FINAL

CASE

Radiation Safety Program

Annual Report
Fiscal Year

2003-2004

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INTRODUCTION

This report is submitted to the President and appropriate members of the Senior administration of the University, as required by the Radiation Safety Committee (RSC) Operating Guidelines and Case Western Reserve University's (CASE'S) Broadscope State of Ohio (Nuclear Regulatory Commission Agreement State) License. It summarizes the activities of the Radiation branch of the Department of Occupational & Environmental Safety (DOES) at CASE. Its contents cover the period from July 1, 2003 through June 30, 2004.

OHIO DEPARTMENT OF HEALTH (ODH) LICENSE

Case has one Ohio Department of Health (ODH) Broadscope License, a Radiation-Generating Equipment Registration, and a Radiation Waste Treatment Permit. The Broadscope license covers possession and use of both nuclear accelerator-produced radioactive material (NARM) and naturally occurring radioactive material (NORM) for experimental purposes, as well as three irradiators.

ODH LICENSE	EXPIRATION DATE	PURPOSE
011-011800-11	January 1, 2005	Broadscope License
09-M-06944-01	May 31, 2006	Radiation-Generating Equipment Registration
0849-34-04	December 31, 2004	South Carolina Radioactive Waste Transport Permit

The Broadscope and the Radiation-Generating Equipment (RGE) Licenses were not inspected this year by the ODH, however both programs were inspected by ODH in June 2003. No violations were found during these inspections.

RADIOACTIVE MATERIAL USE AND STORAGE LOCATIONS

Radioactive material is located at the following facilities:

- Main campus of 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:

- 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 USE

The majority of isotope use at Case is for biomedical research. The most typical isotopes used are ^{14}C, ^{3}H, ^{125}I, ^{32}P, ^{33}P, and ^{35}S. Isotopes are also used in sealed sources contained within scintillation counters, gamma counters, check sources, and calibration standards. For such applications, the most commonly used isotopes are ^{137}Cs, ^{133}Ba, and ^{226}Ra. There are also four licensed high activity radiation sources that are used for biomedical and other research. These include a ^{241}Am-Be Neutron source, one ^{60}Co irradiator, and two ^{137}Cs irradiators.

RADIATION SAFETY PROGRAM: RESPONSIBLE PARTIES

RADIATION SAFETY COMMITTEE (RSC)

The Radiation Safety Committee assists the president and the university by ensuring compliance with the Radiation Safety Program as outlined in the University's Ohio Department of Health (ODH) Broadscope License. Radiation Safety Committee members are chosen from a variety of disciplines to ensure comprehensive expertise. Members must have at least two years of experience in the use and control of licensed material. The committee reviews all applications for use of radioactive materials.

The members of the 2003-2004 Radiation Safety Committee 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 and visiting members (non-voting).

VOTING MEMBERS

Dr. David Danielpour RSC Chairperson Department of Medicine Wolstein 3304 Term Expires: 3/1/2005	Dr. Duna Massillon Department of Nutrition Dental School 201 Term Expires: 9/9/2005	Dr. Monica Montano Department of Pharmacology Wood 307 Term Expires: 9/9/2005
Dr. Matthew Warman Department of Genetics BRB 739 Term Expires: 9/9/2005	Dr. Jian-Ping Jin Department of Physiology/ Biophysics Med East 535 Term Expires: 9/9/2005 Left CASE: 6/9/2004	Dr. Richard Zigmond Department of Neurosciences Med East 702 Term Expires: 9/9/2005
Dr. W. David Sedwick Radiation Safety Officer (RSO) DOES Service Building, 1st Floor	Dr. Helen Evans Department of Radiology Oncology BRB 325 Term Expires: 8/8/2004	

EX-OFFICIO MEMBERS

Kenneth Basch VP of Campus Planning and Operations Adelbert 325	Karen Janiga Asst. RSO Service Building, 1st Floor	Felice T. Porter Quality Assurance Specialist Service Building, 1st Floor

VISITORS

Dr. P.S. Rao UH Radiation Safety Officer (RSO) Department of Radiology Bishop S-629

SUPPORT STAFF

Shirley Mele Office Supervisor Service Building, 1st Floor	Gwendolyn Cox-Johnson Department Assistant Service Building, 1st Floor

The Radiation Safety Committee acts in both an advisory and enforcement capacity to ensure that radioactive materials are safely used in accordance with approved ALARA (As Low As Reasonably Achievable) principles endorsed by the ODH. The Committee conducts audits on a quarterly basis. These audits review programmatic compliance, new and modified DOES procedures, as well as and records pertaining to the program. The RSC also conducts an annual audit in which the entire program is reviewed. These audits ensure:

- specific program components conform to the licensed program as described in the CASE Radiation Safety Manual and license.
- accurate documentation for program conformance and license compliance exists.
- adequate training has been carried out for all classes of workers.
- the RSC is well acquainted with the daily function of the RSOF.

The committee met on eleven occasions during the last 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's administration representative.

A total of three new authorized users were approved during the period covered by this report. Two requests for additional radioisotope use were approved. There were four new requests for radioisotope use in animals. One new request for sealed sources was approved, and one AU was approved for reactivation of AU status.

SENIOR MANAGEMENT

The Radiation Safety Program is designed to monitor, inspect, and support activities of the authorized users and their personnel. Senior management oversight is assured by attendance of the Vice President for Campus Planning and Operations at all RSC meetings. The Radiation Safety Committee conducts independent audits of the Radiation Safety Program. RSOF staff immediately handles results of committee audits that require attention. Responses to audit findings are reported to senior management as part of this report.

RADIATION SAFETY OFFICE AND AUTHORIZED USERS (AUs)

A shared responsibility for safety exists between the Radiation Safety Office and Authorized Users. The Radiation Safety Office is responsible for ensuring that appropriate safety procedures are implemented and that Authorized Users are fulfilling their responsibilities for monitoring safety during experiments carried out in their laboratories. Inspections of all laboratories are conducted at least twice per year to ensure compliance with the CASE license. The inspection program includes routine and unannounced visits of each authorized user's laboratory.

AUDITS

RADIATION SAFETY COMMITTEE

The Radiation Safety Committee (RSC) audits RSOF activities in two 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:

AREA AUDITED	# OF INDIVIDUAL FILES EXAMINED
Valid 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	1
Shipping papers	10
RAM security checks	10
Bioassays	10
Semi-Annual mailings	10
Sealed sources	10

These audits were conducted between September - December 2003, January - April 2004, and May - August 2004. This process resulted in review of more than 80 files and examination of the program areas listed above. Sealed Source and Training audit forms were improved at the suggestion of the RSC members.

Overall, these audits were 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 helped expedite the process.

ANNUAL RADIATION SAFETY PROGRAM AUDIT REPORT

The Radiation Safety Committee conducted its annual audit of the Radiation Safety Office on the morning of September 1, 2004. Drs. David Danielpour (General Medical Sciences-Oncology), Duna Massillon (Nutrition), Monica Montano (Pharmacology), and Mathew Warman (Genetics) conducted the audit. The committee reviewed the performance of 16 areas of the program:

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

The results of this audit are summarized below:

ANCILLARY STAFF TRAINING

RSC AUDIT COMMENT:

A total of 29 ancillary staff training files were randomly selected from the period of July 1, 2003 through June 30, 2004. Only three of the ancillary staff trained within one year, 23 had trained between 1 to 2 years ago, and 3 had trained over 2 years ago.

RSOF RESPONSE:

Ten individuals from CASE Housekeeping, three from Protective Services, and two from the Animal Resource Center are overdue for ancillary training. The individuals from Housekeeping and Protective Services were given a deadline to complete their training. Individuals who have not been retrained are not permitted

to work in areas where radioactive materials are used. The three individuals in ARC that were overdue were also given a deadline for compliance and have since retrained.

AU/ WORKER TRAINING

RSC AUDIT COMMENT:

AU files were audited for their training status, from July 1, 2003 through June 30, 2004. Out of a total of 17 Authorized Users who were randomly selected, all but 2 were current in their training status. The training status of the overdue AUs was delinquent by only one to two weeks. All records were current in Helix; however, one of the AU files did not have a current training record.

RSOF RESPONSE:

One researcher file was misplaced at the time of the audit and has since been correctly filed. Two researchers were sent pre-notices regarding their training expiration and have since completed the training.

BIOASSAYS

RSC AUDIT COMMENT:

Audits were conducted to ensure completion of bioassays for laboratories using greater than 10 mCi of ^{3}H and/or 1 mCi ^{125}I during the period of July 1, 2003 through June 30, 2004. There were 13 files audited, and all files were in compliance.

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 a total of fifty Compliance Review files that were randomly selected, all reports were thorough and up-to-date. Only one of the files that was reviewed April 13, 2004 had violations; this AU's file documented multiple minor violations. The current status of this AU's compliance review is pending a re-check in future audits.

DOSIMETRY PROGRAM

RSC AUDIT COMMENT:

Fifty randomly selected files were reviewed for current dose records within the past year. Seventeen of these did not have a current dose record, only two of which were in storage mode.

RSOF RESPONSE:

All personnel that actively use isotope and have a badge have dose information. However, there are currently a number of individuals that are not actively using isotopes in the audited laboratory. Therefore, they neither have a badge nor dose information.

INCIDENT REPORTS

RSC AUDIT COMMENT:

During the period of July 1, 2003 to June 30, 2004, nine incident reports were randomly selected and reviewed for verification of documentation and follow-up by the RSOF. All these incidents were well documented and had satisfactory follow-up responses.

ISOTOPE ORDERS/ AU POSSESSION LIMITS

RSC AUDIT COMMENT:

Thirty files were randomly selected within the period of July 1, 2003 to June 30, 2004, to verify that the amount of RAM ordered was within AU possession limits and that the orders are in the Helix database. The correspondence between isotope orders, AU possession limits and Helix database was complete and up to date for all but one file. This file had a single order date missing.

RSOF RESPONSE:

The original requisition was cancelled and was never removed from the system. With the introduction of the University's new purchasing system several such discontinuities in our data were initially noted. However, these problems have been resolved.

LICENSING STATUS

RSC AUDIT COMMENT:

Licensing was found to be current. Case's State of Ohio Material License #011-001-800-11 is valid through January 1, 2005, and is currently in the process of being renewed. CASE's Certificate of Registration for Sources of Radiation #09-M-06944-01 is valid through May 31, 2006. Manuals for Radiation and X-Ray use were last updated in May and July of this year, respectively. Dates of renewal for on-site and on-line radiation training are current, and that of RGE was in the process of revision.

RSOF RESPONSE:

The RSOF notes that revised versions of both the Radiation and RGE Manuals will be completed by November 2004. All manuals, licenses, guidelines, and training are reviewed annually.

RADIATION GENERATING EQUIPMENT (RGE) INVENTORY/ TRAINING

RSC AUDIT COMMENT:

Nineteen files were randomly audited for inventory status and the last survey date of equipment during the period from July 1, 2003 to June 30, 2004. All the quarterly inventories were returned and complete. The equipment surveys for all but three were found in the appropriate equipment folder. One of the equipment folders was misplaced but found. Of note some of the RSOF files were also found to be out of order.

RSOF RESPONSE:

The files were not misplaced. Every unit has an individual file, which is separate from the Authorized Possessor file.

RADIATION SAFETY METERS

RSC AUDIT COMMENT:

Files for fifty survey meters were randomly screened for calibration dates within the last twelve months. All but ten of the meters had current calibration dates.

Several meters that have expired calibration dates have not been calibrated since 2002. Others were calibrated last year and have just become overdue.

RSOF RESPONSE:

All AUs with overdue meters were contacted and have since had their meters recalibrated.

RAM SECURITY CHECKS

RSC AUDIT COMMENT:

The audit was to ensure that security checks by the RSOF were carried out, conducted monthly and that follow-ups of these audits were completed. All security checks were conducted monthly. Three of eleven security checks were initially reported to be in violation, mainly by having no lock on the RAM refrigerator. All follow-ups were compliant by a statement that the RAM refrigerator would be locked or kept in a locked room.

SEALED SOURCES

RSC AUDIT COMMENT:

Ten files were randomly selected for verification that the sealed source had been leak tested within the last four months. All these records were well documented and compliant.

SEMI-ANNUAL MAILINGS (AIR/ SEWER INVENTORY)

RSC AUDIT COMMENT:

Of eleven files that were randomly audited for receipt of semi-annual mailings for the last 6 months, all but one file was complete and current.

RSOF RESPONSE

The delinquent inventory missing at the time of the audit was received shortly after the audit was performed.

SHIPPING PAPERS

RSC AUDIT COMMENT:

Fifty audits were conducted to ensure that shipping papers were completed for the transfer of RAM material from site to site, for the period of July 1, 2003 through June 30, 2004. All of these forms were completed, and all but one shipment was properly dated.

RSOF RESPONSE:

The date received for one shipment was corrected in the database after the audit.

VALID RAM APPLICATIONS

RSC AUDIT COMMENT:

Fifty RAM applications were audited to confirm they were valid, complete and current within the last year. All RAM applications were approved, but four of the AUs did not have Application Form 7 (Standard Operating Procedures) in their folders.

RSOF RESPONSE:

The RSOF retrieved and filed the documents with the RAM Application.

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WASTE DISPOSAL FACILITIES (DOA990, WOLSTEIN) & RSOF LABORATORY

RSC AUDIT COMMENT:

The facilities and laboratories were inspected to ensure safe operation and adequate facilities for the required programs of the RSOF. All records of the Facility Maintenance & General Housekeeping, Record Maintenance, and Waste Storage & Handling were evaluated as being adequate, current and safe.

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 Radiation Safety Office thanks the Radiation Safety Committee for the careful audit of its safety activities over the past year.

DOES INTERNAL AUDITS

In addition to audits conducted by the 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 Radiation Safety Office.

The DOES Internal audits are designed to support program effectiveness and efficient operation. Internal audits are conducted either monthly or quarterly. Audit results are available in the DOES office.

INTERNAL AUDITS

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

The Radiation Safety Office has implemented the following changes to its procedures and programs as a result of these audits:

The RSOF's audit of applications for use of radioactive materials revealed that numerous applications have not been updated since the application procedures for AUs were modified by the RSOF. Over the past year, the RSOF

systematically documented items that were incomplete or missing in each AU file. Applications that did not have signatures were corrected and applications that were missing the Standard Operating Procedures (Form 7) were updated during compliance reviews. In the future, application possession limits and protocols will be updated consistent with procedures and standards of the current program.

Active/ decommissioned surveys, website accuracy, and liaison program internal Audits were added this year. Audits of the surveys and the website will also be included as an RSC Audit category. The website accuracy audit will examine accessibility and currency of the web-based material offered by DOES. Internal audits of the active and decommissioned surveys revealed minor problems such as improper filing of surveys, decommissioning surveys filed with active files and vice versa, and equipment clearances filed with laboratory surveys. Corrections to the files were made promptly and the assistant RSO was notified.

ADMINISTRATION CONTROLS

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

Over the past year, the assistant radiation safety officer developed guidelines for authorized users requesting additional isotope. This helped to decrease the amount of information required when RSC approval was sought for new or additional isotopes. During the year, the RSOF updated and revised many of the manuals, training, licenses, certificates, and standard operating procedures that support the radiation safety program.

Authorized user status is classified in categories:

RADIATION ACTIVE (RA)

The authorized user actively uses RAM and has RAM inventory. Currently 123 authorized users have been approved by the RSC to use RAM at the university in 260 laboratories. Laboratories of these AUs are inspected by the RSOF at least three times per year. Audits are more frequent if there are particular concerns in a laboratory. A listing of authorized users can be found in the appendix.

RADIATION ACTIVE AND RADIATION GENERATING EQUIPMENT/ X-RAY (RX)

The authorized user actively uses RAM and X-Ray equipment. One authorized user possesses RAM and X-Ray equipment. This authorized user also facilitates use of irradiators for other investigators.

RADIATION GENERATING EQUIPMENT/ X-RAY (X)

The authorized user actively uses X-Ray equipment: Twenty-seven authorized users are approved to use X-Ray equipment.

RADIATION INACTIVE (RI)

The authorized user does not currently use RAM and does not have inventory. Seven authorized users do not currently use RAM and have been placed in the Radiation Inactive status.

RADIATION ACTIVE (STORAGE MODE) – RA (SM)

The Authorized User does not currently use RAM but does have inventory. Eight authorized users have been placed in storage mode, at their request, and are not currently using RAM.

DEPARTED

The authorized user no longer is employed by Case. Twelve authorized users have left CASE and their laboratories have been decommissioned.

MASTER ISOTOPE LIST

The Master Isotope list shows the university's Isotope Inventory, the sum of the authorized users' inventory (excluding sealed sources), the sum of the authorized user (AU) possession limits, and the NRC/ODH Registration Limit. This list can be found in the appendix.

AUTHORIZED USER (AU) RADIOISOTOPE INVENTORY

The radioisotope inventory report lists the names of researchers authorized to use radioactive material, the authorized radioactive materials used, the AU's possession limits, and activity on hand in each AU's laboratories. This list can be found in the appendix.

RADIATION SAFETY OFFICE (RSOF)

STAFFING

The RSOF operates under University approval with the following positions:

- Radiation Safety Officer (1)
- Assistant Radiation Safety Officer (1)
- Specialist Positions (6)
- Department Administrator (1)
- Department Assistant (1)
- 2nd Shift Specialist (1)
- Quality Assurance Specialist (1)

The RSOF staff is well qualified to support and maintain the radiation safety program. Reorganization of the RSOF resulted in hiring or promoting more individuals into Specialist positions consistent with the Department's goal of improving its knowledge base and providing for more flexible response to emergencies and other issues. A new specialist position joined the RSOF in 2003 with a broad safety background.

All new specialists receive training by the RSO or Assistant RSO and work under the auspices of experienced personnel. New specialists also attend in-house and commercially offered training. Experienced specialists also attend commercially offered training for more specialized functions. Seminars, training, and conferences attended in 2003-2004 included: Hazmat 8-hour Refresher, 16-hour Incident Command, Policy Writing, Radiation Technician Course, Technical Writing, Radiation Safety, Network Security, Asbestos, Auditors Roundtable, and Annual Health Physics Society National Conference.

Presentations to RSOF personnel of current research on campus promotes connection to the research community and broadens the knowledge base within the RSOF. A colloquium presented this year by a CASE researcher addressed current research involving mice and the Micro Positron Emission Tomography (PET) scan. During the year, a new training component was added to our radiation staff meetings. Topics covered included "DOA990 Waste Facility Ventilation" and "Identifying Unknown Isotopes".

The Radiation Safety staff has also become actively involved with laboratory inspections for the Laboratory Standard Program through cross training with Safety Services arm of DOES operations. This cross-training effort allows the Radiation Safety staff to better respond to laboratory incidents involving chemicals and infectious agents, as well as radioactive materials.

One member of the Radiation Safety staff is responsible for the DOES Home Page, which houses all on-line departmental training programs and schedules, safety manuals, safety news letters, MSDSs, and safety information resources. This active website is an essential resource for the campus community that requires continuous updating. This individual also monitors all DOES databases.

LIAISON PROGRAM

The Liaison Program has helped foster a relationship between the RSOF Staff and the research community by building trust through communication and expedited follow-up on inquiries and safety concerns. 100% of the designated laboratories have been contacted by the DOES personnel through the Liaison Program.

DOES EMAIL

Since implementing the DOES Email, the number of inquiries and safety issues from CASE personnel has tripled to an average of ten emails per day. This increase in email communication has led to swift response and follow-up on safety issues in our user community.

TRAINING SESSIONS

The RSC is responsible for ensuring 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 Generators. Initial training must be completed before use of any radioactive materials or radiation generating equipment (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:

AUTHORIZED USERS: A Faculty member that uses RAM is called an authorized user.

RADIATION WORKERS: A radiation worker is any person that uses RAM under the supervision of an authorized user.

ANCILLARY RADIATION LABORATORY WORKER: An individual under an AU who works in RAM laboratories but only has minor incidental contact with radioactive material and/or are required to provide support services in laboratories or classrooms where RAM is used.

ANCILLARY WORKER: An ancillary worker is an individual that does not work with RAM, but due to the nature of their job may come in contact with laboratories or classrooms where RAM is used. These workers include Facility Maintenance, Protective Services, CASE Custodial/ Contractor Services, Shipping/ Receiving, Animal Resource Center, and Research Department Assistants. During orientation, non-laboratory personnel are required to attend Right-To-Know 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 authorized possessor.

The RSOF maintains records of training, attendees, and content of training. Records of refresher training offered online are also maintained. New isotope user classes are offered at least twice per month. During 2003/2004, the office held 37 classes for 283 new isotope users. All retraining was accomplished over the Internet. This year 793 individuals used the Internet retraining option.

The RSOF also held 26 ancillary training classes for 448 individuals. Training is audited on a monthly basis by the Asst. RSO to ensure compliance. All non-laboratory personnel attend Right-To-Know (RTK), which includes a radiation safety component. Nineteen RTK classes were held for 60 individuals. 100% compliance was achieved in Facilities Services as well as Contract Custodial personnel. Protective Services achieved 92% compliance. Shipping and Receiving achieved 94% compliance. CASE Custodial achieved 89% compliance. Animal Resource Center personnel achieved 93% compliance. Current efforts are focused on bringing each of these employee categories to 100% compliance. Employees who do not complete training are restricted from working in areas where radioactive materials are used.

Radiation generating equipment (RGE)/ X-Ray training classes are conducted on an as-needed basis. During 2003/2004 there were 12 classes held for 45 new workers. Authorized possessors of the radiation generating equipment (RGE)/ X-

Ray equipment are responsible for annual machine and performance-specific refresher training for their workers. Retraining classes are not presented by the RSOF for X-Ray users. The radiation generating equipment (RGE)/ X-Ray training program was reviewed and revised to conform to modern DVD specifications, and the content of these training sessions was updated to include recent changes in the regulatory requirements.

FACILITIES AND EQUIPMENT

CASE administration and the RSC ensure that all facilities, equipment, and personnel are available and adequate for safe operation, storage, and disposal of licensed material. The RSO is responsible for overseeing a program to review applications and inspection of the all facilities, equipment, and personnel that use licensed material. Facilities available at CASE for the use of licensed material include:

AW Smith	Bingham	Biomedical Research Building
Bishop	Bolwell	DeGrace
Glennan	Hanna Pavilion	HG Wood
Kent Hale Smith	Med East	Millis
Olin	Pathology	RBC
Rockefeller	Service	Wearn
White	Wickenden	UCRC II

Two new buildings that also licensed material were opened this year:

Wood Research Tower Wolstein Research

LABORATORIES

There are approximately 500 laboratories on campus, including the two new research buildings listed above. All of these laboratories are equipped to use licensed material and equipment. Laboratories typically include chemical hoods, survey meters, protective clothing, analytical detection and measurement equipment, waste receptacles, and decontamination supplies.

RADIATION SAFETY OFFICE

Facilities and equipment for laboratory inspection or isotope storage are located in: a) the Service Building (1st Floor), b) Medical School (DOA990), c) and the Wolstein Building (1118, 1119, & 1120).

PROGRAM OFFICE:

Service Building (1st Floor)-Developmental Offices, Training & Laboratory:

The RSOF is located in the Service Building on the 1st Floor at 2220 Circle Drive. The purchase of up-to-date hardware is crucial for the amount of data that is accumulated to ensure efficient and quick access to records in the RSOF. To this end, we have purchased one Dell Power Edge 2600 Server to support radiation safety Powerpoint presentations. Nine Palm Pilots were purchased for use when conducting inspections. The Palm Pilots facilitate reproducible inspection coverage and on-site availability of location–specific inventory storage information during inspections. A Smart Board System was also purchased to augment the in-house training program. This instrument allows RSOF instructors to demonstrate use of on-line databases and training materials. In addition the Smart Board System provides direct access to library services and campus maps during staff meetings and emergency responses.

New software from Filemaker Pro and Intervideo WinDVD was purchased to update old software and to increase computer memory. Filemaker Pro 6 was updated to Filemaker 7 for the computers. Filemaker Mobile 2.1 was updated to Filemaker Mobile 7 for the Palm Pilots. The training programs were converted from VCR to DVD presentations. Using the Intervideo WinDVD facilitates distribution to users of radioactive materials and on-site training sessions.

The Radiation laboratory is equipped with a Packard Model 1900C Liquid Scintillation Counter (a duplicate machine is 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 ^{125}I. The department also has a multi-channel analyzer with a sodium iodide detector. These instruments are used for bioassays and the quantification of air samples for EPA audits, as well as for identification of unknown isotopes found during radiation inspections. The laboratory includes 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 process/ storage room for radioactive material and disposal activities. The waste room is maintained with negative pressure and 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. The 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 so as 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 (1120) that contains a chemical hood, liquid process and storage area (1119), that contains a walk-in chemical hood, and a solid process and storage area (1118) for radioactive material and disposal activities. The liquid process and 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 then disposal. This area maintains negative pressure relative to surrounding building spaces. The Wolstein Waste Facility is fully operational. One room of this Facility has been developed as a combined Chemical and Radioactive Materials Emergency Response center for the Wolstein Building. 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 chemical, infectious material, or radioactive spills.

IODINATION EQUIPMENT

Special iodination hoods, air pumps, and activated charcoal-filter exhaust are placed in laboratories that conduct Iodinations. Currently six laboratories are equipped to conduct iodinations. Their locations are as follows:

Bishop S630/ S629	DOA 990 (Storage)	Wood 167
BRB 901	Med East 564	Pathology 105

ANIMAL RESOURCE CENTERS (ARC)

Animal care centers are located in the Med East and Wolstein Research buildings. The Med East ARC is a conventional animal care facility that is used by authorized users to conduct animal studies with radioactive materials. A variety of animals (mice, rats, hamsters, rabbits, ferrets & large animals such as sheep, dogs, pigs) are housed within the facilities. The Wolstein ARC is a facility that predominantly houses mice/ rats. Contaminated items are stored in the Med East ARC freezer until disposal.

EQUIPMENT CALIBRATION

Annual calibration consists of an electronic check 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 on site. These instruments are sent to an appropriate vendor by the AU's laboratory. Instruments requiring simple repairs are done in-house.

Liquid Scintillation Counter (LSC) calibrations are conducted daily for the DOES Radiation Laboratory and as required for the LSC in DOA990. A new LSC was installed in the Wolstein building and the performance analysis was verified. Three performance verifications were conducted for the Packard Auto Gamma Minaxi 500 Counter in the DOES Radiation Laboratory.

RADIATION SAFETY PROGRAM

PURCHASE OF RADIOACTIVE MATERIALS

An authorized user or their approved designee is permitted to purchase radioactive material. All radioactive isotope purchases must be approved by the RSOF and the order is processed through the Purchasing Department. Case's new purchasing system has been configured to ensure compliance with mandated security and requirements.

Authorized Users must be pre-approved for specific isotope use and quantity. The activity, when added to the current inventory, may not 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 AU's laboratories.

TRANSFER OF RADIOACTIVE MATERIALS

The RSOF reviews and approves all transfer of radioactive material internally (on-campus) and externally (off-campus). Before initiating a transfer, the appropriate transfer form must be completed and forwarded to the RSOF for approval. Thirty-one isotope transfers were approved this year, for a total of 20.70 mCi.

RECEIPT OF RADIOACTIVE MATERIALS

Every package of radioactive material must be inspected by the RSOF for contamination, dose rates, and evidence of damage or breakage. The AU or designee is required to survey all radioactive material packages upon receipt for contamination and evidence of damage or breakage. Radioisotopes used in biomedical research result in a constant flow of radioactive materials to and from the campus. The Ohio Department of Health (ODH) and our Broadscope license require that shipments be surveyed within three hours of arrival. In the past year, 1310 isotope shipments (totaling 1.470 Curies) were approved by the RSOF for receipt on campus. An inspection sticker and the RAM Package Receipt Form on the package confirm that inspection has been completed by the RSOF. 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 a laboratory representative is contacted.

DISPOSAL OF RADIOACTIVE MATERIALS

During 2003-2004, the RSOF staff made 796 isotope waste pickups (0.327 Ci) and 148 approved AU-directed disposals were made into the sanitary sewers (17.12 mCi). The following table shows a breakdown by isotope of radioactive materials entering and leaving laboratories.

Isotope	Orders #	mCi	Waste Pickups #	mCi	Sewer Disposals #	mCi	Transfers #	mCi
^{14}C	40	27.611	40	5.704	11	2.289	3	7.550
^{45}Ca			1	0.050				
^{109}Cd			1	0.000				
^{36}Cl			8	0.049	1	0.115		
^{57}Co	1	1.0	6	0.518				
^{51}Cr	13	18.0	8	0.510				
^{137}Cs			1	0.000				
^{55}F	1	1.0	6	0.722				
^{3}H	136	188.022	276	111.642	37	8.687		
^{123}I	1	1.0					3	2.522
^{125}I	57	35.684	35	11.853	12	0.904	13	5.114
^{129}I			1	0.000				
^{131}I								
^{111}In	1	2.0	3	0.401				
^{54}Mn			6	1.115				
MXD	2	0.005	2	0.008				
^{22}Na			2	0.003				
^{63}Ni								
^{32}P	934	923.011	298	184.948	66	4.446	6	1.508
^{33}P	46	17.944	14	1.388	9	0.341		
^{86}Rb	20	22.0	12	6.550	1	0.124		
^{35}S	57	230.599	66	100.546	11	0.219	6	4.010
^{99m}Tc								
^{65}Zn	1	2.0	10	0.327				
Total	**1310**	**1469.876**	**796**	**326.775**	**148**	**17.125**	**31**	**20.704**

SEALED SOURCES

Case has 204 sealed sources that are inventoried every six months. Of these 18 require a leak test as stated in our ODH license. Three of the 18 sources are high-level dose irradiators, and one is used to irradiate material with neutrons. Sources found in the irradiators are the only radioactive material sources that

could produce significant external dose hazards if their shielding were compromised. The appendix lists sealed sources on campus. These sources are not included in the summary reports for radioactive materials. This fiscal year, one sealed source was sent to ADCO for disposal.

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 are available. All information is updated on a regular basis. Over the past year, the RSOF provided AUs with a PDF form for the RAM Application and an updated Environmental Release form for RAM (that is submitted online every 6 months). Online Radiation Safety Retraining was also updated.

The DOES newsletter is designed to keep the campus community abreast of safety issues and concerns. It covers the latest government regulations and addendums, addresses concerns that are found during laboratory inspections, and answers questions frequently asked by laboratory personnel. Articles submitted during this year included: UV Radiation, Pregnancy Precautions, Radiation Safety Online, Half-Life Calculation, and Labeling and Sorting Radioactive Waste.

CLEARANCES/ RELOCATION PROGRAM

Researchers on campus frequently require decommissioning services for disposal of equipment as well as repairs, relocation or closing of laboratories. The RSOF requires at least three weeks notice for clearance. An orchestrated effort between the RSOF, Facilities Services, and the AU allows the program to operate efficiently. Fifty clearances and six relocations were completed over the past year.

RADIATION SURVEY METER CALIBRATIONS

CASE's ODH Broadscope license requires calibration of portable survey meters annually. Properly calibrated meters are necessary to perform accurate radiation surveys. Authorized users 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.

There are 252 survey meters on campus, of which the RSOF calibrated 245 meters in the last fiscal year. Four meters were repaired in-house. The RSOF is licensed to perform the electronic linearity test for each meter and to determine efficiencies of the instruments for detection of the isotopes.

Instruments that require maintenance, repairs, and/or calibration that cannot be performed in-house by RSOF are sent to an outside vendor. Each instrument and a copy of the calibration certificate must then be sent to the RSOF for efficiency determination. New instruments must also be inspected by the RSOF for determination of isotope efficiencies.

Five operational pumps used in the Iodination hoods were calibrated. The continuous air monitor that is housed in the Med School Waste Facility required 26 filter changes used for analysis of ^{125}I. A total cost savings of $14,050 was achieved for the in-house monitoring program.

RAM SECURITY

Refrigerators, freezers, or other storage units approved for RAM must either be secured externally or must contain a labeled lock-box within. Radioactive materials and potentially hazardous chemicals are required to be secured from unauthorized access or removal when unattended. Inspections by the RSOF are conducted on a monthly basis, after normal working hours, to ensure that areas where radioactive materials are present are properly secured.

PERSONNEL MONITORING

Radiation dosimeters are issued through the RSOF to personnel who could receive a measurable radiation dose. This includes all laboratory workers, visitors to the laboratory, maintenance workers or contractors working in the laboratory. Other personnel may request dosimeters and are provided at the discretion of the RSOF. Radiation workers must complete Radiation Training and submit an Occupational Exposure History Form before receiving dosimeters. Dosimeters are to be returned promptly at the end of each cycle to ensure that the RSOF can take timely action, consistent with implementation of ALARA, in the event that a significant dose is detected by the dosimeter.

Users of radioactive materials and other individuals potentially exposed to occupational radiation sources are monitored for radiation exposure received during their work on campus. There are 970 workers regularly monitored with radiation badges. However, only 160 are required to wear badges by regulation. No significant exposures were received in 2003/2004.

ODH regulations require that all monitored workers be advised annually of their occupational dose exposure. These workers were mailed a copy of their prior calendar year's dose report in the spring of 2004.

PREGNANT WORKER PROGRAM

Any radiation worker who is pregnant or thinks she may be pregnant may declare herself a pregnant worker by completing a Declaration of Pregnancy Form (in appendix). Counseling is provided and fetal dosimeter is issued monthly. This fetal dosimeter is worn such that any dose to the developing baby is conservatively measured. During the past year, 13 pregnant radiation workers received additional monitoring for fetal doses. All fetal doses were at background radiation levels.

NEUTRON USERS

Personnel monitors sensitive to neutron radiation must be worn for experiments and procedures involving the use of neutron sources. These can be obtained from the RSOF.

USERS OF RGE/ X-RAY

Personnel monitors must be worn for experiments and procedures involving the use of radiation generating equipment. For fluoroscopy procedures, personnel monitors are worn that are specially configured to measure exposure to the neck. These are obtained from the RSOF.

RADIATION GENERATING EQUIPMENT

Machines that produce ionizing radiation (RGE) are regulated by ODH for labeling, appropriate warning indicator systems and radiation leakage. CASE has a total of 100 units on campus (18 are tubes only), of which 23 are in storage, 5 are disabled, and 7 are out of service. There are 51 units used for analytical research including: electron microscopes, X-Ray diffraction and particle accelerators. There are also 32 X-Ray units for health care and diagnostic research, consisting of dental X-Ray units and veterinary X-Ray units. Two units were disposed and one unit was purchased 2003-2004. These units are inventoried quarterly and surveyed annually for leakage. RGE owners are required to provide site-specific training to their workers.

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 currently performs routine bioassays for radioactive iodine (thyroid scan) and tritium uptake (urinalysis). Bioassay records are kept in the RSOF and are available for review by authorized personnel.

RADIOACTIVE IODINE

There are currently five active iodination laboratories and two iodination hoods in the DOA990 Waste facility in storage. A bioassay is required any time more than 1 mCi of radioactive iodine is used in volatile form. The RSOF must be notified when experiments require:

- Handling of more than 1.0 mCi of volatile radioactive iodine.
- Performance of a baseline bioassay for anyone involved in a procedure that does not have a baseline radioactive iodine bioassay on file.
- Monitoring of effluent releases to the atmosphere during the first iodination procedure using a new protocol in order to measure and mitigate any release of radioactive iodine to the environment.

After the iodination, all individuals involved must contact the RSOF and arrange for a bioassay to be completed by the end of the next business day. Bioassays are then conducted to monitor the internal disposition of radioactive materials caused by inhalation or ingestion during experimental procedures. There were a total of 77 bioassays completed throughout the year. Of these, the RSOF staff completed 64 bioassays. Thirteen bioassays were performed on workers for a total of 11 iodination procedures, which included effluent air monitoring. No workers exceeded 10% of the ODH limits.

TRITIUM

Urine bioassays must be carried out for tritium users in accordance with the schedule below, with a baseline bioassay required prior to experiment implementation.

- Less than 100 mCi: Bioassays are performed at the discretion of the RSOF or when requested by the isotope user.

- Greater than or equal to100 mCi but less than 10 Ci: Bioassays are performed weekly until results are in the normal range.

- Greater than or equal to 10 Ci: Bioassays are performed daily until results are in the normal range.

Following approval by the RSOF, tritium users may collect and conduct their own bioassays and submit the results to the RSOF. The bioassay procedure is provided by the RSOF.

LASER SAFETY PROGRAM

Feedback from the Liaison program and subsequent follow-up by radiation staff identified a need for a specific laser safety program on the Case campus. Therefore during the year a new laser program under the direction of the Radiation Safety Office was created. An audit of all lasers on campus was completed; and a training presentation to be given to all laser users was developed. There are a total of 99 lasers on the campus in 10 buildings that are used in the programs of 26 researchers. The lasers of greatest concern are those labeled Class 3B and Class 4. The university currently owns 88 of these types of lasers. Laser safety training is scheduled to begin in September of 2004. All lasers will be audited on a yearly basis. A laser safety officer course will also be offered in December 2004. The specialist in charge of this program is currently obtaining training to become a certified laser safety officer. An inspection program for lasers will begin in January of 2005.

RADIOACTIVE MATERIALS INCIDENTS

EMERGENCY RESPONSE

General emergency 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 is to protect people first and property second. The RSO or his designee provides instruction, assistance or supervision of clean up as required. The RSO is authorized to act independently and take prompt remedial action in emergency situations involving RAM. Such actions are taken upon determination by the RSO of conditions that present imminent danger or threat to personnel, property, or the community at large.

INCIDENT/ SPILL RESPONSE

MINOR INCIDENT/ SPILL

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

MAJOR INCIDENT/ SPILL

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

There was one potential major incident and seven minor incidents over the past year that were documented and are listed as follows:

AUGUST 13, 2003

(Potential Major Incident) A call was received from the Ohio Department of Health stating that a biohazard box that was picked up from our biohazard waste facility set off an alarm at the Stericycle facility in Warren. The surface dose rate was reported to be 0.5 mRem/hr. The Radiation Safety Office picked up the package. A yellow bag containing a flask with white powder was found that read 2000 cpm on the surface. Analysis showed the isotope to be ^{134}Cs, which is not used by any AU on the Case campus. Therefore, the origin of the material could not be determined. The bag containing the flask was placed in our low-level radioactive waste facility for decay and eventual disposal. Corrective actions were not necessary because the incident appeared to be caused by meter malfunction at the time the survey was performed on the package. The meter is currently being checked periodically to ensure it is functioning properly during routine survey procedures.

SEPTEMBER 27, 2003

(Minor Spill) During the preparation of a ^{3}H labeled sample, a technician did not close the cap of the tube tightly enough, resulting in a spill in the hood. No personnel contamination or room contamination was found. The technician will make sure that the tubes are closed tightly after deposition of radioactive material.

JANUARY 6, 2004

(Minor Spill) A technician attached an ampoule of mixed gamma reference solution. When the technician attempted to open the ampoule as per the manufacturer's instructions, the ampoule broke, and 0.005 mCi of the solution drained out of the vial onto the technician's hand (which was gloved) and onto a ring stand holding the material. The contamination was restricted to the ring stand, which was labeled as fixed contamination. The technician will make sure that the ampoule tip is opened more carefully, and will avoid a rubber-coated clamp to hold the sample.

FEBRUARY 17, 2004

(Major Spill) A technician was aliquoting ^{32}P from a stock vial. Instead of a pipette, a pair of forceps was used to take out the safety plug from the vial. The forceps were accidentally dropped on the floor. The approximate activity was 0.5 mCi resulting in contamination on the floor, chair, lab coat, watch, and the technician's wrist. The incident was not reported to the Radiation Safety Office immediately. The technician decontaminated the area and her wrist, but did not report the incident until she got home at around 9 pm. In an initial discussion with the Asst. RSO, she said that her wrist was reading 200 cpm when she left for home. She was instructed to come back to the laboratory for personal decontamination. Her wrist was reading background after decontamination and she was sent home. The Radiation Safety Office staff followed up the next day. No floor contamination was found and only a small area of fixed contamination was left on the chair, which was appropriately labeled. Corrective actions included a change in procedures for sample transfer in the future. All laboratory personnel will immediately report incidents involving personnel contamination to the Radiation Safety Office.

FEBRUARY 24, 2004

(Minor Incident) A call was received from Facilities Services. Workers reported a burning sensation on their arms due to waste released from a pipe during repair in a laboratory. It was discovered that this pipe was connected to a RAM use sink in another laboratory. Both laboratories were surveyed and aliquots were taken of the water. The survey results from the laboratory showed no contamination. The aliquot from the spill tray under the sink contained 0.001 uCi/ml of ^{3}H. The area was labeled properly. As a result of this incident facilities services supervisors attended a meeting at DOES where appropriate use of

personal protective equipment by facilities services was reviewed and subsequently reinforced with Plant Services workers.

MARCH 11, 2004

(Minor Incident) Housekeeping personnel accidentally removed a bag of dry waste containing a maximum of 0.3 mCi of ^{3}H from a campus building and placed it in the regular trash. The housekeeping supervisor was contacted as well as the individual that picked up the trash. The waste was not retrieved. The individual was referred for additional awareness training. Procedures were also implemented to ensure that all new staff is trained at the RSOF before entering laboratory areas.

MARCH 22, 2004

(Minor Incident) A lab coat was contaminated with 0.09 mCi of ^{32}P during a routine survey of a laboratory. The lab coat was collected in a radioactive waste bag and brought to the Radiation Safety Office. The coat was washed and the contamination was removed. No personnel or area contamination was found. The technician was instructed to survey her lab coat before and after completing experiments.

APRIL 14, 2004

(Minor Incident) A radiation safety specialist was injured by a glass pipette containing 0.2 mCi of ^{3}H that had punctured a waste bag during placement into a waste drum. The specialist was wearing proper PPE, and the tip did not puncture the skin. A discussion was held with the laboratory that generated the waste regarding proper methods of waste disposal for sharps.

JUNE 25, 2004

(Minor Incident) During a routine decommissioning survey, a water bath contaminated with 0.006 uCi of ^{14}C was found in a room not labeled for RAM use. No floor or bench contamination was found. The AU was informed and stated that he plans on using the room for RAM use. He was instructed to send a map indicating wipe locations so that the RSOF can properly re-commission the room for RAM use.

RADIOACTIVE MATERIAL RELEASES

SEWER EXPOSURE CONTROL & MONITORING

State and federal regulations permit Case to dispose of low levels of radioactive materials in the sanitary sewers. The Northeast Ohio Regional Sewer District (NEORSD) requires semiannual reports on radioactive material discharged to the sanitary sewer system. Case's sewer releases were in compliance with both federal and state regulations. In the past fiscal year, the report for July through December 2003 was filed on January 26, 2004 and the report for January through June 2004 was filed on August 4, 2004. Only authorized users that are in storage mode or use only sealed sources are exempt from completing this form. One hundred percent compliance with sewer disposal regulations was achieved for both reporting periods.

AIR EXPOSURE CONTROL & MONITORING

During the 2003 calendar year, radioactive material releases to the air were less than 10% of the maximum levels set by the EPA. Therefore, Case had no reports to file, and the University is in compliance with the air effluent releases stipulated by the EPA Clean Air Act, the NRC, and the ODH.

With regard to airborne exposures, the primary concern is to preclude airborne exposure to radioactive iodine that is used for protein iodination experiments. To control exposures the RSOF require that reactions involving use of free iodine for Iodinations be performed within a chemical hood housing an additional iodination hood. The charcoal-filtered exhaust from the iodination hoods typically reduce radioactive material emissions by approximately 90%. Further, experiments requiring use of iodine in especially volatile form are routinely designed as closed systems to prevent airborne release of radioiodine.

WASTE MANAGEMENT

RADIOACTIVE WASTE FACILITY

The Barnwell Waste Facility remains open at a high price. However, we are required to use their services as long as they are 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 radioactive waste facility is used to segregate waste streams and prepare the waste for disposal. The different waste streams include aqueous

waste, sharps, acrylamide or agarose gels, animals, scintillation vials, and dry solid waste. Some radioactive isotopes have relatively short half-lives and are decayed to background in our facility. Other radioactive isotopes have longer half-lives and must be stored on an interim basis before disposal. Short-lived isotope waste is picked up from laboratories by the RSOF staff for interim storage in the radioactive waste facility.

Short-lived solid waste is held for decay (= or > 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 promoted by the RSOF. 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 by routine survey to ensure that material is free of high-energy beta emitters before disposal. In the past, significant amounts of radioactive waste were disposed through commercial vendors since time constraints on in-house disposal were caused by the length of time it took to unpack decayed-in-storage waste, open and distribute bag contents, deface labels and survey barrel contents. 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. Short-lived non-sewer radioactive waste is held for decay, resurveyed after ten half lives, and disposed by Chemical Analytics, a commercial hazardous waste disposal company.

COLLECTION & DISPOSAL OF ANIMAL REMAINS AND BIOHAZARDOUS WASTE

The Animal Resource Center (ARC) maintains a –20°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 in the animal disposal sheet on the cold room door. A log sheet for animals disposed in this manner is also kept in the waste generating laboratories for inventory purposes.

Any item that has come in contact with any etiologic agent is considered biohazardous and is placed in a red biohazardous container. Etiologic agents include bacteria, viruses, and parasites and this infected animal waste is autoclaved (unless the radioactive isotope is volatile) and placed in the ARC (EB10A) for disposal by the RSOF. Radioactive animal waste includes cage bedding, carcasses, viscera, excrement, serum, blood or other animal tissue containing radioactive materials.

RECYCLING PROGRAM

Lead containers that shield vials during transport are called lead pigs. For disposal, the lead pigs must first be removed from their plastic container. The plastic container is then surveyed to make sure it is not contaminated. Lead is a regulated material and cannot be disposed of as trash. It must also be surveyed and free of contamination before it can be picked up by the RSOF.

Over the past few years, we have recycled the lead shielding and lead bricks that have been accumulated from laboratories. The lead is collected at the Waste Facility and then taken to a commercial recycler. Other recycling programs will be facilitated as the need arises.

DISTRIBUTION OF WASTE GENERATED IN JULY 1, 2003 - JUNE 30, 2004

	Generated 7/1/2003-6/30/2004	Disposed: Stericycle	Disposed: Sewer	Disposed: Safety	Disposed: ADCO	In Storage as of 6/30/2004
Short-Lived Dry	63	92 *	0	0	0	64 **
Long-Lived Dry	31	0	0	0	31	0
Scintillation Vials	45	0	0	0	45	0
Animals	1	1	0	0	0	0
Long-Lived Sewer	60	0	60	0	0	0
Long-Lived Non-Sewer	0	0	0	0	0	6
Short-Lived Sewer	80	0	80	0	0	0
Short-Lived Non-Sewer	75	0	0	35	0	40

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 7/1/2003, kept for decay in storage, and disposed during the period of 7/1/2003–6/30/2004. The double asterisk (**) includes one drum that was generated prior to 7/1/2003 and still held for decay in storage.

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 BFI is $40 per drum. There were 92 drums of dry waste and one 32-gallon drum of animal waste surveyed and disposed during 2003-2004 fiscal year at a cost of $3,720. 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 $53,694. The indirect savings to Case due to the decay in storage program was $49,974.

SUMMARY

DEPARTMENT STRENGTHS

We have a staff with broad and diverse backgrounds that can address and resolve a wide range of issues faced in Radiation Safety at Case. We have developed programs that exceed regulatory requirements in most safety areas and proactively anticipate new safety requirements as new programs are promulgated. We also have excellent administrative support.

DEPARTMENT OPPORTUNITIES

Our program continues to mature. We enjoy an excellent interaction with other departments that are developing safety-related initiatives and outside agencies that are dedicated to improving the environmental quality in our facilities. For example, our department developed a training program for the Cleveland Fire Department that will be implemented over the coming year. This program provides excellent liaison with our primary emergency response partners and ensures implementation of best practices to prevent injury to personnel and to minimize property loss during emergency responses.

RADIATION SAFETY ACCOMPLISHMENTS FOR 2003-2004

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

- Implementation of a detailed response plan for radiological emergencies. The Emergency Response Plan was also tested as part of an 8-hour retraining exercise.
- Implementation of new irradiator security programs.
- Completion of a manual for a new laser safety program
- Revision of RGE/ X-Ray Safety Training and Manual
- Implementation of safety services inspection cross-training
- Establishment of new radiation waste facility and safety program for the Wolstein Building.
- Development of more incisive audit programs for all service and record keeping areas of Radiation Safety Operations.
- Generation of $78,246 in cost savings for the University as a result of certain procedures in-house as opposed to being outsourced.

RADIATION SAFETY GOALS FOR 2004-2005

The overall goal for the future will be to position DOES for more effective interaction with the educational and research goals of the University through training and training development. A secondary goal will be to increase the impact of Case safety programs on the surrounding community through educational and programmatic interactions with local emergency responders. Specific efforts will also address:

- Implementation of the new Laser Safety Program.
- Enhancement of interaction with Cleveland fire and emergency response agencies through both training and response interactions.
- Encouragement of staff toward completion of national certification to facilitate participation in community safety training initiatives.
- Update of the Radiation Generating Equipment Manual.
- Implementation of Laundry Services for the University
- Enhancement of the Recycling Program
- Development of a support program for new imaging facilities on the Case Campus.
- Enhancement of radiation safety service operations in all new Case buildings.

Prepared by Felice Thornton-Porter on 10/21/2004.
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APPENDIX