

## **HANDLING OF RADIOACTIVE CADAVERS**

### **ADDRESSEES:**

All holders of PNRI license for the medical use of radioactive materials.

### **PURPOSE:**

This bulletin is issued to inform licensees who, in the course of administering radioactive materials for therapy, will encounter radioactive patients who expire while under confinement. Authorized users and RHSOs must be aware of the proper procedure in handling radioactive cadavers, the permissible radiation limits to be observed, and the precautionary measures employed to minimize any potential hazard to the public that may arise from exposure to radiation coming from the radioactive cadaver. It is expected that licensees disseminate this information to their staff and all concerned officials for their appropriate action and proper consideration.

### **DESCRIPTION OF CIRCUMSTANCES:**

A patient who has been administered with radionuclide may expire while still having substantial residual radioactivity remaining in his body.

The individuals responsible for the handling and disposition of radioactive cadavers may be unaware of the risks involved and the precautions to be taken. Hence, it could result into unnecessary exposure to radiation of these individuals and the public.

**Case 1:** A cancer patient was administered with radioactive I-131. While under confinement, the patient expired. A maximum dose rate of 2.5 mR/hr at one meter from the body was obtained. The licensee did not have any written procedures to respond to such incident. Hospital authorities decided that the body should be disposed of as soon as possible to minimize unnecessary radiation exposure of the public. The deceased was wrapped in a blanket, placed in a coffin, and transported by means of a funeral vehicle to the cemetery. Dose measurements were taken around the coffin and funeral car during transport of the coffin. Readings were within acceptable levels. The body was interred in the presence of a PNRI representative and the attending physician.

**Case 2: NRLSD Bulletin 94-03**, "Notification and Reporting of Incidents", discussed a case wherein a cancer patient administered with I-131 left the hospital unnoticed by the hospital authorities and died at his residence. The patient's household members engaged the services of a funeral parlor. Upon learning that the cadaver was radioactive, the funeral parlor sought the help of the PNRI on the necessary precautions and handling procedures. Because of hospital management policies about errant patients, the licensee refrained from assisting the family of the dead patient. A PNRI team coordinated with the funeral parlor on radiological safety matters throughout the autopsy and embalming procedures. The licensee was cited by the PNRI for noncompliance of the immediate notification requirements of the regulations regarding incidents that will pose a risk to public safety. Since the escaped patient contained radioactive materials in his body, the public could be unnecessarily exposed to radiation when near the corpse without the required protection. The licensee was required to initiate corrective actions to prevent recurrence of the incident. Actions committed to be undertaken included ensuring tighter security in the therapy room, wearing of a special hospital gown by radioactive patients, requiring the patient and his relatives to sign a hospital form indicating that the patient has received radioactive iodine therapy, and observance of radiation protection policies.

## **DISCUSSION:**

**Section 37 of CPR Part 13** requires that any patient administered with I-131 shall not be released from confinement unless the measured maximum dose rate from the patient is less than 25  $\mu$ Sv (2.5 mR) per hour at a distance of one meter or the activity in the patient is less than 0.6 GBq (15 millicuries) of I-131. It is therefore important that the records of administration of a radioactive substance and the corresponding surveys are always available.

A radioactive patient is a potential source of radiation and PNRI regulations specify that exposure to a radioactive source must be controlled and ALARA. **Section 65 of CPR Part 13** requires that a licensee shall provide all personnel that attend to radioactive patients with radiation safety instructions. It is the responsibility of the Radiological Health & Safety Officer (RHSO) to provide such instructions and to ensure that the required procedures and precautions are properly observed.

**Section 67(b) of CPR Part 13** requires that the licensee notifies the RHSO immediately if the radioactive patient dies or has a medical emergency. If a patient dies and still possesses residual radioactivity in his body, those persons who will be responsible for handling the cadaver and for post-mortem procedures should be instructed on the necessary procedures and precautionary measures to protect against unnecessary exposure to radiation. **Attachment 1** and **2** list some model procedures and precautionary measures in case of death of a radioactive patient. The licensee may develop his own procedure and submit to PNRI for review and acceptance.

In accordance with regulations, the Institute must be immediately notified and informed about the death of patients with radioactive materials. Subsequently, a

written report describing the details of the procedures performed must be submitted thirty days after the notification of the incident.

**REQUIRED LICENSEE ACTION:**

Licensees are required to develop their procedures in handling radioactive cadavers and submit the same to the Institute within sixty (60) days from receipt of this bulletin. For further inquiries, please contact the person below.

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**ATTACHMENT 1**

## **PRECAUTIONARY MEASURES IN HANDLING RADIOACTIVE CADAVERS**

The precautions to be taken in handling radioactive cadavers depend on the nature and quantity of the radionuclide present and on the type of handling intended (e.g. autopsy or embalming prior to burial).

### **Storage**

Storage of the cadaver in an adequately refrigerated compartment is necessary until the exposure dose rate at one meter from it is **less than 2.5 mR/hr**. The storage area must be labeled restricted area.

### **Post-mortem Examinations**

When post-mortem examinations are performed at places other than treatment centers, no special precautions are necessary provided that the activities remaining in the cadaver do not exceed **15 mCi of I-131**. Where the pathologist needs to carry out the post-mortem procedures before the activity has decayed to below the above values, the RHSO should be consulted so that the radiation levels likely to be encountered are identified and the hazards involved are assessed. Every effort shall be made to adopt procedures which minimize contamination, and any contamination should be removed immediately after the post mortem examination has been completed.

### **Embalming**

The embalming of radioactive cadavers constitutes an undesirable hazard and should be avoided if possible. If the body is not autopsied and embalming is done simply by injection method, the contamination risk to the embalmer is small. All embalmers should wear disposable gloves, protective clothing and face protectors. Embalmers should be supervised by the RHSO to observe proper radiation protection measures. Embalming should not normally be carried out if the residual activity in the cadaver exceeds **15 mCi of I-131**, but if there are special reasons for doing so, the embalmer should be advised by the RHSO of the hospital as to what precautions should be taken. All cadavers in this category shall have a label attached, identifying the radionuclide and its activity at the time of death.

### **Autopsy**

Autopsy is inadvisable if the amount of radioactivity in the cadaver is greater than **15 mCi of I-131**. The autopsy of highly radioactive cadavers should be invariably restricted to the absolute minimum. It is essential that the staff should wear disposable gloves, and supplementary measures for radiation protection and decontamination should be provided in consultation with the RHSO.

## **Cremation**

No special precautions are necessary for the cremation of cadavers containing not more than **15 mCi of I-131**. Cadavers containing levels in excess of these values should be stored until these limits are reached. The RHSO should be consulted before the cadaver is released for cremation.

## **Burial**

The amount of incorporated radioactivity allowed at the time of burial depends on the regional and environmental conditions such as climate, distance to cemetery, type of transport, and availability of low-temperature refrigerators.

Precautions to be taken may be classified according to three levels of activity remaining at the time of burial.

- (1) Residual activity up to **15 mCi of Iodine-131**.  
There is no need for personal dose control either of the staff or of the relatives of the deceased and no need for supervision by the RHSO. It is unnecessary to mark the cadaver, the coffin, or the clothes or to undertake a contamination test.
- (2) Residual activity of **15-30 mCi of iodine-131**.  
There is no need for personal dose control of the staff or of the relatives of the deceased. Preparations for burial and any contact between relatives and the cadaver should be controlled by the RHSO. The body should be marked with the radiation symbol but no need to label the coffin. All objects, clothes, etc. that might have been in contact with the deceased must be tested for contamination.
- (3) Residual activity of **30-300 mCi of iodine-131**.  
Relatives must be prevented from coming into contact with the body, and people must not be allowed to linger in the presence of the coffin. The hospital staff, the coroner, the persons washing and preparing the corpse for burial, the staff of the undertaker, and the transportation and cemetery staff must be instructed by the RHSO and monitored for their personal dose rate by means of pocket dosimeters. While there is no need to mark the coffin, all objects, clothes, etc. must be tested for contamination. It is expedient to wrap the cadaver in plastic foil immediately after death has occurred, and it should never be handled unless with disposable protective gloves.

## **ATTACHMENT 2**

### **EMERGENCY PROCEDURES IN CASE PATIENT DIES**

1. The nurse or hospital staff on duty must immediately notify the attending physician and the RHSO of the death of a radioactive patient.
2. If the Physician finds that there is still significant residual activity in the cadaver, he must attach a tag with a label indicating that the body contains radioactivity and the estimated activity.
3. The attending physician must ensure that appropriate instructions and information are given to the relatives of the dead patient.
4. The RHSO shall only allow post-mortem examination or any related activities on the cadaver if the measured exposure dose rate at one meter from the body is less than **2.5 mR/hr**.
5. The RHSO must set the working time limits and provide the proper radiation protection accessories if it is necessary to attend to the body immediately.
6. If the body is stored and it is necessary for the workers to be near the storage area, then the RHSO must set the working time limits and the distance from the area.

#### **INFORMATION THAT SHOULD BE IMMEDIATELY AVAILABLE**

1. Date and time the patient died.
2. Radioactive substance remaining in the body of the cadaver (type of radionuclide and activity).
3. Amount of the radionuclide that was initially administered to determine the residual activity at the time of death.
4. Radiation measurements at different distances from the cadaver.

#### **References:**

National Health and Medical Research Council. **Code of Practice for the Safe Handling of Corpses Containing Radioactive Materials (1986)**. Australia: Canberra Publishing & Printing Co., 1986.

Frost, D. and H. Jammet. **Manual on Radiation Protection in Hospitals and General Practice**. Volume 2: Unsealed Sources. Switzerland: World Health Organization, 1975.