Mask

When an assessment indicates that engineering controls are not sufficient, *then* respiratory PPE should be considered. Most respirators protect the user by filtering-out hazardous particulate matter, or harmful chemical vapors. Importantly, different chemicals have different properties, so it is critical that the correct type of respirator be matched to the corresponding hazard type. EH&S is here to help with this decision-making! If Investigators are interested in identifying whether respiratory protection is recommended for a specific research activity, contact EH&S to schedule a risk assessment.

The federal government strictly regulates the use of respirators in the workplace. The Occupational Safety and Health Administration's (OSHA) Respiratory Protection Standard (CFR 1910.134) states that respirator use must be accompanied by medical clearance, specialized training, annual fit-testing, regular inspections of the equipment by the user, and standardized recordkeeping.

Surgical Masks (Fig.1) and N-95 Respirators (Fig.2) are often confused. Surgical Masks **do not** provide adequate protection against airborne hazards. Masks are useful in preventing large droplets of liquid from entering the user's oral or nasal cavity, but that is the general limit of their effectiveness. Due to that limited use, there are no regulatory requirements. In contrast, N-95 respirators, when used properly, protect the user from harmful airborne particles, bacteria, viruses, and other agents that can be harmful when inhaled. Users should follow the aforementioned OSHA guidelines.

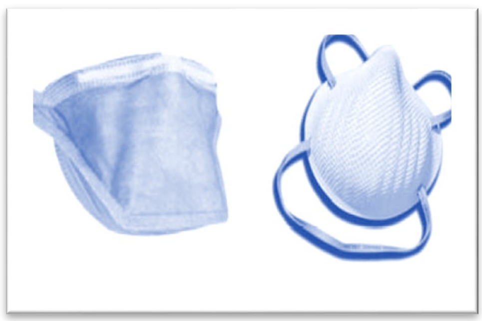

Figure 2. N-95 Respirators Requires Fit Testing

In summary, if a respirator is used in the laboratory:

- Enroll in the University's respiratory protection program in order to receive medical clearance to ensure the ability of the user to wear a respirator.
- Ensure respirator users are properly trained by qualified individual, e.g., EH&S or Workforce Health and Safety.
- Properly maintain the respirator and make sure it is in good condition.
- Be annually fit tested to ensure the expected level of protection.

If Investigators have any questions or concerns about the Respiratory Protection Program, inhalation hazards in research, and/or chemical hygiene at Columbia laboratories, please email occusafety@columbia.edu.

Spotlight on Safety — #SafetyCulture with Dr. Olive

by Biosafety Team — Remi Dosunmu and Cody Cameron

For this edition of Spotlight on Safety, EH&S talked to Dr. Ken Olive about his research and his partnership with EH&S. Dr. Olive is an Assistant Professor of Medicine and Director of the Herbert Irving Comprehensive Cancer Center (HICCC) Oncology Precision Therapeutics and Imaging Core (OPTIC). OPTIC is a shared resource within the cancer center that supports translational cancer research activities across CUIMC.

SafetyMatters: Please introduce us to your research and laboratory.
Dr. Olive: My laboratory is devoted to translational research in pancreatic cancer. We take a multi-disciplinary approach to identifying and targeting critical dependencies of pancreatic cancer and assisting in the translational of promising approaches into a clinical setting. A "critical dependency" is a biological component (protein, metabolite, pathway, or program) that is necessary for the survival of a pancreatic tumor cell but that is dispensable for the function of normal cells. To identify these critical dependencies, our lab makes use of both hypothesis driven approaches and computational techniques from systems biology.

The HICCC OPTIC provides three broad areas of service: 1) the generation of personalized cancer models from patient tissue materials; 2) the design and execution of therapeutic studies in mouse models; and 3) small animal imaging (optical, ultrasound, micro CT, and high field MRI).

SafetyMatters: As a PI how do you promote a positive safety culture in your laboratory?
Dr. Olive: Like most researchers, my lab is often most immediately focused on the next experiment. The key to setting up a safe environment for them is to simply make safety part of the overall culture of the group. By making my team members aware that I value safety, I set an expectation for each scientist to take responsibility for their research activities. I am very fortunate to be supported in this mission by several outstanding staff scientists who are devoted to the creating a laboratory environment that is both safe and productive. Steve Sastra, the manager of my lab's "Mouse Hospital", and Chris Damoci, who manages OPTIC, are both committed to implementing a safety culture even in the context of some extremely complicated and demanding experimental designs. Together they and the other senior members of my team act as a reservoir of experience.

One critical component to establishing this environment is for the PI to explicitly explain to their team that EH&S and other regulatory groups within Columbia are not adversaries, but in fact are resources. More often than not, when we bring in new technology or material into our lab, someone else at Columbia is already working on it. By proactively reaching out to EH&S for advice, we often learn how other groups have handled any safety concerns that might arise. The willingness of EH&S to discuss our research goals with us, research new technologies, and provide advice has been beneficial to our work on multiple occasions.

SafetyMatters: Investigators often use infectious agents, hazardous chemicals, and even radioactive materials. How does the lab ensure best practices both inside the lab and in the imaging core? Did your lab have to adapt any additional practices?
Dr. Olive: The basic training provided by EH&S in managing infectious agents, hazardous chemicals, and radioactivity is an excellent first step in the process. After that, the challenges are ensuring continuing implementation of basic best practices, and handling the introduction of new technologies that may or may not have an established safety protocol. Implementation is all about lab culture - creating an environment of both personal responsibility and attention to the safety of your fellow lab members. When it comes to new technologies or materials, I rely on a simple thought experiment: Would I be comfortable if a member of my family were performing this experiment? Placing it into personal terms ensures a full consideration of how things could go wrong in the worst-case scenario. For example, when CRISPR/Cas9 technology was first introduced and was beginning to be engineered into viral vectors, we spent some time considering how that could go wrong in the worst case, and what could be done to avoid this. We also met with EH&S and discussed both the goals of the work and the potential pitfalls. Together we ended up with some simple guidelines for the work that had minimal burden and should keep our researchers safe.

SafetyMatters: As a scientist with an active twitter account (@KenOliveLab) how do you use this to interface with others both inside and outside of Columbia?
Dr. Olive: Science communication, particularly to a lay audience, is a passion of mine. Twitter represents an extraordinary opportunity to communicate our findings both to other scientists and to non-scientists alike. The requirement of breaking down our work into 280 character tweets forces one to carefully organize scientific ideas into digestible bites. As a lab we are fairly new to the social media scene, but I can already see the potential for building the profile of researchers, particularly for junior scientists who are working to establish a national reputation. My team also uses Twitter to learn about new papers in the field and to communicate their own findings to a wider audience.

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