

**CASE WESTERN RESERVE UNIVERSITY  
DEPARTMENT OF OCCUPATIONAL &  
ENVIRONMENTAL SAFETY (DOES)  
RADIATION SAFETY  
ANNUAL REPORT 2006-2007**

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# RADIATION SAFETY ANNUAL REPORT 2006-2007

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# **RADIATION SAFETY ANNUAL REPORT 2006-2007**

## **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. This report summarizes the activities of the Radiation Safety Office (RSOF) of the Department of Occupational & Environmental Safety (DOES) at Case Western Reserve University. Its contents cover the period from July 1, 2006 through June 30, 2007.

## **IN MEMORIUM**

The Radiation Safety Committee and the Radiation Safety Office sadly note the recent death of Professor Helen Evans. Dr. Evans was a pioneering woman in science, an outstanding researcher in radiation biology, and a tireless worker on for a very large number of University and National Committees. She was recognized worldwide for her expertise in radiation biophysics and approaches to study of its biological effects. Dr. Evans was also an important contributing member of the Radiation Safety Committee for more than 30 years. Dr. Evans will be missed as a dear friend, an outstanding expert in her field, and a resource we all counted on for radiation safety advice.

## **APPRECIATION**

Dr. David Danielpour will be resigning as Chairman of the Radiation Safety Committee at the end of calendar year. The RSOF thanks Dr. Danielpour for his outstanding and meticulous stewardship of the University's radiation safety programs for the last 5 years. While we will miss Dr. Danielpour's guidance, the University's radiation safety programs will remain in good stewardship when Dr. Anthony Berdis, an experienced committee member, assumes the chairman's role. Drs. Berdis and Danielpour will work together to revise the Radiation Safety Committee guidelines before the end of 2007.

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## **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.

<b>ODH LICENSE</b>	<b>EXPIRATION DATE</b>	<b>PURPOSE</b>
011-011800-11	January 1, 2010	Broadscope License
09-M-06944-12	May 31, 2008	Radiation-Generating Equipment Registration
0849-34-07	December 31, 2007	South Carolina Radioactive Waste Transport Permit

No inspections of the Broadscope licensed program by regulatory agencies were conducted in 2006-2007.

The Radiation-Generating Equipment (RGE) License was inspected March 7-23, 2006 by the ODH. Two violations were found during the routine inspection and were resolved with no financial penalty.

## **DECOMMISSIONING FUNDING PLAN**

The Broadscope License and its attendant Decommissioning Funding Plan were updated and became effective March 15, 2005. The Standby Letter of Credit carried by the University for this plan was decreased by more than 40% to \$288,000, consistent with radioactive materials currently located at the University.

## **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
- University Circle Research Center II (UCRC II), 11001 Cedar Avenue, Cleveland, OH
- Wolstein Research Building, 2103 Cornell Road, Cleveland, OH

Radioactive material is received and stored at the following sites:

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- Shipping and Receiving, 2232 Circle Drive, Cleveland, OH
- Cedar Service Center, 10620 Cedar Avenue, Cleveland, OH
- Wolstein Research Building, 2103 Cornell Road, Cleveland, OH

## PURPOSE FOR RADIOACTIVE MATERIAL (RAM) USE

The majority of isotope use on campus 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  $^{137}\text{Cs}$ ,  $^{133}\text{Ba}$ ,  $^{192}\text{Ir}$  and  $^{241}\text{Am}$ . Five (5) licensed high activity radiation sources are currently used for biomedical and other research. These include a  $^{241}\text{Am-Be}$  Neutron source and four irradiators that contain  $^{60}\text{Co}$  or  $^{137}\text{Cs}$  sources. One irradiator is out of service due to building renovation.

IRRADIATOR	06/07	05/06	04/05	03/04	02/03
Workers Trained	14	17	18	5	2
Total Irradiators	4	4	3	3	3

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## RADIATION SAFETY PROGRAM - RESPONSIBLE PARTIES

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

The Radiation Safety Committee assists the President and the University by monitoring and enforcing compliance with the University's Radiation Safety Program as outlined in its 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 2006-2007 Radiation Safety Committee membership and their affiliations are listed below. The President of the University must approve changes to the voting membership. 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. David Danielpour Dept. of Medicine Wolstein 3532 Term Expires: 12/31/2007 Chairperson: 12/31/2007	Dr. Duna Massillon Dept. of Nutrition Research Tower 609 Term Expires: 9/1/2008 Left Case Western Reserve University: 6/2007	Dr. Monica Montano Dept. of Pharmacology HG Wood 367 Term Expires: 9/1/2008
Dr. James Bruzik Dept. of RNA Molecular Biology/ Biochemistry HG Wood 103 Term Expires: 9/1/2008	Dr. Anthony Berdis Dept. of Pharmacology HG Wood 343 Term Expires: 1/1/2008	Dr. Thomas McCormick Dept. of Dermatology BRB 530 Term Expires: 9/1/2008
Dr. Zhenghong Lee Dept. of Radiation Oncology Bishop S109B Term Expires: 9/1/2007	Dr. Helen Evans Dept. of Radiology Oncology BRB 347A Term Expires: 9/22/2007 Retired: 10/2006	Dr. Eckhard Jankowsky Dept. of Biochemistry HG Wood 447 Term Expires: 1/1/2008
Dr. W. David Sedwick RSO Dept. of Medicine DOES Service Building, 1 <sup>st</sup> Floor		Dr. Virgil Muresan Dept. of Physiology and Biophysics Med East- Robbins 535 Term Expires: 9/1/2008 Left Case Western Reserve University: 4/2007

### EX-OFFICIO MEMBERS

Kenneth Basch	Karen Janiga	Felice T. Porter
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Vice President of Campus Planning and Operations Adelbert 329	Assistant RSO DOES Service Building, 1 <sup>st</sup> Floor	Quality Assurance Specialist DOES Service Building, 1 <sup>st</sup> Floor
Kevin Wunderle Assistant RSO University Hospitals Case Medical Center Bishop S611		

## SUPPORT STAFF

Shirley Mele Office Supervisor Service Building, 1 <sup>st</sup> Floor	Gwendolyn Cox-Johnson Department Assistant Service Building, 1 <sup>st</sup> Floor
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The Radiation Safety Committee acts as an advisory and enforcement body to ensure that radioactive materials are safely used in accordance with ALARA (As Low As Reasonably Achievable) principles. The Committee conducts audits trimesterly, 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 for all classes of workers.
- RSC familiarity with the daily function of the RSOF to improve its oversight responsibilities.

The Committee met on nine occasions during the 2006-07 fiscal year to review applications for radioisotope use and act on other business. The minutes of the RSC meetings and Executive Committee actions are available in the RSOF, through the RSC, or through the University Administration.

APPLICATIONS	06/07	05/06	04/05	03/04	02/03
New AU	15	11	8	3	8
Additional Isotopes	7	6	10	2	13
Radioisotope use in Animals	6	5	7	4	4
Sealed Sources	1	6	1	1	2
AU Reactivation	0	1	0	1	0
Possession Limit Increase	1	0	1	0	0
AU Protocol Update	0	0	3	0	0
TOTAL APPROVALS	30	29	30	11	27

## **SENIOR MANAGEMENT**

The Radiation Safety Program is designed to monitor, inspect, and/or audit activities of the AUs and their personnel. Senior management oversight is assured by attendance of the Vice President for Campus Planning and

## **RADIATION SAFETY ANNUAL REPORT 2006-2007**

Operations at all Radiation Safety Committee (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.

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

A shared responsibility for safety exists between the RSOF and the AU. 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.



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## ADMINISTRATIVE CONTROLS

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

The General Safety Compliance Enforcement Policy prescribes sanctions for those who jeopardize safety or the continued favorable relationship between the University and the Ohio Department of Health. It is 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 include the following:

- Improper Laboratory Records
- Improper RAM Use and Storage
- Improper Laboratory Environment/ General Safety

Moderate Severity include the following:

- Food/ Cosmetics in Laboratory
- RAM Unsecured
- RAM in Unauthorized Areas
- Unapproved Move
- Unapproved Disposal
- Unidentified Contamination
- Failure to respond to written notice

Major Severity include the following:

- Falsification of records
- Loss or theft unreported
- Unapproved transfer

<b>VIOLATIONS</b>	<b>2006/7</b>
Minor	57
Moderate	11
Major	1
Total	69

The Assistant RSO along with the RSOF staff and RSO have updated and revised most of the Departments manuals, training, licenses, certificates, and standard operating procedures in 2006-2007.

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## **AU CATEGORIES:**

### **RADIATION ACTIVE (RA)**

These AUs actively use RAM. 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 ACTIVE & RADIATION GENERATING EQUIPMENT/ X-RAY (RX)**

These AUs actively use RAM and X-Ray equipment.

### **RADIATION GENERATING EQUIPMENT/ X-RAY (X)**

These AUs actively use X-Ray Equipment only.

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

These AUs do not currently use RAM and do not possess radioactive materials; and were consequently placed in the Radiation Inactive status this fiscal year.

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

AUs not actively using RAM for a period of at least 6 months, but who wish to maintain their RAM inventory, may request to be placed in storage mode status.

### **DEPARTED (D)**

These AUs no longer carry out research at Case Western Reserve University and their laboratories have been decommissioned.

<b>AUs</b>	<b>06/07</b>	<b>05/06</b>	<b>04/05</b>	<b>03/04</b>
RA	113	124	116	123
RX	0	2	3	1
X	22	23	27	27
RI	8	12	2	7
SM	6	4	9	8
D	12	11	12	12

## **MASTER ISOTOPE LIST**

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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.

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## RADIATION SAFETY OFFICE (RSOF)

### STAFFING

The RSOF operates under University approval with the following positions:

RSO (1)	Assistant RSO (1)
Specialist Positions (4)	Department Administrator (1)
Department Assistant (1)	2 <sup>nd</sup> Shift Specialist (1)
Quality Assurance Specialist (1)	Student (1)
Analyst Programmer (1)	

Three staff members in the Specialist Position of the RSOF left Case Western Reserve University during this fiscal year.

Training and education are central to our Departmental philosophy of developing diverse skills to respond to safety incidents and regulatory mandates.

Specialists are encouraged to attend training and continuing education. Seminars, training, and conferences attended in 2006-2007 included RCRA Hazardous Materials Manager 8-hour Refresher training, HAZWOPER 8-hour, National Incident Command System (ICS)/National Incident Management System (NIMS) FEMA Certification 8-hour, and DOT Hazardous Materials Shipment Refresher Training, State of Ohio Licensed Lead Inspector and Risk Assessor, OSHA 10-Hour Outreach Program, and The Essentials of OSHA Compliance.

One member of the Radiation Safety Staff is responsible for maintaining the DOES home page that houses all on-line departmental training programs and schedules, safety manuals, safety newsletters, MSDSs, and safety information resources. The home page 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.

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## **EMAIL HOT-LINE**

Since implementing the “hotline” the number of inquiries and safety concerns raised by Case Western Reserve University personnel has averaged ten emails per day. This email communication has led to swift response and follow-up of safety concerns reported by our user community.

## **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

A Faculty member who uses RAM is called an Authorized User.

### 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

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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 that uses RGE under the supervision of an AU.

## IRRADIATOR USERS

Personnel using irradiators are required to attend initial training conducted by the RSOF and site-specific training with the manager of the irradiator.

## 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	34	297	695
Ancillary	4	402	0
X-Ray	12	64	N/A
Laser	8	56	10
RTK (Right to Know)	1	1	0
RTK Fluoroscopy	2	2	0
ARC (Animal Research Center)	3	45	0
Shipping	3	13	0
Protective Services	1	42	0
Custodial	3	152	0
Irradiator	0	14	0

Both new isotope user training and retraining classes are offered at least three times per month. X-Ray training classes are conducted on an as-needed basis. AUs are responsible for machine and performance-specific annual refresher training for workers who use X-Ray equipment in their laboratory programs. 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 which is offered on-line.

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All non-laboratory personnel are required to attend Hazard Communication training, which incorporates radiation safety training. ARC, Security, Shipping/Receiving, and Custodial departments use a safety orientation DVD, allowing supervisors to train staff at shift changes, thereby greatly increasing training compliance. Employees who do not complete training are restricted from working in areas where radioactive materials are used.

Training	06/07	05/06	04/05	03/04	02/03
Radiation	297	284	284	283	322
Retraining	0	0	0	0	11
Online Retraining	695	724	775	793	754
X-Ray	64	51	74	45	84
Ancillary	402	413	356	448	540
Laser	56	31	116	0	0
Laser Online	10	11	0	0	0
Irradiator	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
Glennan	Hanna Pavilion	HG Wood
Kent Hale Smith	Med East	Millis
Olin	Pathology	RBC
Rockefeller	Service	Wearn
White	Wickenden	UCRC II
Wood Research Tower	Lerner Tower	Wolstein Research

## LABORATORIES

There are approximately 281 radiation 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.

## Radiation Safety Office (RSOF)

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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).

Up-to-date hardware is crucial to ensure efficient and quick access to records in the RSOF. To this end, one additional Macintosh computer was dedicated to the Radiation Safety Program. 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.

The Legato backup service was set up on all personal computers (PCs). The Carbonite backup service was used for the DOES Server. A Website backup was started to ensure that key files could be replaced.

The following maintenance was accomplished this fiscal year:

### Hardware Maintenance

- Set up new PCs
- Switched hard drives on computer that uses the Landauer Program

### Software Maintenance

- Set up new user accounts for secure server access for DOES personnel
- Helix backup protocol written, moving backups to a more secure location

The Department of Occupational and Environmental Safety has transitioned to the use of Employee ID number in lieu of Social Security Numbers in its training program. The main DOES server was compromised by a hacking attack in December 2006. The system was restored with an operating system with stronger security measures. A representative from the Case Western Reserve University Information Technology Security Department was able to verify that no data had been leaked during the period when the system was affected.

### 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



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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 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 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 spills.

### IODINATION EQUIPMENT

Special hoods, air pumps and activated charcoal-filter exhaust are placed in laboratories that conduct iodinations. Currently one laboratory is able to perform iodinations. Four iodination hoods are in storage. Their locations are as follows:

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Med East 564 – Active (1)

WRB 1119 - Rad Waste Facility Storage (2)  
DOA 990 – Storage (2)

## ANIMAL RESOURCE CENTER (ARC)

Conventional animal care facilities are located in the Medical School East Building (Robbins), Wearn Building, 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, ferrets & large animals such as sheep, dogs, pigs) are housed in the Medical School East (Robbins) facility. The Wearn and Wolstein facilities predominantly house mice and rats. Contaminated items are stored in the ARC freezer in Medical School East (Robbins) until disposal. Animal studies involving radioactive materials are not conducted in the Wolstein facility. The Medical School East (Robbins) facility is currently undergoing major renovation, which will be completed in 2008.

## 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.

Liquid Scintillation Counter (LSC) and Packard Auto Gamma Minaxi 500 Counter calibrations are conducted weekly for the DOES Radiation Laboratory and as needed for the LSC in both DOA 990 and WRB 1119. The continuous air monitor (CAM) in DOA 990 was repaired and recalibrated. The LSCs in the Radiation Laboratory and in DOA 990 were serviced and cleaned. Also a new quench curve was set up on the Radiation Laboratory LSC for researcher use.

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## **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 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 240 isotope transfers approved this year, for a total of 1.233 Ci.

### **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. 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 University Ohio Department of Health (ODH) Broadscope License requires that shipments be surveyed within three hours of arrival. In the past year, 776 isotope shipments (totaling 1.212 Curies) were inspected and approved by the RSOF after receipt on the campus.

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## DISPOSAL OF RADIOACTIVE MATERIALS

Excluding decay of isotope in laboratories and minor inventory changes, isotopes were removed from laboratories either by 506 isotope waste pickups by RSOF staff (382.81 mCi) or by 98 AU-directed disposals into the sanitary sewers (13.58 mCi). The following table presents a tabulated breakdown by isotope of radioactive materials entering and leaving laboratories.

Isotope	Orders		Waste Pickups		Sewer Disposals		Transfers	
	#	mCi	#	mCi	#	mCi	#	mCi
<sup>11</sup> C	0	0	0	0	0	0	23	109.95
<sup>14</sup> C	32	19.36	65	8.537	7	1.818	8	45.56
<sup>45</sup> Ca	4	7.0	15	2.140	2	0.043		
<sup>36</sup> Cl	0	0					0	0
<sup>57</sup> Co	0	0	3	0.225				
<sup>51</sup> Cr	4	4.00	5	0.381	2	0.619		
<sup>137</sup> Cs	0	0			2	0.033		
<sup>18</sup> F	0	0	1	0.007	0	0	137	890.40
<sup>55</sup> Fe	1	5.0			1	0.01		
<sup>59</sup> Fe	4	3.00	13	2.920	1	0.02		
<sup>3</sup> H	39	66.072	132	116.54	20	4.453	13	126.91
<sup>125</sup> I	8	1.999	11	0.971	4	0.055	9	3.872
<sup>111</sup> In	0	0	1	0.02	0	0	10	25.30
MXD	0	0	1	0.00031				
<sup>54</sup> Mn	0	0	6	0.12				
<sup>22</sup> Na	0	0	0	0				
<sup>63</sup> Ni	3	4.035	25	4.69				
<sup>32</sup> P	585	850.105	164	109.816	47	5.553	25	6.486
<sup>33</sup> P	24	7.295	6	1.769	7	0.656		
<sup>86</sup> Rb	5	5	5	0.3	1	0.134		
<sup>35</sup> S	67	239.25	53	134.366	4	0.184	2	0.004
<sup>99m</sup> Tc	0	0					13	25.102
Total	776	1212.116	506	382.81	98	13.578	240	1233.58

RADIATION MATERIALS	06/07	05/06	04/05	03/04	02/03
Orders	776	933	1036	1310	1594
mCi	1212	1332	1428	1470	1570
Pickups	506	634	725	796	1064
mCi	383	304	503	327	61
Sewer Disposals	98	119	98	148	160
mCi	14	12	12	17	18
Transfers	240	124	66	31	0
mCi	1234	273	149	21	0

## SEALED SOURCES

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Case Western Reserve University houses 207 sealed sources. Of these, 188 sealed sources are required to be inventoried every six months. Fourteen sealed sources require six-month leak tests, as stated in our ODH license. Four (4) of the 14 sources are high-level dose irradiators, and one is used to irradiate material with neutrons. 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.

INVENTORY	06/07	05/06	04/05	03/04	02/03
Sealed Sources	207	168	204	204	171
Exempt	188	154	183	186	158
Irradiator	4	4	3	3	3
Neutron	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 in-house services provided by DOES generated \$10,785 in cost saving over the fiscal year in lieu of using outside vendors.

CALIBRATION/ SERVICE	COST PER SERVICE	COST SAVINGS
157 meters	\$55/meter	\$8,635
4 pumps	\$50/pump	\$200
32 thyroid assays	\$25/assay	\$1,800
23 filter changes	\$50/ filter change	\$1,150
	TOTAL COST SAVINGS	\$10,785

There are 245 survey meters on campus. The RSOF calibrated 157 of these meters in the last fiscal year. There were 76 meters removed from service. In service meter calibrations totaled 163. Six meters required outside service for dose calibration. 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.

Four operational pumps for radioactive materials were also calibrated for use in the iodination hoods.

CALIBRATION/ SERVICE	06/07	05/06	04/05	03/04	02/03

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Meter Calibration	157	188	233	245	250
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## 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 undergo radiation security inspections each month. Only minor violations of required security procedures were found.

RAM Security Checks	06/07	05/06	04/05	03/04
Violations	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 dosimeter program. Other personnel may request dosimeters, which, are provided at the discretion of the RSOF. Radiation workers 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.

## PREGNANT WORKER PROGRAM

Any radiation worker who is, or feels she may be pregnant is advised to complete a Declaration of Pregnancy Form and send it to 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

# RADIATION SAFETY ANNUAL REPORT 2006-2007

developing baby. 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 no 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 fluoroscopes. The five 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 to detect activities that might be dangerous to individual workers. Notably, no significant exposures were noted in 2006-2007.

PERSONNEL	06/07	05/06	04/05	03/04	02/03
<b>MONITORING</b>					
Pregnant Workers	2	6	6	13	15
Neutron	0	0	0	0	0
RGE/ X-Ray	38	60	201	160	180
General	705	905	1005	970	1030

Case Western Reserve University was Luxel badges, considered 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 2007.

## **RADIATION GENERATING EQUIPMENT**

Machines that produce ionizing radiation (RGE) require safety labeling using appropriate warning indicator systems and 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. Radiation-generating equipment is inventoried

## RADIATION SAFETY ANNUAL REPORT 2006-2007

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. However, DOES provides general safety classes for individuals using RGE.

<b>RADIATION-GENERATING UNITS (In Use)</b>	<b>06/07</b>	<b>05/06</b>	<b>04/05</b>	<b>03/04</b>	<b>02/03</b>
Health Care & Diagnostic Research	36	42	32	32	32
Analytical Research	39	40	48	51	51
Tubes Only	11	17	19	18	19
<b>TOTAL</b>	<b>86</b>	<b>99</b>	<b>99</b>	<b>101</b>	<b>102</b>

<b>RADIATION-GENERATING UNITS (Not In Use)</b>	<b>06/07</b>	<b>05/06</b>	<b>04/05</b>	<b>03/04</b>	<b>02/03</b>
Analytical units In storage	19	23	21	23	23
Analytical units Disabled	2	3	7	5	7
Analytical units Out of Service	9	11	9	7	7
Diagnostic units Disposed	4	7	3	2	1
Diagnostic units Purchased	4	11	2	1	1

### **RADIOACTIVE MATERIAL RELEASES**

#### SEWER EXPOSURE CONTROL & MONITORING

State and Federal regulations permit Case Western Reserve University to dispose of low levels of radioactive materials in 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 2006 was filed on January 29, 2007 and the report for January through June 2007 was filed on July 27, 2007. 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



## **RADIATION SAFETY ANNUAL REPORT 2006-2007**

During the 2006 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 free 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 radioiodine. The number of airborne iodine exposures has decreased due to the infrequent use of free radioactive iodine in experiments.

### **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 2006-2007, there were three active iodination laboratories. The RSO maintains an inventory of four iodination hoods to be deployed when required. A bioassay is required when more than 1 mCi of radioactive iodine is used in volatile form. The RSOF must be notified when such experiments require:

- Handling of more than 1.0 mCi of volatile radioactive iodine.
- 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. Bioassays for radioiodine were performed following six iodination procedures. No workers exceeded 10% of the ODH limits. This chart highlights the decrease in iodination procedures in University laboratories.

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<b>IODINATION PROCEDURES</b>	<b>06/07</b>	<b>05/06</b>	<b>04/05</b>	<b>03/04</b>	<b>02/03</b>
Total	6	6	7	11	20

<sup>125</sup> I <b>BIOASSAYS</b>	<b>06/07</b>	<b>05/06</b>	<b>04/05</b>	<b>03/04</b>	<b>02/03</b>
RSOF Staff	32	64	67	64	40
Additional	0	7	10	13	20
Total	32	71	77	77	60

## TRITIUM

Urine bioassays must be carried out for tritium users, with a baseline bioassay required prior to experiment. No urine bioassays were 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; one 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.

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There were two major incidents and seven minor incidents documented over the past year.

INCIDENTS	06/07	05/06	04/05	03/04	02/03
Major	2	0	1	1	5
Minor	7	0	4	8	5
TOTAL	9	0	5	9	10

DATE	INCIDENT	CONTAMINATION	ROOT CAUSE	FOLLOW UP
9/8/2006	Minor Spill	No contamination was found in the Wood building laboratory.	A pipe leak flooded a laboratory where radioactive material was used.	A follow up survey was completed to ensure that the area was not contaminated prior to clean up by housekeeping personnel.
9/14/2006	Minor Spill	P32 Contamination was restricted to the radiation area only on the BRB building laboratory floor. No personnel were contaminated.	A laboratory technician was sampling P32 liquid waste and noticed that the bottle containing the liquid P32 waste was leaking after it was removed from the secondary waste container. The floor was contaminated when the technician attempted to place the <sup>32</sup> P waster into a bag to place it in the secondary waste container. The approximate activity of the spilled material was 0.2 mCi.	Laboratory personnel decontaminated the area. The radiation safety office removed the waste and the bottle and the laboratory was given a new bottle for their radioactive liquid waste.
11/9/2006	Major Incident	A survey of the Lerner Tower SAIRC laboratory revealed that the equipment and floor were F18 contaminated, as well as the technician's shoes and pants. It was determined that the contamination came from the outside of the pigs that held syringes when they were received from PETNET. The level of contamination was approximately .001mCi of F-18. It is not known if this occurred before or after the F-18 was received. The contaminated shoes and pants were kept in the SAIRC for decay and the room was sealed to prevent entry until the isotope decayed to acceptable levels.	A laboratory technician was measuring F-18 (half-life 110 minutes) with a dose calibrator in the SAIRC when it was noted that the background reading was higher than normal. She removed the sample holder from the calibrator, and discovered that the outside of the source holder was contaminated.	A follow-up survey was performed the next day. The follow-up survey of all items including the laboratory was at background levels. After discussing this issue with PETNET, it was decided that all syringes in pigs would be transported from PETNET to SAIRC using shipping boxes on carts. The exterior of the shipping box will be surveyed by PETNET before release to SAIRC staff. Upon arrival in the SAIRC, the staff will also wipe test the outside the pigs.
1/3/2007	Minor Spill	The Uranyl Acetate contamination was restricted to a sink inside a chemical fume hood that had been relocated to another non-radioactive	Uranyl acetate contamination was found in a non-radioactive use laboratory undergoing decommissioning for a	The sink was removed and disposed as radioactive waste. The Radiation Safety Office will survey any laboratory where Uranyl

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		use laboratory. The approximate activity was 0.001mCi.	construction project.	acetate was used to preclude this from happening again.
2/7/2007	Major Incident	5.0 mCi of H3 was taken to a research facility in Kenya. No external transfer paperwork was submitted prior to this transfer, this constitutes a major severity violation account to the DOES Enforcement Policy.	An unauthorized transfer of radioactive material was discovered and reported to the RSC on 2/20/2007. The RSC determined that the transfer constituted a major violation of the University's Radiation Safety Program. As required by CASE Broadscope License, the circumstances of the violation were brought before the RSC.	The violation emanated from the repeated transfers of radioactive material without authorization or paperwork on two international trips during February 2007 and December 2002. The RSC suspended the Authorized User's license indefinitely. A letter was sent to the Authorized User, the Department Chair and the Dean of the Medical School. The Authorized User's isotopes were transferred to the Chairman of the Department.
4/11/2007	Minor Incident	The H3 waste bins had been placed in a WRB laboratory room designated for radioactive material use in February of 2006.	A laboratory in the Wolstein building was storing radioactive H-3 waste (.024mCi) in a room not labeled for radioactive material use.	The room was temporarily posted and the waste was picked up on April 13. The room was then decommissioned for radioactive materials use. The laboratory was instructed on proper procedures for room posting and waste storage.
4/19/2007	Minor Incident	It was determined that the waste bag in Bishop Building labeled as Pd209 contained a Brachytherapy seed that was most likely Pd103 with a half-life of 17 days.	A member of the radiation safety staff picked up radioactive waste from the Bishop Building. One of the waste bags contained Pd-109 from 2004. Since Case Western Reserve University is not authorized to possess this isotope, the waste was returned to the Bishop Building and the Assistant Radiation Safety Officer of University Hospitals was contacted.	The waste-containing bag was surveyed and disposed as regular waste by University Hospitals. The radiation safety staff at Case Western Reserve University was instructed to review the waste forms more thoroughly prior to picking up waste.
5/15/2007	Minor Spill	H3 Contamination was restricted to the BRB laboratory only. The approximate activity was 0.175mCi.	During a routine survey of a H-3 laboratory in the BRB, several locations including the floor were contaminated with H-3.	The room was isolated and the laboratory was instructed to decontaminate the areas. All follow-up wipes were at background levels. To avoid contaminating the sink, it was suggested that laboratory personnel pour only H-3 water based solutions through a plastic bag and discard the bag as dry waste. They were

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				also instructed to clean contaminated areas immediately after an experiment.
6/25/2007	Minor Incident	A call was received by the Ohio Department of Health regarding a liquid scintillation counter with a 10uCi Ra-226 source that was disposed at IT Scrap in Solon, OH.	The counter had a Case Western Reserve University equipment sticker attached.	Upon further investigation it was determined that the counter belonged to an individual at MetroHealth Medical Center. The information was sent to the Ohio Department of Health as well as to the Radiation Safety Officer at MetroHealth Medical Center. No further action was required by Case Western Reserve University Radiation Safety.

### DOES WEB SITE & NEWSLETTER

The DOES home web site (<http://does.case.edu>) provides integrated web-based access to DOES 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 following updates were made to the Website this fiscal year:

- Website recoded so that key files now validate as HTML 4.01 Strict or XHTML 1.0 Strict
- Bandwidth reduced about 50% by optimizing key HTML files and portable document formats (PDFs)
- Radiation retrain rewritten
- Radiation refresher quiz rewritten and recoded
- Environmental release page written
- Security issues were updated

The DOES 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:

- How Much Radiation Do You Get from Dental X-Rays?
- Security of Radioactive Materials
- Taking Inventory—Uranyl Acetate
- Security of Radioactive Materials
- Eating Food in the Lab—A Dangerous and Illegal Habit

# **RADIATION SAFETY ANNUAL REPORT 2006-2007**

## **LASER SAFETY PROGRAM**

The Laser Safety Program and related training has progressed well since its inception in September 2004. A standard operating procedure has been incorporated into the Physical Safety Manual that is provided to all laser users.

There are a total of 150 lasers on the campus in 10 buildings. The lasers of greatest concern are those labeled Class 3B and Class 4. The laser inventory was updated and new signs were posted. There are 65 Class 4 lasers, 55 Class 3B lasers, and 30 lasers in the other classes of 1, 2, and 3A.

A consolidated Laser Safety Guidance Packet was developed and sent to each PI. This packet was developed to assist PIs in implementation of their laser safety programs. The guidance packet includes instructions on the following laser topics: OSHA Tech Manual, Guidance for Controlled Entries, Site SOP Guidance, Laser MAP Guidance, UV and Laser Safety, Laser Pamphlet of Calculations, Laser Sign Guidance, Guidance pertaining to Dye Lasers, Duties of the Laser Safety Supervisor, Overview of the ANSI Standard Laser Safety Controls and instructions for a Laser Safety Committee. The status of this program will be presented to the Case Western Reserve University RSC periodically. An ad-hoc member with experience in Laser Safety has been recruited to review laser protocols and will now attend the RSC meetings.

## **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 DOES, Facilities Services, and the AU facilitates these operations. There were 505 clearances required for 570 pieces of equipment. A total of 11 relocations and 12 terminations were completed over the past year.

## **WASTE MANAGEMENT**

### RADIOACTIVE WASTE FACILITY

The Barnwell Waste Facility remains open and we are required to use Barnwell services as long as available. 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, and dry solid waste.

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Short-lived solid waste is held for decay (equal to or less than 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. 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. Currently, only the outside of the bag is surveyed, followed by immediate disposal to simplify handling by staff and provide 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. Short-lived non-sewer (chemical waste) is held for decay, resurveyed after ten half lives, and disposed by Chemical Analytics, a commercial hazardous waste disposal company. Long-lived solid waste (greater than or equal to 10 half lives) 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 10 CFR 20 Appendix B. A sewer disposal log is kept in the DOES offices. Total sewer disposals are reported semi-annually to the Sewer District.

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

The Animal Resource Center (ARC) maintains a  $-20^{\circ}\text{C}$  freezer for storage of radioactive animal remains and waste. These wastes are bagged and labeled 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. Infected animal waste is placed in the ARC (EB04E instead of EB09A) 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.

### RECYCLING PROGRAM

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In the past fiscal year, the RSOF obtained laboratory equipment from AU's who have either left the university or ceased to use RAM. The equipment includes radiation 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 program resulted in re-use of equipment that saved AUs more than \$8,000 during 2006-2007.

### WASTE GENERATED IN JULY 1, 2006 - JUNE 30, 2007

	Generated 7/1/2006- 6/30/2007	Disposed: Stericycle	Disposed: Sewer	Disposed: Safety	Disposed: ADCO	In Storage As of 6/30/2007
Short-Lived Dry	85	90 *	0	0	0	60 **
Long-Lived Dry	20	0	0	0	20	0
Scintillation Vials	30	0	0	0	30	0
Animals	4	3	0	0	1	0
Long-Lived Sewer	35	0	35	0	0	0
Long-Lived Non-Sewer	5	0	0	0	0	5
Short-Lived Sewer	135	0	135	0	0	0
Short-Lived Non-Sewer	30	0	0	20	0	10

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, 2006, kept for decay in storage, and disposed during the period of July 1, 2006–June 30, 2007. The double asterisk (\*\*) denotes the drums that were generated prior to July 1, 2005 and still held for decay in storage. During this fiscal year, all long-lived hazardous aqueous waste was disposed.

Barnwell animal waste cost = \$2,634 per 32-gallon drum  
ADCO DIS dry waste cost = \$555 per 55-gallon drum

The cost of disposal for one drum of biomedical waste at Stericycle is \$40 per drum. There were 90 drums of dry waste and three 32-gallon drum of animal waste surveyed and disposed during 2006-2007 fiscal year at a cost of \$3720. Without the decay in storage program, it would cost \$555 to send one 55-gallon drum of decay in storage (DIS) dry waste and it would cost \$2,634 per 32-gallon drum of animal waste through ADCO services. Therefore, in the absence of decay in storage, the cost to send the waste drums through ADCO would have been \$57,852. Therefore, the indirect savings to researchers due to the decay in storage program was \$54,132.

WASTE GENERATION	06/07	05/06	04/05	03/04	02/03
Short-Lived Dry	85	72	66	63	66



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Long-Lived Dry	20	25	28	31	26
Scintillation Vials	30	47	44	45	39
Animals	4	3	2	1	3
Long-Lived Sewer	35	46	55	60	50
Long-Lived Non-Sewer	5	15	5	0	0
Short-Lived Sewer	135	125	115	80	76
Short-Lived Non-Sewer	30	20	35	75	85

# **RADIATION SAFETY ANNUAL REPORT 2006-2007**

## **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. The RSOF has developed programs that meet or exceed regulatory requirements in most Safety areas. This program proactively anticipates new safety requirements by promulgation of new programs. Success of these programs continues to be 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 2006-2007**

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

- DOES performed more comprehensive internal audits of all programs.
- Included a Laser Safety expert on the RSC.
- Updated AU protocols that are more than 10 year old.
- Accomplished its highest historical level of compliance in all Radiation Safety training programs.
- Revised the Radiation Safety Committee guidelines.
- Generated \$72,917 in cost savings for the University as a result of services provided by DOES versus in-house use of outside contractors, and recycling materials. In-house savings accrued from meter calibration, recycling, and decay in storage programs.

### **RADIATION SAFETY GOALS FOR 2007-2008**

The overall goal of the Radiation Safety Program is to position DOES 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 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 will address:

- Promotion of community interaction through complimenting services and materials.
- Provision of enhanced Safety Monitoring and new program initiation for the Case Western Reserve University to meet requirements of the use of more radiation in specific areas. Accomplishment of this goal requires attention to the balance of the Departments safety programs to ensure that no critical safety areas are left unaddressed.

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- To continue to foster our excellent relationships with Cleveland Fire and our Community emergency response providers.
- To continue our mutual development of campus Emergency response and Security with Protective Services to ensure that use of radioactive materials is carried out in a secure environment.
- Continued enhancement of radiation training offerings to ensure that campus personnel understand the importance of safe and secure handling of radioactive materials.
- Development of a new radiation program specific database to replace Helix, our current database. This is necessary because the Helix vendor no longer adequately supports our current database.
- Continue to encourage radioactive waste minimization through procedural review and experimental practice.
- Develop additional programs in the areas of non-ionizing radiation (microwave, electromagnetic, and ultraviolet radiation).

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## 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
Irradiator	4

These audits were conducted between October and December 2006 and between April and June 2007. This effort resulted in the review of more than 100 files, in the program areas listed above.

## **RSC TRI-ANNUAL AUDITS FOR 2006-2007**

### RSC AUDIT COMMENT:

In November 2006 the Radiation Safety Committee Members, Drs. Virgil Muresan, Tom McCormick, Eckhard Jankowsky, James Bruzik and Zhenghong Lee, David Danielpour, Duna Massillon, and Monica Montano conducted a tri-annual audit of the following components of the Radiation Safety Office:

- Active/Decommissioning Surveys
- Bioassays
- DOES Webpage
- Survey Meters
- RGE Inventory/RGE Training
- Security Checks
- Semiannual Mailings
- Support Staff Training
- RAM Applications

## **RADIATION SAFETY ANNUAL REPORT 2006-2007**

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.

### **ACTIVE/ DECOMMISSIONING SURVEYS**

There were no deficiencies noted in the ten (10) Active Surveys and ten (10) Decommissioning Surveys audited.

### **RSOF RESPONSE**

No response required.

### **BIOASSAYS**

A deficiency was found in one of the six Bioassay files, the remaining files were compliant. The deficiency consisted of the absence of bioassay records on file. The AU was contacted in reference to this deficiency.

### **RSOF RESPONSE**

The worker was no longer at the University, but their bioassays were up-to-date at the time of departure.

### **DOES WEBPAGE (RADIATION SAFETY)**

Fourteen links found on the Radiation Safety Office Web Page were reviewed for being up-to-date for training and in the training manual. All of these links except two were operational and current. One deficiency was noted by an error message in the radiation safety database access: an error message appeared when requesting the PI number. The other deficiency was noted in the Glove Safety link, the link to "dimethyl mercury" giving an error message.

### **RSOF RESPONSE**

The error was found in coding links for the entry. Both issues were corrected.

### **SURVEY METERS**

All but one of the ten (10) Survey Meter files audited was current and complete; the deficiency in one file was due to an expired calibration date.

## **RADIATION SAFETY ANNUAL REPORT 2006-2007**

### **RSOF RESPONSE**

The laboratory listed this meter as “not-in-use” at the time of the audit. The meter was subsequently placed in use and calibrated on 1/11/07.

### **RGE INVENTORY/ RGE TRAINING**

Ten (10) AU files were randomly audited for trimesterly updates of RGE Inventory/ RGE worker Training status. None of these files were deficient.

### **RSOF RESPONSE**

No response required.

### **SECURITY CHECKS**

Five (5) of the ten (10) randomly audited RAM Security Checks noted radioactive material that was incorrectly secured. Of these five, two of the violations had been resolved and documented in the file, while the remaining three were noted to be deficient in follow-up information and resolution at the time of the audit.

### **RSOF RESPONSE**

RAM security checks are carried out once a month. Follow-up information on one violation was completely documented. The remaining two (2) violations did not provide adequate follow-up information on file. The individual performing security checks was reminded to provide follow-up information on all security check forms. The laboratories missing follow-up information did not have any subsequent violations.

### **SEMI-ANNUAL MAILINGS**

Of the ten (10) AU files randomly audited for semi-annual mailings, all were fully compliant.

### **RSOF RESPONSE**

No response required.

### **SUPPORT STAFF TRAINING**

## **RADIATION SAFETY ANNUAL REPORT 2006-2007**

Two (2) of the five (5) files audited for Support Staff Training were noted to be deficient. One custodial worker was overdue for retraining, and nine (9) security workers were overdue for retraining.

### **RSOF RESPONSE**

Each year approximately 400 ancillary support staff members are trained by the RSOF. All support staff training was completed by the end of December 2006 and will be completed in the same timeframe in 2007. Because of support staff turnover a mismatch between the date of initial training when hired and the first subsequent retraining date may occur.

### **RAM APPLICATIONS**

Two (2) of the ten (10) files audited did not have updated room information. One (1) of the ten (10) files audited had a meter that was overdue for calibration.

### **RSOF RESPONSE**

The two files with incorrect room information were generated prior to the relocation of the AUs. These files were updated after the AUs relocated. One meter that was listed as overdue for calibration has been calibrated.

### **RSC AUDIT COMMENT:**

The second trimesterly audit by the RSC was conducted in March 2007. This audit included Shipping Papers, Irradiator User Training/Irradiators, Isotope Inventory, Sealed Sources, Valid Ram Applications, and AU files; and was conducted by the following Radiation Safety Committee members: Drs. Zhenghong Lee, James Bruzik, Tom McCormick, Monica Montano, Anthony Berdis, and Duna Massillon. Each audit consisted of randomly selecting five (5) to twenty (20) files from the past year to ensure items were up-to-date accurate and matched the database.

### **RSOF RESPONSE**

No response required.

### **SHIPPING PAPERS**

There were no deficiencies noted in any of the ten (10) shipping papers audited; however, problems were noted in two of the papers. One shipping paper was not

## **RADIATION SAFETY ANNUAL REPORT 2006-2007**

clearly documented that a direct pickup was made. In another case, FedEx delivered Rad material directly to a laboratory in the Wolstein Building; however, the receiving laboratory took proper procedures and alerted RSOF. This material was surveyed by the RSOF and then checked into the recipient's laboratory.

### **RSOF RESPONSE**

No packages are currently delivered from Receiving to University laboratories. The shipping paper with missing documentation failed to document that an AU picked up the package. This paper was updated with information denoting the package's shipping disposition.

### **IRRADIATOR USER TRAINING/ IRRADIATORS**

Irradiator User/Irradiators audit identified that three (3) of ten (10) randomly selected workers did not complete their training. For irradiator 5001, the irradiator log did not match the user list. Users on the Irradiator Manager list were not on the RSOF list. For irradiator 5003, several users were double listed in the user log. The date of the last audit of each irradiator was noted to match the date of the last audit on file.

### **RSOF RESPONSE**

None of the new users in question had used the Irradiator without complete training. All of the above deficiencies were corrected and audit of these records will be increased to insure such deficiencies do not recur.

### **ISOTOPE INVENTORY**

No deficiency was noted in the Isotope Inventory audit of records from ten (10) randomly selected AUs.

### **RSOF RESPONSE**

No response required.

### **SEALED SOURCES**

The Sealed Source audit revealed one deficiency from a randomly selected list of ten (10) AUs; the deficiency noted was a discrepancy in an inspection date in a file within that database that was resolved the day of this audit.



## **RADIATION SAFETY ANNUAL REPORT 2006-2007**

### **RSOF RESPONSE**

No response required.

### **RAM APPLICATIONS**

Deficiencies were observed in four (4) out of ten (10) Ram Applications. One of these deficiencies consisted of the personnel sheet being two years out of date. In another case, a discrepancy was noted in the room number on file with that on the Rad Report 6. A third deficiency noted was an incorrect calibration date for a survey meter (listed on Rad Report 6). The fourth deficiency was due to omission of a required survey meter on file.

### **RSOF RESPONSE**

Radiation Report 6 is a summary of rooms, personnel, meters, and isotope inventories. The information contained on these sheets is usually updated during the compliance review. If a new printed sheet is not requested, the actions noted on the summary sheet can be out of date. All deficiencies noted in the audit were corrected by printing out updated summary sheets.

### **AU FILES**

The AU file audit noted only one (1) deficiency in ten (10) randomly selected files. The file had a worker more than 30 days overdue for training.

### **RSOF RESPONSE**

Our training enforcement policy provides a window of 30-60 days for training compliance. All delinquent workers are currently up to date.

#### **RSC AUDIT COMMENT:**

Drs. Zhenghong Lee, James Bruzik, Anthony Berdis, Monica Montano, Eckhard Jankowsky, Duna Massillon and David Danielpour conducted a third trimesterly audit in May 2007. This audit included Active/Decommissioning Surveys, Bioassays, DOES Webpage, Rad Survey Meters, Security Checks and Semiannual Mailings. Each audit consisted of randomly selecting five (5) to twenty (20) files in the past year to ensure items were up-to-date, accurate, and matched the database.

### **SURVEYS (ROUTINE/ DECOMMISSIONING)**

## **RADIATION SAFETY ANNUAL REPORT 2006-2007**

Deficiencies were reported in eight (8) of ten (10) selected Active/Decommissioning surveys. Five of these deficiencies resulted from omission of inspection data on log printout sheet. Another entered an incorrect survey date, and last deficiency was due to a typographical error.

### **RSOF RESPONSE**

Four of the rooms are listed for non-radioactive use only and do not require survey information. Another was a room used for sealed sources only and did not require a survey. Two deficiencies noted were the result of data entry errors. These were corrected. The remaining 2 deficiencies involve the same room. (This room had been decommissioned at the time of the audit.)

### **BIOASSAYS**

No deficiency was reported in Bioassays, as no AU ordered  $\geq 10\text{mCi}$  of  $^3\text{H}$  or  $\geq 1\text{mCi}$   $^{125}\text{I}$  in a single vial during the period examined.

### **RSOF RESPONSE**

No response required.

### **DOES WEBPAGE (RADIATION SAFETY)**

All but one Web Page Link were operational and up-to-date. All training links to the Radiation Safety database will be removed to transition from social security numbers to employee ID numbers.

### **RSOF RESPONSE**

No response required.

### **SURVEY METERS**

None of the ten (10) randomly selected Survey Meter documents were deficient.

### **RSOF RESPONSE**

No response required.

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## **WASTE FACILITY**

Deficiencies were noted in four components of the Waste Facility (Weekly DOA decay area, DOA processing area, Wolstein, Air Monitoring.) Surveys for 11/06 and 2/07 were missing for DOA990 Decay area, some weekly surveys were missing for DOA990 Processing area, and Wolstein 1120 (Counting room) was missing monthly surveys for March and April 2007. The last file for air monitoring was dated 5/15/07.

## **RSOF RESPONSE**

Upon review of the survey file for DOA 990 decay area, the month that DOA990 decay area was not surveyed was November 2006. The survey for February 2007 was located. Wolstein 1120 surveys of Wolstein room 1120 for March and April of 2007 were also not located. As a result of the audit, survey requirements for the waste rooms were reviewed at the following radiation safety staff meeting. The misplaced DOA 990 processing area surveys were filed out of sequence. Air-monitoring records were also filed out of sequence. These issues were corrected and all air-monitoring records are now current.

## **SUPPORT STAFF TRAINING**

Deficiencies were noted in 9 of 10 selected records, 8 being from omission of the 4/18/07 signup sheet, and one from incorrect training data in the database.

## **RSOF RESPONSE**

All of the entry issues were corrected. Support staff training was in progress but not completed for Case Western Reserve University and contract custodial, security and ARC personnel. Additional training sessions were scheduled. Training will be completed by December 2007.

## **SECURITY CHECKS**

The survey of 10 security checks revealed 10 reports of insecure RAM; all but one had complete documentation included follow up plans and resolution.

## **RSOF RESPONSE**

# **RADIATION SAFETY ANNUAL REPORT 2006-2007**

Appropriate follow-up was noted on the Security Check sheet and did not require additional documentation.

## **SEMIANNUAL MAILINGS**

All 10 randomly selected Semiannual Mailing sheets were compliant.

## **RSOF RESPONSE**

No response required.

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

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

The Radiation Safety Committee conducted its annual audit of the Radiation Safety Office the second week in August 2007. Drs. David Danielpour (General Medical-Oncology), Monica Montano (Pharmacology), Anthony Berdis (Pharmacology), Eckhard Jankowsky (Biochemistry), James Bruzik (RNA Center), Tom McCormick (Dermatology), and Zhenghong Lee (Radiology UH) conducted the audit. The committee reviewed the performance of 17 components of the RSOF. The areas were:

- Ancillary Staff Training
- AU and Worker Training
- Bioassays
- Compliance Review
- Isotope Orders, AU Possession Limits, and the Helix Database
- Dosimetry Program
- Incident Reports
- Irradiator Program
- Isotope Security Checks
- Licensing Status
- Radiation Generating Equipment Inventory and Training
- Radiation Survey Meters
- Seal Source Leak Test
- Shipping Papers
- Semi-Annual Mailings (air/sewer inventory)
- Valid RAM Application
- Water Disposal Facilities (DOA990, Wolstein) & RSOF Laboratory

The Results of this audit are summarized in this report as follows.

# **RADIATION SAFETY ANNUAL REPORT 2006-2007**

## ANCILLARY STAFF TRAINING

### RSC AUDIT COMMENT:

An annual audit was conducted to verify the training status of ancillary personnel encompassing the following segments of this program: Animal Resource Center, Shipping/Receiving, Custodial, Security, and Plant Services. Ancillary staff worker training files were reviewed from July 1, 2006 through June 30, 2007. Forty-six custodial staff workers were found to be overdue for training, with 9 more that will be in need of retraining in 2 months. Thirty-nine Animal Resource Center workers were noted to be delinquent in retraining, although training for them was planned a couple of days from the time of this audit. Fifteen of the security staff workers were found to be overdue for training, with an additional 35 that will need retraining within two months from time of audit. None of the staff associated with Plant Services were overdue for training, and only one Shipping/Receiving staff member was overdue for training. All other ancillary staff was listed as being current in their training.

### RSOF RESPONSE:

There are 402 Ancillary Staff workers. Annual ancillary training is in progress for all ancillary workers and will be completed by the end of 2007. All overdue ancillary workers were trained. For the first time, training of ancillary workers achieved 100% compliance in the middle of the 2006-2007 fiscal year and is on course to achieve the same goal in fiscal year 2007-2008.

## AU AND WORKER TRAINING

### RSC AUDIT COMMENT:

AU files were audited for AU and Worker training status, from July 1, 2006 through June 30, 2007. At the time of the audit, 48 AUs randomly selected, all but 8 files were current in their training status and one file was not found in database.

### RSOF RESPONSE:

Eight workers were overdue and were notified according to the Radiation Safety Training Enforcement Policy Guidelines. Of these eight workers, seven

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completed annual training within 60 days, leaving one overdue worker. This individual works in a laboratory that uses only sealed sources and was contacted via e-mail. She is not working with radioactive material in her current position and was removed as a RAM use worker.

### BIOASSAYS

#### RSC AUDIT COMMENT:

Audits were conducted to ensure completion of bioassays for laboratories using >10 mCi of  $^3\text{H}$  and/or 1 mCi  $^{125}\text{I}$  during the period of July 1, 2006 through June 30, 2007. All qualifying user files were audited and were found to be compliant.

#### RSOF RESPONSE

No response required.

### COMPLIANCE REVIEW

#### RSC AUDIT COMMENT:

This audit was conducted to verify that AU laboratories were audited within the last six months, and that any non-compliant issues were appropriately followed-up. From 37 randomly selected Compliance Review files, all were thorough and up-to-date.

#### RSOF RESPONSE

No response required.

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

#### RSC AUDIT COMMENT:

Thirty-seven files were selected within the period of July 1, 2006 to June 30, 2007, to verify that the amount of RAM ordered was within AU possession limits and that the orders were in the Helix database. The correspondence between isotope orders, AU possession limits and Helix database was complete and up-to-date for all files audited.

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### **RSOF RESPONSE**

No response required.

### **DOSIMETRY PROGRAM**

#### **RSC AUDIT COMMENT:**

Fifty randomly selected workers associated with 28 AUs were reviewed for having current dose records within the past year. No dose record was found in Helix for 19 files, but they were noted in Landauer as being deactivated. Thirty-five were verified as current and without problems, and one file was noted with a major problem in that it was listed as present in both Helix and Landauer but information for the file was not accessible.

### **RSOF RESPONSE**

The dose records were placed in the delinquent files and the misplaced file was properly filed.

### **INCIDENT REPORTS**

#### **RSC AUDIT COMMENT:**

During the period of July 1, 2006 to June 30, 2007, monthly incident reports were reviewed for verification and documentation of follow-up by the RSOF. There were no incidents reported during this time.

### **RSOF RESPONSE**

No response required.

### **IRRADIATOR INFORMATION REVIEW**

#### **RSC AUDIT COMMENT:**

Irradiator information files were audited to verify that the irradiators were audited by the RSOF within the last six months, and that non-compliance issues were appropriately followed up and pending issues resolved. There are currently three

## **RADIATION SAFETY ANNUAL REPORT 2006-2007**

active irradiators. The Irradiator 5004 was not in use during this period. Inspection and leak test review dates of all irradiators are current. All users showed current training status.

### **RSOF RESPONSE**

No response required.

### **ISOTOPE SECURITY CHECKS**

#### **RSC AUDIT COMMENT:**

The audit was to ensure that security checks conducted by the RSOF were completed monthly and any deficiencies resolved (July 1, 2006- June 30, 2007). Our audit surveyed 25 randomly selected files to confirm that security checks were conducted monthly. All but five security checks, noted for evidence of unsecured RAM, were completed with satisfactory documentation of follow-up and resolution of pending issues.

#### **RSOF RESPONSE:**

Of the 25 reviewed there were actually 6 that had issues, not 5. Of the 6 that had issues:

- Two of the security checks for that month were not located on the security check logs.
- Two of the security checks had documented follow-up.
- The remaining 2 security checks had no follow-up information.

Resolution: The individual performing the security checks was informed to more carefully document activities on the security check log.

### **LICENSING STATUS**

#### **RSC AUDIT COMMENT:**

An annual audit of the radiation licensing status of our radiation safety office was conducted. Components of this audit included Broadscope Licensing, REG License, Waste License, Radiation Manual, X-ray Manual, Radiation Training, X-Ray Training, Radiation Online Retraining Licensing, and RSC Guidelines. All above licenses and training were found to be current, although it was felt that X-Ray manual (updated 12/19/05), X-Ray training (updated 4/19/05), and RSC guidelines (updated 8/1/2003) are in need for updating. Plans are underway to update the RSC guidelines by November 2007. The Broadscope license



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expiration date is 1/1/2010, the RGE registration expires 5/31/2008, and the waste license will expire 12/31/2007.

This audit also included a review of the staff, space, and equipment of the RSOF. The RSOF had 4 current workers (3 Radiation Specialists, 1 Computer analyst, 1 pending position), 1 Quality Assurance personnel, 1 Department Assistant, 1 Department Administrator, 1 RSO, 1 Assistant RSO, and 1 student. The overall space provided for the RSOF was found to be adequate and the same as the previous year. The overall equipment available to the RSOF were found to be adequate and in good working order. There were 3 proper functioning liquid scintillation counters (a new counter replaced an old one), 1 gamma counter, 1 <sup>125</sup>I-Bioassay counter, 4 air sampling pumps, 17 hand-held Friskers, 4 ion chambers, and 1 sodium-iodide multi-channel analyzer. All other (smaller equipment) items were noted to be the same as in the previous year's audit.

### **RSOF RESPONSE**

No response required.

### **RADIATION GENERATING EQUIPMENT INVENTORY AND TRAINING**

#### **RSC AUDIT COMMENT:**

Twenty files were randomly audited for inventory status and last survey date of equipment, during the period of July 1, 2006 to June 30, 2007. Among these files, thirteen did not have a current inventory, one AU file was missing; however, all but 4 were current in training.

#### **RSOF RESPONSE:**

Upon review of the audit information, only 7 files did not have a current inventory. Two of the files missing a current inventory were incorrectly collated. These files have been corrected. A new AU was added after the current inventory was sent out which accounts for 1 of the missing files. Of the remaining files, 3 were returned and one is still outstanding. An email was sent to that individual's department chairperson regarding this issue. The remaining files had issues with site-specific and/or new training. All site-specific training is completed by the AU responsible for the individual unit, and must be documented by the AU. This information is checked during an audit that is done by the Radiation Safety Office. It is common practice that even though someone is added to the worker list, they might not be using that piece of equipment immediately and thus have not yet received specific training. Dental students and technicians are exempt from the training requirements according to the ODH regulations.

# **RADIATION SAFETY ANNUAL REPORT 2006-2007**

## RADIATION SURVEY METERS

### RSC AUDIT COMMENT:

Files associated with 50 survey meters were randomly screened for calibration dates within the last twelve months. All but 9 of meters had a current calibration date, and were documented in both files and in Helix database. Of the nine deficiencies, two had overdue calibration dates, but only by 2 and 5 weeks, respectively. One had no hard copy file although it was in the database, another meter was broken and not in use; and 5 meters had neither hard copy nor been entered into the database.

### RSOF RESPONSE:

One of the overdue meters was calibrated. The AU has been contacted regarding the second overdue meter. The file for the meter with the missing paper work was located. The five meters with no files or Helix entry were removed and placed in reserve for back-up use upon calibration if needed. These meters were old meters that belonged to the Radiation Safety Office but were broken and not in use.

## SEALED SOURCE LEAK TEST

### RSC AUDIT COMMENT:

Fifty files were randomly screened during the last 4 months (prior to the date of audit) for verification that the sealed source had been leak tested. All except 10 of these files were well documented and compliant. The deficiencies were all from being overdue in inspection.

### RSOF RESPONSE:

Nine of the sealed sources were due August 2007 and were subsequently inspected by the RSOF as part of routine procedures. The remaining source was on a meter belonging to an AU who had retired and does not need to be inventoried.

## SHIPPING PAPERS

### RSC AUDIT COMMENTS:

## **RADIATION SAFETY ANNUAL REPORT 2006-2007**

Forty-five shipping paper files were randomly audited to ensure they were adequately completed for the transfer of RAM material from site to site, from the period of July 1, 2006 through June 30, 2007. All but two of these forms were complete and compliant. In both non-compliant cases, the shipping papers were not filled out.

### **RSOF RESPONSE:**

Since no packages are delivered via Shipping and Receiving, no shipping papers are required. However, a statement indicating a direct pick-up by the laboratory is noted in the comments section of the RAM Package Receipt Form, which is required by the office for auditing purposes. This statement was not written on the 2 forms listed as non-compliant. This issue was corrected.

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

#### **RSC AUDIT COMMENT:**

Thirty-seven files were audited for receipt of semi-annual mailings from the last 12 months. Two these were in storage mode and one was inactive.

#### **RSOF RESPONSE:**

Authorized users that are inactive or in storage mode are exempt from completing the semi-annual mailing.

### **VALID RAM APPLICATION**

#### **RSC AUDIT COMMENT:**

Forty-nine RAM applications were audited to confirm they were valid, complete and current, within the last year (July 1, 2006 through June 30, 2007). All but two of the AUs in this group were in active mode. One of the inactive AUs did not have a valid application and did not have a completed Form 7. One of the AUs in active mode also did not have Form 7 completed; a note was made that this AU will be contacted regarding the deficiency.

#### **RSOF RESPONSE:**

The Standard Laboratory Operating Procedures (Form 7) were requested from the 2 AUs missing the form. They were received and placed in the AU's application file.

# **RADIATION SAFETY ANNUAL REPORT 2006-2007**

## WASTE DISPOSAL FACILITIES (DOA990/WOLSTEIN) & RSOF LABORATORY

### RSC AUDIT COMMENT:

The Waste disposal facilities and laboratories of the RSOF were inspected to ensure safe operation and adequacy of amenities as required by programs of the RSOF, during the period of July 1, 2006- June 30, 2007. All records of The Facility Maintenance & General Housekeeping, Record Maintenance, and Waste Storage & Handling were evaluated as being compliant, adequate, orderly and secure.

### 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.

## **DOES 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 Department's Quality Control Specialist reviews all programs and Departmental records on a periodic basis and assists with resolving compliance issues in the RSOF.

Sealed Source  
Shipping Papers  
Valid RAM Applications  
Isotope Orders/ AU Possession Limits  
AU/ Worker Training  
Waste Disposal Facility  
Active/ Decommissioned Surveys

RAM Security Checks  
Semi-Annual Mailings  
RGE Inventory/ Training  
Ancillary Training  
Licensing  
Incidents  
Irradiator

Bioassays  
Dosimetry  
Survey Meters  
Compliances  
Website Accuracy  
Liaison Program

## **RADIATION SAFETY ANNUAL REPORT 2006-2007**

DOES audits have resulted in administrative modifications over the past year to improve record compliance and RSOF response to safety issues in AU's laboratories. Full audit results of this program are available in the DOES office. Radiation Safety internal audits were conducted either monthly or quarterly.

### **INTERNAL AUDITS**

This year, in response to audit finding, the RSOF has implemented changes to its procedures and programs. The RSOF's audit of applications for use of radioactive materials revealed that numerous applications should be updated to be consistent with existing application requirements. The Assistant RSO requested that protocols more than ten years old, be updated by the AUs. This process is ongoing. There were no protocols updated this year due to decreased staff and commensurate increase in commitments by members and ex-officio members of the Radiation Safety Committee.

Internal audit of the following Radiation Safety Programs were conducted during this fiscal year of the following areas of operation:

- Meter Calibration Program
- Standard Operating Procedures
- RAM Security Checks
- Bioassay Reports
- Semi-Annual Mailings
- Liaison Program

Prepared by Felice Thornton-Porter on 9/21/2007.

**RADIATION SAFETY  
ANNUAL REPORT 2006-2007**

APPENDIX

# RADIATION SAFETY ANNUAL REPORT 2006-2007

## AUTHORIZED USERS

### STORAGE MODE

Kumar Alagramam	11/15/2006	Piet DeBoer	8/17/2006
Helen Salz	9/13/2006	Nora Singer	5/23/2007
Yu Chung Yang	6/11/2007	Richard Zigmund	12/13/2006

### RADIATION INACTIVE

Eben Alsberg	7/1/2006	Jeffrey Duerk	12/19/2006
Clifford Harding	10/30/2006	Timothy Kern	9/15/2006
Christopher King	3/12/2007	Michael Lamm	12/19/2006
Sam Mesiano	1/22/2007	Georgia Wiesner	11/1/2006

### DEPARTED

Cheng Ming Chiang	6/30/2007	Richard Eckert	6/19/2007
Karl Herrup	7/7/2006	K. Ganesh Kumar	1/29/2007
Virgil Muresan	4/24/2007	Laura Nagy	8/3/2006
Stephanie Orellana	7/7/2006	Nanduri Prabhakar	12/31/2006
Bryan Roth	8/3/2006	David Schultz	11/6/2006
William Stanley	2/15/2007	Matthew Warman	6/28/2007

# RADIATION SAFETY ANNUAL REPORT 2006-2007

## X-RAY AUTHORIZED POSSESSOR LIST

<u>AP CODE</u>	<u>AP NAME</u>	<u>CONTACT PERSON</u>
AH-JS	Arthur Heuer	Wayne Jennings
BEN	Jay Bensusan	Jay Bensusan
CHO	Gary Chottiner	Gary Chottiner
DC	Sally Baden	Shelly King
FUJ	Hisashi Fujioka	Midori Hitomi
GRE	Edward Greenfield	Teresa Pizzuto
HAR	Ralph Harvey	Ralph Harvey
HIL	Anne Hiltner	Akshay Kamdar
LAG	Peter Lagerlof	Peter Lagerlof
LEE	Zhenghong Lee	Chris Flask
MAC	Alan McIlwain	Wayne Jennings
MAT	Gerald Matisoff	Gerald Matisoff
MIC	Gary Michal	Wayne Jennings
MUZ	Raymond Muzic, Jr.	Chris Flask
OLI	Nancy Oleinick	John Mulvihill
POM	Vincent Pompili	Matthew Joseph
PRO	John Protasiewicz	John Protasiewicz
SAIRC		Raymond Muzic
SCH	Daniel Scherson	Daniel Scherson
SHO	Menachem Shoham	Menachem Shoham
VP	Vikas Prakash	Vikas Prakash



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