

CHAPTER 8 RESPONSE TO RADIOLOGICAL INCIDENTS

1.0 PRECAUTIONS / LIMITATIONS

- **In situations where personal safety is, or may become, in jeopardy, no radiation safety requirement shall be considered as limiting any action necessary to protect personal health and safety.**
- **In the event of a fire or release of hazardous materials; warn personnel in the affected area, evacuate the area, call (9) 911, and follow the directions of emergency response personnel.**
- The Radiation Safety Officer and staff may be reached by calling 542-0107 or 542-5288. During off-normal working hours, the campus police should be called at 542-2200. The campus police have the responsibility for notifying the PREHS (Programs for Research, Environmental health and Safety) team in support of radiological emergencies and incidents.
- Follow all University safety requirements and directions from emergency response personnel during the implementation of all aspects of this procedure.

Note: Radiological incidents such as accidental spills, personnel contamination events, etc. that are handled and reported in accordance with this procedure will NOT result in disciplinary actions to the persons involved unless deliberate misconduct has occurred. Deliberate misconduct does not include accidents or errors, but does include the willful disregard of Radiation Safety policy. Do not hesitate to seek the assistance of the Radiation Safety staff in support of any incident. Failure to report incidents may result in improper actions, violations of policies or regulations, and the unnecessary spread of contamination.

2.0 RESPONSE TO PERSONNEL INJURY IN RADIOLOGICAL AREAS

If a personnel injury occurs in a radioactive materials area, or in the course of performing work with radioactive materials, the following actions should be implemented:

- 1) **Medical considerations are of primary importance.** Radiological concerns are secondary. Administer first aid within the limits of your training and qualifications. Do not attempt to move the victim unless there are significant hazards in the immediate location. Utilize appropriate precautions for blood borne pathogen control (i.e. use gloves, etc.)
- 2) Notify the Authorized User or designee. Follow the guidance of the laboratory safety plan for the handling of personnel injuries including notification to emergency response personnel, if appropriate.
- 3) Notify the RSO of any actual or suspected personnel contamination involving an injury. Follow the directions provided by the RSO. If Radiation Safety personnel arrive on the scene, provide them with all appropriate assistance and information.
- 4) If immediate medical treatment and transport by ambulance is indicated, the

Radiation Safety staff or any individual with radiation safety training should take measures to control the spread of contamination. **Do not interfere with patient care in the course of radiation safety activities.** When emergency response personnel arrive on the scene; offer to assist them by performing monitoring, removing the victims potentially contaminated lab coat or gloves (PPE), or other appropriate actions. Do not attempt decontamination or removal of PPE of injured personnel without the consent of medical professionals. A person with a contaminated injury will be taken to St. Mary's Hospital for treatment

- 5) An AU, Advanced Radiation Worker, or Radiation Worker with a portable monitoring instrument should continuously accompany the patient until a representative of the Radiation Safety staff arrives or all radiological concerns are resolved.
- 6) If immediate medical treatment is not indicated, the Radiation Safety staff should perform personnel contamination monitoring of the individual(s) involved. If the Radiation Safety staff cannot arrive promptly, any trained individual (AU, ARW, RW) should scan the individual(s) involved for contamination with a portable instrument in accordance with section 4.2 of this procedure.
- 7) If the individual is cleared of radiological contamination take any additional precautions needed to secure the area of radiological hazards. Document survey information on a Radiological Survey Form (RSF) or take notes for future reference to report the incident. Documentation should include the individuals name, social security number, date/time, location, and general circumstances of the event. Perform and document follow up surveys, as appropriate, to ensure that no spread of contamination occurred.

3.0 RESPONSE TO A SPILL OF RADIOACTIVE MATERIAL

3.1 Major Spills

A spill is considered a major spill if it involves millicurie quantities of radioisotopes, includes materials with the potential to produce significant airborne radioactivity (mist, dust, fumes), covers a large area (more than a few square feet of area), or if the spill is not easily contained or controlled. Any malfunctions of radiation producing devices (irradiators, large quantity sealed sources, X-ray devices) with the potential to result in high radiation levels should be treated in the same manner as a major spill.

Respond to a major spill as follows:

- 1) Take no actions which could result in injury or unnecessary contamination to yourself or others.
- 2) Stop work. If necessary secure any immediate safety hazards.
- 3) Warn other individuals in the area. All personnel should leave the immediate area but take appropriate measures not to spread contamination. Potentially contaminated individuals should gather in a location nearby for monitoring prior to being released.
- 4) Isolate the area to prevent the spill from spreading.

- 5) If any volatile materials are involved or if there is the potential for airborne radioactivity, make sure that fume hoods are operating and that the sash is partially open. Close any available doors to control ventilation. If outdoors, stay upwind.
- 6) Secure the area to prevent personnel access. Lock doors, post warning signs, or post an individual trained in radiation safety to control access to the affected area from a safe distance.
- 7) Notify the RSO or any member of the Radiation Safety staff. If they are not available, contact the campus police.
- 8) Notify the Authorized User (AU) or other individuals responsible for the area.
- 9) Remain in a safe location until assistance arrives.
- 10) Personnel involved should not leave the scene until cleared by Radiation Safety or emergency response personnel.

3.2 Response to Spilled Radioactive Materials on Skin or Personal Clothing

If radioactive material in a dispersible form is spilled onto a person's skin or clothing, take the following actions:

- 1) **If the contamination is associated with a hazardous material, immediately remove the hazardous material using whatever means are necessary to ensure personal safety.** Notify your lab safety representative as soon as possible.
- 2) If the spill is on clothing, immediately remove the clothing and proceed with monitoring of the skin for contamination as described in section 4.2 of this procedure. When removing clothing use caution not spread contamination to other parts of the body, especially the facial area.
- 3) If the radioactive material may have volatile characteristics (radioiodine, S-35, etc), place the contaminated clothing in an operating fume hood or securely closed plastic bag.
- 4) If the radioactive material is spilled directly onto skin, immediately rinse the affected area with running water. It is best to use water that is lukewarm. Cold water may cause the pores of the skin to close, trapping contamination within the layers of skin. Hot water may cause the pores to open, causing a potential avenue for contamination to travel deeper into layers of the skin.
- 5) Pat the affected area dry with a disposable towel and proceed with contamination monitoring as described in section 4.0 of this procedure.
- 6) Promptly notify the RSO or a member of the Radiation Safety staff of any suspected or confirmed radioactive contamination of the skin or personal clothing.

3.3 Minor Spills

A minor spill involves a small quantity of radioactive materials and does not meet the criteria described for a major spill. Minor spills that are recognized and properly controlled should not result in personnel contamination.

A minor spill should be handled as follows:

- 1) Stop work. If necessary secure any immediate safety hazards.
- 2) Warn other individuals in the area to stay out of the spill location. Notify the AU and/or Advanced Radworker, they should perform/direct further activities.
- 3) If assistance is needed, promptly notify the Radiation Safety staff.
- 4) Isolate the area to prevent the spill from spreading. Cover liquid spills with absorbent materials.
- 5) Perform contamination monitoring of any individuals with the potential to have become contaminated as a result of the spill. If personnel contamination is indicated or suspected, refer to section 4.0 of this procedure for instructions.
- 6) Trained personnel wearing gloves, lab coats, and other appropriate PPE should carefully clean up the spilled material. Remove absorbent materials and place in radioactive waste containers for disposal.
- 7) Survey the affected area for contamination in accordance with Chapter 6 of this manual. Compare the survey results to the action levels specified in Chapter 6 and implement appropriate actions in accordance with that procedure.
- 8) If contamination is indicated, decontaminate the affected area as described in section 3.4 or contact the Radiation Safety staff for guidance.
- 9) When contamination is below limits, record the survey on a RSF. Document both the "as found" contamination levels and the final levels following decontamination.
- 10) Provide copies of the survey results to the Radiation Safety Office.

3.4 Decontamination of Areas and Equipment

Area or equipment decontamination (decon) should be performed as follows:

- 1) Wear PPE (lab coat & gloves), control access to the area, and do not allow personal clothing or unprotected skin surfaces to contact potentially contaminated surfaces during decontamination or when performing post-decon surveys.
- 2) Locate the approximate boundaries of the contaminated area by radiological survey (direct scans, wipe testing).
- 3) Mark the boundaries with a temporary marking of tape or by a similar method.
- 4) Carefully clean the affected location using commercial cleaning materials and disposable wipes. Do not use volatile solvents or larger than necessary quantities of water or cleaning solutions.
- 5) If using cleaners applied by spray, do not spray directly onto contaminated surfaces at a close proximity to the surface. Aggressive spray techniques may spread the contamination.
- 6) When wiping with disposable towels, it is often useful to wipe the most highly contaminated section first, covering the smallest practical area and immediately discarding that towel. Then wipe from the outer boundary (less contaminated) toward the center (more contaminated) of the contaminated area. Make single

passes when wiping and use a new surface of the towel for each wipe. An inward spiraling circular motion is often effective. The method used should prevent spreading the contamination.

- 7) Dispose of all waste properly. Wet contaminated towels should be placed in a dry radioactive waste container with sufficient absorbent material to prevent any visible liquid from developing.
- 8) Perform follow up surveys and continue decontamination efforts if needed.
- 9) Perform personnel contamination monitoring after each decon effort.
- 10) If three attempts at decontamination are unsuccessful, you should use different decontamination agents or methods. Contact the Radiation Safety staff for assistance as needed.
- 11) Decontamination is considered complete when a radiological survey indicates that contamination is below appropriate limits, waste materials have been properly disposed of, and surveys have been documented.

4.0 RESPONSE TO SUSPECT PERSONNEL CONTAMINATION

4.1 Precautions

- 1) Verify that no personnel injury has occurred, if the contamination is related to a personnel injury, follow the instructions of section 3.0 of this procedure.
- 2) **If the contamination is associated with a hazardous material, immediately remove the hazardous material using whatever means are necessary to ensure personnel safety.** Notify the lab safety representative as soon as possible.
- 3) If the personnel hazard is not immediate, perform and document contamination survey information prior to removal of the material by decontamination.
- 4) Always notify the Radiation Safety staff of any suspect or confirmed contamination of skin or personal clothing.
- 5) Whenever possible, the affected individual should seek the assistance of another trained Radiation Worker, an ARW, or the AU in handling the situation and in contacting the Radiation Safety staff.
- 6) Stay calm. Remember that the health risks are very minimal from personnel contamination with the typical quantities and concentrations of radioisotopes used at UGA. A small time delay to take appropriate actions is insignificant compared to the risk of overreacting and causing a personal injury or the spread of contamination.

4.2 Personnel Contamination Monitoring

Perform personnel contamination monitoring as follows:

- 1) Turn the instrument scale to the lowest setting and allow the instrument to stabilize to area background. Personnel contamination monitoring should be performed in an area with the lowest available background radiation levels.

- 2) SLOWLY scan (approximately 2 inches per second) with the detector of the instrument at a distance of approximately 1/2 inch from the surface being monitored.
- 3) Monitor your hands first to ensure that you do not spread contamination.
- 4) Survey all other areas of the body and clothing with the potential for contamination. This should include, but is not limited to, the front of the torso, elbows, arms, face, and shoes (top and bottom).
- 5) If an audible increase in the count rate is heard, or if the meter reading increases, hold the detector still over that location for 5 to 10 seconds and determine if the reading is higher than the background level.
- 6) If contamination is indicated as in item 5 above, it is best to stay where you are to prevent the spread of contamination and have someone assist you in notifying the RSO or a member of the Radiation Safety staff. While waiting for assistance, avoid unnecessary contact between areas of suspected contamination and "clean" surfaces.
- 7) If no contamination is detected, evaluate the situation to determine if additional work area surveys or monitoring of other personnel is indicated.

4.3 Response to Personnel Contamination Events

- 1) If contamination of skin is confirmed, always notify the RSO or a member of the Radiation Safety staff.
- 2) Before beginning decontamination, attempt to determine the location and approximate size of the contaminated area. Record the maximum reading found with the instrument at a distance of 1/2" (near contact) from the contaminated area. For fastest results simply write down the instrument reading and the scale used. In the event that the instrument reading is off-scale at contact, attempt to obtain and record an on-scale reading at a measured distance away. A pencil, pen, or piece of paper may be used to "measure" the distance since this will provide a reference to be measured at a later time. Also note the time (or best estimate) of the initial contamination occurrence. This information is needed to assist in calculating an accurate assessment of the amount of radiation exposure to the skin.

<u>Example:</u>	Time	9:15am
	Approximate size/location	2 square inches, right forearm
	Instrument contact reading	3.5
	Instrument scale	x 0.1 (mR/hr)

- 3) Simple skin contamination can usually be removed by washing the affected area with soft soap and lukewarm water. Make sure that you do not spread the contamination to other areas of the body during the decontamination process.
- 4) Dry the area by patting lightly with a disposable towel. Re-survey the affected area immediately following decontamination. If necessary, repeat decontamination by soap and water.

- 5) When there is no detectable contamination remaining, record the time of the survey.
- 6) If three consecutive decontamination attempts using soft soap and water are not successful, additional measures such as an industrial grade hand cleaners may be used.
- 7) Do not abrade the skin, use harsh chemicals, or attempt decontamination of injuries, the eyes, or body orifices without the assistance of medical professionals and the RSO or designee. However, if no medical complications are apparent, injuries, eyes, or body orifices may be flushed with lukewarm water or saline solution to promptly remove any hazardous materials or radioactive contamination from the affected area. Use precautions not to spread the contamination and capture any rinse water in a suitable container. The rinsate may require analysis in support of a radiation exposure assessment.
- 8) Any facial contamination, contamination involving breaks in the skin, or contamination with the potential for skin absorption or internal contamination will require a determination by the RSO of the need for a bioassay.
- 9) If necessary, restrict and control access to any work locations where contamination events have occurred until follow up surveys can be completed.
- 10) The Radiation Safety staff should perform a preliminary evaluation of incidents to determine the potential causes and to take measures to ensure that no additional personnel contamination events occur as a result of existing conditions or circumstances.

5.0 FOLLOW UP ACTIONS FOR RADIOLOGICAL INCIDENTS

- Document radiological surveys on a Radiological Survey Form or an RSO approved equivalent.
- A *Radiation Safety Improvement Program Report (RSIPR)*, or an RSO approved equivalent, should be used for reporting and tracking of significant radiological incidents.
- RSC and DNR notification of incidents will be performed by Radiation Safety in accordance with regulatory requirements and as described in Chapter 11, *Radiation Safety Improvement Program*.
- A critique should be conducted for significant incidents. At a minimum, participants of the critique should include the individuals involved in the incident, the AU, and the RSO or designee. The critique should focus on determining why the event occurred with the goal of determining the appropriate path forward to prevent future occurrences.