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Environmental Health & Safety

SafetyMatters

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Environmental Health & Safety

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EH&S Surveys: Fire Safety Preparation for FDNY Inspections

by Sebastian Flynn-Roach, Senior Safety Advisor

For many Columbia laboratory personnel, an annual FDNY inspection may be the first interaction with a regulatory authority that directly impacts day-to-day research operations. The FDNY Fire Code regulates many aspects of safe laboratory operation, including the maximum-allowable quantities of flammable chemicals laboratories are permitted to possess. Any non-compliance that results in a violation could potentially hamper the laboratory's ability to continue operating.

EH&S routinely accompanies the FDNY inspector on all laboratory visits and has recently added a new survey component to the program to help prepare laboratories for their annual inspections. Formally titled "Pre-FDNY Surveys," these visits are made and led by the EH&S Safety Advisor team, who conduct door-to-door walkthroughs similar to the formal FDNY inspection process itself. The pre-survey aims to proactively identify frequently cited safety findings and provide researchers with the guidance and resources to maintain compliance in the future, and ideally, to avoid violations during their FDNY visit. Some fire and laboratory safety categories observed during the survey include:

- Chemical container management - Containers must be in good condition and legibly labeled, with any associated hazards clearly marked on the container.
- Appropriate use of electrical equipment - Extension cords are prohibited, and power strips should never be used for large laboratory equipment or appliances (e.g., refrigerators).
- Compressed gas cylinders - Cylinders of any size (except lecture bottles) should be upright and stably secured using suitable implements (chains, straps, mounts, etc.).
- Emergency Egress - Aisle space and egress must be clear to readily facilitate evacuation in the event of a fire or other emergency.
- Proper chemical storage – Containers with corrosive liquids should never be stored directly on metal shelves or surfaces; utilize secondary containers or an appropriate surface liner to prevent direct contact with the bare metal.
- Incompatible chemicals must be sufficiently separated (e.g., flammables and oxidizing agents), either by a twenty-foot distance or a non-combustible barrier.

EH&S collaborates with and assists laboratory personnel with making the necessary corrections for any findings and can help arrange additional support services, such as chemical waste disposal where needed. Laboratories can request an EH&S Pre-FDNY survey by e-mailing labsafety@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.

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

Beneath the BSC

by Cody Cameron, Biological Safety Officer

Research with microbiological agents and tissue culture materials requires effective biological containment to protect the user's product from environmental contamination, as well as protecting the user themselves from exposure to these materials. Biosafety Cabinets (BSCs) are capable of containing aerosols generated within the cabinet's interior work area during operation. BSCs are designed to protect the interior from airborne contaminants exceeding 0.3µm in diameter with an efficiency of 99.97% using air flow and high efficiency particulate air (HEPA) filtration. Despite the degree of air flow and filtration offered by the BSC, improper aseptic technique can contaminate surfaces of the cabinet.

Surface contaminants can be pulled into the air grilles underneath the work surface of the BSC. Furthermore, if users are pipetting over the front grille of the cabinet rather than over the work surface, drips of liquid containing biological material can be pulled through the grilles and be deposited in the space under the work surface tray. Deposited liquid media can facilitate growth of mold within the cabinet. Such contamination of the BSC may potentially compromise the integrity and sterility of the user's product. BSC vendors will professionally certify, or vapor decontaminate the cabinet, but they will not disinfect under the removable work surface tray. The work surface tray can be removed, typically by removing a pair of set screws and sliding it under the cabinet sash. The metal tray is quite heavy, so this is a task best performed by two people. The space under the tray can then be disinfected and a drain valve can be used to flush out excess liquid if necessary. The Environmental protection Agencies' Standard Operating procedures for the use and maintenance of biological safety Cabinets recommend quarterly disinfection or cleaning of all contactable surfaces and removable parts of the BSC by the user. All removable parts and surfaces should be cleaned with a disinfectant that matches the biological agents being used in the BSC. If 10% bleach is used, a subsequent wiping with 70% ethanol will minimize bleach-related corrosion. Any contact times can be referenced from the EPA claims for validation against biological agents. The Biosafety Office can also be contacted at biosafety@columbia.edu for any inquiries regarding any EPA-registered disinfectant claims.

In addition to quarterly maintenance, it is also recommended to document when the BSC was last cleaned. Keeping an active record of the quarterly service will help ensure the surfaces are disinfected routinely for effective use of the Biosafety Cabinet. Quarterly maintenance is essential to maintaining a sterile environment inside of the BSC along with annual certification schedule by a qualified technician. The National Sanitation Foundation follows the American National Standards Institute Standard 4 which outlines the requirements for maintaining an annual certification schedule for Class II BSCs. Annual certification will ensure the motor function and HEPA filter integrity. Questions regarding effective BSC use and maintenance can be directed to the Biosafety Office.

Getting Started with Columbia's LION: Laboratory Information Online Network

by Phylicia Obame, Senior Systems Analyst

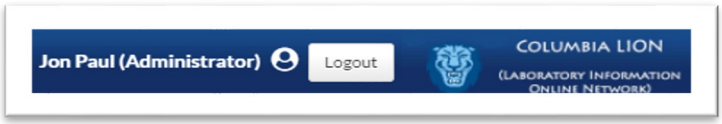
Environmental Health & Safety's (EH&S) data systems support its mission of promoting a safety-conscious work environment at Columbia University. The following information is intended to guide new users through the primary functions of EH&S's Laboratory Information Online Network (LION).

What's available in LION?

LION is each laboratory's home for the digital management of people, places, protocols, protective equipment and training.

Log In: Columbia University's secure single sign-on page where users can input their UNI credentials to log in is available here - http://research.columbia.edu/lion.

Updating User details: Once logged in, a user detail icon will appear next to the user's name in the upper-right corner of the screen. Once selected, a table will appear to enter Principal Investigator (PI) and Department affiliation as well as a phone number and preferred email address.



A screengrab from the LION: the user's name and role will be displayed in the upper-right corner of the screen

Safety Training: All laboratory personnel are required to complete safety training prior to working in a laboratory. Training is provided in-person and via Columbia University's RASCAL training system – please see https://research.columbia.edu/safety-training for the latest information on COVID-related training modifications. Upon completion of a safety training course, LION receives data from RASCAL on a nightly basis and automatically creates an account for every user who completed training. Once an individual account is created, users are able to access their account using the log in steps above.

LATCH: The Laboratory Assessment Tool and Chemical Hygiene Plan (LATCH) is available and specific to each PI based on their research. The LATCH is used to document hazards present in the laboratory, and should be updated and signed annually, or anytime there are significant changes to laboratory hazards.
This module provides access to the laboratory's roster, and for those designated with the laboratory safety manager role, allows each lab to add or modify its personnel. Faculty PIs can update the roster, make safety training assignments, and complete the hazard assessment.

The LATCH also allows users to add emergency contact phone numbers for the laboratory. Public Safety and/or EH&S can use these phone numbers to contact personnel during an after-hours emergency (such as a fire, flood, or hazardous materials) incident that is affecting the laboratory.

Safety Survey Report: After an EH&S survey visit, the PI and a designated laboratory safety contact will be able to view the survey report for the spaces and assets that they have been assigned. The survey report may include corrective actions to address the survey observations. Users can communicate the status of these corrective actions directly in the system by indicating whether they have been completed, request an extension if needed, or ask a question.

For more in-depth instructions on LION and its functions, see EH&S' resource guides:

LATCH – Begin or update a hazard assessment, add personnel and spaces, update training information
Corrective Actions – Respond to a corrective action notice following a laboratory safety survey
Reach out to EH&S at labsafety@columbia.edu with any inquiries regarding the LION system.

On the Borderline Between Ionizing and Non-Ionizing Radiation

by Laszlo Virag, Senior Health Physicist

The term "radiation", when used in a research or safety context, almost always refers to "ionizing radiation" – that is, radiation with enough energy to remove electrons from atoms or molecules. However, research has shown that both ionizing and non-ionizing electromagnetic waves can generate harmful biological effects.

Typical for cells with low water content are the direct effects of ionizing radiation: the radiation energy is absorbed by the cellular nucleus causing damage up to and including the disintegration of the irradiated molecule by inducing changes in the chemical bonds. The indirect effect of ionizing radiation consists of water radiolysis which produces free radicals responsible for radiation damage of biologically important molecules. The radiolysis of water produces free H and HO (hydroxyl) radicals which can interact with DNA molecules causing changes in DNA structure, including changes which may have severe consequences.

On the "border" between ionizing and non-ionizing radiation is the ultraviolet (UV) part of the electromagnetic spectrum. This boundary is not sharply defined because different atoms and molecules ionize at different energies, thus there is not a uniform definition of what constitutes ionizing radiation.

For instance, the US Federal Communication Commission (FCC) defines ionizing radiation as that with a photon energy greater than 10 eV (corresponding to 124 nm wavelength). This value corresponds roughly to the first ionization energy of oxygen and to the ionization energy of hydrogen (both approximately 14 eV). On the other hand, the Environmental Protection Agency (EPA) references the ionization of the water molecule at 33 eV (corresponding to 38 nm) as the biological "border" of ionizing radiation.

Radiation in the UV region is known to be damaging to biomolecules as well. Mid- and low-energy UV light is damaging to biological molecules as a result of electronic excitation (short of ionization). The UV-A band, closest to the visible light energies, has been shown to result in the formation of reactive oxygen species in the skin, causing indirect, reactive damage without causing sunburn (erythema). Similar to ionizing radiation induced damage, these skin effects are more harmful than those produced by simple thermal effects.

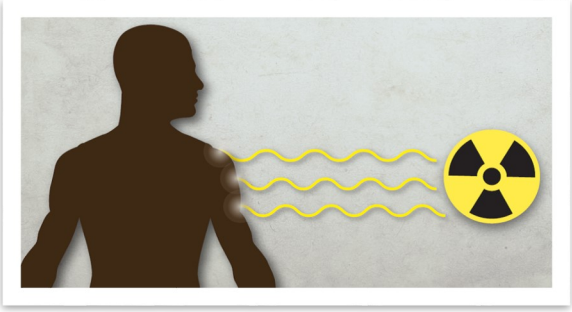


Image courtesy the CDC

The highest energy UV radiation, UV-C, is comprised of electromagnetic wavelengths of 100 to 279 nm, and luckily is completely absorbed by the atmospheric ozone layer. The mid-energy UV-B band (280 to 314 nm) is mostly absorbed by the ozone layer but some of this radiation reaches the Earth's surface, while the low-energy UV-A (315 to 400 nm) is not absorbed by the ozone layer.

Research - much of which has been conducted here at Columbia by the Center for Radiological Research - has shown that far-UVC light (207-222 nm) efficiently inactivates bacteria and some airborne aerosolized viruses without harm to exposed skin. This is because, due to its strong absorbance in biological materials, far-UVC light cannot penetrate even the outer (non-living) layers of human skin or the eye; however, because bacteria and viruses are of micrometer or smaller dimensions, far- UVC can penetrate and inactivate them.

Not all radiation is created equal after all!

Meet the EH&S Staff

Photo: Jon Paul Aponte

Growing up in Solihull, a town on the outskirts of Birmingham in the United Kingdom, Dr. Christopher Aston was inspired to work in Biosafety at an early age, when the world's last person to die of smallpox did so in his hometown. Along the way, his first job gave him an appreciation and love for cooking as he worked in the kitchen of a restaurant during school. Later, Chris earned his PhD in Molecular and Cellular Biology at Rockefeller University and Oxford University (UK) before transitioning to the field of biosafety in 2010.

Dr. Aston moved to New York City in 1989 while studying at Rockefeller, and although he loves NYC, the idea of living somewhere that is inaccessible to outsiders, such as the Vatican or Pyongyang, is appealing. Chris has been an EH&S team member since 2011, and currently holds the position of Associate Director for Biological Safety Programs. During the pandemic, he has been instrumental in helping set up high biocontainment (BSL-3) labs and other COVID-related activities at CUIMC. He thinks the animal that best matches his personality style is that of the badger as he is persistent, determined and has great endurance. These personality qualities suit him well as he is motivated to develop expertise and receive recognition for his professional accomplishments.

Chris is well-liked by his colleagues, is very approachable and a team player. The best piece of work advice he has received in his career is "Don't squander the opportunities you have been given." He admits to being lucky in his professional life, however, luck is what happens when preparation meets opportunity.

Chris is very active away from work as well. As the father of young children, relaxing at home is not an option, so he uses his commute to listen to a podcast on the subway or ride his bike down the Hudson River bike path. He also enjoys home renovation. He is currently rebuilding a bathroom from the studs and teaching himself how to solder copper plumbing. His desire to learn more about music theory directly correlates to his favorite non-working activities of writing, playing, and recording music. The pandemic has taken him away from playing the bass guitar in a band, which he has missed enormously.

He sees climate change as the greatest challenge facing the world. At a Society for Neuroscience meeting, he was inspired by Christopher Reeves when he heard him speak on spinal injury research. He also enjoys listening to Dr. Steve Brule's life tips through comedic wisdom. Not one for sports, not even knowing the rules for most sports, he does not have a favorite team, but roots for the underdog, Mets over Yankees!

Photo courtesy Flavia Villegas

Flavia Villegas Landivar grew up in La Paz, Bolivia, which at 3,869 meters above sea level is the highest altitude capital city in the world. Her first job was in a clothing store during the Christmas season, working 9:00am to 9:00pm. Her hard work paid off as she used her earnings to travel to Chile for a vacation. She learned French as she has always wanted to live in France, loving French food and wine. She associates the streets of France to walking in a museum.

Flavia has been at Columbia University for about two years and is currently the Research Safety Coordinator working out of both the CUIMC and Morningside offices. Her positive attitude and smiling face endear her to colleagues and clients alike, although Flavia identifies herself with a shark because they are both aggressive and goal oriented. She is motivated to learn and experience new things and meet new people. Currently, she is learning Reiki (a Japanese form of alternative medicine also known as energy healing) and Sacred Geometry. Of course, she is still learning the complex world of Hazardous Waste Management for her Coordinator position. In the future, Flavia would also like to learn more about Quantum Physics and Neuroscience.

Although she doesn't have a favorite sports team, she enjoys watching the World Cup. Winding down after work includes dinner with her husband, followed by watching a show and ending the night with a good book. She also loves to meditate, talk to her family in Bolivia, and play with her dog Bowie when she isn't working. Her favorite quote is by Dr. Joe Dipenza, "Where you place your attention is where you place your energy." Flavia enjoys placing her energy in reading and going for long walks in the city, because you never know what special place you will find! She would like to see people be more conscious of their behaviors and how they treat themselves and others, as this could help change the critical social issues in the world. Her favorite piece of professional advice ever received, "Be kind and respectful to everyone, and always do your best!"

Not a Fun-Gi

by Stavros Fanourakis, Senior Manager of Research Safety Programs

Molds are a group of filamentous fungi that grow mostly by decomposing organic material. Many of these fuzzy looking fungi have a history of beneficial relationships with humans. Notably, the first antibiotic, penicillin, was famously discovered by Alexander Fleming when he observed that a metabolite of a Penicillium species inhibited the growth of bacterial colonies in his petri dishes. Penicillium, Aspergillus, Rhizopus, and other fungal genera, contain species that play important roles in the production of human food like cheese, fermented rice and soy products and other nutritionally important ingredients and goods. The single-celled close relatives of molds, yeast, are essential in the production of fermented products (like alcoholic beverages, baked goods, dairy products, and pickles), as well as pharmaceuticals.

Although most molds are innocuous to humans, some fungal species are categorized as opportunistic pathogens, able to infect vulnerable hosts, like the immunocompromised. Most fungal-related infections include dermatophyta, the fungi that cause a common type of skin infections. Rarely, more serious infections can occur, but these are mostly limited to those suffering from related underlying medical conditions.

Molds are ubiquitous. They multiply through different means, one of which includes the massive production of tiny spores, called conidia, that travel through the air and can grow wherever they settle if environmental conditions allow, and there is organic material available for their nutrition. High levels of these virtually invisible spores have been linked to allergic reactions, asthma attacks, and other respiratory symptoms in certain individuals. To prevent high concentrations of mold spores indoors, it is essential to avoid creating conditions that promote the growth of mold. Since mold can grow in a number of commonly used materials, like paper, wood, ceiling tiles, drywall etc., a combination of approaches usually ensures the best results for preventing mold growth. Adequate ventilation, indoor relative humidity below 60%, and absence of porous organic materials (like carpeting etc.) especially in basements, can help create conditions that prevent mold growth.

For more information on mold and its effects on indoor air quality, contact the EH&S Occupational Health & Safety Program at occusafety@columbia.edu.

MEDICAL EMERGENCY ON or NEAR the Morningside and Manhattanville CAMPUSES?

Call 854-5555 for Columbia University Emergency Medical Services (CUEMS)

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Photo courtesy CUEMS

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