

**CASE WESTERN RESERVE UNIVERSITY**  
**DEPARTMENT OF ENVIRONMENTAL HEALTH & SAFETY (EHS)**  
**RADIATION SAFETY**  
**ANNUAL REPORT 2012-2013**

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## **INTRODUCTION**

This report is submitted to the President and designated members of the Senior Administration of the University, as required by the Radiation Safety Committee (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, 2012 through June 30, 2013.

## **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 2012-2013**

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 \$27,170 in 2012/2013 through its services to the research community at Case Western Reserve University.
- Radiation Safety forms were incorporated into OnSite.
- Radiation Safety training information is fully incorporated into OnSite.
- Revision of the X-Ray Safety training is complete.
- Radiation Safety refresher training has been updated on the website using Blackboard for the quiz.
- Incorporation of the Laser Safety and X-Ray Safety Programs into Onsite database

### **RADIATION SAFETY GOALS FOR 2013-2014**

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
- DOA 990 Radiation Waste Facility - repair of floor and brick/mortar
- Complete DOA 990 Radiation Waste Facility - suppression system repairs by ABC Fire and Cleveland Fire
- Begin fire drills for Radiation Safety staff each semester
- Complete Laser online training for Blackboard
- Update Radiation Safety Committee guidelines
- Automate information systems for audits
- Revision of Laser Safety training
- Creation of a link to the UH Fluoroscopy Program manual/training updates
- Review and revision of program assignments for all staff members

## **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) Partial Inspection was conducted on April 26, 2012. One issue of non-compliance concerning utilization of a radiation expert to conduct an area radiation survey upon installation of a dental CT unit was noted. The issue was corrected within the allotted time and 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, 2014	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 2/28/2014. 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, 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 and three high dose irradiators that contain  $^{137}\text{Cs}$  sources and two low dose irradiators charged with  $^{192}\text{Ir}$  and  $^{60}\text{Co}$ . Currently, two irradiators are active and one is out of service. The  $^{60}\text{Co}$  irradiator is now considered as low dose. Both low dose irradiators are currently out of service. There were 51 irradiator users. Of these, 10 were new users and 7 voluntarily had access removed.

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

IRRADIATOR	12/13	11/12	10/11	09/10	08/09	07/08	06/07	05/06	04/05	03/04	02/03
Total Workers	51	48	47	52	68	55	45	28	10	5	2
Total Irradiators	3	4	4	4	4	4	4	4	3	3	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 2012-2013 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: 6/1/2012	Dr. Jeffery Coller Dept. of RNA Center HG Wood 113 Term Expires: 11/8/2013
Colleen Croniger Dept. of Nutrition BRB 925 Term Expires: 5/1/2013	Dr. Eckhard Jankowsky Dept. of Biochemistry HG Wood 137 Term Expires: 1/3/2014
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: 11/8/2013
Dr. Lax Devireddy Dept. of Pathology Wolstein 6524 Term Expires: 11/8/2013	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 Supervisor EHS Service Bldg. 1 <sup>st</sup> Fl.	

## SUPPORT STAFF

Gwendolyn Cox-Johnson  
 Department Assistant  
 Service Bldg., 1<sup>st</sup> Floor

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 RSOF activities is maintained through RSC familiarity with the daily function of the University Radiation Safety Program.

The Committee met on six occasions during the 2012-2013 fiscal years to review applications for radioisotope use and action on other business. Six 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 RSOF, through the RSC, or through the University Administration.

<b>APPLICATIONS</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>	<b>03/04</b>	<b>02/03</b>
New AU	2	7	3	9	5	7	14	11	8	3	8
Additional Isotopes	1	7	5	5	1	7	7	6	10	2	13
Radioisotope use in Animals	1	5	3	5	2	5	6	5	7	4	4
Sealed Sources	3	2	1	1	1	1	1	6	1	1	2
AU Reactivation	0	1	0	0	0	0	0	1	0	1	0
Possession Limit Increase	0	0	1	0	0	0	1	0	1	0	0
AU Protocol Update	14	10	12	0	0	0	0	0	3	0	0
<b>TOTAL APPROVALS</b>	<b>21</b>	<b>32</b>	<b>25</b>	<b>20</b>	<b>9</b>	<b>20</b>	<b>29</b>	<b>29</b>	<b>30</b>	<b>11</b>	<b>27</b>

Major topics acted upon or discussed by the RSC:

- Annual Report Presentation
- Laser Safety Program Summary
- Unreturned badges review
- Incident – Electrician entered radiation laboratory without permission. Electrician retrained.
- Select Agent Program was terminated and animals were transferred from BSL3 to BSL2 laboratories.
- Quarterly audits distributed in Feb 2013.
- The committee is in need of one more committee member.
- Radiation Safety Retraining on Blackboard is up and running.
- ODH Sealed Source Disposal Pilot Program more cost effective.
- Monkey Study with CCF and CWRU is on hold.
- UH Radiation Safety Committee is scheduled for May 2013.
- Monthly Emergency Response Tabletop Exercise is ongoing.
- We are working to update Laser retraining and a Blackboard quiz.
- We will order activated charcoal from Fisher stores for the Wang iodination hood. The bioassay will be reactivated.



- A CWRU plumber entered a RAM room without escort to check on leaking pipes. The plumber was retrained in Right-to Know and the incident report was filed.

## **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 19 moderate violations listed below, 12 were the result of unsecured RAM found during after-hours security checks and routine compliance reviews. Seven (7) 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>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	93	112	64	53	103	83	57
Moderate	19	22	37	76	27	43	11
Major	0	0	2	0	0	0	1
Total	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 2012-2013.

## **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>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>	<b>03/04</b>
RA	78	89	87	87	91	92	112	124	116	123
RI	6	7	4	13	1	14	8	12	2	7
SM	15	13	16	3	4	5	6	4	9	8
D	3	1	2	3	6	8	12	11	12	12
Total in Program	102	110	109	106	102	119	138	151	139	150

## **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 (3)	Accountant (0.5)
Department Assistant (1)	Supervisor (1)
Student (1)	

Shirley Mele, Department Administrator, was laid off in June 2012. Her position was not replaced. Lisa Hausmann was added as the EHS Accountant in July 2012.

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 2012-2013 included 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.

### **LIAISON PROGRAM**

The Liaison Program requires RSOF personnel to visit University laboratories on a routine basis to offer safety advice and to answer safety questions. This program has helped to foster a service-oriented relationship between the RSOF Staff and the research community and has improved follow up on inquiries and safety concerns. Staff members are assigned to various buildings and are responsible for maintaining contact with designated laboratories.

### **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 under the supervision 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.

TYPE	NEW CLASSES	NEW USERS	ONLINE RETRAINING
Radiation Safety	25	239	409
X-Ray	15	76	0
Laser	12	71	16
RTK (Right to Know)	53	144	457
Irradiator (site specific)	6	51	0

New isotope user training classes are offered at least three 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	12/13	11/12	10/11	09/10	08/09	07/08	06/07	05/06	04/05	03/04	02/03
Radiation	239	279	186	279	223	240	297	284	284	283	322
Online Retraining	409	405	311	215	418	430	695	724	775	793	754
X-Ray	76	72	86	52	97	96	64	51	74	45	84
Ancillary	601	382	146	345	403	382	402	413	356	448	540
Laser	71	89	38	48	66	41	56	31	116	0	0
Laser Online	16	32	42	35	28	15	10	11	0	0	0
Irradiator	51	48	47	52	56	10	14	50	0	0	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 267 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	180
X-Ray	46
Laser	41

### 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 retired completely and HP Assist now meets Radiation Safety online needs.
- A consistency checker was designed and placed into service that looks at the data in each database to make sure that the data contained in the data structure meets criteria designed into the data consistency checker.
- The website was recoded to meet the requirements of University Marketing & Communications design rules.
- Self-check for training was established, allowing personnel to see their training history.
- On line training signups for in-person training were established. This system allows personnel 24/7 access to sign up for courses.
- All previous PowerPoint presentations were migrated to Articulate-based presentations. This consisted of complete rewrites of all programs.
- A series of reports were built to automate the data collection process for a number of programs including the Radiation Safety Program, the Laboratory Safety Program, and the Department Metrics Program were put into place. These reports facilitate access to data and data sorts not previously available without in depth SQL knowledge and database back side access.
- Department-wide data backup services were put into place both onsite and offsite. Part of the process involves the changing of drives prior to failure. Drives are changed at period points but not all at once. This guarantees that drives are from different manufacturing batches and are unlikely to fail together.

Up-to-date hardware is crucial to ensure efficient and quick access to records in the RSOF. A Smart Board System augments the in-house training program, and allows our trainers to directly demonstrate the use of on-line database and training materials. It also provides direct access to

library services and campus maps during staff meetings, and emergency incident exercises or responses.

All EHS personal computers (PCs) are being backed up onto a terabyte array. The Carbonite backup service is currently used for two EHS Servers (EHS, onsite-server). The web server (Aurora) itself is backed up, and additionally the files are copied locally on magnetic storage and periodically backed up onto optical storage discs. The Department of Environmental Health & Safety has transitioned to the use of Employee ID numbers in lieu of Social Security Numbers in its training program 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. Iodinations were started in May 2013 in one laboratory on campus which reactivated a program that has been dormant for the past few years. Fresh charcoal was purchased for one of the special hoods. One of the air pumps was calibrated for the iodinations (4/25/2013). As of 6/4/13, all five iodination hoods are in storage. Their locations are as follows:

WRB 1119 - Radiation Waste Facility Storage (1)  
DOA 990 – Storage (4)

### 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) in DOA 990 was put back in service as of March 2013 due to planned purchase of volatile iodine. It was repaired and calibrated by Ludlum 10/31/2012. The air pump connected to it was calibrated 2/4/2013. 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 119 isotope transfers approved this year, for a total of 273 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, 329 isotope shipments (totaling 781 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 64 isotope waste pickups by RSOF staff (110 mCi) or by 41

AU-directed disposals into the sanitary sewers (31mCi). 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>26</sup> Al	0	0	1	0	1	0	2	0.0005
<sup>133</sup> Ba	1	0.00099	0	0	0	0	0	0
<sup>11</sup> C	0	0	0	0	0	0	38	39.0
<sup>14</sup> C	11	2.87	10	1.53	6	2.7097	2	4.20
<sup>45</sup> Ca	0	0	1	0.01	0	0	2	0.00168
<sup>109</sup> Cd	1	0.00093	0	0	0	0	0	0
<sup>36</sup> Cl	0	0	1	0.03	0	0	0	0
<sup>57</sup> Co	1	0.00095	0	0	0	0	0	0
<sup>45</sup> Ca	1	0.00099	0	0	0	0	0	0
<sup>137</sup> Cs	2	0.030	1	0.007	1	0.00371	0	0
<sup>18</sup> F	0	0	0	0	0	0	47	214.61
<sup>59</sup> Fe	5	5.0	1	1.144	1	0.461	0	0
<sup>3</sup> H	18	13.92	14	10.905	8	5.439	2	3.72
<sup>124</sup> I	0	0	1	0.501	0	0	0	0
<sup>125</sup> I	11	23.45	5	12.23	4	6.651	7	0.538
<sup>54</sup> Mn	2	0.00194	0	0	0	0	0	0
Mixed	1	0.011	0	0	0	0	0	0
<sup>22</sup> Na	2	0.20096	1	0.043	1	0.023	0	0
<sup>32</sup> P	251	687.703	19	75.305	15	11.485	19	11.313
<sup>33</sup> P	13	4.082	3	2.085	1	0.032	0	0
<sup>147</sup> Pm	1	0.00011	0	0	0	0	0	0
<sup>35</sup> S	8	43.616	5	6.4671	3	4.636	0	0
Total	329	780.89	64	110.258	41	31.443	119	273.383

RADIOACTIVE MATERIALS	12/13	11/12	10/11	09/10	08/09	07/08	06/07	05/06	04/05	03/04	02/03
Orders	329	331	358	311	428	832	776	933	1036	1310	1594
mCi	781	760	662	655	714	1692	1212	1332	1428	1470	1570
Pickups	64	236	275	417	556	548	506	634	725	796	1064
mCi	110	102	162	187	218	355	383	304	503	327	61
Sewer Disposals	41	90	59	89	76	90	98	119	98	148	160
mCi	31	25	11	24	5	14	14	12	12	17	18
Transfers	119	151	119	84	98	33	240	124	66	31	0
mCi	273	543	802	426	324	40	1234	273	149	21	0

## SEALED SOURCES

Case Western Reserve University's sealed source inventory contains 149 sealed sources. Of these, 144 sealed sources are required to be inventoried every six months. Two (2) of the 144 sealed sources are a low-dose irradiators. The low-dose irradiators are not currently in use.

Five (5) sealed sources require six-month leak tests, as stated in our ODH license. This includes 4 gamma sources and 1 neutron source. Three (3) sources are high-level dose irradiators, and two (2) are used to irradiate material with neutrons. There are currently two active Irradiators and one that is in storage. These 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, three (3) sealed sources were disposed, four sealed sources were transferred, and fourteen (14) new sources were received. Two low-dose irradiators are currently not in use.

INVENTORY	12/13	11/12	10/11	09/10	08/09	07/08	06/07	05/06	04/05	03/04	02/03
Sealed Sources	149	142	147	213	211	213	207	168	204	204	171
Exempt	144	134	138	203	201	190	188	154	183	186	158
Irradiator	3	4	4	4	5	4	4	4	3	3	3
Neutron	1	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 \$12,590 in cost saving over the fiscal year in lieu of using outside vendors.

CALIBRATION/ SERVICE	COST PER SERVICE	COST SAVINGS
134 meters	\$80/meter	\$10,720
2 pumps	\$70/pump	\$140
26 thyroid assays	\$55/assay	\$1,430
16 pre-filter changes	\$75/ set of 4/quarterly	\$300
	TOTAL COST SAVINGS	\$12,590

The RSOF calibrated 134 survey meters in the last fiscal year. There were 7 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 changed every 90 days. Both fan units for the walk-in hood have been changed. The fan for compactor needs to be repair and a facilities request has been made. Currently, there are four filters that must be periodically changed for two units:

- Two single filter units for the chemical hood and decay area (located above the DOA office)
- One double filter unit for the walk-in hood (located in DOA Radiation Area)

Two pumps for radioactive materials were calibrated for use in the iodination hoods.

CALIBRATION/ SERVICE	12/13	11/12	10/11	09/10	08/09	07/08	06/07	05/06	04/05	03/04	02/03
Meter Calibration	134	136	121	142	172	170	157	188	233	245	250

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

METER CALIBRATION BY MONTH	12/13	11/12
7/2012	22	10
8/2012	6	14
9/2012	2	1
10/2012	4	8
11/2012	21	21
12/2012	13	7
1/2013	7	10
2/2013	8	14
3/2013	16	7
4/2013	9	13
5/2013	15	15
6/2013	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. Over the last year a trend toward fewer RAM security violations continued.

RAM SECURITY CHECKS	12/13	11/12	10/11	09/10	08/09	07/08	06/07	05/06	04/05	03/04
Violations	7	16	24	71	19	37	54	74	89	104

## 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.

### 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. Two women 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 four 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 two 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>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>	<b>03/04</b>	<b>02/03</b>
Pregnant Workers	2	2	2	1	1	2	2	6	6	13	15
Neutron	4	4	4	4	4	4	0	0	0	0	0
RGE/ X-Ray	30	30	28	45	103	70	38	60	201	160	180
Dental	36	47	34	28	28	28	28	28	28	28	28
General	456	456	448	518	698	665	705	905	1005	970	1030

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 17 Authorized Possessors with equipment in 46 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>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>	<b>03/04</b>	<b>02/03</b>
Diagnostic units Disposed	4	4	3	3	3	4	4	7	3	2	1
Diagnostic units Purchased	3	4	3	3	3	3	4	11	2	1	1

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

<b>RADIATION GENERATING EQUIPMENT (IN USE)</b>	<b>12/13</b>	<b>11/12</b>	<b>10/11</b>	<b>09/10</b>
Closed Beam Analytical	6	6	6	6
Computer Tomography	1	2	1	1
Electron Microscope/ Photoelectron Spectrometer	11	11	11	11
Enclosed System	4	4	4	4
Fluoroscopy	3	2	3	3
Hand-held Dental	2	2	1	1
Intraoral	27	27	27	27
Open Beam Analytical	1	1	1	1
Panoral	1	1	1	1
Particle Accelerator	1	1	1	1
<b>RADIATION GENERATING EQUIPMENT (IN-OPERABLE)</b>				
Closed Beam Analytical	3	3	3	3
Electron Microscope/ Photoelectron Spectrometer	2	2	2	2
Tube Only	26	26	26	26
<b>TOTAL TUBES</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 2012 was filed by December 27, 2012 and the report for January through June 2013 was filed by July 1, 2013. 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 2012 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 no 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 2012-2013, there was one (1) active iodination laboratories. 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 nine (9) 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>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>	<b>03/04</b>	<b>02/03</b>
Total	9	0	0	0	0	0	6	6	7	11	20

<sup>125</sup> I <b>BIOASSAYS</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>	<b>03/04</b>	<b>02/03</b>
RSOF Staff	17	19	24	24	44	44	32	64	67	64	40
Additional	9	0	0	0	0	0	0	7	10	13	20
Total	26	19	24	24	44	44	32	71	77	77	60

## 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 two (2) major and sixteen (16) minor incidents documented over the past year.

<b>INCIDENTS</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>	<b>03/04</b>	<b>02/03</b>
Major	2	0	0	0	0	1	2	0	1	1	5
Minor	16	7	18	17	20	6	7	0	4	8	5
TOTAL	18	7	18	17	20	7	9	0	5	9	10

DATE	INCIDENT	CONTAMINATION	ROOT CAUSE	FOLLOW UP
5/31/2013	Minor Incident	Intrusion Alarm in DOA 990 Rad Waste room	Wrong code entered by new personnel caused alarm. Security did not respond.	Security was contacted about response.
4/18/2013	Major Incident	CO2 dump in DOA 990 RAM waste room – This was a major safety issue, not a major radioactive material spill or exposure. Danger was potentially to staff who could be asphyxiated by carbon dioxide if they did not leave the Facility right away.	HEPA filter plug caused CO2 dump in RAM Waste room. Cleveland Fire met with EHS personnel to check.	ABC fire determined that heat detector stick was defective and needed to be replaced. All 11 heat sticks must be replaced. ABC Fire will review initial work proposal to ensure that all issues are corrected as initially documented in bid proposal.
4/7/2013	Minor Incident	Unauthorized work in RAM room	Contractor completed repair in RAM use room Wood 148 without clearance.	Contamination survey was completed in room and none was found. The Contractor attended Hazard Communication training.
3/25/2013	Minor Incident	Irradiator Access	Irradiator access was hindered due to the biometric reader.	The system was reset.
1/24/2013	Minor Incident	Irradiator Alarm	During fire alarm testing the control for the whole BRB building was shut down which deactivated the magnetic lock for the irradiator.	Building fire alarms were reactivated and the magnetic lock re-engaged. An exemption has been made so that in the event of fire the magnetic lock will remain secured.
12/28/2012	Minor Incident	Unauthorized Access	Electrician entered locked RAM room Millis G31 to check power source. AU did not inform RSOF but told Facility Manager.	The electrician was told not to enter RAM laboratories without clearance & also was required to attend Hazard Communication training. AU reminded to contact RSOF for unauthorized access.
12/3/2013	Minor Incident	Food in laboratory	During inspection of Wood 129 food was found.	The food was disposed and removed from the laboratory and the AU was contacted.
11/30/2012	Minor Incident	Food in laboratory	During inspection of Wood 210A food was found.	The food was disposed and removed from the laboratory and the AU was contacted.
11/28/2012	Minor Incident	Food in laboratory	During an inspection of Wood 210 food was found.	The food was disposed and removed from the laboratory and the AU was contacted.
11/26/2012	Minor Incident	Food in laboratory	During an inspection of Rockefeller 118 food was found.	The food was disposed and removed from the laboratory and the AU was contacted.
11/20/2012	Minor Incident	Badge exposure	The worker and AU were notified of high shallow exposure.	The worker had left the laboratory and most likely left his badge in the RAM laboratory.
11/19/2012	Minor Incident	Food in laboratory	During inspection of BRB 339 food was found.	The food was disposed and removed from the laboratory and the AU was contacted.

11/6/2012	Minor Incident	Smoke detector alarm	Smoke detector alarm sounded inside of Wood 317D which is a RAM room that houses a centrifuge.	The centrifuge was shut down and the vendor was called for service.
01/12/2012	Minor Incident	Broken leaded glass window on entry door	Window in door broke from collision with wall hook upon entry.	Glass replaced and door stop installed to prevent contact.
10/1/2012	Minor Incident	Food in laboratory	During the decommissioning of Wood 303 food was found.	The food was disposed and removed from the laboratory and the AU was contacted.
9/18/2012	Minor Incident	Unauthorized RAM area	32P contamination discovered in Wood 122 (Cold Room)	AU was contacted and instructed to remove bench paper, resurvey and provide map and legend of area before posting as RAM use area.
7/16/2012	Major Incident	Waste & record Loss – This was a major programmatic excursion not a major loss of radioactive material.	26Al Waste and records in White 403 were accidentally disposed during cleanup.	This waste was below background levels at the time of accidental disposal. RAM inventory removed immediately and stored at EHS until documentation and training of all personnel complete.
7/10/2012	Minor Incident	Irradiator Alarm	Card reader malfunction would not allow entry into room.	Card reader rebooted and normal function restored. Room secured the entire time.
7/3/2012	Minor Incident	Irradiator Alarm	Door open too long. Security did not respond.	Security did not receive signal due to delay to allow door to close before full alarm.

## 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:

- Radiation Generating Equipment (RGE)
- Basic Radiation Safety Tips
- Surveying Radioactive Packages
- Duties of Laser Supervisor
- Dosimetry

## LASER SAFETY PROGRAM

There are a total of 133 lasers/laser systems noted in our database for the campus for 45 Laser PIs in 15 buildings (37 Active and 8 Inactive). Three units are portable where a temporary posting would be applied when used. There are currently 186 active users of lasers in 45

laboratories. This includes 23 laboratories in the class 1-3A/3R groups and 25 laboratories in the class 3B-4 groups. The lasers of greatest concern are those labeled Class 3B and Class 4. There are 56 Class 4 lasers (32 active and 24 inactive), 28 Class 3B lasers (23 active and 45 inactive), and 46 lasers in the other classes of 1, 2, and 3A/3R.

There are 17 class 3B/4 enclosed laser systems that are considered eye-safe under normal use thus decreasing the hazard to the user. Forty-five (45) audits were performed during this fiscal year.

There were no Laser incidents reported this year.

TA new Laser online retraining Power Point update is in progress. A question pool is being generated and the presentation will be incorporated into the campus Black Board system by the end of August 2013. 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 is being developed and will address eye safe laser and laser system use on campus.

## **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 126 pieces of equipment that needed clearances.

## **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, 2012 - JUNE 30, 2013

	GENERATED 7/1/2012- 6/30/2013	DISPOSED: HAZ. WASTE SVCS.	DISPOSED: SEWER	DISPOSED: CHEMICAL SAFETY	DISPOSED: ADCO	IN STORAGE AS OF 6/30/2013
Short-Lived Dry	26	20*	0	0	2	31
Long-Lived Dry	16	0	0	0	16	0
Scintillation Vials	10	0	0	0	10	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	20	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 (\*) denotes the number of drums generated prior to July 1, 2012, kept for decay in storage, and disposed during the period of July 1, 2012–June 30, 2013. 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. There were 20 drums of dry waste surveyed and disposed during 2012-2013 fiscal year at a cost of \$420. 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 \$10,000. Thus, the indirect savings to researchers due to the decay in storage program was \$9,580.

WASTE GENERATION	12/13	11/12	10/11	09/10	08/09	07/08	06/07	05/06	04/05	03/04	02/03
Short-Lived Dry	26	25	25	87	95	91	85	72	66	63	66
Long-Lived Dry	16	10	11	25	50	35	20	25	28	31	26
Scintillation Vials	10	8	7	12	30	25	30	47	44	45	39
Animals	0.5	0.35	0.25	0	1	2	4	3	2	1	3
Long-Lived Sewer	20	17	11.5	60	50	38	35	46	55	60	50
Long-Lived Non-Sewer	0	55	91	120	80	20	5	15	5	0	0
Short-Lived Sewer	20	18.5	21.5	65	50	140	135	125	115	80	76
Short-Lived Non-Sewer	0	1	3	10	20	25	30	20	35	75	85

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.

### 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 if and when their funds do not allow them 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 2012-2013 in lieu of waste disposal.

## **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 2012 and between March and June 2013. This effort resulted in the review of more than 170 files, in the program areas listed above.

## **RSC TRI-ANNUAL AUDITS FOR 2012-2013**

### RSC AUDIT COMMENT:

**In October 2012**, the Radiation Safety Committee Members conducted a tri-annual audit of the following components of the Radiation Safety Office:

- Radiation Survey Meters
- Room Surveys
- Bioassays
- Radiation Website
- Direct Package Receipt
- Semi-Annual Mailings (Air/Sewer Inventory)

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.

### RADIATION SURVEY METERS

Compliant calibration of survey meters was audited on October 25, 2012. Ten (10) files were examined by Dr. Croniger who noted one (1) meter that was due for calibration. The RSOF was notified of the need for calibration and it was completed on 11/2/2012.

#### RSOF RESPONSE

The meter was calibrated promptly.

### ROOM SURVEYS

An audit was performed on 10/25/2012 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 deficiencies from the decommissioned files.

#### RSOF RESPONSE

No response required.

### BIOASSAYS

An audit was performed to verify completion of bioassays for laboratories using >10mCi of  $^3\text{H}$  and/or 1mCi  $^{125}\text{I}$  on 10/30/2012. Dr. Jankowsky noted that no bioassays had been performed for this period.

#### RSOF RESPONSE

No response required.

### RADIATION WEBSITE

The website for the RSOF was audited on 11/15/2012 to ensure proper operation, access and current links were operational. Dr. Devireddy reports that the web pages and links as well as the Forms and Manuals pages were all operational.

#### RSOF RESPONSE

No response required.

### DIRECT PACKAGE PICKUP

Dr. Coller audited 10 files 10/25/2012 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 1 deficiency which was corrected on 11/1/2012.

#### RSOF RESPONSE

The deficiency was corrected during the audit.



### SEMI-ANNUAL MAILINGS (AIR/SEWER INVENTORY)

An audit of the air/sewer disposal inventory was performed on 10/25/2012. Ten (10) files were reviewed by Dr. Valadkhan who noted 1 deficiency. One record was out of date (overdue). The PI was informed to submit his inventory and the deficiency was corrected.

#### RSOF RESPONSE

The inventory was received promptly.

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

- Correspondence Between Isotope Orders, AU possession limits, and the Helix database
- Incident Reports
- Radioisotope security checks
- Licensing Status
- Compliance
- Valid RAM Applications
- Ancillary Staff Training
- Waste Disposal Facilities
- Dosimetry Program
- Room Surveys
- Licensing Status
- Radiation Generating Equipment (RGE) Inventory and Training
- AU and Worker Training
- Sealed Source Leak Tests
- Laser Program
- Irradiator Program

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.

### CORRESPONDENCE BETWEEN ISOTOPE ORDERS, AU POSSESSION LIMITS, AND THE ONSITE DATABASE

Dr. McCormick audited 10 files 4/17/2013 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 Onsite Database. Dr. McCormick noted two (2) deficiencies, in one case an order was logged under a different AU and in another instance a possession limit was incorrectly entered into the database. Both deficiencies were corrected.

#### RSOF RESPONSE

Minor corrections were made in the database promptly.

### INCIDENT REPORTS

A review of incident reports was performed on 4/17/2013 by Dr. McCormick for verification and documentation of follow-up by the RSOF. During this quarterly report there were a total of 3 incidents reported. All incidents were effectively resolved in a timely manner.

#### RSOF RESPONSE

No response required.

#### RADIOISOTOPE SECURITY CHECKS

Verification and documentation of radioisotope security checks was audited on 2/20/2013 by Dr. Schiemann who reports that no security checks were generated during this period.

#### RSOF RESPONSE

No response required.

#### LICENSING STATUS

A quarterly audit was conducted on 2/20/2013 to verify the licensing status of all ODH licenses and registrations. 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.

#### COMPLIANCE

Compliance review audits were performed on 2/20/2013 to ensure that any non-compliance issues were appropriately resolved. Upon examination of 10 files Dr. McCormick noted no deficiencies.

#### RSOF RESPONSE:

No response required.

#### VALID RAM APPLICATIONS

RAM applications were audited on 2/20/2013 to verify that the applications were complete and valid. Dr. McCormick audited 10 files and reported five (5) deficiencies. Three inventory updates were necessary, one meter recalibration and one possession limit were noted to be corrected. Four of the noted deficiencies were corrected as noted. One PI's outstanding inventory will be corrected in the next update of inventory report.

#### RSOF RESPONSE:

All applications were updated with the necessary information promptly following the audit.

#### ANCILLARY STAFF TRAINING

An audit was conducted on 3/1/2013 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. Dr. Devireddy examined 10 files and noted no deficiencies.

RSOF RESPONSE:

No response required.

WASTE DISPOSAL FACILITIES

The waste disposal facilities (DOA990/Wolstein) and RSOF Laboratory were inspected 2/20/2013. 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.

DOSIMETRY

An audit of Current Dose records held by the RSOF was performed on 2/20/2013 to verify that AU laboratory workers were current in dose record and active radiation badges. Dr. Valadkhan audited 5 records and reported no deficiencies.

RSOF RESPONSE:

No response required.

ROOM SURVEYS

An audit was performed on 2/20/2013 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 1 deficiency from the decommissioned files. One AU's inactive status needed to be entered into the database. This deficiency was corrected.

RSOF RESPONSE:

The database was updated promptly following the audit.

LICENSING STATUS

An audit was conducted to verify the licensing status of all ODH licenses and registrations on 2/20/2013. 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.

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

Quarterly inventory status and equipment surveys were examined by Dr. Croniger who examined 10 files on 2/20/2013. Dr. Croniger noted no deficiencies in quarterly inventory reports.

#### RSOF RESPONSE:

No response required.

### AU AND WORKER TRAINING

Authorized users and worker training files were audited on 3/1/2013. Dr. Devireddy examined 50 records and noted 10 workers that were overdue for radiation safety training. Overdue workers were notified of their training status, two workers have left the University.

#### RSOF RESPONSE:

Training was completed by the workers promptly following the audit.

### SEALED SOURCE LEAK TESTS

Files verifying that sealed sources had been leak tested were audited on 2/20/2013. Ten (10) files were examined by Dr. Croniger who reported no deficiencies for the report period.

#### RSOF RESPONSE:

No response required.

### LASER PROGRAM

The laser program was audited by Dr. Jankowsky on 2/20/2013 for accuracy regarding laser inspections, inventory and status of personnel training. Five (5) files were audited. Two deficiencies were noted in AU status. Each deficiency was corrected.

#### RSOF RESPONSE:

Both issues were promptly corrected following the audit.

### IRRADIATOR PROGRAM

An audit of the Irradiator Information Files was performed by Dr. Jankowsky on 2/20/2013 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. Three irradiator workers were not compliant for training. These workers were subsequently retrained.

#### RSOF RESPONSE:

These issues were promptly corrected following the audit.

RSC AUDIT COMMENT:

**The RSC did not conduct a third trimester audit during May 2013.**

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 2013. 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, 2012- June 30, 2013. Dr. Devireddy examined 35 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, 2012-June 30, 2013. Dr. Devireddy examined 35 records and noted 4 workers that were overdue for radiation safety training. Dr. Devireddy further reported a lack of training information for three workers not found in the database (PI name not on file). Overdue workers were notified of their training status.

### RSOF RESPONSE:

The overdue workers were contacted. Active workers updated their training promptly. Some had either left CASE or were no longer working in a Radiation Laboratory. The database was updated to reflect these changes.

## 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, 2012-June 30, 2013. Dr. Jankowsky noted 8 bioassays had been performed for this period. All of the Bioassays were associated with one AU 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. McCormick noted that 8 files indicated Overdue Training issues, 3 files indicated delinquent Storage Issues, and 4 files indicated overdue surveys for laboratories. Overdue personnel for training were notified, as were the PI of all other laboratories with noted deficiencies.

### RSOF RESPONSE

Most compliance reviews have various minor deficiencies that are corrected during and after the review. These deficiencies include past due training, past due meter calibration, as well as other incomplete room surveys. Laboratories very rarely have repeat deficiencies. All noted deficiencies were corrected in a timely fashion and will be verified noted at the next compliance review.

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

### RSC AUDIT COMMENT:

Dr. Collier audited 50 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, 2012-June 30, 2013. Dr. Valadkhan audited 50 records and reported 10 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

The noted files were corrected promptly following the audit.

INCIDENT REPORTS

RSC AUDIT COMMENT:

A review of monthly incident reports From July 1, 2012-June 30, 2013 was performed by Dr. Collier for verification and documentation of follow-up by the RSOF. During this period there were a total of 17 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, and that any compliance issues were appropriately followed up and pending issues corrected. Four Irradiators were active on campus and each file was up-to-date and compliant.

RSOF RESPONSE

No response required.

LASER PROGRAM REVIEW

The laser program was audited by Dr. Jankowsky for accuracy regarding laser inspections, inventory and status of personnel training. Forty-seven (47) files were audited. Laboratories that contained no files for equipment indicated 4 deficiencies and laboratories that had personnel that had not been trained indicated 7 workers due for training. Continuing improvement in compliance in the laser program is noted.

RSOF RESPONSE:

The Laser Program is a new program continues to improve through review of equipment inventory and personnel training for currency and accuracy. The files were corrected promptly following the audit.

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, 2012-June 30, 2013. 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.

RADIOISOTOPE SECURITY CHECKS

RSC AUDIT COMMENT:

Verification and documentation of radioisotope security checks were performed for the period July 1, 2012- June 30, 2013. Dr. Schiemann reports that 5 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. Croniger who examined 40 files for the period July 1, 2012- June 30, 2013. Dr. Croniger noted no deficiencies in quarterly inventory reports and three (3) equipment surveys) that were due. The AU was notified to provide the equipment survey. Dr. Croniger also noted that six individuals in the database were listed as due for training were actually compliant and that the database was incorrect. The database was corrected for these individuals training records.

RSOF RESPONSE:

The database was corrected promptly following the audit.

RADIATION SURVEY METERS

RSC AUDIT COMMENT:



Compliant calibration of survey meters was audited for the period July 1, 2012- June 30, 2013. Fifty (50) files were examined by Dr. Croniger who noted four (4) 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. Dr. Devireddy reports that the Homepage, Training pages and 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. Dr. Schiemann examined 50 files and noted 9 deficiencies from the decommissioned files. Dr. Schiemann recommends that the decommissioned database needs to be updated to facilitate cross referencing of the laboratory with current status. The RSOF has been notified of Dr. Schiemann's recommendations.

**RSOF RESPONSE**

We are in the midst of adding this feature to the database for tracking of those rooms that have been decommissioned.

**SEALED SOURCE LEAK TEST**

**RSC AUDIT COMMENT:**

Files verifying that sealed sources had been leak tested were audited for the period of July 1, 2012- June 30, 2013. Forty-four (44) files were examined by Dr. Croniger who reported no deficiencies for the report period.

**RSOF RESPONSE:**

No response required.

**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, 2012- June 30, 2013. Dr. Collier examined 24 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, 2012- June 30, 2013. Forty-seven (47) files were reviewed by Dr. Valadkhan who noted 3 deficiencies. Three AU's records were out of date (overdue). The PIs were informed to submit their inventories.

RSOF RESPONSE:

The inventories were received promptly following the audit.

VALID RAM APPLICATION

RSC AUDIT COMMENT:

RAM applications were audited for the period July 1, 2012- June 30, 2013 to verify that the applications were complete and valid. Dr. McCormick audited 43 files and reported no deficiencies. Two applicants were noted to be in Storage mode and one PI was in the process of updating her application.

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, 2012- June 30, 2013. 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.

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. Thirteen (13) RAM Applications were updated this fiscal year. During 7/2011-6/2012, nine (9) RAM Applications were updated and from 7/2010-6/2011, twelve (12) RAM Applications were updated.

Continuous Air Monitoring (CAM) Audit – 125I air monitoring has been checked since 1992 using the CAM. The total 125I release has been 0.00uCi since 9/2007. In 10/2008, the filter change out for the CAM was decreased from two times per month to once per month due to the decrease of 125I air monitoring for the DOA 990 waste room. The CAM was turned on in the DOA 990 waste area due to two CO2 dumps in a span of 6 months. The CAM is repaired and upgraded for reimplementation in the DOA 990 waste facility in late 2012.

Bioassay Audit – The Bioassay Program is audited monthly to document the use of any volatile or non-volatile 125I. 125I Bioassays are completed quarterly to correspond with badge exchange. There have been no documented 125I uptakes by the Radiation Safety staff as evidenced by monthly bioassay records that have been kept by our office for the past 20 years. Volatile 125I experiments resumed and the monthly bioassay frequency and the twice per month change-out of the filter in DOA was reinstated.

Clearances Audit – Radiation equipment clearances are done on an as needed basis. One hundred twenty-six (126) clearances were completed this fiscal year for items that were relocated or disposed.

Incidents Audit – There were thirteen (13) radiation incidents for 2012 and five (5) radiation incidents recorded for the 2013 as of June 30, 2013.

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 9/2/2013 and reviewed by Dr. David Sedwick. It covers fiscal years 7/1/2012-6/30/2013.

## APPENDIX

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

### **RADIATION ACTIVE**

Ronald Conlon (11/2012) Michael Maguire (5/2013)

### **STORAGE MODE**

Cheng-Kui Qu (9/2012) Robert Petersen (9/2012) Alan Levine (9/2012)  
Youwei Zhang (11/2012) David Danielpour (6/2013) James McGuffin-Cawley (6/2013)

### **RADIATION INACTIVE**

Paul MacDonald (7/2012) Menachem Shoham (8/2012) Stanton Gerson (9/2012)  
Qingzhong Kong (11/2012) Paul Ernsberger (1/2013) John Prologo (1/2013)

### **DEPARTED**

Anthony Berdis (7/2012) Kenneth Cooke (4/2013)  
Margaret Chandler (4/2013)

## **X-RAY AUTHORIZED POSSESSOR LIST**

### **AP NAME**

Amir Avishai  
Chris Dealwis  
Gary Chottiner  
Liming Dai  
Jean Iannadrea  
Hisashi Fujioka  
Edward Greenfield  
Arthur Heuer  
Mukesh Jain  
Lashanda Korley  
Zhenghong Lee  
Gerald Matisoff  
Raymond Muzic  
John Protasiewicz  
Daniel Scherson  
Kenneth Singer  
Derek Taylor

### **CONTACT PERSON**

Wayne Jennings  
Tian Meijuan  
Gary Chottiner  
Enoch Nagelli  
Susan Opsitnick  
Midori Hitomi  
Teresa Pizzuto  
Wayne Jennings  
Steve Schomisch  
LaShanda Korley  
Chris Flask  
Gerald Matisoff  
Chris Flask  
John Protasiewicz  
Nikola Matic  
Ina Martin  
Heather Holdaway

## **LASER USERS**

Rigoberto Advincula	Iwan Alexander	Mary Barkley (Inactive)
Jesse Berezovsky	Tracey Bonfield	Robert Brown
Clemens Burda	Paul Carey	Patty Conrad
Kevin Cooper (Inactive)	Corbin Covault (Inactive)	Carlos Crespo
Liming Dai	David Dean	Diana Driscoll
James Drake	Jeffrey Duerk (Inactive)	Dominique Durand
Steven Eppell	Philip Feng	Roger French
Maryann Fitzmaurice (Inactive)	Jeffrey Garvin	Alex Huang
Yoshikazu Imanishi	Hatsuo Ishida	James Jacobberger
Alexander Jamieson	Eckhard Jankowsky (Inactive)	Jaikrishnan R. Kadambi
Yasuhiro Kamotani	Kathleen Kash (Inactive)	Melissa Knothe Tate (Left CASE)
Jack Koenig	LaShanda Korley (Inactive)	Jay Adin Mann
Roger Marchant	Michael Martens	Heidi Martin (Inactive)
Thomas McCormick/Minh Lam	Edward Medof (Inactive)	Claudia Mizutani
Wyatt Newman (Inactive)	Nancy Oleinick	Roger Quinn
Sayed Qutubuddin (Inactive)	Rajesh Ramachandran	Andrew Rollins
Charles Rosenblatt	John Ruhl	Shasta Sabo
Daniel Scherson	David Schiraldi	David Schwam
W. David Sedwick (Inactive)	Alp Sehirlioglu	Jie Shan
Kenneth D. Singer	Giuseppe Strangi	Benjamin Strowbridge
Dustin Tyler		