CASE WESTERN RESERVE UNIVERSITY

DEPARTMENT OF ENVIRONMENTAL HEALTH & SAFETY (EHS)

RADIATION SAFETY
ANNUAL REPORT 2015-2016

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Meter Calibration Program, improved turnaround time for meter calibration
Further developed its partnership with the Department of Energy (DOE) through The Pacific National Laboratory (PNNL) to implement security systems and develop programs to ensure that high radiation sources are secure at the University. This program made available substantial funding to harden our high activity radiation sources and to put them behind highly effective security barriers on our Campus. Program development, from this security effort on the Campus, was also aimed at tightly coordinating the Radiation Safety, Dispatch, the Police and Security personnel to respond as a coordinated body to any activities or breakdowns that threaten the security of our irradiator sources. Members of each of the above units completed special training in emergency response to situations that might threaten the security of our radiation sources. Training and automated equipment installation began in 2014 and extended into 2015. Participation in the training and security effort has provided an excellent understanding of how to implement coordinated emergency response to not only irradiator material but to any highly hazardous materials that may threaten the personnel on our camps and in our community. C helps us to provide a highly functioning coordinated task force that can respond to radiation emergencies and that is primed for further training to handle a variety of other hazardous situations that could arise on the CWRU Campus.

RADIATION SAFETY GOALS FOR 2016-2017

The continuing goal of the Radiation Safety Program is to position EHS for more effective interaction with the educational and research goals of the University through training and training development. A secondary goal is to increase the positive impact of Case Western Reserve University Safety Programs on the surrounding community through educational and programmatic interaction with local partners and emergency responders. Specific efforts currently address:

Implement recommendations from Broadscope Inspection.
Continued improvements in all radiation safety programs.
Sealed Source Program, to reduce the amount of unneeded sources on campus.
RAM Package Program, to timely check in packages.
Irradiator Program, to reduce the amount of room alarms.
Dosimetry, to reduce the amount of unreturned badges to as low as possible. We do have some users who are constantly late or do not respond to the multiple request. All of them are Ancillary RAD workers from Plant and Maintenance.
X-Ray Program, to assure that all users of the equipment required Quarterly Safety Check do perform it timely; All users required to have Safe Operating Procedure posted do have it on place; All users required to have an annual Site Specific Training do have a record of it separately from Annual Training on their CHP.
Waste Program, to establish good working relationships with a new waste vendor; Learn, implement and comply with the waste disposal requirements of the new vendor.
Training, to decrease the number of overdue retraining to the minimum
Fire drills for Radiation Safety staff each semester

OHIO DEPARTMENT OF HEALTH (ODH) LICENSE

Case Western Reserve University has one Ohio Department of Health (ODH) Broadscope license. The license covers possession and use of f1

PURPOSE FOR RADIOACTIVE MATERIAL (RAM) USE

The majority of isotope use at the University is for biomedical research. The most typical isotopes used are ^{14}C, ^{3}H, ^{125}I, ^{32}P, ^{33}P, and ^{35}S. Isotopes used in sealed sources contained

SUPPORT STAFF

ADMINISTRATIVE CONTROLS

Administrative controls are established and approved by the Radiation Safety Committee for laboratories where radioactive material (RAM) is used. Controls include signage, training, laboratory access, and dosimetry. Written procedures document procurement, use, and the disposal of all RAM at the University.

General Safety Compliance Enforcement Procedures prescribe sanctions for those who jeopardize safety or the continued favorable relationship between the University and the Ohio Department of Health. These procedures are designed to encourage the participation and cooperation of users of RAM and to promote safe use of such materials in a manner consistent with the rules and regulations of the ODH as interpreted by the RSC and the RSOF.

There are three classes of violations defined as minor, moderate, and major severity.

Minor Severity violations are listed under the following categories:

Improper laboratory records
Noncompliant RAM use and storage
Maintenance of an unsafe laboratory environment

Moderate Severity violations include the following:

Food/cosmetics in laboratory
RAM unsecured
RAM in unauthorized areas
Unapproved radiation laboratories
Unapproved disposal of radioactive materials
Unidentified contamination
Failure to respond to written notices from the Radiation Safety Office

Major Severity violations include the following:

Falsification of records
Unreported loss or theft of radioactive materials
Unapproved transfer of radioactive materials

There were no major severity violations assessed over this year. Of the moderate violations listed below, 7 D 30>> BDC 1 9the bove materi

AU CATEGORIES:

RADIATION ACTIVE (RA)

AUs who a
the RSOF three times per year. Audits are more frequent if there are particular concerns in a laboratory. A listing of AUs and their radioactive materials can be found in the Appendix.

RADIATION INACTIVE (RI)

These AUs do not currently use RAM and do not possess radioactive materials.

RADIATION ACTIVE (STORAGE MODE)

RADIATION SAFETY OFFICE (RSOF)

STAFFING

The RSOF operated under University approval with the following positions:

RSO (1)	Asst. Director/Asst. RSO/Quality Assurance Specialist (0.5)

AU

An Authorized User is a Faculty member who has been approved by the RSC to use RAM.

RADIATION WORKER

A Radiation Worker is any person who uses RAM under the supervision of an AU.

ANCILLARY RADIATION LABORATORY WORKER

Personnel listed under an AU

Fluoroscopy Training Module (kindly provided by University Hospitals CASE Medical Center) in addition to the general X-Ray and site-specific trainings. Right-To-Know Fluoroscopy training is provided on an as-

LABORATORY USE	# OF ROOMS

The Packard Auto Gamma 5000 Counter in the Service Building Radiation Laboratory was replaced by a Packard Cobra II Auto Gamma Counter. The Packard 1900CA LSC was replaced by a Packard 2100TR in the DOA 990 Office. The Gamma counter calibrations are conducted monthly for the EHS Radiation Laboratory and as needed for the LSCs in Radiation Laboratory, DOA 990 and WRB 1119. The continuous air monitor (CAM) and the connected air pump in DOA 990 are out of service and calibration is on hold. The LSCs in the Radiation Laboratory, WRB 1119, and in DOA 990 were serviced and cleaned.

RADIATION SAFETY PROGRAM

PURCHASE OF RADIOACTIVE MATERIALS

AUs and their approved designees purchase radioactive material. All radioactive isotope purchases must be approved by the RSOF before the order is processed through the Purchasing Department.

AUs must be approved for the isotope and the quantity of isotope ordered. The activity, when

isotope. Replacement shipments, trial kits, and free samples also must be approved by the RSOF. All deliveries are sent to the Shipping and Receiving Area for RSOF inspection and clearance befor

TRANSFER OF RADIOACTIVE MATERIALS

The RSOF reviews and approves the transfer of all radioactive material internally (on campus) and externally (off campus) to, or from, an AU. Before initiating a transfer, either the internal or external transfer form must be completed and forwarded to the RSOF for approval. There were 77

SEALED SOURCES

93 sealed sources. Of these, 88 sealed sources are required to be inventoried every six months. Five (5) sealed sources require six-month leak tests, as stated in our ODH license. This includes 4 gamma sources and 1 neutron source.

There are three (3) high-dose irradiators and two (2) low-dose irradiators on campus. Both of the low-dose irradiators and one of the high-dose irradiators are not in use. There are two (2) active high-dose irradiators. These irradiators are the only radioactive material sources that could produce significant external dose hazards should their shielding be compromised.

See the Appendix for a list of sealed sources on campus. These sources are not included in the general he

RADIATION SURVEY METER CALIBRATIONS

12/2015	8	12	17	13	7

worn to conservatively measure any dose to the developing baby. No woman declared their pregnancy. During monitoring, no fetal doses above background radiation levels were detected.

NEUTRON USERS

For experiments and procedures involving the use of neutron sources, personnel monitors sensitive to neutron radiation must be worn. These can be obtained from the RSOF. There were two neutron dosimeter users during the fiscal year.

USERS OF RGE/ X-RAY

The RSOF provides special dosimeters for individuals carrying out experiments and procedures involving the use of radiation generating (x-ray) equipment, such as fluoroscopy and X-Ray Diffractometers. The twenty-five (25) Fluoroscopy users had collar badges.

Although only 20% of the workers currently monitored are required to wear dosimeters to comply with the terms of the Case Western Reserve University Broadscope License or Radiation generating equipment programs, the use of dosimeters is encouraged because it provides an excellent method for early detection of activities that might be dangerous to

With regard to airborne exposure control, the primary concern is to safeguard against exposure to airborne radioactive iodine that is used for protein iodination experiments. To control exposures, the RSOF requires that reactions involving use of volatile radioactive iodine isotopes be performed in an iodination hood that is housed in a chemical hood. The charcoal-filtered exhaust from the iodination hoods typically reduce radioactive material emissions by approximately 90%. Experiments requiring use of large amounts of iodine in especially volatile form are routinely carried out in closed systems to prevent airborne release of radioactive iodine. There were no experiments requiring the use of volatile iodine conducted this fiscal year. This program has been inactive since 2014.

BIOASSAY PROGRAM

Bioassays are required for employees who may receive an internal, measurable radiation dose. Bioassay procedures include, but are not limited to, thyroid screening and urinalysis. The RSOF can perform bioassays for radioactive iodine (thyroid scan) and tritium uptake (urinalysis). Bioassay records are retained in the RSOF and are available for review by the assayed individuals.

RADIOACTIVE IODINE

During 2015-2016, there were no active iodination laboratories. The RSO maintains an inventory of four

TRITIUM

Urine bioassays must be carried out for individuals using more than 10 mCi of tritium, with a baseline bioassay required prior to experiment. There were no urine bioassays required during this fiscal year.

RADIOACTIVE MATERIALS INCIDENTS

EMERGENCY RESPONSE

Emergency response procedures have been developed and approved by the RSOF and RSC for spills, releases or loss of RAM, small fires, large fires, internalized contamination and medical emergencies. The goal during any emergency response is to protect people first and property second. The RSO or designee provides instruction, assistance and supervision of clean up as required. The RSO is authorized to act independently and take prompt remedial action in situations involving RAM that present imminent danger or threat to personnel, property, or the community at large.

INCIDENT/ SPILL RESPONSE

MAJOR INCIDENT/ SPILL

This is a spill that involves personnel contamination or results in contamination outside of the intended work area that cannot be easily and effectively contained and cleaned up.

MINOR INCIDENT/ SPILL

This is a spill that does not involve personnel contamination and that remains inside the intended work area; one that can be easily and effectively contained and cleaned up without assistance from the RSOF. It also includes events that trigger irradiator alarms, most of which

EHS WEB SITE & NEWSLETTER

The EHS home web site (https://case.edu/ehs/) provides integrated web-based access to EHS services. Information on training classes, on-line retraining, and safety manuals is available at this site. All information is updated on a regular basis.

LASER SAFETY PROGRAM

There are a total of 176 lasers/laser systems in our database for the campus used by 40 Laser PIs in 14 buildings (33 Active, 7 Inactive). The lasers of greatest concern are those labeled Class 3B and Class 4. There are 61 Class 4, 46 Class 3B lasers, as well as 68 lasers in other classes 1, 2, and 3A/3R.

There are 21 class 3B/4 enclosed laser systems that are considered eye-safe under normal use that decrease the hazard to the user. Thirty-one (31) audits of Laser systems were performed during this fiscal year. There were no Laser incidents reported this year.

ULTRA VIOLET (UV) SAFETY PROGRAM

As noted by an OSHA director, OSHA has written two standards that cover employee exposure to radiation: Nonionizing Radiation (29 CFR 1910.97) and Ionizing Radiation (29 CFR 1910.1096). The non-ionizing radiation standard only covers the radio frequency region, including microwaves. The ionizing radiation standard covers alpha, beta, gamma, and X-rays; neutrons; high-speed electrons and protons; and other atomic particles; but does not **include** sound or radio waves, or visible, infrared, or ultraviolet light. Therefore, there are no OSHA-mandated employee exposure limits to ultraviolet radiation.

CLEARANCES/ RELOCATION PROGRAM

effort between the RSOF, the Safety Services division of EHS, Facilities Services, and the AU facilitates these operations. There were 1001 pieces of equipment and 250 rooms that were cleared in this reporting period.

WASTE MANAGEMENT

RADIOACTIVE WASTE FACILITY

Our Radiation Waste Facility decay-in-storage licensing with the ODH specifies that we must dispose of any interim generated waste as soon as practical when a waste site is open. The Case Western Reserve University Radioactive Waste Facility (RWF) is used to segregate waste streams and prepare the waste for disposal. The different waste streams include aqueous waste, sharps, animals, scintillation vials, beta plates, and dry solid waste.

^{32}P solid waste is held for decay (for at least 10 half-lives) in the Radioactive Waste Facility. The waste is surveyed and subsequently sent to Stericycle (formally BFI), a commercial

Case Western Reserve University. Reducing the volume of waste to be disposed remains a continuing aim of the waste program. As part of the waste minimization program, isotope users are encouraged to reduce the volume of waste generated in the laboratory by minimizing the use of extraneous paper products. Short-lived non-sewer (Hazardous waste) is held for decay, resurveyed after ten half-lives, and disposed by Chemical Analytics, a commercial hazardous waste disposal company. ^{35}S and ^{125}I are no longer held for decay, but are shipped along with the long-lived solid waste. Long-lived solid waste (greater than 60 day half-life) and scintillation vials are disposed by ADCO Services, a commercial radioactive waste hauler.

Non-hazardous aqueous waste is no longer held for decay. This waste is picked up from laboratories by the RSOF staff and immediate sewer disposal is carried out in the Radioactive Waste Facility since the isotope activities are significantly below our established regulatory limits as per OAC 3701:1-38-12 Appendix C. u 557.98-

RADIATION SAFETY COMMITTEE AUDITS

Radiation Safety Committee (RSC) audits are carried out in two different ways:

Performance audits are conducted on-site at the Radiation Safety Office (RSOF) by individual RSC members at various times throughout the year

A compliance inspection of RSOF records is conducted shortly after the end of each

SUPPORT STAFF TRAINING

An audit was conducted to verify the training status of personnel encompassing ancillary segments of the radiation safety program including; Animal Resource Center (ARC), Shipping & Receiving, Custodial, Security and Plant Security. Ancillary workers were surveyed on 11/04/2015. Dr. Croniger audited 10 files and was unable to find three (3) files for the ancillary staff. The radiation safety office was alerted to this deficiency and is working to update all the training of ancillary staff.

RSOF RESPONSE

Those in non-compliance were contacted and retraining completed.

SHIPPING PAPERS/DIRECT PACKAGE PICKUP

An audit of shipping papers was performed to verify that paperwork is completed for each transfer of radioactive material on 11/4/2015. Dr. McCormick examined 10 files and found no deficiencies among paperwork verifying pickups.

RSOF RESPONSE

No response required.

RADIOISOTOPE POSSESSION LIMITS

Dr. McCormick surveyed ten (10) files on 11/19/2015 to ensure that the possession of isotopes within each surveyed laboratory was within the labs posted possession limits for each isotope. Dr. McCormick reported no deficiencies.

RSOF RESPONSE

No response required.

ROOM SURVEY

An audit was performed on 11/25/2014 to validate active RAM use files and Decommissioned room files to verify that the laboratory was surveyed within the last six months as well as verification for any follow-up on non-compliance issues. Dr. Schiemann examined 10 files and noted two (2) laboratories in the process of decommissioning.

RSOF RESPONSE

Room decommissioning surveys were completed.

SEALED SOURCE LEAK TESTS

Files verifying that sealed sources had been leak tested were audited on 11/19/2015. Ten (10) files were examined by Dr. Croniger who reported no deficiencies for the report period.

RSOF RESPONSE

RSOF RESPONSE:

No response required.

DIRECT PACKAGE PICKUP

INCIDENT REPORTS

A review of incident reports was performed in January 2016 by Dr. Croniger for verification and documentation of follow-up by the RSOF. During this quarterly report there were no incidents reported.

RSOF RESPONSE:

No response required.

LASER PROGRAM

The laser program was audited by Dr. Croniger in January 2016 for accuracy regarding laser inspections, inventory and status of personnel training. Ten (10) files were audited. No deficiencies were noted.

RSOF RESPONSE:

No response required.

In April 2016, the Radiation Safety Committee Members conducted a tri-annual audit of the following components of the Radiation Safety Office:

Irradiation Program
AU253.254(d)4(iii)75.144 697.18 Tm[(N)5(C)5(I253.254(d)4(iSa)11 0 0 DRE)6(P)40 0 TOR US(55)-4(G)-4(R3(10)14BT10 0 IETBTIETBTGk)-6(-0 IETSa
Radioisotope Possession Limits
Waste Disposal Facilities
Valid RAM Applicip4(p)4(p)4(li)11(ci)-4(p4(p3112(n)6( )ea2 72.0G8u)3(e BDC BT1 0 0 1 72.024 608.621 72.024 s101 0 (ci)-4(p4)-5(iDC 1 18Tf1 0 0 1 7

SUPPORT STAFF TRAINING

Dr. Croniger audited the training records of support staff on 04/18/2016. Dr. Croniger audited ten (10) files and noted five (5) deficiencies. The RSOF was informed of these training requirements.

RSOF RESPONSE:

Those in non-compliance were contacted and retraining completed.

Overall, this bi-annual part of the audit process was successful. Records were easily accessed and reviewed. The program was found to be efficient. Productive interaction among committee members and RSOF staff during the audit process helped expedite the process. All corrections to the files and OnSite database were made following each trimester audit.

ANNUAL RADIATION SAFETY PROGRAM AUDIT REPORT

The Radiation Safety Committee conducted its annual audit of the Radiation Safety Office the first week in June 2016. Members of the RSC conducted the audit. The committee reviewed the performance of 20 components of the RSOF. The areas were:

overdue for training. In addition, Dr. Licatalosi reported that 4 workers out of the 50 survey were also not ancillary by definition. The radiation safety office notified overdue workers and corrected the ancillary status for those individuals identified as not ancillary.

RSOF RESPONSE:

Those in non-compliance were contacted and training completed.

AU AND WORKER TRAINING

RSOF RESPONSE:

The information was added to the database.

DOSIMETRY PROGRAM

An audit of Current Dose records held by the RSOF was performed to verify that AU laboratory workers were current in dose record and active radiation badges for the period July 1, 2015-June 30, 2016. Dr. Jankowsky audited 50 records and reported 17 individuals without dose records who were notified of the deficiency. One (1) person found in the active personnel files had actually left the University.

RSOF RESPONSE

The information was archived in the database.

INCIDENT REPORTS

A review of monthly incident reports From July 1, 2015-June 30, 2016 was performed by Dr. Ogino for verification and documentation of follow-up by the RSOF. During this period there were a total of nineteen (19) incidents reported. All incidents were effectively resolved in a timely manner.
RSOF RESPONSE

No response required.

IRRADIATOR INFORMATION REVIEW

An audit of the Irradiator Information Files was performed by Dr. McCormick to verify that the irradiators were audited by the RSOF within the past six months between the period of July 1, 2015-June 30, 2016, and that any compliance issues were appropriately followed up and pending issues corrected. Four Irradiators were active on campus and each file was up-to-date and compliant.

RSOF RESPONSE

No response required.

LASER PROGRAM REVIEW

The Laser program was audited by Dr. Schiemann for accuracy regarding laser inspections, inventory and status of personnel training in the period July 1, 2015-June 30, 2016. Fifty (50) files were audited. No deficiencies were noted for this period in inspection data.

RSOF RESPONSE:

No response required.

LICENSING STATUS

SEMI-ANNUAL MAILINGS (AIR/ SEWER INVENTORY)

An annual audit of the air/sewer disposal inventory was performed for the period July 1, 2015-June 30, 2016. Fifty (50) files were reviewed by Dr. Valadkhan who noted five (5) questionable status updates. The Assistant RSO was notified of these questions.

RSOF RESPONSE:

Two forms were processed and place in the file, two forms were for sealed source only users, and one misfiled form was refiled.

EHS INTERNAL AUDITS

Three layers of audits are utilized by the RSOF on an ongoing basis to ensure that the Radiation Safety programs and procedures are working smoothly. In addition to audits conducted by the RSOF Staff and Radiation Safety Committee, the Assistant RSO conducts Quality Control reviews of all programs and records and assists with resolution. Full audit results of the program are available in the EHS Office.

Sealed Source	RAM Security Checks	Bioassays
Shipping Papers	Semi-Annual Mailings	Dosimetry
Valid RAM Applications	RGE Inventory/ Training	Survey Meters
Isotope Orders/ AU Possession Limits	Ancillary Training	Compliances
AU/ Worker Training	Licensing	Website Accuracy
Waste Disposal Facility	Incidents	Liaison Program
Room Surveys (Active/ Decommissioned)	Irradiator	Laser Program

Corrections to the files were made promptly. In response to internal audit findings, Radiation Safety continues to improve its procedures and programs.

This report was prepared by Felice Thornton-Porter on 7/22/2016 and reviewed by Dr. David Sedwick. It covers fiscal years 7/1/2015-6/30/2016.

APPENDIX