

### Contaminated Lab Chairs

If you work in a lab, you know that the material you work with can sometimes be spread and result in contamination of non-lab equipment (e.g., telephones, computers, etc.). To reduce this risk, all workers should wear disposable gloves, a lab coat and safety glasses when working with hazardous material. Workers remove the disposable gloves and wash their hands before handling other, “clean” equipment so they can avoid cross contaminating non-lab materials.

Contamination can also be spread through laboratory furniture, specifically your chair. Think of it this way. You are probably working with hazardous or toxic substances or radioactive materials. Much of this is liquid or dry, powder. Persons often work with very small volumes. It is just possible that these hazardous substances can dribble or drift onto your lab chair and, if the chair is porous (e.g., fabric covered with sponge seat), it is possible to cross contaminate yourself or one of your coworkers when they use the chair. It is best to have a lab chair that is as easy to decontaminate as any other piece of laboratory equipment.

When buying laboratory furniture, get furniture that is easily cleaned; laboratory chairs and stools should be covered with non-fabric materials that are impervious to spills and can be easily cleaned. If using radioactive materials, remember to use a geiger counter to survey your chair when you survey your hands and work area at the end of a procedure. When you clean your work area, remember to clean your chair as well.

Additionally, Federal granting agencies may make impervious lab chairs a condition of the research grant if it involves certain biological and pathological agents. The easiest solution is to insure all furniture in the lab is impervious. Do this by specifying impervious coverings when ordering new chairs.

### High Risk Chemical Facility Regulation

In our last newsletter, we mentioned the Homeland Security rule. That rule has just been finalized ([http://www.dhs.gov/xnews/releases/pr\\_1193971111885.shtm](http://www.dhs.gov/xnews/releases/pr_1193971111885.shtm)) and the final editing of Appendix A, Chemicals of Interest, ([http://www.dhs.gov/xprevprot/programs/gc\\_1169501486179.shtm](http://www.dhs.gov/xprevprot/programs/gc_1169501486179.shtm)), has been published. Recall, the Auburn University web site to comply with this reporting requirement is located at <https://auburn.edu/hci>. This site also has information regarding timelines, but we believe that Auburn University will need to have all of the required information entered by January 15, 2008.

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# Auburn University RISK MANAGEMENT AND SAFETY

## Laboratory Safety Newsletter – November 2007

The academic semester is rapidly coming to a close. Before too long the break at Thanksgiving, preparation for finals and plans for the semester break will take precedence. We are using this issue to primarily discuss safety when working with carcinogens and provide information on lab furniture.

### Carcinogens

**Cancer** is the general name for a group of diseases in which normal homeostatic cellular control is lost and cells grow continuously, invading, crowding, and overwhelming the surrounding normal tissues. If left unchecked, this unregulated growth results in the death of the organism. Almost every body tissue can give rise to cancerous cells and malignancies. While each form of cancer has unique features, there are also similar processes that underlie tumor growth.

The term **carcinogen** describes any agent that can initiate or speed the development of malignant or potentially malignant tumors, malignant neoplastic proliferation of cells, or cells that possess such materials. Most scientists believe that carcinogenesis, the process that transforms a normal cell into a cancer cell, is a multi-staged process. That is, any single event by itself is not sufficient to turn a normal cell into a cancer cell. Only when the correct number, combination, and types of aberrant alterations have accumulated in one cell will a cancer cell develop.

Epidemiological studies have long identified relationships between unusually high exposures to particular agents and specific types of cancers and, having observed these relationships, epidemiologists have suggested plausible biological rationales. Some agents associated with specific cancers are tobacco smoke, radiation (both ionizing and UV B), chemicals (e.g., benzene, arsenic containing pesticides, polychlorinated biphenyls [PCB], mineral oils, etc.), viruses, etc.

One problem researchers face in the evaluating carcinogens is that the interplay between genes and environment is dynamic, it is not a simple cause-and-effect process, and thus, scientists believe it is unlikely that a singular, key change or agent will be found to explain cancer. Researchers currently believe the steps involved in cell growth regulation and division likely trigger the source that ultimately result in cancer.

How do scientists identify a substance as a carcinogen? Agencies such as the International Agency for Research on Cancer (IARC) and the National Toxicology Program (NTP) of NIH are two of the major agencies used by the Occupational Safety and Health Administration (OSHA) in their determination. OSHA has identified a group of “select carcinogens” which require special handling. An agent is a **select carcinogen** if:

- It is regulated by OSHA as a carcinogen.
- It is listed under the category “Known to be carcinogens,” in the Annual Report on Carcinogens published by the National Toxicology Program.

- It is listed under Group 1, “Carcinogenic to humans,” by the International Agency for Research on Cancer Monographs.
- It is listed in either Group 2A, “Probably carcinogenic to humans,” or Group 2b, “Possibly carcinogenic to humans,” by the International Agency for Research on Cancer or is listed under the category “Reasonably anticipated to be human carcinogenic to humans,” by the National Toxicology Program.

As you can imagine, this list of carcinogens contains over 200 agents and it does not include industrial processes which have been identified to cause cancer nor chemicals which may pose a health hazard such as experimental carcinogens and mutagens.

Radiation and radioactive material are a well know carcinogen. At Auburn there are more than 750 active research lab spaces. Among these, there are about 50 labs in which radioactive material is used as a part of research. These labs use geiger counters to monitor their radiation work. If you visit these labs when they are working with their radioactive material, you might hear the geiger counter "clicking" away. Sometimes the clicking worries visitors because everyone knows that radiation is a carcinogen. However, those same people might work with other carcinogens without a second thought, "After all," they may think, "how could this small amount be hazardous?"

Cancer induction does not work in the same way that response to an acute exposure injury does. First, for solid tumors, there is usually a long latent period, usually 10 to 30 years, between exposure and cancer presentation. Thus, except for long term, chronic exposures, identifying the exact exposure which caused the cancer is problematic.

With exposure to carcinogens, each exposure may carry with it a small amount of cancer risk. Exactly how much risk is constantly being debated. When attempting to develop risk models, researchers have determined that the risk depends on many factors such as, sex, age at exposure, organ exposed, magnitude of exposure, concentration of agent, exposure rate, other exposures, etc. The results of risk modeling, while accurately predicting the cancer risk to large populations exposed to an agent, is useless in predicting the outcome for individual exposures to the carcinogen. When dealing with individual workers, that worker will either develop a cancer or not develop a cancer. It does not change that individual’s outcome to report that a specific population does (or does not) exhibit a higher (or lower) than predicted cancer rate.

Safety is about reducing the individual risk from exposure to all hazardous materials, including carcinogens as well as hazardous substances that pose a threat of physical injury (e.g., burns, cuts, asphyxiation, etc.). Risk assessment is performed by reviewing the substance from two angles: the risk that an exposure to the substance poses to workers (i.e., is the substance a physical and / or health hazard?) and the amount of material being handled.

Once a substance is determined to be "hazardous," the next step is to evaluate the magnitude of the risk, how likely is it that the worker will be exposed in the work place. One factor related to the possibility of internal deposition of the agent is the concentration of the material. The table helps to demonstrate the various levels of risk (or protection factors) based upon material concentration.

From the table, you see that a hazardous substance that is in storage is 100-times safer than that same material being used in normal operations. Similarly, working with a material which is dry and dusty presents 100-times as much risk as normal operations.

What does this mean from the point of view of planning your work? First, assess your materials. Determine which pose risks and whether that risk is physical (e.g., flammable, toxic, etc.) or carcinogenic. Review the type of procedures to be performed (e.g., from very simple to dry and dusty). If your procedure involves using dry powders to make a dilute solution, perhaps there is a commercial compound being sold at the dilution you need. By buying a pre-made solution, you may reduce your risk by up to a factor of 1000 (i.e., from dry and dusty to very simple). Keep all containers closed and capped when not in use. This includes liquid waste containers. Closed containers provide a safety factor 10- to 100-times compared to the risk from normal substance use.

Type of Operation	Protection Factor
Storage (stock solutions)	x 100
Very simple wet operations	x 10
Normal operations	x 1
Complex wet operations with risk of spills and simple dry operations	x 0.1
Dry and dusty operations	x 0.01

In the future, the Laboratory Safety section of Risk Management and Safety will be developing guidelines for working with carcinogens and other particularly hazardous substances. The goal of these will be to assure that worker exposures to hazardous materials are kept as low as practicable.

### X-rays, Lasers and Dosimeters

Do you have a new device in your lab that can produce x-rays (e.g., electron microscope, x-ray diffraction, bone densitometer, cabinet x-ray machine)? Except for electron microscopes, the State requires x-ray producing devices be registered with the Department of Public Health. Contact Sevgi Kucuktas or Mike Anderson at 4-6238. They will assist you in completing the registration paperwork and will perform any radiation surveys you desire to assure radiation exposures are well within limits.

Lasers produce very narrow, intense, monochromatic (i.e., one color), coherent (i.e., in phase) beams of light. Lasers are routinely found in many work areas. Properly emplaced and operated, lasers are an effective research tool. Lasers are regulated by the US Food & Drug Administration. The FDA attempts to insure commercial laser systems can be operated safely. However, even when operated properly, some lasers are capable of causing injury. These lasers are often identified by having a “Danger” sign on the laser. Radiation Safety has a Health Physicist with special training in laser safety. He will be surveying all of these “dangerous” laser systems. If you have questions about the lasers in your lab, need special training in laser safety, etc., call Mike Anderson at 4-6238.

Many individuals who work with x-rays and radioactive material are given special devices to monitor their radiation exposure. These “dosimeters” are passive devices that are worn by the worker for either 3 or 6 months and then sent to the vendor for “read-out.” Whether a worker is issued a dosimeter depends upon the kind of radiation they are potentially exposed to and the quantity of radioactive material they will work with. A new worker completes a New Radiation Worker form (<http://www.auburn.edu/administration/rms/rso/nrwf.pdf>) and receives radiation safety training. If dosimeters are required, the worker’s supervisor will notify Sevgi Kucuktas, 4-6238, and she will order a dosimeter. It takes about 1 week for us to get the dosimeter from the vendor.