Individuals who work in areas where ionizing radiation is used may be required to be monitored for radiation dose. Regulations and the Radiation Control and Safety Program (RCSP) require monitoring for external dose to demonstrate compliance with the occupational dose limits. If monitoring is required, the regulations require the University of Cincinnati (UC) to supply monitoring devices (e.g., whole body dosimeters). UC must also ensure any individual issued a dosimeter wears the dosimeter appropriately. This includes timely exchange of dosimeters and wearing the dosimeter at the unshielded location most likely to receive the highest radiation exposure. Individuals may receive a radiation dose attributed to the work they perform, work others perform, along with ambient background/radiation in their work environment. A dosimeter is worn to document the worker’s radiation dose from workplace radiation sources, and not ambient/“background” radiation or radiation from personal medical procedures.

In addition to measuring occupational radiation dose, dosimeters also record “background” radiation. Background radiation has two primary sources; cosmic radiation and terrestrial radiation. The background dose recorded on a dosimeter is removed by subtracting the background dose as determined by a control dosimeter, or by estimating the background dose. Subtracting the background dose provides a more accurate record of a worker’s radiation dose from radiation sources in the workplace.

The Radiation Safety Office (RSOF) recently completed an investigation that began with a suspicion that dosimeters may have been irradiated while in transit during their shipment back to the dosimeter vendor, Landauer. The March dosimeter report included an abnormal number of elevated readings. It is suspected these elevated readings came from one or more packages containing radioactive materials on the same transport as the package containing the dosimeters. The majority of the dosimeters involved the monitoring period of 2/1/12 - 2/28/12, with a few involving the monitoring period of 1/1/12 – 1/31/12. Most of the readings ranged from a few millirem to about 60 millirem. Landauer was asked to investigate the possibility of an in-transit dose. Landauer’s investigation confirmed the suspicion. Subsequently, approximately 350 individuals were identified as those whose recorded dose required further investigation for possible dose correction. Each individual and/or their supervisor were contacted with a request for the individual to identify their potential dose during the monitoring period. The largest group of affected individuals (about 59%) identified themselves as receiving a standard occupational exposure for the monitoring period and requested that their dose be reduced to correspond with the average of their last 6 months monitoring periods. 33% of the group had their recorded dose removed completely, based on no radiation exposure during the monitoring period.

Could an unusually high dosimeter reading be the result of non-occupational sources of radiation or from exposure at another facility? The answer is yes. In addi-
tion to in-transit exposure of dosimeters, dosimeters may record radiation exposure from an individual’s or co-workers medical procedure. Millions of medical procedures involving radiation are performed each year in the U.S. and some of the patients are occupational radiation workers and/or individuals who work with radiation workers. Medical procedures involving radiation include x-ray and nuclear medicine procedures. X-ray procedures result in a dose that is limited to the patient, unless the patient also takes their work dosimeter into the x-ray room. After completion of a nuclear medicine procedure, a small amount of radioactive material remains in the patient’s body for a short period of time. A common nuclear medicine procedure conducted is the heart stress test. For a heart stress test, a radiopharmaceutical containing either Tc-99m ($T_{1/2}$ - six hours) or TI-201 ($T_{1/2}$ - three days) is administered to the patient. If the patient is a radiation worker and wore their assigned dosimeter during the stress test, the radiation exposure from the radiopharmaceutical retained in their body would be recorded on the dosimeter. If this same radiation worker went back to work the next day, the possibility exists that they could potentially expose co-workers dosimeters to the radiation retained in their body. The dose that could potentially be received is small; but, the dose from medical procedures should not be included in occupational doses. Therefore, work issued dosimeters should not be worn during medical procedures and, depending on the procedure and the potential work related radiation exposure, possibly for a short period afterwards. Consult the RSOf if you have questions about wearing your dosimeter after being administered a radiopharmaceutical.

Radiation dosimeters should be stored in low/standard background areas (e.g., offices, non-RAM rooms) when not being worn by the radiation workers since dosimeters record dose even when not being worn by the worker. As explained previously, standard background dose recorded is deleted from the occupational dose. However, any radiation exposure above background to the dosimeter and not the person, cannot easily be distinguished from dose to the person. Examples of high background “storage” areas uncovered during investigations include, dosimeters that have fallen off of radiation workers in Radiology suites during exams without their knowledge, dosimeters stored near an object that contains naturally occurring radioactive materials and dosimeters stored near radioactive material or waste. When dosimeter results indicate a radiation worker has received an unusual dose, e.g., an unexplained high dose, an investigation may be initiated by the RSOf. Dose results for radiation workers are important legal records. Achieving accurate results is critical and is a combination of wearing dosimeters correctly, and following storage and exchange procedures.

**ANNUAL RETRAINING**

The Radiation Control and Safety Program (RCSP), and the University of Cincinnati’s (UC) broad scope license require all Authorized Users (AU) and radioactive material (RAM) radiation workers (RW) attend a radiation safety training course each calendar year. Every year the Radiation Safety Office (RSOf) schedules more than 115 training classes that are presented throughout the calendar year at various days and times. With so many training opportunities, it is the belief of the Radiation Safety Committee (RSC) that there is no good justification for failing to meet the obligation.

There are three ways an individual may meet the retraining requirement.

- First, the individual may attend one of the 45 scheduled one hour retraining courses listed on the RSOf training calendar. (The schedule is posted on the RSOf website (www.uc.edu/radsafety).)
- Second, a group of individuals (e.g., a laboratory or department) may schedule a one hour retraining session at their desired location and time. This option requires a minimum of six attendees. If there are less than six people in a laboratory group, the RSOf suggests that two or more groups get together and schedule a retraining session.
- Third, radiation workers may attend a Basic or Advanced training class. This option is normally not as desirable due to the time duration of the Basic class and the Advance class being 3 – 4 hours each, compared to a hour retraining course.

The Radiation Protection Procedures Manual (AU Manual) and the RSC Policy 04-1A detail the consequences of not completing the retraining obligation. “If any AU is not retrained by the last scheduled retraining class during a calendar year, the AU will have radioactive material (RAM) ordering privileges suspended as of January 1st until the required retraining is accomplished. If an AU still has not met their previous year’s retraining obligation by the first RSC meeting of the new calendar year, the RSC shall
terminate the AU’s RAM radiation worker and authorization status. Reapplication of the RAM radiation worker status and/or authorization shall require the AU to complete the initial site-specific training. Any RAM radiation worker who does not attend retraining by the last scheduled retraining class during a calendar year will be suspended from working with RAM on January 1st until retraining is accomplished. If a RAM radiation worker has not met their previous year’s retraining obligation by the first RSC meeting of the new calendar year, the RSC shall terminate the individual’s RAM radiation worker status. Reapplication of the RAM radiation worker status shall require the individual to complete the initial site-specific training.”

If a suspended radiation worker is observed working with RAM, the following applies.
• If the supervising AU is a non-human use AU, the AU’s authorization(s) will be issued 75 points. This will require the RSC to consider suspension of the authorization(s).
• If the supervising AU is a human-use AU, the AU is required to meet with the RSC and provide an explanation and corrective action plan.

RSC policy and the RSO attempt to assure no one is caught unaware of their retraining obligation as the end of the year approaches. As listed in RSC Policy 04-1A, at a minimum, the RSO sends retraining reminders approximately monthly beginning in July. In addition, starting in late July, the Radiation Safety Officer’s (RSO) monthly service announcements include retraining reminders.

Please don’t delay! Complete your retraining class early. Call the RSOf (558-4110) and schedule a retraining class today.

**Routine Surveys**

All areas where unsealed radioactive material (RAM) is used and stored are required to routinely be surveyed for contamination. Under the Radiation Control and Safety Program, these surveys must be performed at least monthly. In areas where greater than 0.2 mCi (200 microcuries) of unsealed RAM is used at any one time, the surveys must be performed during the week of use and it is recommended that the surveys be performed as soon as practical after the procedure is completed.

Routine surveys must include monitoring with a survey meter and “wipe tests.” The meter survey should be performed first to help locate RAM and areas that potentially have removable contamination. If contamination is detected during a survey, the contamination level readings must be recorded in disintegrations per minute (DPM), or in counts per minute (CPM) plus the efficiency of the instrument. The recorded efficiency(s) must include the efficiency(s) of the radionuclide(s) detected.

If there is no RAM in a RAM use area during a month, “no use” may be documented in lieu of a survey. “No use” means no RAM is used or stored in an area, including RAM stock in storage and RAM waste waiting for pick-up. Minimum documentation for “no use” includes the date of the last clean survey, the date of last use, and the date “no use” was documented. For “no use”, overall survey records must include a clean survey after the last day of use.

Surveys must be documented on a RS Form 12, “Authorized User Routine Laboratory Survey Report,” or an equivalent form. Survey documentation must include at a minimum:
• Area Surveyed (i.e., laboratory building and room number)
• Survey Frequency (e.g., monthly, weekly)
• Make, Model, Serial Number of instrument(s) used (e.g., survey meter, liquid scintillation counter (LSC), gamma counter)
• Instrument background(s) and efficiency(s) (Include efficiency(s) for all instruments for each radionuclide(s) used.)
• Results and any follow-up action
• Surveyor’s name
• Date of Survey

Included with the survey documentation must be a map of the areas surveyed with areas wiped clearly documented, and the printout of results from the LSC and/or gamma counter. These records must be maintained for at least three years and must be available for review by the Radiation Safety Office (RSO), the Ohio Department of Health (ODH), or other inspector.

If contamination is detected during routine surveys, the results must be communicated to other radiation workers (RW) and the Authorized User (AU). If multiple AUs share an area, all AUs and their RWs must also be
Worker motivation is necessary to reinforce a culture of radiation safety. Managers must promote an organized environment in which workers are motivated to reveal and correct adverse conditions, rather than neglecting or hiding such issues.

Question: What is the responsibility of an individual in connection to nuclear safety culture?
Answer: Personal accountability is highly important within nuclear safety culture. All individuals must take responsibility for the safety of themselves, along with the safety of others.

Question: What do you think may be the role of security in nuclear safety culture?
Answer: Security of radiation sources is part of nuclear safety culture. All radiation sources must be secured from unauthorized access or use. AUs and laboratory staff are expected to be vigilant about radiation source security. Vigilance includes questioning any individuals entering the area who are not part of the routine laboratory staff. Unoccupied radiation source use areas must be locked to prevent unauthorized entry.

Vicki Morris, Radiation Safety Officer
Mark Cornelissen, Assistant Radiation Safety Officer
Dramane Konate, Assistant Radiation Safety Officer
Ken Egan, Senior Radiation Safety Specialist
Beth Boston, Radiation Safety Specialist
Jason Collier, Radiation Safety Specialist
Chris Crawford, Radiation Safety Specialist
Dave Root, Senior Health Physics Technician
Mark Powers, Senior Health Physics Technician
Dave Kobza, Senior Health Physics Technician
Dick Henderer, Staff Health Physics Technician
Janine Sumrall, Staff Health Physics Technician
Margaret Frank, Junior Health Physics Technician
Carolyn Hurt, Business Manager
Debbie Kirkpatrick, Program Manager
Robin Davis, Administrative Secretary
Patricia Kerley, Records Management Officer