RADIATION REVIEW

UW - Madison Safety Department
262-8769

Radiation Safety Program
November 1991

NRC INSPECTION FINDINGS:

A team of six inspectors from the Nuclear Regulatory Commission inspected the University's facilities from June 17-21 of this year. On behalf of the University Radiation Safety Committee, the Health Physics Staff thanks the University's faculty, staff, and students for their responsiveness and cooperation with the Nuclear Regulatory Commission inspectors. A total of six violations were identified by the inspectors. No fine was issued.

1. Surveys required for areas where radiopharmaceuticals are routinely used or administered were done daily during work days. However, they were not done during some of the weekends when these areas were used.

2. A thyroid scan indicated an iodine uptake. The activity present in the thyroid was calculated for the day the scan was done. However, the initial activity that was present when the uptake took place was not calculated.

3. A teletherapy irradiator room has a radiation monitor. However, it did not have a backup power supply as specified by one of the license conditions.

4. A teletherapy irradiator room has a radiation monitor that has a visible and audible alarm. However, it did not have a device that will automatically generate a visible and audible alarm before the source can be put into operation.

5. A teletherapy irradiator room has a radiation monitor with a backup power supply as specified by license conditions. However, during the inspection the backup power supply unit was out for repair.

6. The access door to a teletherapy room was changed, but we did not amend our license to inform the NRC of this change.

Most of the above problems have been corrected.

CORD HOLIDAY HOURS

CORD will be closed November 28 & 29. Orders for Dupont and Amersham "Fresh Lots will be called in for delivery December 2.

CORD will also be closed December 24 through January 1. Material received from vendors during this time will be delivered. Please plan ahead.

NRC's Areas of Concerns:

In addition to the six violations found by the NRC, there were twelve areas of concerns. Some of these areas of concern are listed below. Due to lack of space in this issue of Radiation Review the rest of the concerns will be included in future issues.

1. The licensee should provide lab personnel with hands-on training in radiological instrumentation use, wipe tests techniques, record keeping, and decontamination procedures.

   The Health Physics Staff will be providing such training. Training dates will be announced to radiation workers via mail.

2. The licensee should use the radioactive check source installed on radiation survey instruments (i.e GM meters), to ensure operability of instruments prior to use.

   Most portable radiation survey meters have a check source installed by the University Health Physics Staff. If your meter does not have a check source, bring it to the Safety Department.

   Do check the operation of your meter using the check source before you use it. When you use your meter to perform the required monthly and/or semiannual surveys, you may document check source reading on your survey results.

3. The licensee should remind all laboratory personnel to secure all areas where radioactive material is used or stored to the extent that a safety hazard may exist.

   The Safety Department does depend on you to comply with security requirements of all areas where radioactive material is stored or used. Some of the security measures you should take are:

   - Lock authorized rooms that are not occupied by radiation workers.

   - Unlock only the authorized rooms you will be using that day.

-Challenge people you do not know who enter your labs.

-If you're the first person arriving at work, do not immediately open all the rooms. Open only the room you will be working in. The rest of the rooms may be opened when your colleagues arrive.

-Lock the authorized rooms immediately after you are done working whenever possible.

-Any other security measures you can think of is appreciated.

UPDATES IN THE SAFETY DEPARTMENT

Sue Engelhardt, a long time employee of the University as the Radiation Safety Officer (RSO), is leaving the Radiation Safety Department to devote her entire time to her consulting business in the field of radiation safety, NRC licensing, radioactive waste management, training, biotechnological development and other related fields. She will be with the Safety Department until the end of February of 1992. Her business will be in Madison, on Fish Hatchery Rd.

On behalf of the University community, the Safety Department thanks her for superb job performance and wishes her sincere luck with her new business and career. She will be truly missed by all. **Abdul BenZikri** is the acting Radiation Safety Officer until the vacant RSO position is permanently filled.

Jeff Orwin has been promoted to the Health Physics Technician Supervisor. **James Pence** will take over the CORD Health Physics Technician responsibilities. Congratulations to both of them.

HEALTH PHYSICS CORNER

RADIOLOGICAL UNITS

In the traditional (cgs) system the curie, denoted as Ci is the standard unit for quantity of radioactivity. It was originally defined as the activity of one gram of ^{226}Ra. The curie is the activity of that amount of radioactive material in which 3.7 X 10^{10} disintegrations per second takes place. In the new international system (SI), the unit for activity is the becquerel, defined as the activity of that amount of radioactive material in which one disintegration per second takes place. The relationship between the curie and the becquerel, therefore, is

$$1 \text{ Ci} = 3.7 \text{ X } 10^{10} \text{ Bq}$$

When X-ray or gamma radiation interact with air, ionization occurs, resulting in a net positive or negative charge on many of the particles the air is composed of. These charges can be measured electronically. The amount of ionization caused by radiation is called exposure. The cgs unit of exposure is the roentgen, denoted R, and defined as that amount of X or gamma radiation that will give one cubic centimeter of air a charge of one electrostatic unit at standard temperature and pressure (STP). The roentgen is a cumulative measure and doesn't take into account the time over which the exposure is measured. X-ray or gamma ray field strength is usually expressed as an exposure rate, such as roentgens per hour (R/hr). The SI unit of exposure is the X unit defined as the quantity of radiation needed to impart one coulomb of charge to one kilogram of air at STP.

When ionizing radiation comes in contact with a material (i.e. tissue), some of the energy is deposited in the material. The amount of energy deposited in a material is the dose or absorbed dose. The cgs unit of absorbed dose is the rad, the dose occurring when 100 ergs of energy is deposited in one gram of matter. The SI unit of absorbed dose is the gray (Gy), 1 Joule of energy per kilogram of matter.

Different types of radiation (i.e. alpha particles, fast neutrons, etc.) affect tissue differently for the same amount of ab- sorbed dose. A quality factor (QF) is used to take into account the difference in these effects. The dose equivalent is the absorbed dose adjusted with the quality factor and is given in units of rems. The SI unit of dose equivalent is the sievert (Sv). So,

H (Dose equivalent in Sv or rems) = D (Dose in Gy or rads) X Q (quality factor)

The QF for gamma,X-ray and beta radiation is approximately one, so for Health Physics purposes, we can consider: 1 R = 1 rem = 1 rad

One Roentgen of gamma ray exposure is approximately equal to one rad of absorbed energy which equals one rem dose in terms of its biological effectiveness.

WASTE WATCHERS

Hidden Sources

Many liquid scintillation counters contain an internal radioactive source, often ^{226}Ra or ^{133}Ba. This source must be removed before you dispose of the machine. Before disposing of an LSC counter, please call the Health Physics Technician Supervisor at 262-8769.

Other "hidden" radioactive materials which must be considered prior to disposing of equipment are found in static controllers and smoke detectors. Static controllers often contain small amounts of Polonium or Americium. Smoke detectors usually contain Americium, although the old ones were made with Radium. Many of these materials are present in levels below the regulatory limits, but should still be dealt with in a safe manner. If you have questions about anything that you would like to dispose of call Safety at 262-8769 and ask for a Health Physicist.

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