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PET Safety Manual



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**Ahmanson-Lovelace Brain Mapping Center
University of California, Los Angeles
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SAFETY & EMERGENCY PROCEDURES

Brain Mapping Center PET FACILITY SAFETY POLICIES

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Foreword

The current goal of the PET Laboratory is to support positron emission tomography (PET) research and development. The adjacent facility is also equipped with a cyclotron, which is capable of producing a wide range of radionuclides. The radiopharmaceutical laboratory (Hot Lab) is not currently planned to be used for radiopharmaceutical syntheses, though it is used for testing and for storage of radioactive materials that are either produced locally by the cyclotron or received from other sources in accordance with relevant local, state and federal regulations. Occupational and environmental radiation exposures are controlled in all areas to ensure low doses in accordance with ALARA policy.

The following policies are intended to provide guidance for the assurance of safe operation of the PET scanner. The proper application of the procedures and documentation of radiation exposures require the joint efforts of the facility staff and the Radiation Safety Office. Periodic safety audits will include reevaluations of the effectiveness of these policies.

A. Introduction: The UCLA Ahmanson-Lovelace Brain Mapping PET Laboratory is located within the Ahmanson-Lovelace Brain Mapping Center and supports positron emission tomography imaging for research protocols. It is located immediately adjacent to the cyclotron, which allows for the use of Oxygen-15 gas and water which have a very short half life (about 2min). The nuclides produced by the cyclotron are transferred either directly to the PET scanner room or to the radiochemistry laboratory ("hot lab") for processing. Because of the nature of the operations, radiation as well as non-radiation hazards exist.

The purpose of these safety policies is to insure maximum safety to all personnel in and around the Brain Mapping PET Facility. They are intended to establish and maintain correct methods of operational safety and to familiarize personnel with the potential hazards that exist. They reflect the policies of the University Radiation Safety Committee and the Radiation Safety Office and conform to the regulations of the State of California Department of Health Services and other government agencies.

This manual covers the policies and instructions that are unique to the activities and operations in the facility. More universal safety practices pertaining to initiation and maintenance of records, radioactive material labeling, waste disposal, and to many non-radiation hazards are discussed only briefly. Supplemental information may be found in the references and regulations listed at the end of this manual and in the notices from the Radiation Safety Office. For more detail information regarding cyclotron policies please refer to the cyclotron section of this manual.

B. Description of the Laboratory: The Brain Mapping PET Laboratory consists of an ECAT EXACT HR+ PET Scanner, control room and radiochemistry processing laboratory. Auxiliary areas include the cyclotron facility.

The PET scanner room and control room are controlled areas. The radiochemistry laboratory

and cyclotron room are considered high radiation areas.

C. Radiation Monitoring

- 1. Access Control and Personnel Monitoring:** The Brain Mapping PET Facility is a controlled Access area. The entrances to the radiochemistry laboratory and PET control room are always locked when no operational personnel are present. Only personnel with a specific need to be in the radiochemistry laboratory, cyclotron room, PET control room or PET scanner room are issued passcodes to unlock these entrance. The doorways between the radiochemistry laboratory and the cyclotron room and between the PET control room and PET scanner room are also locked and both use a regular key rather than a passcode. Only personnel with a specific need to be in the cyclotron or PET scanner room are issued this key. The cyclotron room and radiochemistry laboratory are designated high radiation areas. The PET scanner room and control room are considered controlled areas. All areas are labeled with appropriate radioactive signs.

Routine radiation badge service is provided for all personnel permanently assigned to the Laboratory. Visitors and temporary personnel may be assigned badges according to their degree of Access to radiation areas. For groups of visitors, at least one member of the group will wear a dosimeter. All laboratory personnel are required to wear badges in controlled and high radiation areas in accordance with University regulations. Access to controlled and high radiation areas and the distribution of film badges is under the direction of the Laboratory Supervisor. Visitors must be accompanied by an escort designated by the Laboratory Supervisor. For detection of personnel contamination, low range gamma survey meters are available. Before leaving an area where contamination may exist, personnel are required to monitor and decontaminate themselves as necessary.

- 2. Area Monitoring:** Environmental dosimeters are placed in various locations around the PET and Cyclotron Facility (including on the roof) in both controlled and non-controlled areas to monitor radiation exposure. These badges are measured on a quarterly basis. The reports are reviewed upon receipt to ensure that radiation exposures in all areas are within the restricted limits.
- 3. Air Exhaust Monitoring:** Exhaust air from the cyclotron room, the radiochemical laboratory and fume hood, the control room and the PET scanner room are monitored with a Bicron NE Networked Radiation Monitoring System. This system provides continuous monitoring of the activities of gaseous components in the exhaust ducts of the ventilation systems. Monitoring is ongoing at all times, and the data is collected and automatically organized by a dedicated computer. Analysis of the data can be performed at any convenient time, even retrospectively hours later. If at any time, exhaust levels exceed preset values; alarms are activated and appropriate action is taken (e.g., termination of the bombardment or experiment or reduction of the effluent activity).
- 4. Portable Survey Instruments:** The laboratory is equipped with portable pressurized ion chamber survey meters and Ludlum Model 3 beta-gamma survey meters which use model 44-9 Geiger-Mueller pancake detectors. The meters are calibrated annually and labels are affixed to the meters giving the calibration data, the initials of the person performing the calibration and the date the next calibration is due. Since the laboratory has more than one of each type of survey meter, one meter at a time can be taken out of service for calibration. No instrument is to be used if the calibration due date has passed.

The Laboratory Supervisor is to be notified of any instruments whose calibration has expired.

5. **Radiation Surveys:** The purpose of radiation surveys is to check for radioactive contamination. Portable survey instruments are used to take these measurements. Routine operational surveys are performed when radioactive isotopes are used in the laboratory. These surveys do not need to be performed if radioactive isotopes have not been used.

These surveys consist of measurements of radiation exposure dose rates in the radiochemical laboratory, the PET control room and the PET scanner room, the hallway outside the facility, and the bathroom used by PET subjects. Any non-controlled areas (i.e. hallway and bathroom) that reveal contamination during the survey must be decontaminated or restricted until radioactive contamination has decayed to background levels.

- a. **Direct Daily Surveys:** The UCLA Radiation Safety Office requires the use of an ionization chamber to perform a direct survey in order to measure exposure rates. A direct survey with a Geiger-Muller instrument is also recommended.
- b. **Weekly Wipe Surveys:** Contamination monitoring using wipes is performed weekly. However, the weekly survey does not need to be performed for weeks in which no radiation was used. A wipe test must be performed simultaneously with, or immediately after, the direct survey. Wipes are counted using a Packard Cobra II E5003 gamma counter.

D. Laboratory Safety Instructions

1. **General:** Hazards of a general nature include fires and explosions, falls, accidents during lifting and handling of heavy equipment, electrical shock, and toxic material release and dispersion. All of these topics are covered in detail in a number of regulations and publications, some of which are contained in the references at the end of this manual. Every member of the Laboratory staff must be familiar with common laboratory hazards and be prepared to initiate the necessary corrective action. The Laboratory Supervisor is responsible for the general PET operational safety and will insure that all personnel are thoroughly familiar with the safety procedures and that all operations are conducted safely. All experiments, irradiations, and processing operations will be reviewed and evaluated with respect to potential non-radiation hazards. Any operation which is considered to be unsafe will be discontinued immediately and will not be resumed until appropriate corrective measures are taken.

Due to high voltage electrical hazards in the PET scanner and its power supplies only certified PET engineers may service the scanner.

2. Laboratory Safety

- a. All PET Laboratory personnel are required to wear radiation badges when working in the facility.
- b. Eating, drinking, smoking or application of cosmetics is not permitted in the laboratory areas, the cyclotron vault, or the scanner room.
- c. No food or drink storage is permitted in the radiation areas.
- d. Protective clothing will be worn in all areas where the handling of radioactive

- materials may result in contamination.
- e. Radioactive materials with substantial radiation levels will be handled with tongs and transferred and stored in approved shielded containers.
 - f. All radioactive materials and their containers will be labeled in accordance with the UCLA Radiation Protection Manual.
 - g. Transfer and control of all radioactive materials will be under the direction of the Laboratory Supervisor.
 - h. All target irradiations, beam experiments, and Hot Lab operation must be approved by the Laboratory Supervisor.
 - i. Personnel entering the exclusion areas will be instructed regarding hazards, safety and emergency procedures.
 - j. All radioactive waste will be deposited in designated containers only and will be packaged and disposed of in accordance with University procedures.
 - k. Decontamination operations will be performed under the direction of the Laboratory Supervisor.
 - l. All personnel exposed to radioactive contamination are required to monitor their hands, feet and clothing before leaving the contaminated area. If contamination is found, decontamination procedures must be followed before leaving the area.
 - m. No radioactive materials will be washed down the floor or sink drains in the Hot Lab or PET scanner room without the approval of the Radiation Safety Office.
 - n. All materials must be packaged, labeled, and monitored in accordance with approved procedures before transfer from the Hot Lab.

- 3. Emergency Procedures:** The goal of any emergency procedure is to prevent injury if none has occurred in an accident and to prevent further injury if it has occurred. Furthermore, every effort must be made to confine and control any radioactivity that may be released as the result of an accident. Safety procedures have been established in the laboratory, which are designed to reduce the possibility of an accident to a minimum; however, it is recognized that even in the most efficient safety program, the possibility of an emergency situation still exists. In the Brain Mapping PET Laboratory, such emergencies may arise as the result of operational accidents, natural disasters (earthquakes, floods) or civil disturbances (riots, sabotage, vandalism). The responsibility for the safety program rests with the Laboratory Supervisor, Dr. John Mazziotta. Emergency contact information is posted on the PET control room and Hot Lab doors. All personnel listed on the emergency contacts are trained in radiation safety practices and are authorized to direct and/or perform decontamination operations.

In the instance of a radiation emergency during off-work hours, contact the UCLA Police Department at 911 (not 8-911) on a campus phone or (310) 825-1491 from a non-campus phone.

The types of emergencies that may arise are fires, explosions, toxic gas leaks, electrical shock, water flooding, chemical and radioactive spills or gas releases. All emergency procedures are posted on the PET control room and Hot Lab doors.

NOTE: If radioactive materials are involved, every person who might have been in the area at the time of the accident or following it is considered contaminated until a personnel radiation survey has been performed by one of the individuals on the notification list. Those involved in the accident or its control will remain in the immediate vicinity until decontamination has been performed. Do not enter the accident

area until an authorized survey and decontamination has been performed and the area has been declared safe by one of the individuals on the notification list.

- 4. Decontamination:** The Radiation Safety Office (Ext. 56995) will be notified of all human contamination. Decontamination materials are located under the sinks in the Hot Lab and PET scanner rooms. A radiation safety spill kit is located in the scanner control room. Radiation survey meters are located in the hot lab, scanner control room, and cyclotron. In most situations at the Brain Mapping PET Laboratory, due to the short lived radionuclides produced (less than 2 hours), physical decontamination is not necessary. Usually, covering and isolating the contaminated area to allow for radioactive decay will suffice for decontamination.

Decontamination of equipment, furniture, and building surfaces will be performed only by a qualified person, an individual who has been trained and/or approved by the Laboratory Supervisor. Contaminated areas will be isolated, secured and posted until authorized decontamination can be performed or until activity has decayed to a safe level. Whenever possible, personnel decontamination will be performed by a qualified person. However, since prompt removal of the contamination is of the utmost importance to reduce the potential hazard, if a qualified person is not readily available; other persons are permitted to perform decontamination.

All operating personnel will receive instructions on the use of the portable radiation survey instruments in the facility.

- E. Waste Management:** Most of the radioactivity generated by the Brain Mapping PET Laboratory is of the short half-life variety (less than 2 hours). For this reason, disposal of radioactive waste is not a significant problem. In most cases, the material can be allowed to decay to background behind appropriate shielding and disposed of in the ordinary laboratory waste after being monitored.

However, when this is not possible the procedures specified in the UCLA Radiation Protection Manual will be followed. Metal or plastic step-on cans are provided in all radiation areas and are to be used for dry waste only. No liquids are to be placed in these step-on cans. The containers are labeled radioactive. The inner container is lined with a plastic bag which is removed, sealed and labeled with a completed radioactive waste tag for transfer to the Radiation Safety Office waste area when it is full.

Liquid waste is collected in the heavy gauge, wide mouth plastic containers also labeled as radioactive material. They are tagged with a completed radioactive waste tag and sent to the Radiation Safety Office waste area when full.

F. Personnel Responsibilities

- 1. Laboratory Supervisor:** All activities that are conducted in the Brain Mapping PET Facility are under the direction and supervision of the Laboratory Supervisor. No irradiation, beam experiment, radiochemical processing operation, or radiopharmaceutical administrations will be conducted without his/her approval. He/She is responsible for insuring that all procedures are performed in compliance with University safety policies and applicable State of California regulations.

2. **The Brain Mapping PET Advisory Committee:** The Brain Mapping PET Advisory Committee is responsible for all matters of policy, general priorities for research projects, and special problems concerned with health safety. Currently, the Committee is composed of John Mazziotta, M.D., Ph.D., and Roger Woods, M.D.
3. **Cyclotron Operator:** The Cyclotron Operator is responsible for the physical operations and manipulations of the cyclotron and its Accessories. This person is charged with ensuring that all such operations are conducted in compliance with applicable regulations for mechanical, electrical, and radiological safety.
4. **Laboratory Supervisor or Certified Nuclear Medicine Technologist:** The radiation safety and health physics program will conform with all applicable regulations set forth by the University Radiation Safety Office and the Radiation Safety Committee. Records, reports and procedures of this program will be maintained as to be consistent with UCLA campus practices at all times, and be subject to audits by the Radiation Safety Office and by the State of California. In general, Health Physics is an important aspect in the smooth operation of this facility. Duties include:
 - a. Management of personnel film badges.
 - b. Overseeing calibration of radiation survey meters and dose calibrators through the Radiation Safety Office.
 - c. Assuring that surveillance wipe tests, inventory and control of radioactive sources, activated materials, waste storage and disposal and decontamination procedures are performed properly.
 - d. Record keeping of all radioactive transfers.
 - e. Monitoring and instructing visitors to the Brain Mapping PET Laboratory about radiation safety rules. These duties will be shared by all the personnel of the Brain Mapping PET Laboratory with the assistance and support of the Radiation Safety Office.
 - f. Ensuring that all persons working in the Hot Lab are thoroughly familiar with regulations and safety procedures.
 - g. Conducting all quality control tests for the PET scanner and auxiliary equipment.
5. **Certified Nuclear Medicine Technologist:** Administer radiopharmaceuticals under the general supervision of a Board Certified Nuclear Medicine physician. The term 'general supervision' is defined in California Title 17, Section 30502. CNMT's must ensure that all radiopharmaceutical administrations are compliant with applicable local, state and federal regulations.

G. Records: The procedures for initiating and maintaining radiation records and reports are set forth in the Radiation Protection Manual and applicable California regulations. These will be followed, and, in addition, other records pertinent to the activities of the Brain Mapping PET Facility will be maintained.

1. **Personnel Dosimeter Log:** Individual radiation badge records are routinely maintained by the Radiation Safety Office, and it is not the intent of this record to duplicate that effort. A copy of this record is maintained at the Brain Mapping PET Laboratory. It includes radiation badge readings for operational as well as visiting personnel.
2. **Radiation Survey Record:** This record contains detailed information regarding routine

and special surveys, safety inspections, PET equipment maintenance operations, accidents and decontamination activities, and any unusual operational conditions and requirement. It is maintained by the Laboratory Supervisor or designated personnel.

- 3. Radioactive Materials Accountability Record:** Information and records regarding radioactive material inventories, transfer and waste disposal are maintained in this record. Copies of current valid radioisotope applications of persons and agencies requesting radioisotopes are maintained as part of this record. The Laboratory Supervisor or designated personnel has responsibility for this record.
- 4. Radiation Instrument Maintenance and Calibration Record:** This record contains the maintenance and calibration information and dates for all radiation survey instruments and gaseous effluent monitors. The Laboratory Supervisor or designated personnel is responsible for this record.
- 5. Cyclotron Operations Log:** This log contains the operational data of the cyclotron, including pertinent instrument settings, nature of experiment of irradiation, irradiation periods, and names of responsible individuals. It will be maintained by the Cyclotron Operator and will be Accessible at or near the control consoles.

H. Protocol Review for New Experimental Arrangements: The Laboratory Supervisor will review each new PET protocol in order to assess radiation exposures or other hazards. The approved protocols will be kept on file at the PET Facility.

I. Radioactive Materials: The following radioactive materials may be present in the Brain Mapping Center PET Laboratory.

1. Beta or gamma reference sources for spectral analysis and wipe counting. These sources are less than 10 μCi and are not considered a serious external radiation hazard.
2. Sealed sources used for calibration of PET scanner, survey meter or isotope calibrators. These sources are stored in the PET scanner room in appropriately shielded containers.
3. Gaseous radiopharmaceuticals, Oxygen-15, will be converted to oxygen-15 labeled water using a dedicated commercial bedside conversion unit located in the PET scanner room, so in most instances, isotope will travel from the cyclotron directly to the PET scanner room via specially designed shielded conduits without the need for direct handling. A pass through window from the Hot Lab to the PET scanner control room allows any radiopharmaceuticals prepared in the Hot Lab to be transferred to the PET scanner via the control room without entering the outside hallways. Although not needed for currently planned operations, shielded conduits also connect the cyclotron to the fume hood located in the Hot Lab.
4. Radiopharmaceuticals stored in the Hot Lab that are produced locally by the cyclotron or received from other sources for research protocols involving phantom or human studies.

J. Radiopharmaceutical Transfers: All radiopharmaceuticals from other facilities are transferred and received in accordance with US DOT and NRC regulations. Upon receipt, all radiopharmaceutical packages are checked for contamination using a pressurized ion chamber survey meter and wipe tests. Any packages that do not meet DOT and NRC regulations are reported to the UCLA Radiation Safety Office.

K. Administration of Radiopharmaceuticals

1. No one may administer radiopharmaceuticals to a human subject or patient or supervise such administration by a CNMT unless they have been explicitly authorized to do so in writing by John Mazziotta, M.D., Ph.D. There are no exceptions to this policy, not even if the study were to be performed under the supervision of some other nuclear medicine physician and/or under an authorization other than LA 705.
2. Certified Nuclear Medicine Technologists (CNMT's) must provide a copy of their current California certification and curriculum vitae to John Mazziotta, M.D., Ph.D. when requesting authorization to administer radiopharmaceuticals.
3. Physicians who are currently Board Certified in Nuclear Medicine must provide a copy of their current Board Certification, their current California Medical license and current curriculum vitae to John Mazziotta, M.D., Ph.D. when requesting authorization to administer radiopharmaceuticals or to supervise the administration of radiopharmaceuticals by a CNMT.
4. Physicians who are not currently Board Certified in Nuclear Medicine are only permitted to administer radiopharmaceuticals at the discretion of the UCLA Medical Radiation Safety Committee and may not supervise the administration of radiopharmaceutics by a CNMT. Requests to allow such physicians to administer radiopharmaceuticals in the Brain Mapping PET facility may only be advanced by John Mazziotta, M.D., Ph.D. The UCLA Radiation Safety Committee currently appears reluctant to grant permission to physicians who are not board certified in Nuclear Medicine, and requests will only be advanced under circumstances that John Mazziotta, M.D., Ph.D. considers likely to be compelling to the Committee.
5. Continuing authorization to administer radiopharmaceuticals by CNMT's is contingent on evidence of current certification being on file and posted in the PET Laboratory. Authorization will be automatically suspended when certificates on file have expired. It is the responsibility of the CNMT to assure that renewed certificates are posted in the PET Laboratory.
6. Continuing authorization of a Board Certified Nuclear Medicine Physician to administer radiopharmaceuticals or to supervise such administration by a CNMT is contingent on evidence of current board certification and evidence of current California medical licensure being on file in the PET Laboratory. Authorization will be automatically suspended when certificates or licenses on file have expired. It is the responsibility of the physician to assure that renewed certificates and licenses are filed in the PET Laboratory.
7. Criteria for continuing authorization to administer radiopharmaceuticals by physicians who are not board certified in nuclear medicine will be determined on a case-by-case basis and will be reviewed at least annually by John Mazziotta, M.D., Ph.D., and the UCLA MRSC.
8. Authorization to administer radiopharmaceuticals or supervise such administration by a CNMT will be automatically suspended for any individual delinquent in obtaining Radiation Safety Training credits and will not be reinstated until it has been documented that the deficiencies have been corrected.

9. CNMT's are only authorized to administer radiopharmaceuticals under the general supervision of a Board Certified Nuclear Medicine Physician. It is the responsibility of the CNMT to document the name of the supervisor and to verify that general supervision is provided at the time of radiopharmaceutical administration. The term 'general supervision' is defined in California Title 17, Section 30502. Documentation must also be on file in the PET laboratory confirming that the Board Certified Nuclear Medicine Physician has accepted responsibility for general supervision of the CNMT in the context of the particular subject to whom the radiopharmaceutical is administered or more broadly in the context of the particular project in which the subject is participating. Failure to comply with this requirement will be the basis for immediate and automatic suspension of authorization to administer radiopharmaceuticals.
10. Misadministration of a radiopharmaceutical by any individual will result in immediate and automatic suspension of authorization to administer radiopharmaceuticals pending a formal review. Misadministration includes any of the following:
 - a. Administration of a radiopharmaceutical without a properly signed and dated prescription from a properly qualified physician that states the name of the person to whom the radiopharmaceutical is to be administered, the route of administration and the administered dose. The prescribing physician need not be a nuclear medicine physician but must prescribe in compliance with the corresponding IRB protocol and any related FDA regulations.
 - b. Administration of a radiopharmaceutical to the wrong patient or subject.
 - c. Administration of a radiopharmaceutical by a route other than that prescribed.
 - d. Administration of a dosage of a radiopharmaceutical that differs from the prescribed dosage by more than 50 percent.
 - e. Administration of a radiopharmaceutical to a human subject who has not signed a UCLA approved consent form that covers the administration.
11. Authorization to administer radiopharmaceuticals may be revoked or suspended at any time by John Mazziotta, M.D, Ph.D.
12. Regulations: According to TITLE 17, Section 30521, CNMT's must be under "general supervision" when performing nuclear medicine technology procedures. Per Section 30510, this supervisor must be a nuclear medicine physician. Unlike "direct supervision" which requires the supervisor to be physically present (Section 30501), "general supervision" is defined in Section 30502 to mean that the supervisor is responsible for, and in control of, all of the following:
 - a. Quality, technical and medical aspects of all nuclear medicine technology procedures
 - b. Radiation health and safety of patients, ancillary personnel and other persons
 - c. Ascertaining that Certified Nuclear Medicine Technologists maintain their competency by participation in management-sponsored training, formal continuing education, and training offered by professional organizations or societies, or by institutions of higher learning.

L. Pregnant Radiation Workers

1. Pregnant radiation workers are strongly advised not to work in the ALBMC PET Laboratory or Cyclotron Facility at any time during pregnancy. To make arrangements to stop working in these areas, a pregnant radiation worker may pursue one or more of the following options:
 - a. Make arrangements for reassignment of duties with her immediate supervisor.
 - b. Make arrangements for reassignment of duties with the Responsible User for the radiation authorization under which she works (most, if not all protocols in Brain Mapping will be under LA 705, for which John Mazziotta, M.D., Ph.D. is the Responsible User).
 - c. Formally declare her pregnancy to the UCLA Radiation Safety Office, whose policy it is to in turn contact the Responsible User to assure that radiation exposure to the embryo/fetus of a declared pregnant woman does not exceed 500 mrem during the entire pregnancy and 50 mrem per month during the entire pregnancy. If the fetus/embryo received a dose greater than 50 mrem during the time the woman did not know she was pregnant, monthly exposures for the remaining of the pregnancy will be adjusted not to exceed a fetal dose of 500 mrem during the entire pregnancy. In the PET environment, reassignment of duties is highly likely to be the preferred approach for limiting radiation exposure to this low level.
2. If a pregnant radiation worker chooses not to formally declare her pregnancy to the UCLA Radiation Safety Office and, contrary to the strong advice above, desires to continue to work in the ALBMC PET Lab or Cyclotron area during her pregnancy, her supervisor must notify John Mazziotta immediately either verbally or by email and document this fact in writing to John Mazziotta within 3 working days of learning that she is pregnant.
3. If a radiation worker has declared her pregnancy in the UCLA Radiation Safety Office and it is planned for her to continue to perform any tasks in the ALBMC PET Laboratory or Cyclotron Facility in accordance with the radiation limits for declared pregnant workers, this plan must be formally documented in writing by the woman or her supervisor and approved in writing by John Mazziotta before the declared pregnant woman does any additional work in the PET or cyclotron facility.

REFERENCES

1. National Bureau of Standards: Radiological Safety in the Design and Operation of Particle Accelerators, (U.S.) Handbook, No. 107, June, 1970.
2. United States Atomic Energy Commission, Division of Operational Safety: Electrical Safety Guide for Research, Safety and Fire Protection Technical Bulletin 13, December, 1967.
3. United States Atomic Energy Commission, National Accelerator Safety Committee: Safety Guidelines for High Energy Accelerator Facilities, TID 23992, 1967.
4. United States Department of Health, Education and Welfare: Particle Accelerator Safety Manual Handbook, MORP 68-12, October, 1968.
5. University of California at Los Angeles, Radiation Safety Office Radiation Protection Manual, 1995.
6. State of California Department of Health Services, California Radiation Control Regulations, Title 17, California Administrative Code.
7. NCRP Report No. 51, Radiation Protection Design Guidelines for 0.1 to 100 MeV Particle Accelerator Facilities, March 1, 1977.
8. NCRP Commentary No. 3, Screening Techniques for Determining Compliance with Environmental Standards, March 31, 1986.

Brain Mapping Center
PET LABORATORY SAFETY AND EMERGENCY PROCEDURES

All users of radioactive materials should be familiar with these procedures before any emergency arises. When an accident involving radioactive material occurs, address the greatest hazard first. **Lifesaving measures always take precedence over decontamination or other concerns, so call 911 immediately if needed.** If personnel have received high radiation exposure or radioactive contamination in addition to physical injury, inform paramedics that the patient is or may be contaminated.

Site Specific Emergency Procedures

The types of emergencies that may arise are fires, explosions, toxic gas leaks, electrical shock, water flooding, chemical and radioactive spills or gas releases. The step-by-step procedure to be followed in the event of one or more of the above emergencies is outlined below.

If radioactive materials are involved, every person who might have been in the area at the time of the accident or following it is considered contaminated until a personnel radiation survey has been performed by one of the individuals on the notification list. Those involved in the accident or its control will remain in the immediate vicinity until decontamination has been performed. Do not enter the accident area until an authorized survey and decontamination has been performed and the area has been declared safe by one of the individuals on the notification list.

Fire or Explosion in a Radioisotope Area

In case of a fire or explosion, call 911 (not 8-911). If possible, stay in the area at a safe distance to acquaint the firefighters with the nature of the radiation hazards present and assist them if necessary.

NOTE: In the event of an electric shock situation where the individual or individuals are still in contact with the power source and it cannot be shut off, remove the source or the victim(s) using an insulated material such as dry wood, cloth or newspapers.

- Turn off, disconnect or otherwise disable all equipment involved
- Evacuate the area
- Close all doors to isolate any fires
- Notify the campus emergency units immediately
- For fires, use the alarm box in the hallway and phone 911 (UCLA Emergency)
- Give the operator the name and location of the building (Ahmanson-Lovelace Brain Mapping Center, 660 Charles E Young Drive South), room number (115 for control room and PET scanner; 117 for hot lab and cyclotron), fire box number (A-42), and the nature and extent of the fire and personnel injuries
- Use available fire equipment to extinguish or contain any fires. A multipurpose dry chemical fire extinguisher is mounted next to the door in the Hot Lab
- Administer first aid to injured personnel
- Notify at least one of the persons on the notification list below
- Secure the area, sealing off openings if flooding or gas leaks are present
- In the event of a fire, wait until the fire has been completely extinguished and fire department personnel have declared the area safe to enter with regard to fire safety

- If radioactivity is involved, check all personnel, including fire and rescue personnel, for contamination
- If contamination is found, follow the personnel decontamination procedures
- Transport injured personnel not requiring an ambulance to the Employee Medical Facility
- Record as much of the following information as possible:
 - Time and place of accident
 - Names of persons involved
 - Radiation exposure readings and instrument settings, if applicable
 - Description of accident in as much detail as possible with the probable cause and the action taken

Earthquake

In the event of an earthquake, the following action is to be taken in addition to the above procedure:

- At the outset of the earthquake, seek refuge from possible falling and/or flying objects under strongly secured furniture or equipment
- After the earthquake has passed, remain in the vicinity for notification from campus emergency units or other competent authorities
- Check the area for fires, floods, gas leaks or other damage and take appropriate action to eliminate or control the hazard
- Initiate the step-by-step emergency procedure above
- Prepare for possible aftershocks, secure all rolling equipment or objects that may fall
- **DO NOT:** Smoke or light a flame or make unnecessary telephone calls

Gas Leak

The fume hood in the hot lab contains a natural gas valve (along with air and water). The hood also contains a fan that should be always on. When this fan is working gas leaks are not easily detected, as the fan vents the hood. In the event that this fan stops working, please call facilities to reset it. The reset panel is located on the BMC roof. If gas is smelled in the hot lab or fume hood, the gas valve may be leaking or the valve may have been accidentally turned on. First, check the valve to make sure it is in the off position. If this does not reduce the smell put in a stat call to facilities. Have them check for leaks, tighten the valve and/or perform any other necessary procedures to contain the leak/smell.

Minor Spill

A spill can be considered minor if it contaminates small areas or equipment, with no external or internal contamination to personnel.

- **Notify** personnel in the area that a spill has occurred
- **Monitor** personnel leaving the area and remove any contaminated clothing
- **Cover** a liquid spill with absorbent pads or paper, dampen dry powders, being careful not to spread the contamination
- **Shield** the source, if possible the spill should be shielded without creating further contamination or increasing the personnel exposure
- **Plan** a decontamination procedure before proceeding, keep in mind these points:
 - limit personnel to a minimum

- wear protective clothing such as shoe covers and gloves, and use the remote handling tongs
- use appropriate survey instruments such as out Ludlum 3 meters with attached pancake probe
- dispose of all the contaminated material as radioactive waste in appropriate radioactive waste cans
- **Record** the incident by completing a PET Lab “incident report” form and notify Radiation Safety if the spill occurred in any public areas

Major Spill

A spill can be considered major if it results in any of the following: contamination of large areas, internal radiation dose to personnel by inhalation or ingestion of radioactive materials, excessive external radiation exposure to or contamination of personnel.

- **Clear the area** and notify personnel not involved in the spill to vacate the laboratory and prevent other personnel from entering the contaminated area, confine movement of all potentially contaminated personnel to prevent further spread or contamination
- **Cover** a liquid spill with absorbent pads or paper, dampen dry powders, being careful not to spread contamination, do not attempt to clean up the spill
- **Shield** the radioactive the source, if possible the spill should be shielded without creating further contamination or increasing personnel exposure
- **Monitor** involved personnel for contamination; remove any contaminated clothing, if the skin is contaminated, flush thoroughly with water and wash with mild soap and lukewarm water without vigorous scrubbing
- **Notify** the Radiation Safety Office as early as possible after the spill
- **Assist** Radiation Safety personnel in the evaluation and decontamination

Brain Mapping Emergency Contacts

- **John Mazziotta, M.D., Ph.D.**
 - x 52699, room # 247
 - Cell: (310) 927-7948, Pager: 06338
 - mazz@loni.ucla.edu
- **Roger Woods, M.D.**
 - x 44057, room # 205
 - Cell: (818) 425-5598, Pager: 11424
 - rwoods@ucla.edu
- **Mary K. W. Susselman, CNMT**
 - x 64291, room # 115
 - Cell: (310) 562-0818
 - mwalker@mednet.ucla.edu
- **Darin Williams**
 - x 64291, room # 115
 - Cell: (310) 993-8812
 - darinwilliams@mednet.ucla.edu

All personnel on the above list are trained in radiation safety practices and are authorized to direct and/or perform decontamination operations.

PET SCANNER EMERGENCY ELECTRICAL SHUTDOWN PROCEDURES

The PET scanner should be electrically shutdown in the event of a fire, flood or electrocution. To do this press the "Emergency Shut Off PET Scan" switch which is located above the PET scanner console computer in the north-east corner of the control room.

- This EPO (Emergency Power Off) switch that is mounted on the north-east corner of the control room wall will kill all AC power to all components of the PET scanner. This should only be done in a extreme emergency as noted above.
- Be aware that tripping the EPO switches will also trip the breakers in the breaker panel. You will need to reset those breakers in order to power the system back up.
- The E-Stop switches that are on the front panels of the scanner and the little box at the operator console (with the e-stop & reset switches) only kill gantry & PHS motion – they do not actually shut anything down.
- See **“PET Facility Safety Policies” & “PET Laboratory Safety and Emergency Procedures”** for more information on emergency procedures
- If an emergency event occurs please notify Dr. Mazziotta and Dr. Woods immediately:
 - John Mazziotta, M.D., Ph.D.
 - x 52699, room # 247
 - Cell: (310) 927-7948, Pager: 06338
 - mazz@loni.ucla.edu
 - Roger Woods, M.D.
 - x 44057, room # 205
 - Cell: (818) 425-5598
 - rwoods@ucla.edu
- If a major radiation spill has occurred simultaneously please notify UCLA Radiation Safety Office immediately:
 - In the instance of a radiation emergency during work hours (Monday – Friday, 7:30 a.m. – 5p.m.) call the Radiation Safety Office at (310) 825-5689.
 - In the instance of a radiation emergency during off-work hours, please contact the UCLA Police Department at 911 on a campus phone or (310) 825-1491 from a non-campus phone. Indicate that you have a radiation emergency, give the location of the emergency and provide your name and a call-back number.
- In case of a fire, explosion or if someone is in need of medical treatment, call 911 (not 8-911).

RADIATION SAFETY OFFICE EMERGENCY PROCEDURES

In the case of any emergency with injuries, manage the injury first! The radiation health concerns are secondary to the first-aid of an injured person. A radiation emergency may be any of the following:

- An over-exposure from a radiation producing machine or from radioactive materials.
- Personal contamination from radioactive materials.
- Possible inhalation or ingestion of radioactive materials.
- A spill of radioactive materials. The RSD is available to assist or advise for minor spills. A major spill is one which occurs in a public or uncontrolled area, or a spill in which you do not have the necessary resources to contain and clean up. A major requires Radiation Safety Division involvement, so it must be reported.

In the instance of a radiation emergency during work hours (Monday – Friday, 7:30 a.m. – 5 p.m.) call the Radiation Safety Office at (310) 825-5689.

In the instance of a radiation emergency during off-work hours, please contact the **UCLA Police Department** at **911 on a campus phone** or (310) 825-1491 from a non-campus phone. Indicate that you have a radiation emergency, give the location of the emergency and provide your name and a call-back number.

If there is a spill, utilize the following actions.

S.W.I.M.

- **Stop the spill.** Take actions to prevent the further spread of radioactive contamination.
- **Warn others.** Report the spill to the numbers listed above. Note contaminated and/or injured personnel. Call UCLA 911 for medical emergencies. Treatment of life-threatening injuries is a priority over spill actions. Document all spill actions.
- **Isolate the spill area.** Use physical boundaries if possible. Verify contamination boundaries by scanning with the appropriate radiation detection instrument. Note that some isotopes (Tritium, H-3, for example) cannot be detected using portable instrumentation. A liquid scintillation counter must be used in this case.
- **Minimize your exposure.** Wear necessary protective clothing. Avoid contact with the skin. Utilize time, distance and shielding. Avoid ingestion and inhalation of radioactivity.

RADIATION SAFETY DIVISION CONTACTS

Radiation Safety Division

Email: RadiationSafety@facnet.ucla.edu | Phone: (310) 825-5689 | Fax: (310)-206-9051

Address

501 Westwood Plaza, 4th Floor
Box 951605
Los Angeles, California 90095-1605

Program	Service	Phone
Dosimetry	Add / Delete / Change Dosimetry & Fetal Monitoring	(310) 825-8797
	Exposure History Requests	(310) 825-8797
Emergency Response	During Normal Office Hours	(310) 825-6995
Emergency Response	Off-Work Hours	911 from campus phone (310) 825-1491 (police)
Instruments	Calibration / Replacements	(310) 825-5396
Isotopes	Receiving / Shipping (Radiation Safety Lab)	(310) 825-5396
	Sealed Sources	(310) 206-4633
Training	Scheduling	(310) 794-5328
Waste Management	Scheduling / Special Pick-Ups / Supplies (Waste Tags or Carboy Returns)	(310) 825-5396
	Shipments / Transfers	(310) 206-4633
	Questions	(310) 206-4633
Survey Program	Room Commissioning/Clearance	(310) 825-7282
	Lab Radiation Safety Questions	(310) 825-7282

Radiation Safety Office (310) 825-6995 RadiationSafety@ehs.ucla.edu	Health Physicist Matt Labron, 310-825-8797 mlabron@ehs.ucla.edu
Radiation Safety Officer Colin Dimock, 206-8204 dimockc@ehs.ucla.edu	

RADIATION SPILL KIT

The radioactive spill kit is located in the PET Lab, room 115, underneath the gamma counter, on the bottom self. It is red and label "Radiation Safety Spill Kit."

The Radioactive Spill Kit Contains:

- absorbent pads
- biohazard bags
- Caution: Radioactive Material signs, labels and tape
- disposable gloves (small, medium, large)
- disposable lab coats
- paper towels
- pencil and red pen
- plastic bags
- q-tips
- radiacwash towelettes
- radioactive spill procedures
- radiation safety contact information
- radioactive spill incident report form
- shoe covers
- tongs
- tubes for swipe samples

RADIATION MONITORING

A low range gamma instrument is located in the laboratory for self monitoring. All personnel who have been working with radioactive materials or who have been in a contamination area are required to monitor their hands, feet and clothing before leaving the area.

Self Monitoring

- Ensure that the instrument is operating (background clicks should be heard through the speaker and the meter needle should be moving randomly)
- If the instrument is off, turn it on and wait at least one minute before performing measurements, observe the background level
- Open the window shield and move hands and fingers across window, being careful not to touch the window
- Remove probe from the monitor and slowly move the window end of the probe close to other exposed parts of the body, clothes, and feet
- If the meter indicates any activity greater than 100 counts per minute above background, replace the probe on the monitor and proceed to the sink in the hot lab or PET scanner room, whichever is nearer, and wash all contaminated areas thoroughly with the soap
- Be sure to scrub all parts of the hands, under the nails, and across the knuckles with a surgical scrub brush, but do not abrade the skin
- Dry with paper towels and place the used paper towels in a radioactive waste container
- Re-check all areas of the body with the low range gamma probe located in the control room or hot lab, and repeat the washing operation until the radiation level reaches less than 100 counts per minute greater than background or until successive washings fail to lower the level significantly
- Notify the Laboratory Supervisor or UCLA Radiation Safety Office, if any difficulty is encountered

Area Monitoring:

- Perform a preliminary check of the instrument outside and away from the contaminated area
- Ensure that the instrument selected for the measurement is sensitive to the radiation to be measured and is in operating condition
- Measure background before and periodically during the survey
- Pass the detector window slowly and carefully over the entire surface
- When the meter indicates a radiation level above background, stop and wait for the maximum deflection
- If the radiation level exceeds the maximum meter reading on the Ludlum survey meter, switch to the next highest scale
- If the reading is off-scale on the highest scale, use the ionization survey meter instead, it will adjust its scale automatically

**BRAIN MAPPING CENTER
PET LAB
INCIDENT REPORT**

Submitted by:

Reviewed by:

I. BASIC INFORMATION

Date of Incident:

Time of Incident:

Person reporting incident:

Telephone extension of person reporting incident:

Room where incident occurred:

Supervisor:

Radioisotope:

Activity:

Compound:

Personnel Involved:

II. DESCRIPTION OF INCIDENT

III. SURVEY RESULTS

Survey Instruments used:

Survey Results:

Decontamination Results:

IV. FOLLOW-UP ACTIONS TAKEN TO PREVENT RECURRENCE

V. RADIATION SAFETY DIVISION AND/OR ANCILLARY PERSONNEL INVOLVED IN CLEANUP

VII. ADDITIONAL COMMENTS

VIII. Authorized Signature _____ **Date** _____