RADIATION REVIEW 2003
UWM RADIATION SAFTY PROGRAM

SECURITY OF RADIOACTIVE MATERIAL

You've heard me preach time and time again about the security of radioactive materials and the NRC's aggressive response to situations involving unsecured or lost material. Recently, regulatory authorities have increased their scrutiny of radioactive materials control since there is both public and governmental fear that lost material could be used to create a "dirty bomb" .

As I have discussed before, "dirty bombs" are devices that contain conventional explosives, along with an added attraction. . . radioactivity! The theory is that when they explode, they will release enough radioactivity to contaminate a relatively large area. And while the radiological impacts of such a device would probably be small and relatively easy to control, it may impossible to control the panic of people that happen to be in the immediate vicinity, or their potentially dangerous reactions. So dirty bombs are definitely a force to be reckoned with, regardless of their relatively limited radiological impact.

As a licensee we must now be aware that the loss of radioactive materials would bring more than a "notice of violation" or fine from the NRC. Certainly the Department of Justice would become involved over the concern that the missing material has fallen into the wrong hands. The media would soon report on the issue and since the public and the press often don't know the difference between a missing kilo-curie teletherapy source and 100 uCi vial of P-32 dCTP the negative reactions are just as likely.

The security of radioactive materials is more important than ever. All radioactive materials **MUST** be secured from unauthorized use, removal and vandalism at all times. Secure stock solutions of radioactive material and sealed/plated sources in a locked storage area and/or locked lab room whenever left unattended. Unsecured radioactive materials must **NEVER** be stored in an unrestricted and unposted room, area or facility. **REMEMBER,** the key is to restrict radioactive material access from anyone not authorized to use those materials at UWM.

REGULATORY CHANGES

On May 30, 2002 the State of Wisconsin Division of Radiation Protection filed their application with the Nuclear Regulatory Commission to assume regulatory control over by-product radioactive materials within the state. Approval of that application is anticipated in August 2003 and Wisconsin will officially become an "Agreement State".

What does that mean to us at UWM? Beginning in August, the State of Wisconsin will license, control and inspect our campus as the NRC now does. They will have regulatory authority over by-product, accelerator produced and naturally occurring radioactive materials. This change will have the greatest effect on labs using accelerator produced materials. Inspectors will now review the use, survey and inventory of those materials (Be-7, Co-57, etc) to ensure compliance with the applicable regulations.

It is hoped that this transition will be relatively transparent to most campus users of radioactive material . Radiation safety will work with those users most affected by this change to ensure all work being done is in compliance with the new regulations. I will be preparing some new documents and procedures to help facilitate the transition and providing information to all radioactive material users as the time approaches.

If you are interested in reviewing a copy of the new HSS 157 code or have any questions about this change please contact me at the Radiation Safety Program office.

NRC INSPECTION EXPECTED

The University is routinely inspected on a biannual basis by the Nuclear Regulatory Commission (NRC) to verify compliance of our program to federal regulations. While we are long overdue for such an inspection, colleagues within the state have informed me that prior to the State of Wisconsin assuming regulatory control, (see related article on page 1) the NRC will complete a final inspection of all licensees. That means that sometime **before August 2003** we can anticipate a visit from NRC inspectors. What can we expect the inspectors to check during their pending visit?

Security and Surveillance. The inspector(s) will walk the halls of selected buildings checking rooms that are posted "Caution - Radioactive Materials". If the door is open, they look in the room to see if it is occupied. If a door is shut, they check the knob to see if it is locked. If unlocked, they open the door and check to see if the room is occupied. If a posted room is unoccupied and radioactive material is found unsecured, a violation may be issued for that incident. While the security of radioactive materials has always been a strong focus during NRC visits, continuing concern regarding the potential for terrorist activities has drawn even more attention to this issue.

GM Survey Meters. The inspector(s) will visit a random selection of campus labs. Usually, whenever they see a survey meter, they pick up the meter and check the calibration dates. They will also likely turn the meter on to verify it is operating properly.

Training. Lab workers will likely be asked to demonstrate their knowledge of using survey meters. Remember: (1) check batteries, (2) meter check source and verify a ± 20% response, (3) make a background measurement in a low-background area, (4) meter within 1 cm of the surface of interest. The UWM action level is 5x background.

Inventories. If the inspector pointed to a stock vial in your refrigerator, you should be able to find the inventory sheet and state how much radioactivity remains in the vial.

No Food or Drink. Remember, a laboratory is a potentially hazardous workplace. The goal is to ensure no worker accidentally ingests a potentially hazardous compound — not just radioactive materials.

Routine Surveys. Make sure that all your daily area-monitoring checks are performed and documented. Labs are required to perform and document a survey of the lab area on each day in which radioactive materials are used. If the survey data itself is not posted, a notice of where the data is located should be posted.

Emergency Response. Information regarding proper response and action in the event of a spill (major or minor) of radioactive materials is posted in each lab. Each lab is also supplied with a "spill response kit" in a white 5-gallon bucket. Take time to periodically review spill response information and make sure you know where the laboratory spill kit is stored. Remember, in the event of a spill or incident involving radioactive materials you should always contact the Radiation Safety Program Office at 229-4275. If the spill occurs after hours consult the emergency call list and/or contact the University Police at 9-911. They will contact a member of the EHS&RM staff to assist you.

WE'VE MOVED

In advance of the remodeling of the north tower of Lapham Hall the departmental offices of Environmental, Health Safety and Risk Management have moved. The Radiation Safety Office is now in room **358 Lapham Hall** and the departmental office is now located in room 364 Lapham Hall. All campus mail can still be addressed to Radiation Safety without reference to the room location. Our lab facilities remain the same in 218 Lapham as does my phone number: 229-4275. Please stop by to see our new "above grade" location.

RADIATION MYTHS

Many workers may have or adopt preconceived notions (from other individuals, from the media, etc) regarding radiation and radioactive materials. I'd like to take this opportunity to discuss a few of these "**Radiation Myths".**

"My detector/GM clicks, so I am being exposed." Your Geiger counter is a tool to detect radiation, it is not a dosimeter. It is designed to detect beta-particle radiation. The fact that it clicks, does NOT mean you are being irradiated. It means that radiation is being detected. So, why does the meter click? The GM can detect beta radiation if the energy is greater than 100 keV (S-35 have a maximum energy of 167 keV), so it will "click". But your "exposure" will be based on the energy you are exposed to. The key to radiation safety is to understand the ENERGY of the radiation. Energy is related to how far the radiation travels. Also remember that the meter is detecting the background radiation that we are continually being exposed to from various naturally occurring and cosmic sources.

Whether you are being exposed to radiation (receiving a "radiation dose) will depend on the energy of the material you are working with. Low energy betas emitted from S-35, P-33, C-14 do not travel far. If you wear a double pair of disposable gloves, no beta energy from these nuclides will penetrate, so no dose.

"A lead apron will reduce my dose." The only radiation workers who will benefit from using a lead apron are those working with mCi quantities of I-125. Lead aprons are designed for x-ray use. They will stop radiation best if the gamma energy is between 30-50 keV. What about Cr-51 or Rb 86? The energy of Cr-51 is 320 keV and Rb-86 is 1160 keV . So, a lead apron will not even slow down these gamma rays. Always use APPROPRIATE shielding for high-energy betas and gammas...plexiglass for betas and the proper thickness of lead for gammas.

"I can feel the radiation." Some people when they first start working with radioactive material, feel an itching sensation on their hands and attribute the itching to radioactivity. No one at UWM has enough radioactivity to make you "feel it". If you feel anything on you hands, you may have a latex allergy or you may be allergic to the powder in the gloves. Additionally, if you have used protective gloves for a long time, you may become sensitized to either the latex or the powder in the gloves. If you observe this reaction switch to gloves that are latex/talc free. Remember to always wear gloves, along with other personal protective equipment when working with radioactive materials. We recommend wearing a double pair of gloves and frequently checking the outer pair on a GM to make sure it is not contaminated. While there is no physical hazard from the radiation in quantities routinely used, contaminated gloves may contaminate the lab and contamination may be spread outside the lab and even to your home.

TRANSPORTING RADIOACTIVE MATERIALS

Naturally, those of us at Environmental Health and Safety spend our leisure time perusing the transportation regulation in 10 CFR 71 just for entertainment. Don't you? Well, that statement may not be entirely true, but we do try hard to keep current and well informed of these important and often complicated rules. Remember, any time radioactive materials are transported on or across a public street or highway, we are required to comply with the applicable requirements of the Department of Transportation in 49 CFR 170-189 for shipment. That means preparing shipping papers, using DOT-approved packaging, appropriate labeling of the package and vehicle if required, and a host of other typical radioactive materials transportation actions.

Radiation Safety personnel will package any material for off-campus transport or shipment following all applicable regulations. We have recently gone through the process of testing 3 different reusable containers for compliance with the DOT specifications and now have them available for use when required.

If you will be involved with the transportation or shipment of radioactive materials the DOT requires initial training, as well as refresher training every three years. Radiation Safety has these training materials available; if you need training or have questions about the transportation of radioactive materials, please contact Sharron Daly, UWM RSO at 229-4275, email: sdaly@uwm.edu.

RULES OF THUMB FOR RADIOACTIVITY

-It requires a beta particle of at least 70 keV to penetrate the protective layer of skin, 0.07 mm thick.

- The range of a beta particle in air is about 12 ft per MeV; a 1.7 MeV beta has a range of 20 feet in air.

-The intensity of a bremsstrahlung increases approximately with the energy of the beta particle and about the square of the atomic number of the absorbing material.

-When betas of 1 - 2 MeV pass through light material such as water, aluminum, or glass, less than 1% of their energy is dissipated as bremsstrahlung.

- The bremsstrahlung from 1.0 mCi of P-32 aqueous solution in a glass bottle is about 0.001 mR/hr at 1 meter, about 0.1 mr/hr at 10 cm, and about 10 mR/hr at 1cm.

- The activity of any radionuclide is reduced to less than 1% after 7 half lives (0.78%) and is reduced to less than 0.1% after 10 half-lives (0.098%).

- For radionuclides with half-lives of less than six days, the change in activity in 24 hours will be less than 10%.

-For gamma emitters with energies 70 keV $\leq$ E $\leq$ 2 MeV, the exposure rate (mr/hr) at 1 ft is 6CEn, where C is activity (mCi), E is energy (MeV), and n is the number of gamma rays emitted per decay.