

**CASE WESTERN RESERVE UNIVERSITY**  
**DEPARTMENT OF ENVIRONMENTAL HEALTH & SAFETY (EHS)**  
**RADIATION SAFETY**  
**ANNUAL REPORT 2013-2014**

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## TABLE OF CONTENTS

INTRODUCTION	3
SUMMARY	3
RADIATION SAFETY ACCOMPLISHMENTS FOR 2013-2014	3
RADIATION SAFETY GOALS FOR 2014-2015	4
OHIO DEPARTMENT OF HEALTH (ODH) LICENSE	5
RADIATION SAFETY PROGRAM-RESPONSIBLE PARTIES	7
ADMINISTRATIVE CONTROLS	10
RADIATION SAFETY OFFICE (RSOF)	12
RADIATION SAFETY PROGRAM	18
RADIATION SAFETY COMMITTEE AUDITS	30
APPENDIX	45
• Authorized User (AU) Inventory List	I
• Sealed Sources	II
• Organizational Chart	III

## **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 (RSC) Operating Guidelines and Case Western Reserve University's State of Ohio (Nuclear Regulatory Commission Agreement State) Broadscope 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. Its contents cover the period from July 1, 2013 through June 30, 2014.

## **SUMMARY**

### **DEPARTMENT STRENGTHS**

The RSOF has a staff with broad and diverse backgrounds that can address and resolve a wide range of issues faced in Radiation Safety at Case Western Reserve University (CASE). The RSOF has developed programs that meet or exceed regulatory requirements. This program proactively anticipates new safety requirements by promulgation of new programs. Success of these programs 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 2013-2014**

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

- The Radiation Safety Program generated in-house savings accrued from meter calibration, recycling, and decay-in-storage programs amounting to more than \$22,320 in 2013/2014 through its services to the research community at Case Western Reserve University.
- Completed Laser online training for Blackboard
- Updated Radiation Safety Committee guidelines
- Radiation Safety's personnel attended a number of training classes throughout the year to ensure that Radiation safety is operating at the highest level.
- Creation of a link to the UH Fluoroscopy Program manual/training updates
- Review and revision of program assignments for all staff members
- DOA 990 Radiation Waste Facility - repair of floor and brick/mortar
- Efforts to update all Authorized User Files continued throughout 2013/2014.
- During 2013/2014, the Laser-Safety Program approached operational maturity highlighting success of an effort extending over the past three years.
- Disposed of 50 sources through Sealed Source Disposal Pilot Program facilitated by Ohio Department of Health.
- Radiation Safety with our Fire Response Team at EHS coordinated a successful effort to ensure our alarm and fire suppression systems are fully functional and reliable in our Campus Waste Facilities. Plant Services and the City Fire Department who both consulted with our personnel and inspected all new alarm

and suppression system installations in our CWRU waste facilities aided this effort. This reexamination of our waste Facility, alarm and fire suppression systems was necessitated by a mechanical failure leading to accidental release of carbon dioxide suppression gas into our waste Facilities.

- In 2014, the Radiation safety group of EHS formed a partnership with the Department of Energy (DOE) through The Pacific National Laboratory (PNNL) to implement security systems and develop programs to ensure that high radiation sources are secure at the University. This program made available substantial funding to harden our high activity radiation sources and to put them behind highly effective security barriers on our Campus. Programmatically, program development from this security effort on the Campus is also aimed at tightly coordinating the Radiation Safety, Dispatch, the Police and Security personnel to respond as a coordinated body to any activities or breakdowns that threaten the security of our irradiator sources. Members of each of the above units are or will soon complete special training in emergency response to situations that might threaten the security of our radiation sources. Training and automated equipment installation began in 2014 and will extend into early 2015, aiming toward the beginning of 2015 for completion. Participation in the training and security effort has provided and excellent understanding of how to implement coordinated emergency response to not only irradiator material but to any highly hazardous materials that may threaten the personnel on our camps and in our community. It is projected that capitalizing on "lessons learned" can provide a highly functioning coordinated task force in the near future that can respond to radiation emergencies and that is primed for further training to handle a variety of other hazardous situations that could arise on the CWRU Campus.

## **RADIATION SAFETY GOALS FOR 2014-2015**

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

- Continuous review and updating of all Radiation Safety, X-Ray Safety, and Laser Safety Manuals
- Begin fire drills for Radiation Safety staff each semester
- Automate information systems for audits
- Transition Irradiator Program from HELIX to comparable stand-alone computer system
- EHS Radiation Safety will work to complete implementation of all aspects of the Irradiator Security Program and to be an educational and coordinating resource of other safety response situations at CWRU.
- The Laser Safety Program will be brought to full compliance and operational maturity during this year. A final step will be to complete installation of the automatic exam for the laser-safety training course.
- Self-audit and Radiation Safety Committee audits will be vigorously pursued in preparation for an expected audit by the Ohio Department of health during 2014/2015.
- Personnel will continue their efforts to improve their skills and achieve Certifications for their efforts from outside agencies.

## **OHIO DEPARTMENT OF HEALTH (ODH) LICENSE**

Case Western Reserve University has one Ohio Department of Health (ODH) Broadscope license. The license covers possession and use of both nuclear accelerator-produced radioactive material (NARM) and naturally occurring radioactive material (NORM) for experimental purposes. It also provides for the licensed use of four (4) irradiators. A Broadscope License inspection was last conducted by ODH on October 14-15, 2009. No issues of non-compliance requiring a written response were noted during this inspection.

The University has one ODH Radiation Generating Equipment (RGE) registration. The registration covers the receipt, possession, use, storage, and disposal of all radiation-generating sources including dental x-ray machines, x-ray diffraction units, fluoroscopy units, and electron microscopes. The Radiation-Generating Equipment (RGE) Inspection was conducted on July 19, 2014. One issue of non-compliance concerning Dental school violations were corrected within a week of the inspection. All units have technique charts available. Units requiring the 6 month safety check are inspected during the semi-annual inventory. One Bruker unit was disposed in August 2014. The issue was corrected within the allotted time and the corrective action report was submitted and accepted.

<b>ODH LICENSE</b>	<b>EXPIRATION DATE</b>	<b>PURPOSE</b>
011-011800-11	January 1, 2015	Broadscope License
09-M-06944-12	May 31, 2015	Radiation-Generating Equipment Registration

## **DECOMMISSIONING FUNDING PLAN**

The Broadscope License and the Decommissioning Funding Plan became effective 2/25/2010. The University is required to maintain a Standby Letter of Credit to cover possible costs if the University's Broadscope License is required to undergo rapid decommissioning. The expiration date for the Standby Letter of Credit is 2/28/2015. Funds required for this letter of credit depend on the kind and amounts of radioactive materials maintained in active use or waste by the University. Experimental procedures using more sensitive methods increasingly require less radioactive materials. There were no significant changes in cost for the Decommissioning Funding. Therefore, following ODH guidelines, the cost estimate was increased by 16%. The Standby Letter of Credit carried by the University is now \$333,406, consistent with the above changes. This document covers all possible decommissioning costs for radioactive materials located at the University at the time of the last submission of the University Broadscope License to the State.

## **RADIOACTIVE MATERIAL USE AND STORAGE LOCATIONS**

Radioactive material is located at the following facilities:

- Main campus of Case Western Reserve University, 10900 Euclid Avenue, Cleveland, OH
- University Hospitals (UH), 2065 Adelbert Road, Cleveland, OH
- Wolstein Research Building (WRB), 2103 Cornell Road, Cleveland, OH

Radioactive material is received and/or stored at the following sites:

- Shipping and Receiving, 2232 Circle Drive, Cleveland, OH
- Wolstein Research Building, 2103 Cornell Road, Cleveland, OH

## PURPOSE FOR RADIOACTIVE MATERIAL (RAM) USE

The majority of isotope use at the University is for biomedical research. The most typical isotopes used are  $^{14}\text{C}$ ,  $^3\text{H}$ ,  $^{125}\text{I}$ ,  $^{32}\text{P}$ ,  $^{33}\text{P}$ , and  $^{35}\text{S}$ . Isotopes used in sealed sources contained within irradiators, scintillation counters, gamma counters, check sources, and calibration standards are most commonly  $^{137}\text{Cs}$ ,  $^{133}\text{Ba}$ , and  $^{241}\text{Am}$ . Five (5) licensed low-to-high activity radiation sources are currently used for biomedical and other research. These include an  $^{241}\text{Am}$ -Be neutron source, 3 high dose irradiators that contain  $^{137}\text{Cs}$  sources, and 2 low dose irradiators charged with  $^{192}\text{Ir}$  and  $^{60}\text{Co}$ . Currently, 2 high dose irradiators are in use and the third is out of service. The  $^{60}\text{Co}$  irradiator is now considered low dose. Both low dose irradiators are currently out of service. There were 36 irradiator users. Of these, 9 were new users and 24 voluntarily had access removed.

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

IRRADIATOR	13/14	12/13	11/12	10/11	09/10	08/09	07/08	06/07	05/06	04/05
Total Workers	36	51	48	47	52	68	55	45	28	10
Total Irradiators	3	3	4	4	4	4	4	4	4	3

## RADIATION SAFETY PROGRAM - RESPONSIBLE PARTIES

### **RADIATION SAFETY COMMITTEE (RSC)**

The Radiation Safety Committee sets policy for use of radioactive materials for the University Community. Members of this Committee are appointed by the President of the University and have responsibility for monitoring and enforcing compliance with the University's Radiation Safety Program as outlined in the University's Ohio Department of Health (ODH) Broadscope License. Radiation Safety Committee members are chosen from diverse disciplines to provide comprehensive expertise. The Committee reviews all applications for use of radioactive materials.

The 2013-2014 Radiation Safety Committee 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: 11/8/2014 Chairperson Term Expires: 11/8/2014	Dr. Jeffery Coller Dept. of RNA Center HG Wood 113 Term Expires: 10/15/2016
Colleen Croniger Dept. of Nutrition BRB 925 Term Expires: 10/15/2016	Dr. Eckhard Jankowsky Dept. of Biochemistry HG Wood 137 Term Expires: 10/15/2016
Dr. W. David Sedwick Radiation Safety Officer (RSO) Dept. of Medicine EHS - Service Building, 1 <sup>st</sup> Floor	Dr. Saba Valadkhan Dept. of RNA Center Research Tower 100-8 Term Expires: 10/15/2016
Dr. Lax Devireddy Dept. of Pathology Wolstein 6524 Term Expires: 10/15/2016	Dr. William Schiemann Dept. of Medicine WRB 2404 Term Expires: 1/10/2015

### EX-OFFICIO MEMBERS

Richard Jamieson Vice President of Campus Svcs. Adelbert Hall 205	Felice T. Porter Asst. Dir./Asst. RSO Quality Assurance Specialist EHS Service Bldg., 1 <sup>st</sup> Fl.
Bruce DeMeza Asst. RSO University Hospitals Case Medical Center Bishop S621	R. Michael Sramkoski Senior Research Associate & Laser Specialist Comprehensive Cancer Center WRB 3542
Joseph Nikstenas EHS Laser Safety Officer & Safety Specialist Service Bldg. 1 <sup>st</sup> Fl.	

## SUPPORT STAFF

Gwendolyn Cox-Johnson Department Assistant Service Bldg., 1 <sup>st</sup> Floor
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The Radiation Safety Committee acts as an advisory and enforcement body to ensure that radioactive materials are safely used in accordance with ALARA (As Low As Reasonably Achievable) principles. The Committee conducts audits each trimester, which address programmatic compliance. The RSC also conducts an annual audit in which the entire program is reviewed. The audits ensure:

- Specific program components conform to the licensed program as described in the Case Western Reserve University 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 RSO activities is maintained through RSC familiarity with the daily function of the University Radiation Safety Program.

The Committee met on eight occasions during the 2013-2014 fiscal years to review applications for radioisotope use and action on other business. Four RSC meetings were cancelled because agenda items did not require immediate address. The minutes of the RSC meetings and Executive Committee actions are available in the RSO, through the RSC, or through the University Administration.

APPLICATIONS	13/14	12/13	11/12	10/11	09/10	08/09	07/08	06/07	05/06	04/05
New AU	7	2	7	3	9	5	7	14	11	8
Additional Isotopes	3	1	7	5	5	1	7	7	6	10
Radioisotope use in Animals	3	1	5	3	5	2	5	6	5	7
Sealed Sources	6	3	2	1	1	1	1	1	6	1
Sealed Sources Update	2	0	0	0	0	0	0	0	0	0
AU Reactivation	0	0	1	0	0	0	0	0	1	0
Possession Limit Increase	0	0	0	1	0	0	0	1	0	1
AU Protocol Update	15	14	10	12	0	0	0	0	0	3
TOTAL APPROVALS	36	21	32	25	20	9	20	29	29	30

Major topics acted upon or discussed by the RSC:

- Annual Report Presentation
- Laser Safety Program Summary
- UH Health Physicist assisting with evaluation of our new X-Ray equipment and will submit a report to us that we can provide to the State Inspector.
- 51 sealed sources were disposed through the pilot program approved by the State at the end of July 2013.
- The maintenance contract for one scintillation counter has been canceled.
- Decommissioned room files were moved to another location to make them easily accessible.
- UH Health Physicist will provide a report regarding two reclassified X-ray units.
- Several committee members were reappointed to the RSC.
- Suggestion of a letter for non-voting members for their time spent on the committee was discussed. Richard Jamieson will investigate.
- Reclassification regarding the CT machines is under review. A letter was sent to the State requesting help with the reclassification of these units.
- RSO/ARSO attended a meeting in Columbus regarding Global State Reduction.
- Follow-up needed regarding DOA Waste Facility with Cleveland Fire for CO2 Suppression System certification test.

- Richard Jamieson reported that Marc Rubin is now responsible for two additional departments, Emergency Management and IT.
- Chair thanked the members for their continued support serving on the committee.
- ARSO will attend the next UH Radiation Safety Committee meeting.
- Chairperson is on jury duty for Dec 2013 meeting.
- X-Ray reclassification change as CT units was rescinded. They are being called cabinets instead of CT units.
- Meeting with PNNL Group regarding irradiators is scheduled for April 2014 in EHS office.
- UH has acquired several small hospitals but will put them on their license at a later date.
- There are six liquid scintillation counters that any AU can acquire at no cost. Disposal of the LSCs is the second option.
- Quarterly audits will be conducted in April 2014.
- Two researchers passed away, Roger Marchant (Laser) and Richard Hanson (Radiation). Their laboratories and personnel have been placed under the responsibility of the Department Chairperson.
- Laser Safety Officer and Assistant attended Laser Safety Training in Cincinnati, OH.
- DOA Radiation Waste Facility was certified by Cleveland Fire Department in April 2014.
- Department of Energy meeting regarding Irradiators was scheduled. Architects will need to expedite Dispatch renovation.
- The cyclotron for one AU is down. Another cyclotron another and the ducts will need to be vented.
- Contamination was found in a KHS radiation laboratory and the area was decontaminated, decommissioned, the inventory removed, and the AU made Inactive.
- EHS is undergoing an Internal Audit of all programs including Radiation Safety.
- Annual Audit will be conducted in June 2014.
- One more LSC is available for AU.

## **SENIOR MANAGEMENT**

The Radiation Safety Program monitors, inspects, and audits radiation materials, radiation generating equipment and source use by AUs and their personnel. Senior management oversight and support of radiation safety-related activities is ensured by attendance of the Vice President for Campus Services at all RSC meetings. The RSC conducts independent audits of the Radiation Safety Program. Radiation Safety Office (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 Radiation Safety Programs.

## **RSOF AND AUTHORIZED USERS (AUs)**

The AU and RSOF share responsibility for safety. The AU is directly responsible for safe use of radioactive materials 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 Case Western Reserve University's license. The audit program includes routine unannounced inspections of each AU's laboratory.

## **ADMINISTRATIVE CONTROLS**

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

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

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

Minor Severity violations are listed under the following categories:

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

Moderate Severity violations include the following:

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

Major Severity violations include the following:

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

There were no major severity violations assessed over this year. Of the 52 moderate violations listed below, 40 were the result of unsecured RAM found during after-hours security checks and routine compliance reviews. Twelve (12) were assessed to laboratories that had three or more minor violations during one compliance review by Radiation Safety during routine audits. Documented follow up and resolutions were completed for all major & moderate violations.

<b>VIOLATIONS</b>	<b>13/14</b>	<b>12/13</b>	<b>11/12</b>	<b>10/11</b>	<b>09/10</b>	<b>08/09</b>	<b>07/08</b>	<b>06/07</b>
Minor	134	93	112	64	53	103	83	57
Moderate	52	19	22	37	76	27	43	11
Major	0	0	0	2	0	0	0	1
Total	178	113	134	103	129	130	106	69

The Assistant RSO, the RSOF staff, and RSO have updated and revised most of the Departments manuals, training, licenses, certificates, and standard operating procedures in 2013-2014.

## **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 radioactive materials can be found in the Appendix.

### **RADIATION INACTIVE (RI)**

These AUs do not currently use RAM and do not possess radioactive materials. AUs in storage mode for more than two years were placed in Radiation Inactive mode this fiscal year.

### **RADIATION ACTIVE (STORAGE MODE) – RA (SM)**

AUs who did not actively use RAM for a period of at least six months and no more than two years, but who wished to maintain their RAM inventory are, by their request, placed in storage mode status this fiscal year.

### **DEPARTED (D)**

AUs who no longer carry out research at Case Western Reserve University and whose laboratories have been decommissioned for radioactive material use are placed in the Departed category this fiscal year.

<b>AUs</b>	<b>13/14</b>	<b>12/13</b>	<b>11/12</b>	<b>10/11</b>	<b>09/10</b>	<b>08/09</b>	<b>07/08</b>	<b>06/07</b>	<b>05/06</b>	<b>04/05</b>
RA	66	78	89	87	87	91	92	112	124	116
SM	13	15	13	16	3	4	5	6	4	9
RI	6	6	7	4	13	1	14	8	12	2
D	0	3	1	2	3	6	8	12	11	12
Total in Program	79	93	102	103	90	95	97	118	128	125

## **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 AU Possession Limits, relative to NRC/ODH Registration Limit.

## **AU RADIOISOTOPE INVENTORY**

The Radioisotope Inventory Report (see APPENDIX) lists researchers along with the amount of radioactive material each is authorized to use, each AU’s possession limits, and the activity of isotopes on hand.

## **RADIATION SAFETY OFFICE (RSOF)**

### **STAFFING**

The RSOF operated under University approval with the following positions:

RSO (1)	Asst. Director/Asst. RSO/Quality Assurance Specialist (0.5)
Specialist Positions (4)	Accountant (0.5)
Department Assistant (1)	
Student (1)	

The position for Joseph Nikstenas has changed from supervisory in Radiation Safety to add Chemical Safety duties in May 2014.

Training and education are central to our Department's aim to develop diverse skills among our personnel that are required for response 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 2013-2014 included Radiological Instrument Training, RCRA Selected Hazardous Waste Training, 8-Hour HAZWOPER Refresher Training, & Hazardous Materials Transportation Security Awareness.

One member of the EHS Staff is responsible for maintaining the EHS website that houses all on-line departmental training programs and schedules, safety manuals, safety newsletters, MSDSs, and safety information resources. The website is an essential resource for the campus community that requires continuous updating. This individual also monitors and backs up all departmental databases.

### **EHS EMAIL**

Since implementing the EHS Email (does@case.edu), the number of inquiries and safety concerns raised by Case Western Reserve University personnel has averaged fifteen (15) 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 may 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 "*As Low As Reasonably Achievable*" (ALARA). The RSOF provides training for all personnel that use RAM or Radiation Generating Equipment (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 that are trained include:

## AU

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

## RADIATION WORKER

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

## ANCILLARY RADIATION LABORATORY WORKER

Personnel listed under an AU who work in RAM laboratories but have only minor incidental contact with radioactive material or have to service radioactive laboratories or classrooms where RAM is used.

## 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, Animal Resource Center, 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 that has met the requirements for unescorted room access, including background & fingerprint check and radiation safety, site-specific, & laboratory safety training.

## TRAINING

The RSOF documents 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 Case Western Reserve University safety philosophy. Training is audited on a monthly basis by the Assistant RSO to ensure compliance.

<b>TYPE</b>	<b>NEW CLASSES</b>	<b>NEW USERS</b>	<b>ONLINE RETRAINING</b>
Radiation Safety	23	168	652
X-Ray	13	48	0
Laser	10	35	39

RTK (Right to Know)	50	355	630
Irradiator (site specific)	4	38	0

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 University Hospitals CASE Medical Center) in addition to the general X-Ray and site-specific trainings. Right-To-Know Fluoroscopy training is provided on an as-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 annual retraining for all workers involved with these units and this training is offered on-line.

All non-laboratory personnel are required to attend Hazard Communication & 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 radioactive materials are used.

TRAINING	13/14	12/13	11/12	10/11	09/10	08/09	07/08	06/07	05/06	04/05
Radiation	168	239	279	186	279	223	240	297	284	284
Online Retraining	652	409	405	311	215	418	430	695	724	775
X-Ray	48	76	72	86	52	97	96	64	51	74
Ancillary	985	601	382	146	345	403	382	402	413	356
Laser	35	71	89	38	48	66	41	56	31	116
Laser Online	39	16	32	42	35	28	15	10	11	0
Irradiator	38	51	48	47	52	56	10	14	50	0

## FACILITIES AND EQUIPMENT

Case Western Reserve University 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 Case Western Reserve University for the use of licensed material include:

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

## LABORATORIES

There are 225 laboratories 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	149
X-Ray	37
Laser	39

### Radiation Safety Office (RSOF)

Facilities and equipment used by the RSOF to support laboratory inspection or isotope storage are located in the Service Building (1<sup>st</sup> Floor), Medical School (Rm. DOA990), and the Wolstein Building (Rms. 1118, 1119, & 1120).

#### Information Technology and Data Analysis Group:

- The HELIX system is no longer in use however, it is accessible if needed.
- The HELIX stand-alone database for the Irradiator Program will be switched to another program by the end of the year.
- HP Assist or OnSite has met Radiation Safety needs.
- Consistency checker has benefited Radiation Safety with fewer problems to be found during inspection, more training emails sent to the right people and right address, and better statistics.
- A manual rewrite of the EHS and Radiation Safety website was done last year. Porting to T4 by 2<sup>nd</sup> quarter of 2015 is planned.
- Training self-check has benefited Radiation Safety with reduced phone time.
- Radiation Safety has not utilized the online training signup.
- The Laser Safety online retrain is now in Articulate. Radiation Safety Online Retrain is still an HTML read-through document.
- The following reports were built to automate Radiation data collection:
  - List of Radiation PIs
  - Sewer totals in a given date range
  - Summary of sewer disposal in a given date range
  - Update waste records to include proper waste disposal code
  - List of x-ray people
  - Environmental Releases
  - Total packages received in a given date range
  - Isotopes and total activity
  - Total Activity for all isotopes
  - Check particular isotopes for problems
- Some backups are done to the terabyte array, others to onsite-server.
- Two computer drives were replaced. More computer systems were replaced than parts.
- OnSite serve backs up via Carbonite.
- The webserver Aurora is still in use until the T4 move. The backup is presently to disk.
- EHS has transitioned from use of social security number to employee IDs since 2008.

### RSOF Laboratory:

The RSOF is located in the Service Building on the 1<sup>st</sup> Floor at 2220 Circle Drive. The laboratory in the RSOF is equipped with a Packard Model 1900C Liquid Scintillation Counter (duplicate machines are located in both Radioactive Waste Facilities), and a Packard 5000 Gamma Counter. The RSOF maintains bioassay equipment consisting of a single-channel analyzer and a detector for monitoring thyroid uptake of <sup>125</sup>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 EPA audits, as well as for identification of unknown isotopes found during radiation inspections. The RSOF laboratory also houses a chemical hood, survey meters, decontamination supplies, and essential analytical and calibration equipment.

### 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 5-gallon carboys and placed in spill trays to contain leakage. Radioactive animal carcasses are kept in a designated freezer in the ARC until they are disposed.

#### Wolstein Building Waste Facility:

This facility has a counting room (Rm. 1120) that contains a chemical hood, a liquid process/storage area (Rm. 1119) that contains a walk-in chemical hood, and solid process/storage area (Rm. 1118) for disposal activities. The liquid process/storage area and solid process/storage area are used for short-term storage only. All waste is transferred to the DOA990 facility for decay in storage and disposal. This area maintains negative pressure relative to surrounding building spaces.

One room (1120) in this Facility has been developed as a combined Chemical and Radioactive Materials Emergency Response Center. It contains spill supplies, a liquid scintillation counter, survey meters for both count and dose rates, and a computer that provides access to our Helix web database and MSDS in the event of radioactive/chemical spills.

### IODINATION EQUIPMENT

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

### ANIMAL RESOURCE CENTER (ARC)

Conventional animal care/use facilities are located in the Robbins Building, Wearn Building, Metrohealth Hospital, Small Animal Imaging Research Center, and the Wolstein Research Building. 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 & large animals such as sheep, dogs, and pigs) are housed in the Robbins facility as needed. The Wearn 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. A major renovation was completed in the Robbins facility during in 2009 which added an Ultra Barrier Facility. One irradiator behind the Ultra Barrier is not in current use but is being considered for re-commissioning in the program.

### 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 AU's laboratory. Instruments requiring simple repairs are repaired in-house.

Packard Auto Gamma Minaxi 500 Counter calibrations are conducted monthly for the EHS Radiation Laboratory and as needed for the LSCs in Radiation Laboratory, DOA 990 and WRB 1119. The continuous air monitor (CAM) and the connected air pump in DOA 990 are in service and were calibrated. The LSCs in the Radiation Laboratory, WRB 1119, and in DOA 990 were serviced and cleaned.

## **RADIATION SAFETY PROGRAM**

### **PURCHASE OF RADIOACTIVE MATERIALS**

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

AUs must be approved for the isotope and the quantity of isotope ordered. The activity, when added to the AU's existing inventory, cannot exceed the AU's 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 the Shipping and Receiving Area for RSOF inspection and clearance before delivery to the AUs' laboratories.

### **TRANSFER OF RADIOACTIVE MATERIALS**

The RSOF reviews and approves the transfer of all radioactive material internally (on campus) and externally (off campus) to, or from, an AU. Before initiating a transfer, either the internal or external transfer form must be completed and forwarded to the RSOF for approval. There were 72 isotope transfers approved this year, for a total of 1,261 mCi.

### **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 1 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 placed on the package confirm that inspection has been completed by the RSOF. The Campus mail group delivers packages to most laboratories. Laboratories located across Adelbert Rd or Cornell Rd 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 Broadscope License requires that shipments be surveyed within three hours of arrival. In the past year, 261 isotope shipments (totaling 634 mCi) were inspected and approved by the RSOF after receipt on the campus. A few shipments/transfers off campus were made by laboratories. The RSOF assisted these laboratories by making sure that paperwork was properly prepared and proper labeling was used. There was one <sup>68</sup>Ge sealed source transferred to UH. There were also three shipments off campus, which included <sup>3</sup>H, <sup>137</sup>Cs, <sup>14</sup>C, & <sup>60</sup>Co.

### **DISPOSAL OF RADIOACTIVE MATERIALS**

Exclusive of decay of isotope in laboratories and minor inventory changes, isotopes were removed from laboratories by either <sup>237</sup> isotope waste pickups by RSOF staff (24,637 mCi) or

by 61 AU-directed disposals into the sanitary sewers (27mCi). The following table presents a breakdown by isotope of radioactive materials entering and leaving laboratories.

ISOTOPE	ORDERS		WASTE PICKUPS		SEWER DISPOSALS		TRANSFERS	
	#	mCi	#	mCi	#	mCi	#	mCi
<sup>14</sup> C	6	4.62	48	1.38	14	2.35	2	0.0002
<sup>137</sup> Cs	8	0.21	0	0	1	0.006	0	0
<sup>18</sup> F	0	0	0	0	0	0	47	1,227.00
<sup>59</sup> Fe	1	1.0	0	0	1	0.2	0	0
<sup>59</sup> Fe	0	0	13	0.175	1	0.005	0	0
<sup>3</sup> H	13	7.37	47	5.27	16	5.88	5	9.08
<sup>125</sup> I	2	1.17	11	0.018	4	0.133	6	0.58
<sup>22</sup> Na	0	0	0	0	1	0.043	1	0.087
<sup>63</sup> Ni	1	9.99	1	0.001	0	0	0	0
<sup>32</sup> P	216	565.69	100	24,621.99	18	15.91	5	3.74
<sup>33</sup> P	9	4.98	4	0.503	1	0.01	0	0
<sup>35</sup> S	6	39.22	10	7.44	3	2.47	0	0
<sup>99m</sup> Tc	0	0	0	0	1	0.1	6	20
Total	261	634.25	237	24,636.84	61	27.16	72	1,260.49

RADIOACTIVE MATERIALS	13/14	12/13	11/12	10/11	09/10	08/09	07/08	06/07	05/06	04/05
Orders	261	329	331	358	311	428	832	776	933	1,036
mCi	634	781	760	662	655	714	1,692	1,212	1,332	1,428
Pickups	237	64	236	275	417	556	548	506	634	725
mCi	24,637	110	102	162	187	218	355	383	304	503
Sewer Disposals	61	41	90	59	89	76	90	98	119	98
mCi	27	31	25	11	24	5	14	14	12	12
Transfers	72	119	151	119	84	98	33	240	124	66
mCi	1,261	273	543	802	426	324	40	1234	273	149

## SEALED SOURCES

Case Western Reserve University's sealed source inventory contains 99 sealed sources. Of these, 94 sealed sources are required to be inventoried every six months. Five (5) sealed sources require six-month leak tests, as stated in our ODH license. This includes 4 gamma sources and 1 neutron source.

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

See the Appendix for a list of sealed sources on campus. These sources are not included in the general summary reports for radioactive materials. This fiscal year, fifty-one (51) sealed sources were disposed, six (6) sealed sources were transferred, and seven (7) new sources were received.

INVENTORY	13/14	12/13	11/12	10/11	09/10	08/09	07/08	06/07	05/06	04/05
Sealed Sources	94	149	142	147	213	211	213	207	168	204
Exempt	89	144	134	138	203	201	190	188	154	183
Irradiator	3	3	4	4	4	5	4	4	4	3
Neutron	1	1	1	1	1	1	1	1	1	1

## RADIATION SURVEY METER CALIBRATIONS

Case Western Reserve University's ODH Broadscope 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 EHS provided in-house services that generated \$10,450 in cost saving over the fiscal year in lieu of using outside vendors.

CALIBRATION/ SERVICE	COST PER SERVICE	COST SAVINGS
109 meters	\$80/meter	\$8,720
2 pumps	\$70/pump	\$140
18 thyroid assays	\$55/assay	\$990
2 pre-filter changes	\$75/ set of 4/quarterly	\$600
	TOTAL COST SAVINGS	\$10,450

The RSOF calibrated 109 survey meters in the last fiscal year. There were 16 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. 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 hood are two double filter units for (located in DOA Radiation Area and are OK due to non-use. The fan for compactor has been repaired. Currently, there are two pre-filters and two HEPA filters that are regularly changed for two units:

- Two single filter units for the chemical hood and decay area (located above the DOA office)

Two pumps for radioactive materials were calibrated for use in an iodination hood and the continuous air monitor (CAM).

CALIBRATION/ SERVICE	13/14	12/13	11/12	10/11	09/10	08/09	07/08	06/07	05/06	04/05
Meter Calibration	109	134	136	121	142	172	170	157	188	233

METERS IN USE	13/14	12/13	11/12
Hi-Q	2	1	1
Inovision	1	2	2
Ludlum	68	92	93
RPI Mini Monitor	8	13	15
Technical	1	1	1
Victoreen	5	10	9
WB Johnson	9	15	15

METER CALIBRATION BY MONTH	13/14	12/13	11/12
7/2013	19	22	10
8/2013	8	6	14
9/2013	1	2	1
10/2013	5	4	8
11/2013	1	21	21

12/2013	17	13	7
1/2014	11	7	10
2/2014	10	8	14
3/2014	12	16	7
4/2014	8	9	13
5/2014	16	15	15
6/2014	1	11	16

## RAM SECURITY

Radioactive materials 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 located 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. An increase was noticed this year due to increased moves and clearances in areas.

RAM SECURITY CHECKS	13/14	12/13	11/12	10/11	09/10	08/09	07/08	06/07	05/06	04/05
Violations	40	7	16	24	71	19	37	54	74	89

## 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 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.

The contract for dosimetry was renewed with Landauer, Inc. which provides Radiation Monitoring Services. The dates of the contract are for 7/1/2011 to 6/31/2013 with two 1-year renewal options. We are in the 2<sup>nd</sup> renewal option year.

## 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/](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 their pregnancy. During monitoring, no fetal doses above background radiation levels were detected.

## NEUTRON USERS

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

## USERS OF RGE/ X-RAY

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

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

<b>PERSONNEL MONITORING</b>	<b>13/14</b>	<b>12/13</b>	<b>11/12</b>	<b>10/11</b>	<b>09/10</b>	<b>08/09</b>	<b>07/08</b>	<b>06/07</b>	<b>05/06</b>	<b>04/05</b>
Pregnant Workers	1	2	2	2	1	1	2	2	6	6
Neutron	2	4	4	4	4	4	4	0	0	0
RGE/ X-Ray	33	30	30	28	45	103	70	38	60	201
Dental	46	36	47	34	28	28	28	28	28	28
General	552	456	456	448	518	698	665	705	905	1005

Case Western Reserve University uses Luxel badges, which are considered to be 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 2013.

## **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. Analytical research units include electron microscopes, X-Ray diffraction and particle accelerators. There are also X-Ray units in use for health care & diagnostic research. There are currently 16 Authorized Possessors with equipment in 33 laboratories. Radiation-generating equipment is inventoried quarterly 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. The EHS provides general safety classes for individuals using RGE.

<b>RADIATION-GENERATING UNITS (Not In Use)</b>	<b>13/14</b>	<b>12/13</b>	<b>11/12</b>	<b>10/11</b>	<b>09/10</b>	<b>08/09</b>	<b>07/08</b>	<b>06/07</b>	<b>05/06</b>	<b>04/05</b>
Diagnostic units Disposed	0	4	4	3	3	3	4	4	7	3
Diagnostic units Purchased	0	3	4	3	3	3	3	4	11	2

The ODH has changed the Radiation Generating Units classification. One hand-held Dental unit was added July 2013. The table below reflects that change.

<b>RADIATION GENERATING EQUIPMENT (IN USE)</b>	<b>13/14</b>	<b>12/13</b>	<b>11/12</b>	<b>10/11</b>	<b>09/10</b>
Closed Beam Analytical	6	6	6	6	6
Computer Tomography	1	1	2	1	1
Electron Microscope/ Photoelectron Spectrometer	11	11	11	11	11
Enclosed System	4	4	4	4	4
Fluoroscopy	3	3	2	3	3
Hand-held Dental	1	2	2	1	1
Intraoral	27	27	27	27	27
Open Beam Analytical	1	1	1	1	1
Panoral	1	1	1	1	1
Particle Accelerator	1	1	1	1	1
<b>RADIATION GENERATING EQUIPMENT (IN-OPERABLE)</b>					
Closed Beam Analytical	3	3	3	3	3
Electron Microscope/ Photoelectron Spectrometer	2	2	2	2	2
Tube Only	12	26	26	26	26
Disposed	14	0	0	0	0
<b>TOTAL TUBES</b>	<b>73</b>	<b>74</b>	<b>88</b>	<b>87</b>	<b>87</b>

## **RADIOACTIVE MATERIAL RELEASES**

### SEWER EXPOSURE CONTROL & MONITORING

State and Federal regulations permit Case Western Reserve University to dispose of low levels of radioactive materials into the sanitary sewers. The Northeast Ohio Regional Sewer District (NEORS) requires semiannual reports on radioactive material discharged to the sanitary sewer system. Case Western Reserve University's sewer releases were in compliance with both Federal and State regulations. The report for July through December 2013 was filed by 12/31/2013 and the report for January through June 2014 was filed by 6/30/2014. Fourteen 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 2013 calendar year, radioactive material releases to the air were less than 10% of the maximum levels set by the EPA. Therefore, Case Western Reserve University 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.

With regard to airborne exposure control, the primary concern is to safeguard against exposure to airborne radioactive iodine that is used for protein iodination experiments. To control exposures, the RSOF requires that reactions involving use of volatile radioactive iodine isotopes be performed in an iodination hood that is housed in a chemical hood. The charcoal-filtered exhaust from the iodination hoods typically reduce radioactive material emissions by approximately 90%. Experiments requiring use of large amounts of iodine in especially volatile form are routinely carried out in closed systems to prevent airborne release of radioactive iodine. There were two experiments requiring the use of volatile iodine conducted this fiscal year.

## BIOASSAY PROGRAM

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

## RADIOACTIVE IODINE

During 2013-2014, there was one (1) active iodination laboratory. The RSO maintains an inventory of five iodination hoods to be deployed when needed. A bioassay is required when more than 1 mCi of radioactive iodine is used in volatile form. The RSOF must be notified prior to:

- Handling more than 1.0 mCi 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. Bioassays were completed for the RSOF staff involved in radioactive waste handling. There were two (2) iodination procedures performed this fiscal year. No workers exceeded 10% of the ODH limits. This chart highlights the sustained decrease in iodination procedures in University laboratories.

<b>IODINATION PROCEDURES</b>	<b>13/14</b>	<b>12/13</b>	<b>11/12</b>	<b>10/11</b>	<b>09/10</b>	<b>08/09</b>	<b>07/08</b>	<b>06/07</b>	<b>05/06</b>	<b>04/05</b>
Total	2	9	0	0	0	0	0	6	6	7

<b><sup>125</sup>I BIOASSAYS</b>	<b>13/14</b>	<b>12/13</b>	<b>11/12</b>	<b>10/11</b>	<b>09/10</b>	<b>08/09</b>	<b>07/08</b>	<b>06/07</b>	<b>05/06</b>	<b>04/05</b>
RSOF Staff	16	17	19	24	24	44	44	32	64	67
Additional	2	9	0	0	0	0	0	0	7	10
Total	18	26	19	24	24	44	44	32	71	77

## TRITIUM

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

## **RADIOACTIVE MATERIALS INCIDENTS**

### EMERGENCY RESPONSE

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

### INCIDENT/ SPILL RESPONSE

#### MAJOR INCIDENT/ SPILL

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

#### MINOR INCIDENT/ SPILL

This is a spill that does not involve personnel contamination and that remains inside the intended work area; one that can be easily and effectively contained and cleaned up without assistance from the RSOF.

There were no major and eight (8) minor incidents documented over the past year.

<b>INCIDENTS</b>	<b>13/14</b>	<b>12/13</b>	<b>11/12</b>	<b>10/11</b>	<b>09/10</b>	<b>08/09</b>	<b>07/08</b>	<b>06/07</b>	<b>05/06</b>	<b>04/05</b>
Major	0	2	0	0	0	0	1	2	0	1
Minor	8	16	7	18	17	20	6	7	0	4
<b>TOTAL</b>	<b>8</b>	<b>18</b>	<b>7</b>	<b>18</b>	<b>17</b>	<b>20</b>	<b>7</b>	<b>9</b>	<b>0</b>	<b>5</b>

<b>DATE</b>	<b>INCIDENT</b>	<b>CONTAMINATION</b>	<b>ROOT CAUSE</b>	<b>FOLLOW UP</b>
6/20/2014	Minor Incident	Irradiator Biometric Reader Malfunction	Person did not use biometric reader correctly and the alarm was triggered.	The reader was functioning properly. Normal access was granted.
5/27/2014	Minor Incident	Failure to obtain clearance for renovation	BRB 749 was renovated without clearance from Radiation or Chemical Safety.	The researcher will submit new survey map and include survey of room and equipment.
5/15/2014	Minor Incident	Room Contamination & untrained worker	While conducted compliance, untrained worker in KHS 205 was using 22Na. The	Radiation work was stopped, isotope inventory removed, room decommissioned,

			laboratory was contaminated with <sup>22</sup> Na.	and worker trained.
3/24/2014	Minor Incident	Irradiator Biometric Reader Malfunction	Biometric Reader malfunctioned although irradiator room was secure.	The reader was rebooted remotely.
2/25/2014	Minor Incident	Irradiator Alarm	Irradiator Intrusion Alarm accidentally set and RSOF was called.	The person will be more careful.
1/12/2014	Minor Incident	Flood	Water pipe burst and leaked in Wood 333, 337, 217, & 151. Areas were cleared for Radiation.	All was collected and area cleaned.
10/31/2013	Minor Incident	Irradiator Intrusion Alarm	Person tripped alarm in Irradiator room.	Person was contacted and reminded to briskly close the door
9/4/2013	Minor Incident	Flood	Autoclave in WRB 5415 expelling water and freezer in WRB 5408 was being defrosted without a proper-sized container causing overflow of water on 4 <sup>th</sup> floor. WRB 5517 was cleared for Radiation.	All water was collected and area cleaned.

## EHS WEB SITE & NEWSLETTER

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

The EHS newsletter is filled with articles that are designed to keep the campus community abreast of safety issues and concerns. It covers the latest government regulations, addresses concerns that are found during laboratory inspections, and provides answers to questions frequently asked by laboratory personnel. Articles that were submitted during this year included:

- Research Isotopes
- Properly Securing Radioactive Materials
- When to Record a Post-Experimental Survey
- Electron Microscopes
- Radiation-Generating Equipment

## LASER SAFETY PROGRAM

There are a total of 154 lasers/laser systems noted in our database for the campus for 43 Laser PIs in 14 buildings (36 Active, 7 Inactive). Two units are portable where a temporary posting would be applied when used. There are currently 95 active users of lasers in 45 laboratories. This includes 26 laboratories in the class 1-3A/3R groups and 19 laboratories in the class 3B-4 groups. The lasers of greatest concern are those labeled Class 3B and Class 4. There are 57 Class 4 (26 active and 31 inactive), 38 Class 3B lasers (29 active and 9 inactive), and 59 lasers in the other classes of 1, 2, and 3A/3R. Three (3) PI's left the Laser Program during this fiscal year.

There are 19 class 3B/4 enclosed laser systems that are considered eye-safe under normal use thus decreasing the hazard to the user. Forty (40) audits were performed during this fiscal year. There were no Laser incidents reported this year.

The CWRU Blackboard system is being used to track the laser retraining tests. It automatically updates the training information in our database. The Onsite database is updated as audits and inventory checks occur. An online Laser Awareness training for classes of 1, 2, and 3A/3R users was developed that will address eye-safe and enclosed laser use on campus. This work had been put on hold this past year.

## **ULTRA VIOLET (UV) SAFETY PROGRAM**

With increased use of UV equipment on campus, a program for UV Safety has been implemented. A UV safety PowerPoint presentation has been placed on the EHS website. UV users are being identified through laboratory inspections and new employee orientations and training.

## **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 the AU facilitates these operations. There were 450 pieces of equipment and 49 rooms that were cleared in this reporting period.

## **WASTE MANAGEMENT**

### RADIOACTIVE WASTE FACILITY

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

<sup>32</sup>P solid waste is held for decay (for at least 10 half-lives) in the Radioactive Waste Facility. The waste is surveyed and subsequently sent to Stericycle (formally BFI), a commercial disposal facility for incineration. Currently, only the outside of waste bags are 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 Case Western Reserve University. Reducing the volume of waste to be disposed remains a continuing aim of the waste program. As part of the waste minimization program, isotope users are encouraged to reduce the volume of waste generated in the laboratory by minimizing the use of extraneous paper products. Short-lived non-sewer (Hazardous waste) is held for decay, resurveyed after ten half-lives, and disposed by Chemical Analytics, a commercial hazardous waste disposal company. <sup>35</sup>S and <sup>125</sup>I are no longer held for decay, but are shipped along with the long-lived solid waste. Long-lived solid waste (greater than 60 day half-life) and scintillation vials are disposed by ADCO Services, a commercial radioactive waste hauler.

Non-hazardous aqueous waste is no longer held for decay. This waste is picked up from laboratories by the RSOF staff and immediate sewer disposal is carried out in the Radioactive Waste Facility since the isotope activities are significantly below our established regulatory limits as per OAC 3701:1-38-12 Appendix C. A sewer disposal log is kept in the EHS offices. Total sewer disposals are reported semi-annually to the Northeast Ohio Regional Sewer District.

### COLLECTION & DISPOSAL OF ANIMAL REMAINS AND BIOHAZARDOUS WASTE

The RSOF maintains two -20°C freezer for storage of radioactive animal remains and waste. One is located at the Animal Resource Center (ARC) and the other in Wolstein 1118. Radioactive wastes are 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.

Any item that has come in contact with an etiologic agent is considered biohazardous. Etiologic agents include bacteria, viruses, and parasites and must be disinfected or decayed to background before disposal. Infected 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. Additional information regarding etiological agents is placed on the tag. All animal waste is disposed by the RSOF.

### WASTE GENERATED IN JULY 1, 2013 - JUNE 30, 2014

	GENERATED 7/1/2013- 6/30/2014	DISPOSED: HAZ. WASTE SVCS.	DISPOSED: SEWER	DISPOSED: CHEMICAL SAFETY	DISPOSED: ADCO	IN STORAGE AS OF 6/30/2014
Short-Lived Dry	20	15*	0	0	2	20
Long-Lived Dry	10	0	0	0	10	0
Scintillation Vials	5	0	0	0	5	0
Animals	0.5	0	0	0	0	1
Long-Lived Sewer	20	0	20	0	0	0
Long-Lived Non-Sewer	0	0	0	0	0	0
Short-Lived Sewer	15	0	20	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. The single asterisk (\*) demarkates the number of drums generated prior to July 1, 2013, kept for decay in storage, and disposed during the period of July 1, 2013–June 30, 2014. During this fiscal year, all long-lived hazardous aqueous waste was disposed.

ADCO animal waste cost = \$22.5/lb. for 10 pound barrel = \$225 per 10 pound barrel  
ADCO dry waste cost = \$500 per 55-gallon drum

The cost of disposal for one box of biomedical waste at Hazardous Waste Services (Stericycle) is \$21 per box (average of 2 boxes per 55 gal drum). There were 15 drums of dry waste surveyed and disposed during 2013-2014 fiscal year at a cost of \$630. Without the decay in storage program, it would cost \$500 to send one 55-gallon drum of decay in storage (DIS) dry waste and it would cost \$225 per 10 lb. drum of animal waste through ADCO services. Therefore, in the absence of decay in storage, the cost to dispose of the waste drums through ADCO would have been \$7,500. Thus, the indirect savings to researchers due to the decay in storage program was \$6,870.

WASTE GENERATION	13/14	12/13	11/12	10/11	09/10	08/09	07/08	06/07	05/06	04/05
Short-Lived Dry	20	26	25	25	87	95	91	85	72	66
Long-Lived Dry	10	16	10	11	25	50	35	20	25	28
Scintillation Vials	5	10	8	7	12	30	25	30	47	44
Animals	0.5	0.5	0.35	0.25	0	1	2	4	3	2
Long-Lived Sewer	20	20	17	11.5	60	50	38	35	46	55
Long-Lived Non-Sewer	0	0	55	91	120	80	20	5	15	5
Short-Lived Sewer	15	20	18.5	21.5	65	50	140	135	125	115
Short-Lived Non-Sewer	0	0	1	3	10	20	25	30	20	35

The contract for radioactive waste disposal has been renewed for 11/1/2010 to 6/30/2013 with two 1-year renewal options with ADCO Services. This contract provides for disposal of all long-lived dry materials, scintillation vials, & animal wastes. We are in the 2<sup>nd</sup> renewal option year.

### RECYCLING PROGRAM

The RSOF occasionally obtains laboratory equipment, in very good condition, from AU's 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 AU's to conserve funds otherwise needed to buy new radioactive materials handling equipment. This cost-saving recycling program resulted in re-use of equipment that saved AUs & EHS more than \$5,000 during 2013-2014.

## **RADIATION SAFETY COMMITTEE AUDITS**

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

- Performance audits are conducted on-site at the Radiation Safety Office (RSOF) by individual RSC members at various times throughout the year
- A compliance inspection of RSOF records is conducted shortly after the end of each fiscal year by a team of RSC Members.

Performance audits of RSOF activities included the following areas:

<u>AREA AUDITED</u>	<u># OF INDIVIDUAL FILES EXAMINED</u>
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
Web site Accuracy	1
Irradiators	5
Room Surveys (Active/Decommissioned)	10
Compliance Reviews	10
Lasers	10
Licensing	10
Dosimetry	10
Incidents	10

These audits were conducted between October and December 2013 and between March and June 2014. This effort resulted in the review of more than 170 files, in the program areas listed above.

## **RSC TRI-ANNUAL AUDITS FOR 2013-2014**

### RSC AUDIT COMMENT:

**In October 2013**, the Radiation Safety Committee Members conducted a tri-annual audit of the following components of the Radiation Safety Office:

Isotope Orders, AU possession limits, & the OnSite Database  
RAM security checks  
Radiation Generating Equipment (RGE) Inventory and Training  
Room Surveys  
Sealed Source Leak Tests  
Bioassay  
Irradiator Program  
Semi-Annual Mailings  
AU/Worker Training  
Survey Meters  
Web Page (Radiation Safety) of EHS Website

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

#### ISOTOPE ORDERS, AU POSSESSION LIMITS, & THE ONSITE DATABASE

Dr. Coller audited 10 files 10/16/2013 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. Coller noted five (5) deficiencies; in all instances dates were inaccurate on the inventory sheet. All deficiencies were corrected.

#### RSOF RESPONSE

Data entry errors were corrected expeditiously. We were training a new student and the errors in entry had not yet been caught by our office audit process.

#### RAM SECURITY CHECKS

Verification and documentation of radioisotope security checks was audited on 10/10/2013 by Dr. Coller who reports that no security checks were generated during this period.

#### RSOF RESPONSE

No response required.

#### RADIATION GENERATING EQUIPMENT (RGE) INVENTORY AND TRAINING

A quarterly audit was conducted on 10/16/2013 to verify the update of inventory and the x-ray training dates for workers. Components of the audit include: X-Ray Training and semi-annual updates of Inventory. Dr. Schiemann reviewed the RGE Inventory and training and reported two (2) deficiencies where no training dates were provided. Users were contacted and training was verified.

#### RSOF RESPONSE

Those in non-compliance were contacted and training completed.

#### ROOM SURVEY

An audit was performed on 10/16/2013 to validate active RAM use files and Decommissioned room files to verify that the laboratory was surveyed within the last six months as well as verification for any follow-up on non-compliance issues. Dr. Schiemann examined 10 files and noted no deficiency from the decommissioned files.

#### RSOF RESPONSE

No response required.

#### SEALED SOURCE LEAK TESTS

Files verifying that sealed sources had been leak tested were audited on 10/16/2013. Ten (10) files were examined by Dr. Croniger who reported one (1) deficiency for the report period. One user had a missing

inspection sheet however they were listed as current in the database. The user was contacted and the deficiency was corrected.

#### RSOF RESPONSE

The source was tested and the report filed.

#### BIOASSAY

The bioassay program was audited by Dr. Jankowsky on 10/15/2013 for accuracy regarding bioassay samples. Ten (10) files were audited. No deficiencies were noted in bioassays.

#### RSOF RESPONSE

No response required.

#### IRRADIATOR PROGRAM

An audit of the Irradiator Information Files was performed by Dr. Jankowsky on 10/16/2013 to verify that the irradiators and irradiator workers were audited by the RSOF within the past six months, and that any compliance issues were appropriately followed up and pending issues corrected. Four Irradiators were active on campus and each file was up-to-date and compliant. Six (6) irradiator workers were not compliant for training. All of these workers were contacted and subsequently retrained.

#### RSOF RESPONSE

Those in non-compliance were contacted and training completed. We are working to develop to a more efficient procedure with Access Services on removal of access to the facility for some users.

#### SEMI-ANNUAL MAILINGS

Dr. Valadkhan audited the response to semi-annual notification of Authorized Users (AU) on 10/15/2013. Dr. Valadkhan inspected 15 records and reported four (4) deficiencies. These AU were contacted and completed their reporting.

#### RSOF RESPONSE

Those in non-compliance were contacted and report submitted.

#### AU/WORKER TRAINING

Dr. Devireddy audited the training records of AU/Workers that are overdue for training (by 30 or 60 days) on 11/05/2013. Dr. Devireddy audited ten (10) files and found that six (6) workers were not in compliance. Workers and AU were notified and retraining was scheduled.

#### RSOF RESPONSE

Those in non-compliance were contacted and training completed.

## SURVEY METERS

Dr. McCormick examined ten (10) survey meters to audit the calibration dates and match the dates with the database of survey meter calibration. Dr. McCormick reported no deficiencies in the audited meters.

### RSOF RESPONSE

No response required.

## WEB PAGE (RADIATION SAFETY) OF EHS WEBSITE

The "Radiation Safety" link of the EHS website was audited by Dr. Devireddy. He audited whether or not the links were active and accessible. Dr. Devireddy audited ten (10) random links and reported one (1) non-operational link. The EHS webmaster was alerted to this link and the link was repaired.

### RSOF RESPONSE

The Web link has been repaired.

**In February 2014**, the Radiation Safety Committee Members conducted a tri-annual audit of the following components of the Radiation Safety Office:

- Waste Disposal Facilities
- Valid RAM Applications
- Dosimetry Program
- Compliance Review
- Direct Package Pickup
- Incident Reports
- Laser Program
- Licensing Status
- Web Page (Radiation Safety) of EHS Website
- Support Staff Training

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

## WASTE DISPOSAL FACILITIES

The waste disposal facilities (DOA990/Wolstein) and RSOF Laboratory were inspected to ensure safe operation and maintenance as required by RSOF for the quarterly audit in February 2014. Dr. Valadkhan 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.

### VALID RAM APPLICATIONS

RAM applications were audited for the quarter on 2/19/2014 to verify that the applications were complete and valid. Dr. McCormick audited 10 files and reported 7 deficiencies. Deficiencies were due to three (3) instances where the Personnel List was not updated, three (3) reported meter calibrations post-due and one (1) instance where monitoring equipment did not match the application. RSOF was notified of the deficiencies.

#### RSOF RESPONSE

Those in non-compliance were contacted and information corrected. RAM applications have many categories where non-compliance can occur and audit is the best way to identify small discrepancies.

### DOSIMETRY PROGRAM

An audit of Current Dose records held by the RSOF was performed on 2/19/2014 to verify that AU laboratory workers were current in dose record and active radiation badges. Dr. Valadkhan audited ten (10) records and reported nine (9) deficiencies. Workers were contacted and badges were updated except in one case where the worker had left the University.

#### RSOF RESPONSE

Those in non-compliance were contacted and badges retrieved.

### COMPLIANCE REVIEW

Compliance review audits were performed on 2/19/2014 to ensure that any non-compliance issues were appropriately resolved. Upon examination of 10 files Dr. Croniger noted no deficiencies. Dr. Croniger further noted that the database was in need of updating for six (6) AU and two (2) upcoming AU were due in the next month. The RSOF was notified.

#### RSOF RESPONSE

The database was corrected.

### DIRECT PACKAGE PICKUP

Dr. Coller audited 5 files on 2/19/2014 to verify that ordered radioactive material (RAM) was picked up by the AU (or laboratory) and that all orders placed were in the Helix Database. Dr. Coller noted no deficiencies.

#### RSOF RESPONSE:

No response required.

### INCIDENT REPORTS

A review of incident reports was performed on 2/19/2014 by Dr. Coller for verification and documentation of follow-up by the RSOF. During this quarterly report there were no incidents reported.

RSOF RESPONSE:

No response required.

LASER PROGRAM

The laser program was audited by Dr. Jankowsky on 02/19/2014 for accuracy regarding laser inspections, inventory and status of personnel training. Five (5) files were audited. Two deficiencies were noted in inventory of equipment. Each deficiency was corrected.

RSOF RESPONSE:

The inventory was corrected.

LICENSING STATUS

An audit was conducted to verify the licensing status of all ODH licenses and registrations on 02/19/2014. Components of the audit include: Broadscope 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. Dr. Schiemann reviewed all license programs and reported no deficiencies. All licenses are active and accurate.

RSOF RESPONSE:

No response required.

WEB PAGE (RADIATION SAFETY) OF EHS WEBSITE

The "Radiation Safety" link of the EHS website was audited by Dr. Devireddy on 03/06/2014. He audited whether or not the links were active and accessible. Dr. Devireddy audited ten (10) random links and reported two (2) non-operational links, one for RGE link and the other for Irradiator. The EHS webmaster was alerted to this link and the link was repaired.

RSOF RESPONSE:

The link was repaired.

SUPPORT STAFF TRAINING

Dr. Devireddy audited the training records of support staff on 03/06/2014. Dr. Devireddy audited ten (10) files and no deficiencies.

RSOF RESPONSE:

No response required.

**In April 2014**, the Radiation Safety Committee Members conducted a tri-annual audit of the following components of the Radiation Safety Office:

- RAM security checks
- Radiation Generating Equipment (RGE) Inventory and Training
- Room Surveys
- Sealed Source Leak Tests
- Bioassay
- Irradiator Program
- AU/Worker Training
- Semi-Annual Mailings
- Survey Meters
- Web Page (Radiation Safety) of EHS Website

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

### RAM SECURITY CHECKS

Verification and documentation of radioisotope security checks was audited on 04/16/2014 by Dr. Coller who reports that no security checks were generated during this period.

RSOF RESPONSE:

No response required.

### RADIATION GENERATING EQUIPMENT (RGE) INVENTORY AND TRAINING

A quarterly audit was conducted on 04/16/2014 to verify the update of inventory and the x-ray training dates for workers. Components of the audit include: X-Ray Training and semi-annual updates of Inventory. Dr. Schiemann reviewed the RGE Inventory and training and reported no deficiencies.

RSOF RESPONSE:

No response required.

### ROOM SURVEY

An audit was performed on 04/16/2014 to validate active RAM use files and Decommissioned room files to verify that the laboratory was surveyed within the last six months as well as verification for any follow-up on non-compliance issues. Dr. Schiemann examined 10 files and noted one minor deficiency (Typo) in the decommissioned files.

RSOF RESPONSE:

The data entry error was corrected.

### SEALED SOURCE LEAK TESTS

Files verifying that sealed sources had been leak tested were audited on 04/15/2014. Ten (10) files were examined by Dr. Croniger who reported no deficiencies for the report period.

RSOF RESPONSE:

No response required.

BIOASSAY

The bioassay program was audited by Dr. Jankowsky on 04/16/2014 for accuracy regarding bioassay samples. Ten (10) files were audited. No deficiencies were noted in bioassays.

RSOF RESPONSE:

No response required.

IRRADIATOR PROGRAM

An audit of the Irradiator Information Files was performed by Dr. Jankowsky on 04/16/2014 to verify that the irradiators and irradiator workers were audited by the RSOF within the past six months, and that any compliance issues were appropriately followed up and pending issues corrected. Four Irradiators were active on campus and each file was up-to-date and compliant. All surveyed irradiator workers were in compliance for training.

RSOF RESPONSE:

No response required.

AU/WORKER TRAINING

Dr. Devireddy audited the training records of AU/Workers that are overdue for training (by 30 or 60 days) on 04/17/2014. Dr. Devireddy audited ten (10) files and found that ten (10) workers were not in compliance by 1-2 months. Workers and AU were notified and retraining was scheduled.

RSOF RESPONSE:

Those in non-compliance were contacted and retraining completed.

SEMI-ANNUAL MAILINGS

Dr. Valadkhan audited the response to semi-annual notification of Authorized Users (AU) on 04/16/2014. Dr. Valadkhan inspected 11 records and reported no deficiencies.

RSOF RESPONSE:

No response required.

SURVEY METERS

Dr. McCormick examined ten (10) survey meter records on 04/16/2014 to audit the calibration dates and match the dates with the database of survey meter calibration. Dr. McCormick reported no deficiencies in the audited meters.

RSOF RESPONSE:

No response required.

#### WEB PAGE (RADIATION SAFETY) OF EHS WEBSITE

The "Radiation Safety" link of the EHS website was audited by Dr. Devireddy on 04/18/2014. He audited whether or not the links were active and accessible. Dr. Devireddy audited ten (10) random links and reported no non-operational links.

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 RSOF staff during the audit process helped expedite the process. All corrections to the files and OnSite database were made following each trimester audit.

### **ANNUAL RADIATION SAFETY PROGRAM AUDIT REPORT**

The Radiation Safety Committee conducted its annual audit of the Radiation Safety Office the first week in June 2014. Members of the RSC conducted the audit. The committee reviewed the performance of 20 components of the RSOF. The areas were:

- Ancillary Staff Training
- AU and Worker Training
- Bioassays
- Compliance Review
- Isotope Orders, AU Possession Limits, and the Database
- Dosimetry Program
- Incident Reports
- Irradiator Program Review
- Laser Program Review
- Licensing Status
- Radioisotope Security Checks
- Radiation Generating Equipment Inventory and Training
- Radiation Survey Meters
- Radiation Website
- Room Surveys
- Seal Source /Leak Test
- Shipping Papers
- Semi-Annual Mailings (air/sewer inventory)
- 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

#### RSC AUDIT COMMENT:

An annual audit was conducted to verify the training status of personnel encompassing ancillary segments of the radiation safety program including; Animal Resource Center (ARC), Shipping & Receiving, Custodial, Security and Plant Security. Ancillary workers were surveyed from July 1, 2013-June 30, 2014. Dr. Devireddy examined 28 files and noted no deficiencies.

#### RSOF RESPONSE:

No response required.

### AU AND WORKER TRAINING

#### RSC AUDIT COMMENT:

Authorized users and worker training files were audited for a period from July 1, 2013-June 30, 2014. Dr. Devireddy examined 25 records and noted six (6) workers that were overdue for radiation safety training. Overdue workers were notified of their training status.

#### RSOF RESPONSE:

Those in non-compliance were contacted and training completed.

### BIOASSAYS

#### RSC AUDIT COMMENT:

An audit was performed to verify completion of bioassays for laboratories using >10mCi of  $^3\text{H}$  and/or 1mCi  $^{125}\text{I}$  during the period July 1, 2013-June 30, 2014. Dr. Jankowsky noted 1 bioassay had been performed for this period. All of the Bioassays were associated with Dr. Lee and all bioassays were in order.

#### RSOF RESPONSE

No response required.

### COMPLIANCE REVIEW

#### RSC AUDIT COMMENT:

Compliance review audits were performed to ensure that any non-compliance issues were appropriately resolved. Upon examination of 50 files Dr. Croniger noted no deficiencies.

#### RSOF RESPONSE

No response required.

## ISOTOPE ORDERS, AU POSSESSION LIMITS, AND THE HELIX DATABASE

### RSC AUDIT COMMENT:

Dr. Collier audited 35 files 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. Collier noted no deficiencies and all was in order.

### RSOF RESPONSE:

No response required.

## DOSIMETRY PROGRAM

### RSC AUDIT COMMENT:

An audit of Current Dose records held by the RSOF was performed to verify that AU laboratory workers were current in dose record and active radiation badges for the period July 1, 2013-June 30, 2014. Dr. Valadkhan audited 50 records and reported 11 individuals who were found to be in the active personnel files that had actually left the University. Individuals without badges were notified of the deficiency.

### RSOF RESPONSE

No response required.

## INCIDENT REPORTS

### RSC AUDIT COMMENT:

A review of monthly incident reports From July 1, 2013-June 30, 2014 was performed by Dr. Collier for verification and documentation of follow-up by the RSOF. During this period there were a total of 8 incidents reported. All incidents were effectively resolved in a timely manner.

### RSOF RESPONSE

No response required.

## IRRADIATOR INFORMATION REVIEW

An audit of the Irradiator Information Files was performed by Dr. Jankowsky to verify that the irradiators were audited by the RSOF within the past six months between the period of July 1, 2013-June 30, 2014, and that any compliance issues were appropriately followed up and pending issues corrected. Four Irradiators were active on campus and each file was up-to-date and compliant, two irradiators were in storage mode.

### RSOF RESPONSE

No response required.

### LASER PROGRAM REVIEW

The laser program was audited by Dr. Jankowsky for accuracy regarding laser inspections, inventory and status of personnel training in the period July 1, 2013-June 30, 2014. Fifty (50) files were audited. No deficiencies were noted for this period.

#### RSOF RESPONSE:

No response required.

### LICENSING STATUS

#### RSC AUDIT COMMENT:

An audit was conducted to verify the licensing status of all ODH licenses and registrations during the period July 1, 2013-June 30, 2014. Components of the audit include: Broadscope 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. Dr. Schiemann reviewed all license programs and noted that new documentation was necessary for the RGE license. This document was completed on 7/25/2014 by the radiation safety office. All licenses are active and accurate at this time.

#### RSOF RESPONSE

No response required.

### RADIOISOTOPE SECURITY CHECKS

#### RSC AUDIT COMMENT:

Verification and documentation of radioisotope security checks were performed for the period July 1, 2013- June 30, 2014. Dr. Collier reports that 33 security checks were generated during this period. Unlocked RAM storage accounted for all of these security checks. All incidents were noted to be resolved in an efficient and timely manner.

#### RSOF RESPONSE:

No response required.

### RADIATION GENERATING EQUIPMENT INVENTORY AND TRAINING

#### RSC AUDIT COMMENT:

Quarterly inventory status and equipment surveys were examined by Dr. Schiemann who examined 40 files for the period July 1, 2013- June 30, 2014. Dr. Schiemann noted no deficiencies in inventory reports and equipment surveys.

#### RSOF RESPONSE:

No response required.

## RADIATION SURVEY METERS

### RSC AUDIT COMMENT:

Compliant calibration of survey meters was audited for the period July 1, 2013- June 30, 2014. Thirty-five (35) files were examined by Dr. McCormick who noted six (6) meters that were due for calibration.

### RSOF RESPONSE:

The meters were calibrated promptly following the audit.

## EHS WEBPAGE (RADIATION SAFETY)

The website for the RSOF was audited to ensure proper operation, access and current links were operational for the period July 1, 2013- June 30, 2014. Dr. Devireddy reports that the Homepage, Training pages and all links as well as the Forms and Manuals pages were all operational.

### RSOF RESPONSE

No response required.

## ROOM SURVEYS (ACTIVE/DECOMMISSION)

An audit was performed 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 for the period July 1, 2013- June 30, 2014. Dr. Schiemann examined 50 files and noted no deficiencies from the decommissioned files.

### RSOF RESPONSE

No response required.

## SEALED SOURCE LEAK TEST

### RSC AUDIT COMMENT:

Files verifying that sealed sources had been leak tested were audited for the period of July 1, 2013- June 30, 2014. Fifty (50) files were examined by Dr. Croniger who reported four (4) sources were due for leak testing. The RSOF was notified of this report.

### RSOF RESPONSE:

The sources were leak tested and database updated.

## SHIPPING PAPERS

### RSC AUDIT COMMENTS:

An annual audit of shipping papers was performed to verify that paperwork is completed for each transfer of radioactive material for the period July 1, 2013- June 30, 2014. Dr. Collier examined 33 files and found no deficiencies among paperwork verifying transfers.

RSOF RESPONSE:

No response required.

SEMI-ANNUAL MAILINGS (AIR/ SEWER INVENTORY)

RSC AUDIT COMMENT:

An annual audit of the air/sewer disposal inventory was performed for the period July 1, 2013- June 30, 2014. Thirty-five (35) files were reviewed by Dr. Valadkhan who noted no deficiencies.

RSOF RESPONSE:

No response required.

VALID RAM APPLICATION

RSC AUDIT COMMENT:

RAM applications were audited for the period July 1, 2013- June 30, 2014 to verify that the applications were complete and valid. Dr. McCormick audited fifty (50) files and reported no deficiencies. Nine (9) applicants were noted to be in Storage mode.

RSOF RESPONSE:

No response required.

WASTE DISPOSAL FACILITIES (DOA990/WOLSTEIN) & RSOF LABORATORY

RSC AUDIT COMMENT:

The waste disposal facilities (DOA990/Wolstein) and RSOF Laboratory were inspected to ensure safe operation and maintenance as required by RSOF for the period July 1, 2013- June 30, 2014. Dr. Valadkhan inspected the facilities and reported that all records of maintenance, housekeeping, records and waste storage and handling were all in compliance. Dr. Valadkhan noted that the rest room areas needed maintenance. The RSOF was alerted to this report.

RSOF RESPONSE:

Maintenance was contacted and the rest room cleaned.

SUMMARY

RSC AUDIT COMMENT:

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 Radiation Safety Committee, the Assistant RSO conducts Quality Control reviews of all programs and records and assists with resolution. Full audit results of the program are available in the EHS Office.

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

## INTERNAL AUDITS

Update of RAM applications – Audits of RAM applications revealed applications that were more than ten (10) years old. Recently, the decision was made to flag these applications for update to be consistent with newly agreed upon application requirements. AUs are now required to update protocols that are more than 10 years old and every 5 years thereafter. There are currently forty (40) applications that require updating. Fifteen (15) RAM Applications were updated this fiscal year. During 7/2012-6/2013, thirteen (13) RAM applications were updated. During 7/2011-6/2012, nine (9) RAM Applications were updated and from 7/2010-6/2011, twelve (12) RAM Applications were updated.

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

This report was prepared by Felice Thornton-Porter on 11/13/2014 and reviewed by Dr. David Sedwick. It covers fiscal years 7/1/2013-6/30/2014.

## APPENDIX

**AUTHORIZED USERS WITH STATUS CHANGE DURING FISCAL 2012-2013**

**RADIATION ACTIVE**

Tomoaki Ogino (9/17/2013)                      Jacek Skowronski (4/16/2014)                      Jennifer Dorth (5/14/2014)  
Yong Gao (6/19/2014)

**STORAGE MODE**

Nancy Oleinick (3/5/2014)                      Mary Barkley (5/15/2014)                      Monica Montano (4/8/2014)

**RADIATION INACTIVE**

Carole Liedtke (8/12/2013)                      Ruth Siegel (8/26/2013)                      Cheng-Kui Qu (12/16/2013)  
Guang Zhou (3/12/2014)                      Eric Andrulis (3/14/2014)                      Alexander Jamieson (5/29/2014)

**DEPARTED - NONE**

**X-RAY AUTHORIZED POSSESSOR LIST**

<u>AP NAME</u>	<u>CONTACT PERSON</u>
Amir Avishai	Wayne Jennings
Chris Dealwis	Tian Meijuan
Gary Chottiner	Gary Chottiner
Liming Dai	Enoch Nagelli
Jean Iannadrea	Susan Opsitnick
Hisashi Fujioka	Midori Hitomi
Edward Greenfield	Teresa Pizzuto
Arthur Heuer	Wayne Jennings
Mukesh Jain	Steve Schomisch
Lashanda Korley	LaShanda Korley
Zhenghong Lee	Chris Flask
Gerald Matisoff	Gerald Matisoff
John Protasiewicz	John Protasiewicz
Daniel Scherson	Nikola Matic
Kenneth Singer	Ina Martin
Derek Taylor	Heather Holdaway

**LASER USERS**

Rigoberto Advincula	Mary Barkley (Inactive)	Jesse Berezovsky
Clemens Burda	Paul Carey	Patty Conrad
Carlos Crespo	Liming Dai	Diana Driscoll
Jeffrey Duerk (Inactive)	Dominique Durand (Inactive)	Steven Eppell
Philip Feng	Roger French	Maryann Fitzmaurice (Inactive)
Jeffrey Garvin	Alex Huang	Yoshikazu Imanishi
Hatsuo Ishida	James Jacobberger	Eckhard Jankowsky (Inactive)
Jaikrishnan R. Kadambi	Kathleen Kash (Inactive)	Robert Kirsch
LaShanda Korley	Roger Marchant (Deceased)	Michael Martens (Inactive)
Heidi Martin (Inactive)	Minh Lam	Edward Medof (Inactive)
Claudia Mizutani	Nancy Oleinick	Rajesh Ramachandran
Andrew Rollins	Charles Rosenblatt	Shasta Sabo
Daniel Scherson	David Schwam	Alp Sehirlioglu
Jie Shan (left CWRU)	Kenneth D. Singer	Giuseppe Strangi
Benjamin Strowbridge		