CASE WESTERN RESERVE UNIVERSITY

DEPARTMENT OF ENVIRONMENTAL HEALTH & SAFETY

RADIATION SAFETY
ANNUAL REPORT 2024-2025

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INTRODUCTION

This report is submitted to the president and designated members of the senior administration of the University as required by the Radiation Safety Committee's (RSC) operating guidelines and Case Western Reserve University's State of Ohio (Nuclear Regulatory Commission Agreement State) Broad Scope License. The report summarizes the activities of the Radiation Safety Office (RSOF) of the Department of Environmental Health & Safety (EHS) at Case Western Reserve University (CWRU). Its contents cover the period from 7/1/2024 – 6/30/2025.

SUMMARY

DEPARTMENT STRENGTHS

The RSOF is comprised of a staff with extensive and diverse backgrounds who can address and resolve a wide range of issues faced in radiation safety at CWRU. The RSOF has developed programs that meet or exceed regulatory requirements. These programs proactively anticipate new safety requirements by promulgation of new programs through the RSC of the University. The success of these agendas is enhanced by excellent administrative support.

DEPARTMENT OPPORTUNITIES

The RSOF enjoys excellent interaction with other departments that are developing safety-related initiatives and outside agencies that are dedicated to improving environmental quality in our facilities.

RADIATION SAFETY ACCOMPLISHMENTS FOR 2024-2025

Over the past year, the radiation safety division of EHS continued to improve the effectiveness of the Radiation Safety Program. Notable new accomplishments include:

- Disposed of Liquid Scintillation Counters (LSC) via GMI.
- Disposed of X-Rays tubes via Demotech.
- Disposed of Laser units via Demotech.
- Generated in-house savings accrued from meter calibration, recycling and decay-in-storage programs amounting to more than **$13,930** in 2024-2025 through its services to the research community at CWRU.

RADIATION SAFETY GOALS FOR 2025-2026

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 CWRU safety programs within and around the adjacent community through educational and programmatic interaction with local partners and emergency responders. Specific efforts currently address:

- Planning and Preparation for Irradiator purchase of an X-Ray Irradiator through the DOE Office of Radiological Security (ORS) in Spring 2026.
- Update the Radiation & Laser Training PowerPoints.

OHIO DEPARTMENT OF HEALTH LICENSE

CWRU has one Ohio Department of Health (ODH) broad scope license. The license covers possession and use of both nuclear accelerator-produced radioactive materials (RAM) and naturally occurring RAM for experimental purposes. It also allows for the licensed use of four irradiators. The ODH broad scope license site visit was last conducted on 10/27/2022.

The University has two ODH radiation-generating equipment (RGE) registrations. The registrations cover the receipt, possession, use, storage, and disposal of radiation generating equipment including dental X-ray machines, X-ray diffraction units, and fluoroscopy units. The ODH RGE (X-ray) inspection for the dental bus mobile units was conducted on 12/13/2022. The ODH RGE (X-ray) general inspection was conducted on 12/12-19/2023.

ODH LICENSE	EXPIRATION DATE	PURPOSE
011-011800-11	January 1, 2030	Broad Scope License
09-M-06944-12	May 31, 2026	Radiation-Generating Equipment Registration
06-E-06944-020	March 31, 2026	Radiation-Generating Equipment Registration (Bus Mobile Units)

DECOMMISSIONING FUNDING PLAN

The CWRU broad scope license and the decommissioning funding assurance approval became effective in 2/2025. Before 10/2019, the University was required to maintain a standby letter of credit to cover possible costs if the University's broad scope license was required to cover costs of rapid decommissioning. The funds required for this letter of credit depended on the kind and amounts of RAM maintained in active use or waste by the University. The University now operates under an agreement with ODH that requires no letter of credit but is dependent on the University's good financial standing. This agreement covers all possible decommissioning costs for RAM located at the University as long as the University's credit rating is maintained.

RADIOACTIVE MATERIAL USE AND STORAGE LOCATIONS

RAM and/or RGE are located at the following facilities:

- Main campus of Case Western Reserve University, 10900 Euclid Avenue, Cleveland, Ohio 44106
- University Hospitals (UH), 2065 Adelbert Road, Cleveland, Ohio 44106
- Wolstein Research Building (WRB), 2103 Cornell Road, Cleveland, Ohio 44106
- Health Education Campus (HEC) Dental Clinic, 9601 Chester Avenue., Cleveland, Ohio 44106 (RGE, no RAM)
- Health Education Campus (HEC) Main Building, 9501 Euclid Avenue., Cleveland, Ohio 44106 (RGE, no RAM)

RAM and/or RGE are received and/or stored at the following sites:

- Shipping and receiving, 2220 Circle Drive, Cleveland, Ohio 44106
- Wolstein Research Building, 2103 Cornell Road, Cleveland, Ohio 44106
- Health Education Campus (HEC) Dental Clinic, 9601 Chester Avenue, Cleveland, Ohio 44106 (RGE, no RAM)
- Health Education Campus (HEC) Main Building, 9501 Euclid Avenue, Cleveland, Ohio 44106 (RGE, no RAM)

PURPOSE FOR RAM USE

The majority of isotopes used at the University are for biomedical research. The most typical isotopes used are ^{14}C, ^{18}F, ^{3}H, ^{124}I, ^{32}P, and ^{35}S. Isotopes used in sealed sources contained within irradiators, scintillation counters, gamma counters, check sources and calibration standards are most commonly ^{137}Cs, ^{133}Ba, and ^{241}Am.

RADIATION SAFETY PROGRAM – RESPONSIBLE PARTIES

RADIATION SAFETY COMMITTEE

The RSC sets the policy for the use of RAM for the University's committee. Members of this committee are appointed by the president of the University and has responsibility for monitoring and enforcing compliance with the University's Radiation Safety Program as outlined in the University's ODH broad scope license. RSC members are chosen from diverse disciplines to provide comprehensive expertise. The committee reviews all applications for the use of RAM.

The 2024-2025 RSC membership and their affiliations are listed below. The ODH is informed of committee membership changes. The committee is also aided by input from ex-officio (non-voting) and visiting members (non-voting).

VOTING MEMBERS

Dr. Thomas McCormick Dept. of Dermatology BRB 530 Term Expires: 9/1/2026 Chairperson Term Expires:9/1/2026	Felice T. Porter EHS Associate Director/RSO Quality Assurance Specialist Service Bldg., First Floor	Dr. Saba Valadkhan Dept. of Molecular & Microbiology HG Wood 210A Term Expires: 9/30/2025
Dr. Colleen Croniger Dept. of Nutrition BRB 925 Term Expires: 9/30/2025	Dr. Suhrim Fisher Animal Resource Center BRB RB5P Term Expires: 9/1/2026	
Dr. Zhenghong Lee Dept. of Radiology Bolwell Building S107 Term Expires: 9/1/2026	Dr. Thomas Gerken Dept of Biochemistry Wood 477 Term Exp: 9/30/2025	

EX-OFFICIO MEMBERS

Richard Jamieson Vice President Dept. of Campus Services Administration Adelbert Hall 229	Marc Rubin EHS Senior Director Service Bldg. First Floor
Bruce DeMeza University Hospitals Asst. RSO Bishop S621	Joseph Nikstenas EHS Asst. Dir./Asst. RSO/Laser Safety Officer Service Bldg. First Floor

SUPPORT STAFF

Naomi Boles Department Assistant Service Bldg., First Floor

The RSC acts as an advisory and enforcement body to ensure that all RAM is safely used in accordance with the 'As Low As Reasonably Achievable' (ALARA) principles. The committee conducts audits each trimester, addressing programmatic compliance. The RSC also conducts an annual audit in which the entire program is reviewed.

The audits ensure that:

- Specific program components conform to the licensed program as described in the CWRU Radiation Safety Manual and License
- Accurate documentation for program conformance and license compliance is maintained.
- Adequate training is provided for all classes of workers.
- Oversight for RSOF activities is maintained through RSC familiarity with the daily function of the University radiation safety program.

The RSC met via Zoom and in person on 8 occasions during the 2024-2025 fiscal years to review applications for radioisotope use and action on other business. There were no quorum meetings. Four RSC meetings were canceled because agenda items did not require immediate address. The minutes of the RSC meetings and executive committee actions are available in the RSOF, through the RSC or through the University's administration. The presence of radioactive materials and use of irradiators required continuing audit activities over this period by both the RSOF staff and the RSC members.

APPLICATIONS	24/ 25	23/ 24	22/ 23	21/ 22	20/ 21	19/ 20	18/ 19	17/ 18	16/ 17	15/ 16	14/ 15
New AU	0	1	1	1	1	0	2	3	3	1	3
Additional Isotopes	2	3	1	2	3	2	1	2	0	2	2
Radioisotope use in Animals	2	1	1	1	1	1	0	2	2	4	1
Sealed Sources	3	0	1	2	3	0	0	1	5	0	6
Sealed Sources Update	2	1	0	1	1	2	2	1	0	0	0
AU Reactivation	0	0	0	0	0	0	0	0	0	0	0
Possession Limit Increase	0	0	0	0	0	0	0	0	0	0	2
AU Protocol Update	3	8	3	5	4	3	16	4	7	2	7
TOTAL APPROVALS	12	14	7	12	13	8	21	13	17	9	21

Important topics acted upon or discussed by the RSC:

- The new X-ray Irradiator is being assembled with the basic X-ray tube, and the delivery has been postponed to 8/2025. The primary X-ray tube will be installed by late 1/2026. The State will be notified of delivery, installation, and unit registration. CWRU hired a structural engineer to conduct structural analysis of the route of the unit through UH to the SAIRC and the room where the unit will be housed. The analysis confirmed the route was safe. The Wu SAIRC Medea X-ray unit arrived in late 4/2025 and is now in use for 18F FDG and 99mTc. Dosimeters for this quarter wee below background levels. There are no fetal monitors for this quarter. Through the Source Collection & Threat Reduction (SCATR) Program we disposed of several old sealed sources in 4/2025. The SCATR program will allow for 50% coverage of the costs for waste disposal through the Conference of Radiation Control Program Directors (CRCPD). Quarterly High Security Checks of Irradiators as well as Annual High Security Training for required personnel were completed. 2024-2025 Annual Report is in progress. (6/2025)
- CWRU Summer operations are going well. ISEB construction continues. Expecting a large Freshman enrollment of over 1650 students in Fall 2025. Housing has more than enough capacity to house the incoming class. Brian Burnett is the new Executive Vice-President (VP) for Finance and Chief Financial Officer (CFO) as well as Richard Jamieson's boss, since John Sideras retired in 12/2024. All RSC Annual Audits must be completed by 6/25/2025 to close 2024-2025 fiscal year. Next RSC meeting will be 7/2025. (6/2025)
- An inactive stored laser (KHS 220), formerly under Liming Dai, was dismantled and the tube removed for hazardous waste due to possible Beryllium in the ceramic. The rest will be scrapped by Demotech and billed back to the Engineering department. The Hore laboratory was decommissioned for RAM use. RSOF moved many lead shielding bricks to DOA which included 12 carts full in 7 trips. The X-ray irradiator has been delayed again. Working with UH to verify that all regulations are being followed. Chunying Wu,

SAIRC Co-Director, awaits the PET X-Ray unit and expects it in late 4/2025. Dosimeters are below levels and there is no fetal monitoring. There is no ODH visit yet. Hopefully SCATR collection of old sealed sources next month. (3/2025)

- Due to government administrative changes, CWRU will make 5% budget cuts across the board for 2025-2026. Up to 4% merit raises continue for 2024-2025. Up to 2% merit raises possible in 1/2026. ISEB construction continues. National Institute of Health (NIH) grant caps are frozen. Sven Gallo (UH RSO) shared that UH inspection by ODH is upcoming. (3/2025).
- Stored LSCs (3) from various laboratories were disposed of via GMI 2/17/2025. Several of the decayed sources that have been collected from various researchers who have retired, decommissioned or left CWRU and are currently in storage will also be disposed through the SCATR program. The new X-ray Irradiator is being assembled with the basic X-ray tube, and the delivery has been postponed to 3/2025. The primary x-ray tube will be installed by Fall 2025. The State will be notified of delivery, installation, and unit registration. The new Wu SAIRC Medea X-ray unit is scheduled to arrive in late 1/2025. Dosimeters for this quarter were below background levels. There is one fetal monitor for this quarter. CWRU has submitted a response to ODH requesting additional information concerning the two disposed irradiators as well as the CWRU Decommissioning Funding Plan. The renewal of the CWRU Radiation License was completed and submitted before its expiration on 1/1/2025 and a letter of timely renewal was received. RSC 1/2025 Audits are complete. (2/2025)
- GMI Beckman LSC update includes that the PO numbers have been generated to cover costs for the parties included. Three crates will be shipped ahead of the visit for the units being taken by GMI. SCATR sealed source disposal awaits a response from the SCATR program concerning disposal of decommissioned LSCs and other sources. ROSF is going through the sources we have collected and have holding onto that are not being used to add to the list. The CWRU RAM License timely renewal has been submitted to Ohio Department of Health (ODH). We should expect a visit soon. RSC audits for 1/2025 have begun. Irradiator quarterly checks with be done this week. Computer updates will hopefully decrease Dispatch issues. For the last quarter, there were no high doses reported, and one pregnant worker declared. CANVAS training has been updated. Working through some bugs within the quizzes. Some people still have problems with the release of quizzes. Lasers (8) were removed from DOA as e-waste. A thank you letter was received from President Kaler regarding the RSC Annual Report. National Source Tracking System (NSTS) report which tracks high-risk radioactive sources as a major security initiative of the National Regulatory Commission (NRC), was submitted and confirmed as received. (1/2025)
- Construction has begun for the Interdisciplinary Science and Engineering Building (ISEB) and should be completed by Fall 2026. CWRU is hoping to increase the number of researchers by 50%. CWRU has met the goal of new faculty members in Engineering and Arts/Science. (1/2025)
- The next RSC Annual Audit is 4/2025. Several University Hospital (UH) changes per Bruce DeMeza (UH ARSO). Norbert Avril will retire in 3/2025 and will no longer conduct research. Quibai Li will replace Avril as UH Division Chief of Nuclear Medicine. David Jordan will replace Avril as Vice Chair of UH RSC. Ahmad will retire in 2/2025 and Sven Gallo will replace Hatami as UH RSO. (1/2025)
- Stored lasers (8) in DOA Waste Facility from various laboratories will be disposed via e-waste, scrap metals and hazardous waste in 12/2024. The status of Beckman Liquid Scintillation Counter (LSC) decommissions and disposal of 137Cs sources through DOE SCATR Program. This also includes one Perkin Elmer LSC with 133Ba sealed source. RSOF has removed the sources from the two LSCs (133Ba-Wu in SB39 & 137Cs-Gerken in 439) that are being decommissioned, and the departments will be back-billed ($541/source) for this RSOF service. There will be preventative maintenance (PM) on 1 LSC-Stamler (4113) for $5K, evaluation with service on 1 LSC-Gott (108) for $1,650 disposal of 3 LSCs with sources for $0 cost. The 2023-2024 RSC Annual Report has been delivered to CWRU President Kaler and can be found on the EHS website. The new X-Ray Irradiator is being assembled with the basic X-Ray tube and hopefully will be delivered by 1/2025. The primary X-Ray tube will be installed by Summer 2025. The State of Ohio will be notified of delivery, installation and unit registration. There are no high doses this quarter and fetal monitoring this quarter. RSC 10/2024 audits are complete. X-Ray calibration of our CWRU Dental Bus & some Dental Clinic diagnostic x-ray units was completed. Dosimeters for this quarter were below background levels. There is one fetal monitor for this quarter. We now have a new vendor for Laundry Service, Liniform Service, which will replace Merchants Linen Service, after many years of laundering research laboratory coats. Liniform Services is celebrating their 100th anniversary of dedicated service to Northeast Ohio since 1924. (11/2024)
- The next RSC Audits are in 1/2025. (11/2024)
- Status of Beckman LSCs Decommission and Disposal of 137Cs sources through SCATR Program. This also includes Perkin Elmer LSC with 133Ba sealed source. RSOF will remove the sources from the LSCs that are being decommissioned, and the departments will be back-billed ($541/source) for this RSOF service. (10/2024)
- Dosimeters for this quarter were below background levels. There is one fetal monitor for this quarter. The Yanming Wang RAM Protocol for the Small Animal Imaging Research Center (SAIRC) was formally

transferred to Chunying Wu as RAM Co-Director of the SAIRC in 9/2024. She will be responsible for the purchase, maintenance, and disposal of RAM, equipment, personnel, and waste disposal for SAIRC. Christopher Flask will be the CHEM, BIO Co-Director of the SAIRC. Yanming Wang retired 6/30/2024 and his laboratory protocols for Radioactive materials, Chemicals, & Biologicals are formally closed now. (10/2024)

- CWRU Fall Break in 10/2024. On 10/23/2024, the ISEB groundbreaking begins and there is the CWRU Trustee Meeting. Residence Halls are fully occupied by new students now. There have been increased auto break-ins which are negatively impacting affected faculty, staff, and students. (10/2024)
- 10/2024 RSC Audits are in progress. (10/2024)
- CWRU Google disruption in the summer caused issues with Dispatch, UGEN, and alarms. Corrections have been made. Maintenance of both irradiators is complete. There are no high doses this quarter nor fetal monitoring this quarter. X-Ray calibration of our CWRU Dental Bus & some Dental Clinic diagnostic x-ray units were completed. 2023-2024 RSC Annual Report is in progress. RSC Annual Meeting will be held in 10/2024. X-Ray Irradiator assembly is in process, and the date of delivery has been postponed to late Fall 2024. (9/2024)
- Both newly constructed dorms were open successfully. The two residence halls, Mary Chilton Noyes House and John Sykes Fayette House in the South Residential Village (SRW) opened in 8/2024 adding 600 beds for Sophomore students as well as modern amenities, lounges, laundry, and a health clinic. (9/2024)
- Per Thomas Gerken, still waiting on the cost for disposal of 3 liquid scintillation counters (LSC) in Biochemistry. (9/2024)
- Yanming Wang retired on 6/30/2024 and his laboratories will be decommissioned. The UH/CWRU Memorandum of Understanding (MOU) will continue. Assembly has started on the x-ray irradiator, and the date of arrival is pending. There has been a meeting with the contractor, and the room location has been changed to a larger room. Training sessions have not been determined for the x-ray irradiator. RSC Annual Audits have been completed. (7/2024)
- The academic year was successful, with campus operations going well. The new residence halls should be completed by 8/5/2024. Yost Hall has been demolished. Interdisciplinary Science and Engineering Building (ISEB) is under construction. It is a new research facility designed for collaborative innovation and is slated to open in Fall 2026. There they hope to advance research in the areas of artificial intelligence, sustainable manufacturing, and climate change. (7/2024)
- Thomas Gerken has Emeritus status and research grants that last until 7/2025. (7/2024)

SENIOR MANAGEMENT

The Radiation Safety Program monitors, inspects and audits RGE and sources used by AUs and their personnel. Senior management oversight and support of radiation safety-related activities is guaranteed by attendance of the vice president for campus security, or an appointed representative, at all RSC meetings. The RSC conducts independent audits of the Radiation Safety Program. The RSOF staff immediately responds to audit findings. Audit findings and responses are reported to senior management and the Committee. Richard Jamieson, vice president of campus services, continues to provide direct administrative representation for the Radiation Safety Program. In the absence of Richard Jamieson, Marc Rubin, EHS executive director, provides administrative representation.

RSOF AND AUTHORIZED USERS (AUs)

The AUs and the RSOF share responsibility for safety. The AU is directly responsible for the safe use of RAM in the laboratory. The radiation safety office is responsible for ensuring that appropriate safety procedures are implemented and that AUs are fulfilling their responsibilities for monitoring safety during experiments carried out in their laboratories. Audits of laboratories are conducted by the RSOF to ensure compliance with CWRU's license. The audit program includes routine unannounced inspections of each AU's laboratory.

ADMINISTRATIVE CONTROLS

Administrative controls are established and approved by the RSC for laboratories where 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 ODH. 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 RSOF

Major severity violations include the following:

- Falsification of records
- Unreported loss or theft of RAM
- Unapproved transfer of RAM

There were no major severity violations assessed over this year. Of the moderate violations listed below, zero were the result of unsecured RAM found during after-hours security checks and routine compliance reviews. No laboratories were assessed with a moderate violation that had three or more minor violations during compliance reviews by radiation safety during routine audits. Documented follow up and resolutions were completed for all major and moderate violations.

VIOLATIONS	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
Minor	33	36	16	31	24	19	38	43	70	78	81
Moderate	0	8	6	3	7	2	17	13	11	10	13
Major	0	0	0	0	0	0	0	0	0	0	0
Total	33	44	22	34	24	21	55	56	81	88	94

The assistant RSO, the RSOF staff and the RSO updated and revised most of the department manuals, training, licenses, certificates, and standard operating procedures in 2024-2025.

AU CATEGORIES:

RADIATION ACTIVE (RA)

AUs who actively use RAM are "radiation active." Laboratories of these AUs are inspected by the RSOF three times per year. Audits are more frequent if there are particular concerns in a laboratory. A listing of AUs and their RAM can be found in the APPENDIX.

RADIATION INACTIVE (RI)

These AUs do not currently use or possess RAM.

RADIATION ACTIVE STORAGE MODE (SM)

AUs who did not actively use RAM, but who wish to maintain their RAM inventory will, by their request, have their inventory placed in storage mode status this fiscal year.

DEPARTED (D)

AUs, who no longer carry out research at CWRU, and whose laboratories have been decommissioned for RAM use, have been placed in the departed category this fiscal year.

AUs	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
RA	26	28	29	32	35	44	47	49	50	54	62
SM	10	10	12	16	18	16	18	20	15	20	8
RI	2	2	4	5	5	2	2	7	5	5	3
D	0	0	3	1	1	2	3	5	5	2	6
Total in Program	36	38	41	48	53	64	70	69	65	74	70

MASTER ISOTOPE LIST

The master isotope (see APPENDIX) list shows the University's isotope inventory, the sum of the AUs' inventory (excluding sealed sources) and the sum of the AUs' possession limits relative to the National Regulatory Commission/ODH registration limit.

AU RADIOISOTOPE INVENTORY

The radioisotope inventory report (see APPENDIX) lists researchers, along with the amount of RAM material each is authorized to use, each AUs' possession limits and the activity of isotopes on hand.

RADIATION SAFETY OFFICE (RSOF)

STAFFING

The RSOF operated under university approval with the following positions:

Associate Director/RSO/Quality Assurance Specialist (1)
Asst. Director/Asst. RSO (1)
Student (4)
Specialist positions (3)
Department assistant (2)

Training and education are central to our department's goal in developing diversified skills among our personnel who are required to respond to safety incidents and for maintenance of regulatory mandates. Specialists are encouraged to attend training and continuing education. Seminars, training, and conferences attended or completed during 2024-2025 included radiological instrument training, RCRA selected hazardous waste training, 8-hour HAZWOPER refresher training and Class 7 Radioactive Hazardous Materials Transportation DOT/IATA security awareness. Training was provided by Zoom courses during the past year.

EHS staff are responsible for maintaining the EHS website that houses all online departmental training programs and schedules, safety manuals, safety newsletters, safety data sheets and safety information resources. The website is an essential resource for the campus community that requires continuous updating. EHS staff also monitors and backs up all departmental databases.

EHS EMAIL

Since implementing the EHS email (cwruehs@gmail.com), (cwruehs@case.edu), and the website case.edu/ehs. the number of inquiries and safety concerns raised by CWRU personnel has averaged twenty-five emails per day. This communication has led to swift response and follow-up of safety concerns reported by our user community.

To report concerns of unethical activity, employees may contact the integrity hotline and provide information anonymously. They can also call 866.483.9367 or go to https://www.caseintegrityhotline.com. They are encouraged to give the date, time, location, and any other pertinent information concerning the incident.

TRAINING SESSIONS

It is the responsibility of the RSC to ensure that individuals using RAM are adequately trained to keep doses to personnel and releases to the environment per ALARA (As Low As Reasonable Achievable). The RSOF provides training for all personnel that use RAM or RGE/X-ray. Initial training must be completed before use of any radioactive materials or RGE/X-ray equipment. Annual retraining is required for the continued use of RAM. Ancillary workers (non-radiation workers), who occasionally have contact with RAM, are retrained annually. Personnel who are trained include:

AU

An AU 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 WORKER

An ancillary worker is a non-radiation worker who may have contact with laboratories or classrooms where RAM is used. This includes individuals working in facility services, protective services, in-house and contract custodial services, shipping/receiving, the ARC and research department assistants. During orientation, non-laboratory personnel are required to attend training that includes a radiation safety component.

RADIATION GENERATING EQUIPMENT (RGE) WORKER

An X-ray worker is any person who uses RGE as part of the research program of an AU.

IRRADIATOR USERS

Personnel using irradiators are required to attend initial radiation safety training conducted by the RSOF and site-specific training with the manager of the irradiator. An irradiator worker is any person who has met the requirements for unescorted room access, including background and fingerprint checks, radiation safety, and site-specific laboratory safety training.

TRAINING

The RSOF keeps a record of all dates of training, attendees, and content of training. Records of refresher training offered online are also maintained. Classes and online sessions attended are essential components of CWRU's safety philosophy. Training is audited on a monthly basis by the RSO to ensure compliance. The RSOF maintains both a program description and other pertinent safety training materials for this purpose. It also monitors on-site training for irradiator use. The annual Irradiator Training was completed for 98 Public Safety, Irradiator, & RSOF personnel in 2/2025.

New isotope user training classes are offered at least two times per month. Annual radiation safety retraining is done online. X-ray training classes are conducted once a month. AUs are responsible for machine and performance-specific annual refresher training for workers who use X-ray equipment in their laboratory programs. Fluoroscopy users are required to complete a fluoroscopy training module (kindly provided by UH Cleveland Medical Center) in addition to the general X-ray and site-specific training. Fluoroscopy Right-To-Know training is provided on an as-needed basis to individuals who desire to observe fluoroscopy procedures. Additionally, there are monthly training classes for users of Class 3B and Class 4 lasers. The RSOF requires bi-annual retraining for all laser workers involved with these units and this training is offered online.

All non-laboratory personnel are required to attend hazard communication and ancillary radiation training. Groups trained now include custodial, plant, ARC, shipping, security departments, and contractor workers. Employees who do not complete training are restricted from working in areas where RAM are used. As of 7/2024, the Health Education Campus (HEC) Safety Training allows Clinical personnel (faculty, staff, and students in Medical, Dental, Nursing, & Physician Assistants) to fulfill Safety Training requirements if they have a CWRU Google account. It is a CANVAS initial and annual composite training that includes Laboratory/Biosafety/Hazard Communication, and Ancillary Radiation Training which tripled ancillary training totals. The table below summarizes worker training over the past 10 years.

TRAINING	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
Radiation	62	74	91	70	69	108	143	133	118	61	92
Online Retraining	168	197	208	217	258	298	398	342	349	563	615
X-ray	32	41	10	7	15	12	32	22	43	58	50
Ancillary	1504	486	865	1764	1651	725	1561	710	741	619	279
Laser	64	48	55	71	30	58	66	59	40	46	41
Laser Online	61	65	51	62	42	48	40	68	22	67	27

Over 1,891 laboratory workers were trained through the Radiation Safety Program in 2024-2025.

FACILITIES AND EQUIPMENT

CWRU administration and the RSC ensure that appropriate facilities, equipment, and trained personnel are available for the safe operation, storage, and disposal of licensed material. The RSO and assistant RSO are responsible for overseeing the review of applications and inspection of all facilities, equipment and personnel that use licensed material. Facilities that are available at CWRU for the use of licensed material include:

AW Smith
Bingham
Biomedical Research
Bishop
Bolwell
DeGrace
Glennan
HEC Dental
HEC Main
HG Wood
Kent Hale Smith
Lerner Tower
Med East/Robbins
Millis
Olin
Pathology
Research Tower
Rockefeller
Service
Wearn
West Quad (CCSB)
White
Wickenden
Wolstein Research
Startup Incubator (formerly BioEnterprise)

LABORATORIES

There are 243 spaces on campus equipped to use licensed material and equipment. The laboratories typically include chemical safety hoods, survey meters, protective clothing, analytical detection and measurement equipment, waste receptacles and decontamination supplies.

LABORATORY USE	# OF ROOMS
Radiation	79
X-ray	77
Laser	87

Radiation Safety Office (RSOF):

Facilities and equipment used by the RSOF to support laboratory inspection or isotope storage are in the service building on the first floor, the School of Medicine (DOA990) and the Wolstein Building (1118, 1119, & 1120).

RSOF Laboratory:

The RSOF is in the service building on the first floor, 2220 Circle Drive. The laboratory in the RSOF is equipped with a Perkin Elmer Tricarb 4910 liquid scintillation counter (additional machines are in both radioactive waste facilities) and a Packard Cobra II Auto gamma counter. The RSOF maintains bioassay equipment consisting of a single-channel analyzer and a detector for monitoring thyroid uptake of ^{125}I. The department also has a multi-channel analyzer with a sodium iodide detector. These instruments are used for bioassays and the quantification of air samples for the Environmental Protection Agency (EPA) audits as well as for identification of unknown isotopes found during radiation inspections. The RSOF laboratory also houses a chemical hood, survey meters, a multi-channel analyzer (MCA) that was upgraded (2016) to a universal serial bus (USB) version, new software & computer, decontamination supplies and essential analytical and calibration equipment. A Perkin Elmer 2470 automatic gamma counter (Wallac Wizard 2) was acquired.

Radioactive Waste Facilities:

Medical School Waste Facility (DOA990):

This facility has a separate office and a process/storage room for radioactive material and disposal activities. This facility is maintained at negative pressure and has a filtered air exhaust system. It also has a waste compactor, waste shredder, chemical and walk-in hood, survey meters, liquid scintillation counter, air monitoring equipment and emergency response equipment.

The storage area contains racks for the proper storage of solid and liquid waste. Waste streams consist of dry solid, bulk liquid and liquid scintillation vials. Dry solid waste and the liquid scintillation vials are packed in standard 55-gallon drums. Liquid waste is stored in five-gallon carboys and placed in spill trays to contain leakage. The floor of the waste facility was repaired for cracks and resurfaced in 2/2016. Radioactive animal carcasses are kept in a designated freezer in the ARC until they are removed. More than half of the racks, which were not being used, were disassembled in 2017. In addition, old, broken, and unwanted equipment and materials were disposed.

Wolstein Building Waste Facility:

Room 1120, in this facility, is a counting room that also contains a chemical hood. Room 1119 contains a walk-in chemical hood and a liquid process/storage area, and Room 1118 is used for solid process/storage activities. The liquid process/storage area and solid process/storage areas are used for short-term storage only.

Room 1120 has also been developed as a combined chemical and RAM emergency response center. It contains a liquid scintillation counter and computer that provides access to our OnSite web database and safety data sheets in the event of radioactive/ chemical spills.

IODINATION EQUIPMENT

Special hoods, air pumps and activated charcoal-filter exhausts are placed in laboratories that conduct iodinations. Five iodination hoods are in storage. Their locations are as follows:

WRB 1119 - Radiation Waste Facility Storage (1) – 1 hood with fan and one pump
DOA 990 – Storage (3) – three hoods with fans and three pumps; one extra fan unit
Bishop S629C – Storage (1) – one hood with fan and one pump

ANIMAL RESOURCE CENTERS

Conventional animal care facilities are in the following buildings: Robbins, Wearn, Wickenden, Metro Health Hospital, the Small Animal Imaging Research Center (SAIRC), and the Wolstein Research (WRB). These facilities are used by AUs to conduct animal studies with radioactive, chemical, and biological materials. A variety of animals (mice, rats, hamsters, rabbits, groundhogs, ferrets, and large animals such as sheep, dogs, and pigs) are housed in the Robbins building as needed. The Wearn, Wickenden, and Wolstein facilities predominantly house mice and rats. Contaminated items are stored in the ARC freezer in Robbins until disposal. Animals used in studies involving radioactive materials are not housed in the Wolstein facility. Robbins no longer houses an 137Cs irradiator behind the ultra-barrier. The inactive 137Cs irradiator was decommissioned and removed by DOE on 11/2/2023.

EQUIPMENT CALIBRATION

Annual calibration procedures consist of an electronic assessment of survey instruments, plus a measurement of their performance using calibrated isotope reference standards. Survey meters that require dose rate calibrations or repairs are not calibrated by the RSOF. These instruments are sent to an appropriate vendor by the AUs' laboratory. Instruments requiring simple repairs are repaired in-house.

The Packard Cobra II auto gamma counter and the Perkin Elmer Tricarb 4910 are in the service building's radiation laboratory. The old LSC was moved to the WRB laboratory.

Quality control checks are conducted monthly for the EHS liquid scintillation and gamma counters in the radiation laboratory, DOA 990 and WRB 1119. The continuous air monitor (CAM) in DOA 990 is out of service until further need arises. All iodination air pumps are out of service. Air flow meters are annually calibrated, so calibration of iodination pumps can be done when needed. The LSCs in the radiation safety laboratory andWRB 1120 are on service contracts and maintained. There were 36 monthly calibration checks of the Liquid Scintillation Counters (LSC) in the RSOF. There are 10 LSCs on campus currently. Four LSCs were removed from campus via GMI for 3 RAM researchers.

RADIOACTIVE MATERIALS RECEIVED & DISPOSED

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 purchasing. AUs must be approved for the isotope and the quantity of isotope ordered. The activity, when added to the AUs' existing inventory, cannot exceed the AUs' approved possession limit for that isotope. Replacement shipments, trial kits and free samples also must be approved by the RSOF. All deliveries are sent to shipping and receiving for RSOF inspection and clearance before delivery to the AUs' laboratories.

ISOTOPE	ORDERS		TRANSFERS	
	#	mCi	#	mCi
^{225}Ac	0	0	2	0.515
^{133}Ba	0	0	3	0.023
^{137}Cs	2	0.002	0	0
^{64}Cu	2	1.27	0	0
^{18}F	1	17100	36	265
^{55}Fe	1	0.010	0	0
^{68}Ga	0	0	5	28
^{68}Ge	1	0.49	0	0
^{124}I	3	3.6	0	0
^{177}Lu	0	0	1	5
^{22}Na	1	0.025	0	0
^{32}P	16	72.982	4	0.04
^{99m}Tc	0	0	7	53
Total	27	17,178.38	58	351.58

TRANSFER OF RADIOACTIVE MATERIALS

The RSOF reviews and approves the transfer of all RAM 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 58 isotope transfers approved this year.

RADIOACTIVE MATERIALS	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
Orders	27	28	35	32	43	86	131	137	164	193	241
mCi	17,178.38	182	1381	97.97	206	335	444	363	383	578	732
Pickups	41	53	73	31	53	100	106	44	176	306	250
Sewer Disposals	7	8	5	15	14	35	37	21	53	69	50
Transfers	58	64	85	53	27	63	110	85	123	77	61
mCi	351.58	473	1415	299.4	220	471	227	641	462	173	814

RECEIPT OF RADIOACTIVE MATERIALS

Every package of radioactive material is inspected by the RSOF for contamination, dose rates and evidence of damage or breakage. If a package is contaminated or has dose rates greater than 10 mR/hr at one meter or 200 mR/hr at the surface, the package is held by the RSOF, and the laboratory is contacted. An inspection sticker and the RAM package receipt form is placed on the package to confirm that inspection has been completed by the RSOF. The campus mail group delivers packages to most laboratories. Laboratories located across Adelbert Road or Cornell Road use direct pickup. Direct pickup by a laboratory designee alleviates the need to complete the bill of lading since the package is carried to the laboratory and not transported in a vehicle. The AU or designee is required to survey all radioactive material packages upon receipt for contamination and evidence of damage or breakage.

Radioisotope use, for biomedical research, results in frequent movement of radioactive materials to and from the campus. The broad scope license requires that shipments be surveyed within three hours of arrival. In the past year, 27 isotope shipments were inspected and approved by the RSOF upon receipt on the campus. The transfer of short-lived radiopharmaceuticals such as 18F has increased due to advancements in nuclear medicine, especially the growth of targeted radiopharmaceutical therapies (RPTs) and diagnostics. This necessitates a specialized transfer process to manage the isotope's rapid decay and complex regulatory requirements. A few DOT shipments/transfers off campus were also made by the RSOF for the laboratories to ensure that paperwork was properly prepared and proper labeling was used on the packages.

DISPOSAL OF RADIOACTIVE MATERIALS

Exclusive of decay of isotope in laboratories and minor inventory changes, isotopes were removed from laboratories by either 41 isotope waste pickups by the RSOF staff, or by 7 AU-directed disposals into the sanitary sewers. The following table presents a breakdown of radioactive materials entering and leaving laboratories over the past 10 years.

SEALED SOURCES

CWRU's sealed source inventory contains 72 sealed sources. Of these, 64 sealed sources are required to be inventoried every six months. Eight sealed sources require six-month leak tests as stated in our ODH license. This includes 8 gamma sources.

There are two high-dose active irradiators on campus. 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 currently housed on campus. These sources are not included in the general summary reports for radioactive materials. This fiscal year, 2 sources were changed to inventory due to decay, no sources were disposed by Ecology

Services, and two new sources were received. The RSOF has actively encouraged AUs to dispose of sealed sources for which there is no anticipated use.

INVENTORY	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
Sealed Sources	70	75	75	77	78	84	82	86	94	93	93
Exempt	64	69	71	73	73	78	76	79	89	88	88
Irradiator	2	2	3	3	3	3	3	3	3	3	3
Neutron	0	0	0	0	0	0	0	1	1	1	1

IRRADIATORS

Two licensed low-to-high activity radiation sources are possessed for biomedical and other research. These include two high dose irradiators that contain ^{137}Cs sources. There were 41 irradiator users.

The number of Individual workers authorized to use irradiators are shown in the following table.

IRRADIATOR	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
Total Workers	41	34	31	22	22	19	20	26	34	30	38
Total Active Irradiators	2	2	2	2	2	2	2	2	2	2	2

RADIATION SURVEY METER CALIBRATIONS

CWRU's ODH Broad Scope license requires annual calibration of portable survey meters. Properly calibrated meters are necessary for laboratories to perform accurate radiation surveys. AUs are responsible for the annual calibration, maintenance, and repair of their survey instruments. Count rate calibrations on survey instruments and minor repairs are provided by the RSOF as a free service. The Rad Eye meters, pump, and filter changes were not done in house, thus the total EHS in-house services generated were $13,930 in cost savings over the fiscal year in lieu of using outside vendors.

CALIBRATION/ SERVICE	COST PER SERVICE	COST SAVINGS
59 meters	$200/meter	**$11,800 (EHS)**
11 Rad Eye meters	$200/meter	$1,375 (vendor)
1 pump	$355/pump	$355 (vendor)
0 thyroid assays	$100/assay	**$0 (EHS)**
4 pre-filter changes	$100/ set of 4/quarterly	$400 (vendor)
	TOTAL COST	**$13,930**

There were 70 survey meters calibrated in the last fiscal year. There were 8 meters removed from service. Certificates of calibration are kept in the RSOF for all meters in service at the University. Records for all meters include instrument efficiencies for isotopes used in laboratories. The DOA pre-filters are on a 90-day change out schedule. EHS no longer changes the pre-filters. Facilities Services now performs this function. Both fan units for the walk-in hood have not been changed since they do not run unless the walk-in hood is used. The HEPA filters for the walk-in hoods are two double filter units located in DOA radiation area. There are two single filter units for the chemical hood and decay area (located above the DOA office). The fan for the compactor has been repaired. Currently, there are two pre-filters and two HEPA filters that are regularly changed for two units.

The Bioassay Program is Inactive since 2021. There were no pumps calibrated for use in iodination hood and thus no thyroid assays were done. The CAM system is not in service and has not been calibrated.

CALIBRATION/ SERVICE	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
Meter Calibration	59	78	70	75	81	73	88	95	91	115	112

METERS IN USE	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
Hi-Q	1	1	1	1	1	1	1	1	2	2	1
Inovision	0	0	2	2	0	1	1	1	2	1	1
Ludlum	37	45	45	50	52	45	58	63	61	81	87
RPI Mini Monitor	3	3	3	4	4	2	4	6	10	13	8
Technical	0	0	0	0	1	1	1	1	1	1	1
Victoreen	1	1	3	0	4	2	3	2	4	6	4
WB Johnson	5	5	5	6	7	6	6	6	7	10	10
Fluke Biomedical	0	0	0	0	0	1	1	1	1	1	1
Research Product	1	1	1	1	1	2	1	1	1	1	1
Rad Eye	11	12	12	12	11	12	12	12	2	2	0

METER CALIBRATION BY MONTH	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
7/2024	8	11	10	12	16	10	13	24	12	18	17
8/2024	1	1	6	4	17	20	17	12	8	12	10
9/2024	4	5	5	25	13	9	15	9	7	8	6
10/2024	17	21	26	14	11	10	2	4	5	7	6
11/2024	10	15	6	4	3	0	5	4	4	6	1
12/2024	5	4	4	2	8	10	5	6	8	8	12
1/2025	3	3	1	2	5	1	0	1	0	7	9
2/2025	6	5	5	8	5	5	8	0	0	12	15
3/2025	1	1	4	2	1	1	1	23	8	10	13
4/2025	2	3	1	1	2	2	13	4	17	8	10
5/2025	1	2	5	0	1	2	8	7	9	7	12
6/2025	1	7	1	1	1	2	1	1	7	12	1

RAM SECURITY

RAM and potentially hazardous chemicals must be secured against unauthorized access or removal when unattended. All refrigerators, freezers or other storage units with RAM labels that are in unsecured areas must either have a security lock to limit access to the refrigerator or freezer or must contain a secured and labeled lock box within the storage unit. Access to isotope inventory must also be controlled when no authorized individual is in the area and constant surveillance cannot be maintained. Security checks by the RSOF are conducted on a monthly basis after normal working hours to ensure that radioactive materials are properly secured. All buildings underwent radiation security inspections each month. Only minor violations of required security procedures were found. Involved AUs were notified, corrective actions recommended, and remediation was monitored at the next inspection.

RAM SECURITY CHECKS	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
Violations	0	7	6	3	7	2	15	10	10	7	13

PERSONNEL MONITORING

Personal radiation dosimeters are issued through the RSOF to radiation workers and personnel who have the potential to receive a measurable radiation dose while working at the University. All laboratory workers, visitors to the laboratory, maintenance workers and contractors working in a laboratory are candidates for inclusion in the dosimetry program. Other personnel may request dosimeters, which are provided by the RSOF. Radiation workers who are issued dosimeters must complete the new radiation worker training class and fill out an occupational exposure history form. Dosimeters and area monitors are to be returned promptly at the end of each cycle of use so that the RSOF can take timely action consistent with implementation of ALARA in the event any significant exposure to radiation is detected by the dosimeter. ODH will be notified when exposure limits are exceeded.

The contract for dosimetry was renewed with Landauer, Inc., which provides radiation monitoring services. The date of the contract was extended to 6/2026.

PREGNANT WORKER PROGRAM

Any radiation worker who is, or thinks she may be, pregnant is advised to complete a declaration of pregnancy form found on the EHS website https://case.edu/ehs/ under the 'radiation safety' link and send it to the RSOF. Counseling is provided and an additional dosimeter is issued to the worker that is read every month. This additional fetal dosimeter is worn to conservatively measure any dose to the developing baby. One woman declared pregnancy.

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 2 neutron dosimeters used in the Surgical Training and Research Laboratory (STAR) 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 RGEX-ray (X-ray), such as fluoroscopy and X-ray diffractometers. The 4 fluoroscopy users had collar badges. We ceased the badging of fluoroscopy observers and chose to use area monitors for the STAR Facility as of 2019.

Although only 20 percent of the workers currently monitored are required to wear dosimeters to comply with the terms of the CWRU's broad scope license or RGE programs, the use of dosimeters is encouraged as it provides an excellent method for early detection of activities that might be dangerous to individual workers.

PERSONNEL MONITORING	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
Pregnant Workers	1	0	0	1	0	1	1	1	0	0	0
Neutron	2	2	2	2	2	2	2	2	2	2	2
RGE/ X-ray	35	32	25	25	25	175	76	251	32	25	37
Dental	25	35	47	47	51	38	35	41	27	37	28
General	274	347	340	342	399	325	284	347	485	460	473

CWRU uses Luxel badges, which are state-of-the-art detection technology for personnel dosimetry. Luxel badges can measure minimum detectable limits of 1.0 mRem. ODH regulations require that all monitored workers be advised annually of their occupational dose exposure. All workers were sent a copy of their prior calendar year's dose report in 2024.

RADIATION GENERATING EQUIPMENT

Machines that produce ionizing radiation (RGE) require safety labeling using appropriate warning indicator systems augmented by testing for radiation leakage during operation. Machines must be always locked, except under operator surveillance, to prevent unintentional exposures. Analytical research units include X-ray diffraction. As of 8/2015, X-ray registration is no longer required for electron microscopes. There are also X-ray units in use for healthcare and diagnostic research. There are currently 10 AUs of RGE with equipment in 63 laboratories. RGE is inventoried semi-annually and surveyed annually for leakage. Investigators in charge of RGE, not the RSOF, are required to provide site-specific training programs for workers using this equipment. EHS provides general safety classes for individuals using RGE.

RADIATION-GENERATING UNITS	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
Diagnostic units Disposed	0	2	0	0	25	0	0	0	0	2	0
Diagnostic units Purchased	0	2	0	0	0	0	0	0	0	1	3

The ODH has changed the radiation generating units' classification. One unit was declassified as an X-ray unit and was removed during the ODH inspection from the CWRU license. There were no units purchased, 1 removed, and 2 units disposed of in 2024-2025. The table below reflects that change.

RADIATION GENERATING EQUIPMENT (IN USE)	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
Closed Beam Analytical	6	5	5	5	5	5	6	6	6	6	6
Dental Computer Tomography (CT)	2	2	2	2	2	5	5	2	2	2	1
Fluoroscopy	1	1	1	1	1	2	2	2	2	2	3
Handheld non-medical	1	1									
Hand-held Dental	6	8	8	8	8	8	13	4	3	2	3
Hand-held Dental (Inoperable)	4	6	1	1	1	1	1	0	1	1	0
Intraoral	44	46	55	55	55	73	72	30	30	28	27
Intraoral (Inoperable)	4	2									
Panoral (Only)	1	1	1	1	1	1	1	1	1	1	1
Cabinet System exclude admittance	3	3	2	2	2	3	3	3	3	3	3
Cabinet System exclude Admittance (In-Op)	2	2									
Tube Only (Inoperable)	1	1	11	11	11	9	0	0	9	9	12
TOTAL TUBES	**75**	**78**	**87**	**87**	**87**	**112**	**103**	**49**	**71**	**71**	**74**

RADIOACTIVE MATERIAL RELEASES

SEWER EXPOSURE CONTROL and MONITORING

The Northeastern Ohio Regional Sewer District (NEORSD) lifted the requirement for annual report submission; however, State and federal regulations permit CWRU to dispose of low levels of RAM into the sanitary sewers. CWRU RSOF requires semiannual reports on RAM that is discharged into the sanitary sewer system. CWRU's sewer releases were in compliance with both federal and state regulations. The report for July through December 2024 was filed by 12/31/2024 and the report for January through June 2025 was filed by 6/30/2025. Seven AUs in storage mode or using only sealed sources were exempt from completing this form. One hundred percent compliance with sewer disposal regulations was achieved for both reporting periods.

AIR EXPOSURE CONTROL & MONITORING

During the 2024 calendar year, RAM released into the air were less than 10 percent of the maximum levels set by the EPA. Therefore, CWRU had no reports to file and the University was in compliance with the air effluent releases stipulated by the EPA Clean Air Act, the NRC and the ODH.

Regarding 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 reduces radioactive material emissions by approximately 90 percent. 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 had been inactive since 2021.

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. The Bioassay Program has been inactive since 2021.

RADIOACTIVE IODINE

During 2024-2025, there were no active iodination laboratories. The RSO maintains an inventory of four iodination hoods to be deployed when needed. A bioassay is required when more than one mCi of radioactive iodine is used in volatile form. The RSOF must be notified prior to:

- Handling more than 1.0mCi of volatile radioactive iodine.
- The following must be completed prior to the procedure:
    - Performance of a baseline bioassay for anyone involved in the procedure that does not have a baseline radioactive iodine bioassay on file.
    - Arrangements for monitoring of effluent releases to the atmosphere during the first iodination procedure using a new protocol to measure and mitigate any release to the environment.

After an iodination procedure, individuals involved in the procedure must contact the RSOF and arrange for a bioassay to be completed by the end of the next business day. There were no iodination procedures performed this fiscal year. No workers exceeded 10 percent of the ODH limits.

IODINATION PROCEDURES	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
Total	0	0	0	0	0	0	1	0	0	0	0

^{125}I BIOASSAYS	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
RSOF Staff	0	0	0	0	16	16	16	16	16	16	16
Additional	0	0	0	0	0	0	2	0	0	0	0
Total	0	0	0	0	16	16	18	16	16	16	16

TRITIUM

Urine bioassays must be carried out for individuals using more than 10mCi 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 are caused by mechanical failures and installation of new high security equipment.

There were no major incident and nineteen minor incidents documented over the past year.

INCIDENTS	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
Major	0	1	2	0	0	0	0	0	0	0	0
Minor	19	22	12	15	19	7	11	20	21	22	30
TOTAL	19	23	14	15	19	7	11	20	21	22	30

DATE	INCIDENT	CONTAMINATION	ROOT CAUSE	FOLLOW UP
6/5/2025	Minor Incident	IRR Intrusion Alarm	Researcher entered room and alarm went off and researcher left the room.	Proper procedures were discussed with the researcher.
6/2/2025	Minor Incident	WRB Computer Alert	Communication loss of the WRB computer with low quality stream.	Computer reboot and monitors are working.
5/20/2025	Minor Incident	WRB Computer Alert	Communication loss of the WRB computer.	Computer reboots and monitors are working.
4/17/2025	Minor Incident	Motion Alarm	Researcher accidentally scanned badge while inside room and was stuck inside the room and the alarm sounded.	Researcher was assisted with exiting the room.
3/18/2025	Minor Incident	Dispatch IRR Alarm Drill	Two attempts did not trigger alarm, however the third attempt promptly a silent alarm.	Dispatch updated their alarm procedure without notifying EHS Radiation Safety. Met with Dispatch and revised IRR Security manuals.
3/5/2025	Minor Incident	IRR Alarm	Researcher double swipe triggered alarm.	Reviewed the proper procedure with the researcher. Noted prompt response by Police/Security.
3/3/2025	Minor Incident	WRB Computer & Camera Alert	WRB computer unresponsive and camera unstable.	WRB reboot restored computer and camera.
2/13/2025	Minor Incident	WRB Computer Alert	WRB Computer Network Outage Alert	Vendor fixed the issue.
1/31/2025	Minor Incident	WRB Computer Alert	WRB Computer Network Outage Alert	Vendor reconfigured the IP address.
11/26/2024	Minor Incident	DOA Waste Facility Alarm	Forgot to turn off DOA alarm before entering which set off alarm.	Reviewed the proper procedure with the EHS staff member. Noted prompt response by Police/Security.
11/24/2024	Minor Incident	IRR Computer Alert	RMS Communication crashed and needed a reset.	Vendor Reset the system.
9/26/2024	Minor Incident	IRR Motion Alarm	Researcher accidentally scanned badge and triggered alarm.	Reviewed the proper procedure with the researcher. Noted prompt response by Police/Security.
9/20/2024	Minor Incident	Network Issue Alert	RMS Communication crashed and needed a reset.	Reset the system.
8/28/2024	Minor Incident	IRR Motion Alarm	RMS Communication service needs repair.	Vendor was called to to repair system. System working.
8/1/2024	Minor Incident	IRR Motion Alarm	IRR alarmed while two researchers entered and one left triggering motion alarm. EHS, Police, & Security arrived.	Reviewed the proper procedure with the researcher. Noted prompt response by Police/Security.
7/26/2024	Minor Incident	IRR Motion Alarm	IRR alarmed while	Reviewed the proper

			two researchers entered and one left triggering motion alarm. EHS, Police, & Security arrived.	procedure with the researcher. Noted prompt response by Police/Security.
7/8/2024	Minor Incident	Uranium Oxide found	Uranium Oxide (Yellow Cake) in a container labeled Radioactive Geology storage room shelf. Graduate Student notified EHS.	RSOF surveyed shelf and surrounding area. No contamination was found. Uranium Oxide was disposed via Ecology Services.
7/1/2024	Minor Incident	Door Intrusion Alarm	Forgot to turn off DOA alarm before entering which set off alarm.	Reviewed the proper procedure with the EHS staff member. Noted prompt response by Police/Security.

EHS WEBSITE & NEWSLETTERS

The EHS home website (https://case.edu/ehs/) provides integrated web-based access to EHS services. Information on training classes, online retraining and safety manuals is available at this site. All information is updated on a weekly basis. There were 24 revisions/additions to the EHS website for 2024-2025.

EHS also produces a bi-monthly general newsletter and a Radiation/Laser Safety newsletter. The EHS newsletter is filled with articles that are designed to keep the campus community abreast of general safety issues and concerns. It covers the latest government regulations, addresses various concerns that are found during laboratory inspections and provides answers to questions frequently asked by laboratory personnel. The Radiation/Laser Safety bi-monthly newsletter was introduced in 2024 and focuses on common radiation concerns and violations that are discovered during routine radiation safety audits. There were 37 newsletters sent to 115 researchers on campus with a total of 37 articles written. Articles included:

- 4/2025-5/2025 – Fukushima Plant Cleanup Continues, Small Nuclear Reactors replacing Natural Gas, Radioactive Ohio Landfill Reveals Deep Fractures, Updated Policy on NORM, EHS Training – Formaldehyde is now an Annual Requirement
- 2/2025-3/2025 - Advantages of Small Modular Reactors, Damage to RNA Found to be Main Cause of Sunburn, Continuing Your Education with The International Atomic Energy Agency.
- 12/2024-1/2025 – Have the Chernobyl Animals Developed Superpowers?, Is γ-radiation the cause of Lightning?, Know your Inventory!, New Regulations Regarding Methylene chloride.
- 10/2024-11/2024 - Toxic Chemicals are in the Food we Eat Every Day, The ADVANCE Act is boosting Nuclear Energy, Old Coal Plants Going Nuclear, Got E-Waste?.
- 8/2024-9/2024 - Cause of skin cell death due to UV radiation better understood, Name that Isotope! Tritium, What is a Personal Radiation Monitor?

LASER SAFETY PROGRAM

As noted by an Occupational Safety and Health Administration (OSHA) director, "OSHA does provide technical guidance regarding protecting employees from ultraviolet light with respect to

laser hazards. This guidance is found in the OSHA Technical Manual (TED 1-0.15A, Section III - Chapter 6) on the website link at https://www.osha.gov/otm/section-3-health-hazards/chapter-6. The relevant chapter includes information on control measures and safety programs for laser hazards associated with exposure to ultraviolet light."

There are 253 lasers/laser systems in our database for the campus used by 57 laser PIs in 19 buildings (52 Active, 5 Storage). The lasers of greatest concern are those labeled Class 3B and Class 4. There are 53 class 3B/4 enclosed laser systems that are considered eye-safe (class 1) under normal use that decrease the hazard to the user. Fifty-two audits of laser systems were performed during this fiscal year. There were no laser incidents reported this year.

LASERS	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18
Active Lasers	52	52	38	39	42	38	33	29
Storage Lasers	5	9	5	6	2	4	6	9
Laser PI	57	61	43	45	44	43	39	38
Laser Bldgs.	19	23	21	19	16	16	16	16
3B/4 PIs	26	33	26	26	27	24	25	25
3B/4 Lasers	143	150	146	146	145	144	133	124
1,2,3R PIs	31	28	17	19	17	12	14	13
1,2,3R Lasers	110	109	104	90	91	92	77	76
Enclosed Lasers	53	56	51	41	36	36	31	29
Total Lasers	253	259	253	236	243	238	210	216

ULTRAVIOLET (UV) SAFETY PROGRAM

As noted by an Occupational Safety and Health Administration (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 for ultraviolet radiation. Also, the American Conference of Governmental Industrial Hygienists (ACGIH), a non-governmental organization, has established allowable employee threshold limit recommendations (TLVs) for direct ocular and skin exposures to ultraviolet radiation. The values are published in the annual Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices."

CLEARANCES/ RELOCATION PROGRAM

The RSOF requires at least three weeks' notice to decommission laboratories. An orchestrated effort between the RSOF, the safety services division of EHS, facilities services and AUs facilitates these operations. There were 455 pieces of equipment and 6 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 CWRU 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, and dry solid waste.

^{32}P solid waste is held for decay (for at least 10 half-lives) in the radioactive waste facility. As of 2022, the waste is surveyed and subsequently sent to Daniels Intl Facility in Michigan, a transfer and treatment disposal facility for incineration of medical waste. Currently, only the outside of waste bags is surveyed (with approval from ODH) followed by immediate placement into a burn box. This simplifies handling by staff and provides for compliant and economical disposal of these materials. This procedure has greatly decreased hazard exposures to RSOF personnel handling radioactive waste at CWRU. 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 Chemtron, 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. Ecology Services, a commercial radioactive materials waste hauler, dispose long-lived solid waste (greater than 60-day half-life) and scintillation vials.

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 and 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. A sewer disposal log is kept in the EHS offices.

COLLECTION AND DISPOSAL OF ANIMAL REMAINS AND BIOHAZARDOUS WASTE

The RSOF maintains two -20°C freezers (BRB B05A) for storage of radioactive animal remains and waste. One is located at the ARC and the other in Wolstein 1118. Radioactive waste is bagged and labeled in yellow bags in the same manner as dry solid waste. All waste placed in the freezer must be logged on the animal disposal sheet on the cold room door. A log sheet of animals disposed in this manner is also kept for inventory purposes by the laboratories generating the waste.

Animal waste is placed in the ARC (BRB B05A) for disposal by the RSOF. Radioactive animal waste includes cage bedding, carcasses, viscera, excrement, serum, blood or other animal tissue containing radioactive materials. All waste is tagged. All animal waste is disposed of by the RSOF.

WASTE GENERATED IN JULY 1, 2024 - JUNE 30, 2025

	GENERATED 7/1/2024 6/30/2025	DISPOSED: DANIELS INTL FACILITY	DISPOSED: SEWER	DISPOSED: CHEMICAL SAFETY	DISPOSED: Ecology Services	IN STORAGE AS OF 6/30/2025
Short-Lived Dry	2	0	0	0	0	2
Long-Lived Dry	1	0	0	0	2	2
Scintillation Vials	1	0	0	0	2	2
Animals	0	0	0	0	0	0
Long-Lived Sewer	30	0	30	0	0	0
Long-Lived Non-Sewer	5	0	0	0	0	5
Short-Lived Sewer	10	0	10	0	0	0
Short-Lived Non-Sewer	0	0	0	0	0	0

All values in the dry waste, vial and animal categories denote the number of 55-gallon drums. All values for the liquid waste categories are in gallons. No drums generated prior to 7/1/2024 were kept for decay in storage and disposed during the period of 7/1/2024-6/30/2025. During this fiscal year, all long-lived hazardous aqueous waste was disposed.

Ecology Services animal waste cost = $22/lb. for 10-pound barrel = $220 per 10-pound barrel
Ecology Services dry waste cost = $470 per 55-gallon drum

The cost of disposal for one box of biomedical waste at Daniels Intl Facility is $25 per container (average of 2 containers per 55-gallon drum). There were no drums of decay-in-storage dry waste surveyed and disposed of during 2024-2025. Thus, the indirect savings to researchers due to the decay in storage program was $0.

WASTE GENERATION	24/25	23/24	22/23	21/22	20/21	19/20	18/19	17/18	16/17	15/16	14/15
Short-Lived Dry	2	2	1	3	5	4	6	18	9	11	10
Long-Lived Dry	1	1	2	2	2	6	8	6	5	9	6
Scintillation Vials	1	3	4	2	2	6	6	6	12	9	10
Animals	0	0	0	0	0	0	0	0	1	0.25	1
Long-Lived Sewer	30	20	22	20	35	25	35	28	30	23.75	25
Long-Lived Non-Sewer	5	0	0	0	0	1	5	2	2	2	2
Short-Lived Sewer	10	0	0	5	10	20	30	25	21	18	20
Short-Lived Non-Sewer	0	0	0	0	0	1	1	2	0	4	5

The contract for radioactive waste disposal has been extended to 6/2026 with Ecology Services. This contract provides for disposal of all long-lived dry materials, scintillation vials and animal waste.

RECYCLING PROGRAM

The RSOF occasionally obtains laboratory equipment in very good condition from AUs who have either left the University or ceased to use RAM. The equipment includes radioactive waste

containers (lead and Lucite), shielding (lead and Lucite) and survey meters. This equipment is offered to the AUs to conserve funds otherwise needed to buy new RAM handling equipment. This cost saving from these recycling efforts resulted in re-use of equipment that saved AUs and EHS $0 during 2024-2025.

E-WASTE PROGRAM

As CWRU researchers depart the campus, relocate within the campus, or discard equipment, EHS steps in to assist with removal of old, unused, or broken equipment, thus providing more space in the areas. CWRU utilizes the RET3 Job Corp., a nonprofit organization dedicated to refurbishing and recycling electronic equipment to donate to the community. The Green Computing Program provides refurbished computers to schools and non-profits in Northeast Ohio. Fewer items were collected for recycling or refurbishing. There were 220 scheduled pickups for e-waste disposal by Demotech for 2024-2025.

RADIATION SAFETY COMMITTEE AUDITS

The RSC audits are carried out in two different ways:

- Individual RSC members conduct performance audits on-site at the RSOF at various times throughout the year.
- A compliance inspection of RSOF records is conducted shortly after the end of each fiscal year by a team of RSC Members.

Performance audits of RSOF activities included the following areas:

AREA AUDITED	# OF INDIVIDUAL FILES EXAMINED
RAM Applications	10
Isotope Orders/ AU Possession Limits	10
RGE inventory/ training	10
Ancillary staff training	10
AU/ worker training	10
Radiation survey meters	10
Waste disposal facility	2
Shipping papers	10
RAM security checks	10
Bioassays	10
Semi-Annual mailings	10
Sealed sources	10
EHS Radiation Webpage	1
Irradiators	2
Room Surveys (Active/Decommissioned)	10
Compliance Reviews	10
Lasers	10
Licensing	10
Dosimetry	10
Incidents	10

These audits were conducted between October and December 2024 and between March and June 2025. This effort resulted in the review of more than 170 files in the program areas listed above.

RSC TRI-ANNUAL AUDITS FOR 2024-2025

RSC AUDIT COMMENT:

In October 2024, the RSC members conducted a trimester audit of the following components of the RSOF:

Active/Decommissioning Room Surveys
AU/Worker Training
Dosimetry Program
Incident Reports

Irradiator User Training/Irradiators
Laser Program
Licensing Status
Radiation Generating Equipment (RGE) Inventory & Training
Security checks
Survey Meters
Waste Disposal Facilities

Each audit consisted of randomly selecting five to twenty files from the past year to ensure its contents were up-to-date, accurate and consistent with the database.

Active/Decommissioning Room Surveys

A Quarterly audit was performed on October 16th, 2024 by Dr. Thomas McCormick 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. 10 files were inspected and no deficiencies reported.

RSOF RESPONSE:

No response required.

AU/Worker Training

Authorized users and worker training files were audited for up-to-date training on radiation safety procedures on October 14th, 2024. Dr. Colleen Croniger reported eight (8) workers that were over 60 days past training. The Radiation Safety Office was notified of these deficiencies.

RSOF RESPONSE:

The 8 workers were notified, and the files were updated.

Dosimetry Program

An audit of Current Dose records held by the RSOF was performed on October 8th, 2024 to verify that AU laboratory workers were current in dose record and active radiation badges. Dr. Zhenghong Lee audited ten (10) records and reported 10 users that failed to pick up badges. These workers were notified and the RSOF was notified.

RSOF RESPONSE:

The 10 workers were notified, and the badges were collected.

Incident Reports

A review of monthly incident reports was performed by Dr. Colleen Croniger on October 14th, 2024, for verification and documentation of follow-up by the RSOF. During the year, Dr.

Croniger noted 22 incidents were reported, both alarm activations. The RSOF followed up on these alarms and the incidents were addressed.

RSOF RESPONSE:

No response required.

Irradiator User Training/Irradiators

An audit of the Irradiator Information Files was performed by Dr. Lee on October 8th, 2024, to verify that the irradiators were audited by the RSOF in the last quarter. The logbook for each irradiator was used to match users for each irradiator. Two Irradiators were active on campus and Dr. Lee reported one non-authorized user in the logbook. The RSOF was informed of this individual's identification and follow-up was performed.

RSOF RESPONSE:

The unauthorized user was removed from the list, no longer works at CWRU, and has no access.

Laser Program

The Laser program was audited by Dr. Thomas Gerken for accuracy regarding laser inspections, inventory and status of personnel training on October 8th, 2024. Ten (10) files were audited. Three (3) deficiencies in inspection were noted and the RSOF was notified of the responsible PI to contact for follow up on worker training.

RSOF RESPONSE:

The workers were notified to update training.

Licensing Status

An audit was conducted to verify the licensing status of all ODH licenses and registrations on October 8th, 2024, by Dr. Shurim Fisher. Components of the audit include: Broad scope license and Radiation Generator License (RGE). Dr. Fisher reviewed all license programs and noted that all licenses were current (no deficiencies).
RSOF RESPONSE:

No response required.

Radiation generating equipment (RGE) inventory and training

Inventory status and equipment surveys were examined by Dr. Saba Valadkhan on October 7th, 2024 who examined 10 files for RGE status, including authorized possessors (APs), and persons responsible for RGE. Dr. Valadkhan noted no deficiencies.

RSOF RESPONSE:

No response required.

Security checks

Verification and documentation of radioisotope security checks were performed on October 16th, 2024. Dr. McCormick reports no security checks issues during the last three-month period.

RSOF RESPONSE:

No response required.

Survey Meters

Compliant calibration of survey meters was audited on October 7th, 2024. Ten (10) files were examined by Dr. Valadkhan who noted, 2 meters surveyed, had calibration dates that did not match the calibration date in the database. The RSOF office was notified of these deficiencies for follow up.

RSOF RESPONSE:

The 2 meter owners were notified, and the meters were calibrated.

Waste Disposal Facilities

The waste disposal facilities (DOA990/Wolstein1118, 1119) and RSOF Laboratory were inspected to ensure safe operation and maintenance as required by RSOF on October 8th, 2024. Dr. Fisher inspected the facilities and reported that all records of maintenance, housekeeping, records and waste storage and handling were all in compliance.

RSOF RESPONSE:

No response required.

In January 2025, the RSC members conducted a tri-annual audit of the following components of the RSOF:

Active/Decommissioning Room Surveys
AU/Worker Training
Compliance
Direct Package Pickup
Dosimetry Program
EHS Webpage
Incident Reports
Isotope Possession Limits
Licensing Status

Sealed Sources Leak Tests
Security Checks
Waste Disposal Facilities

Each audit consisted of randomly selecting five to 20 files from the past year to ensure its contents were up-to-date, accurate and consistent with the database.

Active/Decommissioning Room Surveys

An audit was performed on January 27th, 2025, 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. Thomas Gerken examined 10 files and reported one (1) deficiency where the database needed an update for the RSOF in Wolstein 1119. This request was submitted to the RSOF for follow-up.

RSOF RESPONSE:

The one deficiency of data were corrected in the database.

AU/Worker Training

Authorized users and worker training files were audited for up-to-date training on radiation safety procedures on January 8th, 2025. Dr. Saba Valadkhan reported ten (10) workers that were between 30-60 days past training. The RSOF was notified of these findings.

RSOF RESPONSE:

The ten support staff were contacted, and the database was updated.

Compliance

Compliance review audits were reviewed on January 22nd, 2025, to ensure that any non-compliance issues were appropriately resolved. Upon examination of 10 files, Dr. Shurmin Fisher noted one deficiency. Dr. Fisher noted that one date in the printed list and computer records differed. The RSOF was notified of the discrepancy.

RSOF RESPONSE:

The one deficiency of data were corrected in the database

Direct Package Pickup

An audit was performed on January 27th, 2025, to verify that package receipts were completed with each transfer of material from site to site. Dr. Thomas Gerken noted one deficiency regarding missing paperwork. The RSOF was notified of the discrepancy.

RSOF RESPONSE:

The one deficiency of paperwork was found and placed in the correct file.

Dosimetry Program

An audit of Current Dose records held by the RSOF was performed on January 28th, 2025, to verify that AU laboratory workers were current in dose record and active radiation badges. Dr. Zhenghong Lee audited 10 records and reported 1 badge that had not been picked up. The RSOF was informed of the user ID.

RSOF RESPONSE:

The worker was notified and their badge was collected.

EHS Website

The website for the RSOF was audited to ensure proper operation, access and current links were operational on January 8th, 2025. Dr. Saba Valadkhan reports all links within the Radiation Website were operational.

RSOF RESPONSE:

No response required.

Incident Reports

A review of monthly incident reports was performed by Dr. Colleen Croniger on January 27th, 2025 for verification and documentation of follow-up by the RSOF. During this period two (2) incidents were reported. The RSOF followed up on these alarms and the incidents were addressed.

RSOF RESPONSE:

No response required.

Isotope Possession Limits

Dr. Colleen Croninger audited 10 PI files on January 27th, 2025, to verify that the amount of radioactive material (RAM) ordered was within the possession limits of the AU and that all orders placed were in the Helix Database. Dr. Croniger noted that no isotope orders exceeded the PI possession limit.

RSOF RESPONSE:

No response required.

Licensing Status

An audit was conducted to verify the licensing status of all ODH licenses and registrations on January 30th, 2025 by Dr. Thomas McCormick. Components of the audit include: Broadscope license and Radiation Generator License (RGE). Dr. McCormick reviewed all license programs and noted that the Radiation Broadscope license was currently in review. No other current licenses we noted for any deficiencies.

RSOF RESPONSE:

No response required.

Sealed Source Leak Tests

Files verifying that sealed sources had been leak tested were audited on January 30th, 2025 by Dr. McCormick. Ten PI files were examined with no deficiencies noted.

RSOF RESPONSE:

No response required.

Security checks

Verification and documentation of radioisotope security checks were performed on January 28th, 2025. Dr. Zhengzhong Lee reports no security check issued during the last quarter.

RSOF RESPONSE:

No response required.

Waste Disposal Facilities

The waste disposal facilities (DOA990/Wolstein1118, 1119) and RSOF Laboratory were inspected to ensure safe operation and maintenance as required by RSOF on January 22nd, 2025. Dr. Shurim Fisher inspected the facilities and reported that a weekly inspection was missing for the week of 12/16/2024 for all facilities. The RSOF was notified of the missing inspection report.

RSOF RESPONSE:

The staff were reminded to ensure weekly inspection.

In April 2025, the RSC members did conduct a tri-annual audit of the RSOF. The Annual audit was performed as scheduled in person on campus with proper PPE and social distancing measures enacted during the process.

AU/Worker Training
Dosimetry Program
EHS Website
Incident Reports
Irradiator Information Review
Laser Program
Licensing Status
RGE inventory and training
Security Checks
Support Staff Training
Survey Meters
Valid RAM Applications
Waste Disposal Facilities

Each audit consisted of randomly selecting 5 to 20 files from the past year to ensure its contents were up-to-date, accurate and consistent with the database.

AU/Worker Training

Authorized users and worker training files were audited for up-to-date training on radiation safety procedures on April 15th, 2025. Dr. Colleen Croniger reported that ten workers that were between 30-60 days past training. The RSOF was notified of the findings.

RSOF RESPONSE:

The 10 workers were contacted, and the training was updated in the database.

Dosimetry Program

An audit of Current Dose records held by the RSOF was performed on April 21st, 2025, to verify that AU laboratory workers were current in dose record and active radiation badges. Dr. Thomas Gerken audited 10 records and reported no deficiencies where badges were not picked up.

RSOF RESPONSE:

No response required.

EHS Website

The website for the RSOF was audited to ensure proper operation, access and current links were operational on April 15th, 2025. Dr. Thomas McCormick reports all links within the Radiation Website were operational.

RSOF RESPONSE:

No response required.

Incident Reports

A review of monthly incident reports was performed by Dr. Zhenghong Lee on April 18th, 2025 for verification and documentation of follow-up by the RSOF. During this period there were three (3) incidents reported. The RSOF followed up on all of these incidents.

RSOF RESPONSE:

No response required.

Irradiator Information Review

An audit of the Irradiator Information Files was performed by Dr. Thomas Gerken to verify that the irradiators were audited by the RSOF within the past quarter. The audit was performed on April 21st, 2025. Two Irradiators were active on campus and each file was up-to-date and compliant, Dr. Gerken noted no overdue users for training.

RSOF RESPONSE:

No response required.

Laser Program

The Laser program was audited by Dr. Zhenghong Lee for accuracy regarding laser inspections, inventory and status of personnel training on April 18th, 2025. Dr. Lee noted no deficiencies.

RSOF RESPONSE:

No response required.

Licensing Status

An audit was conducted to verify the licensing status of all ODH licenses and registrations on April 18th, 2025. Components of the audit include Broad scope license, RGE license, and RSC guidelines. Dr. Zhenghong Lee reviewed all license programs and noted that all licenses were current (no deficiencies).

RSOF RESPONSE:

No response required.

Radiation Generating equipment (RGE) inventory and training

Quarterly inventory status and equipment surveys were examined by Dr. Suhrim Fisher who examined 8 files on April 22nd, 2025. Dr. Fisher noted two deficiencies, both concerning missing files. The RSOF was notified of the deficiencies.

RSOF RESPONSE:

The two x-ray workers were notified, and the training was updated.

Security checks

Verification and documentation of radioisotope security checks were performed on April 22nd, 2025. Dr. Shurim Fisher noted no deficiencies for this quarter.

RSOF RESPONSE:

No response required.

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 on April 15th, 2025. Dr. Croniger examined the files and reported ten deficiencies in past due training for ancillary staff. The RSOF was notified of these deficiencies for follow up.

RSOF RESPONSE:

The 10 Support Staff workers were notified and their training was updated.

Survey Meters

Compliant calibration of survey meters was audited on April 10th, 2025. Ten (10) files were examined by Dr. Valadkhan who noted two (2) meters whose calibration dates did not match the computer and paper records. The RSOF was notified of these discrepancies.

RSOF RESPONSE:

The 2 owners were notified, and their meters were calibrated.

Valid Ram Applications

RAM applications were audited on April 22nd, 2025 to verify that the applications were complete and valid. Dr. Shurim Fisher audited ten (10) files and reported six (6) deficiencies. The RSOF was informed of these deficiencies.

RSOF RESPONSE:

The 6 applications were reviewed and updated in the database.

Waste Disposal Facilities

The waste disposal facilities (DOA990/Wolstein1118, 1119) and RSOF Laboratory were inspected to ensure safe operation and maintenance as required by RSOF on April 17th, 2025. Dr. Thomas McCormick inspected the facilities and reported that all records of maintenance, housekeeping, records and waste storage and handling were all in compliance.

RSOF RESPONSE:

No response required.

Overall, this tri-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 the RSOF staff during the audit process expedites the procedure. All corrections to the files and the Onsite database were made following each trimester audit.

ANNUAL RADIATION SAFETY PROGRAM AUDIT REPORT

The RSC conducted its annual audit of the RSOF in June 2025. The committee reviewed the performance of 20 components of the RSOF. Please note that surveys for October, January/February, April, and the annual audit were performed as scheduled in person on campus. The RSC members are to be commended for their participation and response to the duties of the committee. The areas audited were:

- Ancillary Staff Training
- AU and Worker Training
- Bioassay Program - Inactive
- Compliance Review
- Direct Package Pickup
- EHS Radiation Website
- Incident Reports
- Licensing Status
- Radiation Generating Equipment Inventory and Training
- Room Surveys
- Semi-Annual Mailings (air/sewer inventory)
- Radiation Survey Meters
- Isotope Orders, AU Possession Limits, and the database
- Dosimetry Program
- Irradiator Program Review
- Laser Program Review
- Radioisotope Security Checks
- Sealed Sources
- Valid RAM Application
- Waste Disposal Facilities (DOA990, Wolstein) & RSOF Laboratory

The results of this audit are summarized in this report as follows:

Ancillary Staff Training

Dr. Gerken audited the records of Ancillary Staff Training to verify the retraining status of these personnel on June 12th, 2025. Dr. Gerken reported that 14 out of 20 staff members had not completed retraining for the period July 1st, 2025-June 12th, 2025. The names of the individuals due for training were reported to the RSOF for follow-up.

RSOF RESPONSE:

Fourteen workers were notified via email and phone calls to determine if they were still at CWRU. Those that had left were archived in the database, while the others did retrain.

AU and Worker Training

An annual audit was conducted on June 25th, 2025, to verify the training status of Authorized users and worker training files for a period from July 1st, 2024-June 30th, 2025. Dr. Saba Valadkhan reported nine (9) workers were overdue. The RSOF was notified of the overdue training and performed follow-up contact.

RSOF RESPONSE:

The 9 workers were notified via email and phone calls to determine if they were still at CWRU. Those that had left were archived in the database, while the others did retrain.

Bioassays

This program has been inactive since 7/2021 as there have been use of >10mCi of ^{3}H and/or 1mCi ^{125}I in the laboratories.

RSOF RESPONSE:

No response required.

Compliance

Compliance Review Audits were reviewed for the period July 1st, 2024-June 30th, 2025, on June 27th, 2025, to ensure that any non-compliance issues were appropriately resolved. Upon examination of 50 files, Dr. Thomas McCormick noted six (6) files that needed to be reviewed/updated. The RSOF was informed of these necessary follow-up records.

RSOF RESPONSE:

The 6 compliance reviews were processed, and the database was updated.

Direct Package Pickup

An audit was performed on June 27th, 2025, to cover the period of July 1st, 2024-June 30th, 2025, to verify that package receipts were completed with each transfer of material from site to site. Dr. Thomas McCormick noted 4 files with deficiencies regarding receiving dates or data entry. The RSOF was informed of these inconsistencies in the records.

RSOF RESPONSE:

The 4 package receipts were corrected and entered in the database.

Dosimetry Program

An audit of Current Dose records held by the RSOF was performed on June 9th, 2025, to verify that AU laboratory workers were current in dose record and active radiation badges. Dr. Colleen Croniger audited thirty-three (33) records and reported no missing Dose Records.

RSOF RESPONSE:

No response required.

EHS Radiation Webpage

The website for the RSOF was audited on June 27th, 2025, to ensure proper operation, access and current links were operational for the period July 1st, 2024-June 30th, 2025. Dr. McCormick reports all links within the Radiation Website were operational.

RSOF RESPONSE:

No response required.

Incident Reports

A review of yearly incident reports was performed by Dr. Shurim Fisher on June 23rd, 2025, for the period July 1st, 2024-June 30th, 2025, to verify documentation of follow-up by the RSOF. Dr. Fisher reviewed twenty (20) incidents reports and noted that all had been resolved by the RSOF.

RSOF RESPONSE:

No response required.

Irradiator Information Review

The Annual audit of the Irradiator Information Files was performed by Dr. Croniger on June 9th, 2025, to verify that the irradiators were audited by the RSOF in the last quarter. The logbook for each irradiator was used to match users for each irradiator. Two Irradiators were active on campus and Dr. Croniger reported no issues.

RSOF RESPONSE:

No response required.

Isotope Orders, AU possession limits and the Database

Dr. Colleen Croninger audited 11 PI files on June 9th, 2025, to verify that the amount of radioactive material (RAM) ordered was within the possession limits of the AU and that all orders placed were in the Helix Database. Dr. Croniger noted that no isotope orders exceeded the PI possession limit.

RSOF RESPONSE:

No response required.

Laser Program

The Annual Laser program audit was performed by Dr. Thomas Gerken on June 12th, 2025. Twenty (20) files were audited. Dr. Gerken identified thirteen (13) individuals whose training status was in need of an update. Inventory status of all of the inspected files was correct. The RSOF was notified of the responsible PI to contact for follow up on worker training.

RSOF RESPONSE:

The 13 laser workers noted as past due were completed within the month and filed promptly. Notifications were also sent to workers for training, and the database was updated.

Licensing Status

An audit was conducted on June 25th, 2025, to verify the licensing status of all ODH licenses and registrations during the period July 1st, 2024-June 30th, 2025. Components of the audit include: Broad scope license, RGE license, Waste license, Radiation Manual, X-ray Manual, Laser Manual, Radiation Training, X-Ray Training, Radiation Online Training, UV online training and RSC guidelines were reviewed by Dr. Saba Valadkhan. She reported that all licenses reviewed were in compliance.

RSOF RESPONSE:

No response required.

Radiation Generating Equipment (RGE) inventory and training

Inventory status and equipment surveys were examined by Dr. Shurim Fisher on June 23rd, 2025, who examined thirty-two (32) files for the period July 1st, 2024-June 30th, 2025. Dr. Fisher noted two PIs with personnel overdue. Numerous equipment surveys were noted to be missing from the files. The RSOF was informed of the missing files and deficient training.

RSOF RESPONSE:

The laser workers were notified, and the equipment surveys were misfiled. The database was updated, and the files were found and filed properly.

Room Surveys

An audit was performed on June 25th, 2025, to validate active RAM use files and Decommissioned room files for the period July 1st, 2024-June 30th, 2025, 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. Saba Valadkhan examined thirty-three (33) files and noted 3 rooms that had out-of-date decommission postings. The RSOF was informed of the location of these rooms.

RSOF RESPONSE:

The 3 room folders were updated to reflect the date of decommissioning.

RAM Security Checks

Annual review for verification and documentation of radioisotope security checks was performed on June 11th, 2025. Dr. Zhenghong Lee reviewed security check logs for the past 6 months and noted that the June reports were not completed. One other report required follow-up. The RSOF was informed of the incomplete reports.

RSOF RESPONSE:

Follow reports were resolved and filed.

Sealed Source Leak Tests

The annual audit of files verifying that sealed sources had been leak-tested were audited on June 11th, 2025, by Dr. Zhenghong Lee. Dr. Lee examined eleven (11) files and reported that only one of Dr. Muzic's sealed sources were in the computer records, although Dr. Muzic has three (3) additional sources that should be added to the computer records. The RSOF was informed to update the inventory for Dr. Muzic.

RSOF RESPONSE:

The update of the additional sources were completed.

Semi-Annual Mailings (Air/Sewer Inventory)

An annual audit of the air/sewer disposal inventory was performed on June 23rd, 2025, for the period July 1st, 2024-June 30th, 2025. All files were reviewed by Dr. Shurim Fisher who noted 2 deficiencies in Active PIs. The RSOF was informed of these deficiencies.

RSOF RESPONSE:

The 2 AUs with notified to submit their semi-annual mailing and the database was updated. One file was made for the new AU.

Survey Meters

Compliant calibration of survey meters was audited on June 27th, 2025, for the period July 1st, 2024-June 30th, 2025. Fifty (50) files were examined by Dr. Thomas McCormick who noted one meter was on hold with the RSOF. All other meters were up to date on calibration data.

RSOF RESPONSE:

For the 1 meter, the researchers was sent notification and the database was updated to reflect current status.

Valid Ram Applications

An annual review of valid RAM applications was audited on June 11th, 2025, to verify that applications were complete and valid. Dr. Zhenghong Lee audited twenty-six (26) files and reported two (2) missing forms in the files. The RSOF was informed of these deficiencies.

RSOF RESPONSE:

Of the 2 RAM applications, both were active, and forms were added to the files.

Waste Disposal Facilities

The annual audit of the waste disposal facilities (DOA990/Wolstein 1118, 1119) and RSOF Laboratory were performed on June 12th, 2025. Dr. Thomas Gerken inspected the facilities and reported that all records of maintenance, housekeeping, records and waste storage and handling were all in compliance. Dr. Gerken noted that both gamma counters in the RSOF facility are in need of re-calibration.

RSOF RESPONSE:

Calibrations were completed for both gamma counters.

SUMMARY

No major problems exist in the RSOF program and the RSOF staff is functioning on a very competent level.

RSOF RESPONSE:

The RSOF thanks the RSC for its careful audit of safety activities over the past year. Deficiencies uncovered during the audit were referred to the RSOF auditor for increased scrutiny during the coming year.

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 RSC, 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
Shipping Papers
Valid RAM Applications
Isotope Orders/ AU Possession Limits
AU/ Worker Training
Waste Disposal Facility
Active/Decommissioned Room Surveys
RAM Security Checks
Semi-Annual Mailings
RGE Inventory/ Training
Ancillary Training
Licensing
Incidents
Irradiator
Bioassays
Dosimetry
Survey Meters
Compliances
EHS Radiation Webpage
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 T. Porter on 10/8/2025. It covers fiscal years 7/1/2024-6/30/2025.

APPENDIX

AUTHORIZED USERS WITH STATUS CHANGE DURING FISCAL 2024-2025

RADIATION ACTIVE
Chunying Wu SAIRC (10/4/2024)

STORAGE MODE
Parameswaran Ramakrishnan (7/11/2024)
Maria Hatzoglou (1/24/2025)

RADIATION INACTIVE
Andrea Romani (7/25/2024)
Derek Taylor (3/5/2025)
Michael Hore (3/27/2025)
Hua Lou (5/13/2025)

DEPARTED
Derek Abbott (2/13/2025)

X-RAY AUTHORIZED POSSESSOR LIST

AP NAME	CONTACT PERSON	UNITS
Harihara Baskaran	Evan Guarr	1
Zhenghong Lee	Chris Flask	3
Suparna Mahalaha	Aeysha Kisner	4
Jeffrey Pigott	Jeffrey Pigott	3
Anna Samia	Anna Samia	1
Steve Schomisch	Steve Schomisch	1
Andrew Shoffstall	Andrew Shoffstall	1
Syed Ali	Susan Opsitnick	60
Chunying Wu	Michael Kavran	1
Lei Zhu	Lei Zhu	2
Inactive:		
Corbin Covault	Andrew Lininger	1

LASER USERS

Active:

Ozan Akkus (3)	Eric Baer (3)	Harihara Baskaran (2)	James Basilion (2)
Jesse Berezovsky (14)	Walter Boron (2)	Clemens Burda (6)	Rui Cao (3)
Sudha Chakrapani (1)	Brian Cobb (1)	Carlos Crespo (10)	Amar Desai (7)
Claire Dorsett (5)	Mohammed Draz (1)	Diana Driscoll (17)	Dominique Durand (2)
Steven Eppell (11)	Stanton Gerson (1)	Alex Huang (2)	Hatsuo Ishida (5)
Michael Jenkins (12)	Jonathan Karn (1)	Kathleen Kash (15)	Chirag Kharangate (8)
Lydia Kisley (8)	Ya-Ting Liao (3)	Michael Martens (2)	Claudia Mizutani (2)
Michael Moffitt (4)	Svetlana Morozova (8)	Patrick Osei-Owusu (1)	Andre Paes (2)
Paul Park (1)	Rajesh Ramachandran (2)	Valentin Rodionov (1)	Andrew Rollins (18)
Britton Sauerbrei (1)	Daniel Scherson (17)	Bryan Schmidt (6)	Alp Sehirlioglu (2)
Andrew Shoffstall (1)	Scott Sieg 2)	Daniel Simon (1)	Jonathan Stamler (1)
Giuseppe Strangi (14)	David Wald (2)	Christopher Wirth (1)	Gary Wnek (2)
Gabriella Wolff (1)	Lei Zhu (1)	Peter Zimmerman (1)	Christian Zorman (5)

Storage:
Roger French (3) Heidi Martin (1) Thomas McCormick (1)

Start in progress:
Samuel Root (3) Laura Bruckman (1)

Archive:
Carlos Subauste (1 laser to Paul Park)
Jeffrey Garvin (departed with 1 laser)
Alan Diehl (2 laser disposed)
James Jacobberger (2 lasers to David Wald)
Kenneth Singer (18 lasers to other Users or disposed)
Robert Gao (3 lasers to Ya-Ting Liao)

V.

EHS Organizational Chart 2024-2025