



**NRL**

National Radiation Laboratory

## **DEATH OF A PATIENT TREATED WITH RADIOACTIVE MATERIAL**

### **Introduction**

Radioactive materials have been used for medical treatments ever since they were first discovered. Some of the materials used have short half-lives so they can be permanently located in the area of the body requiring treatment, and they deliver their dose while they decay away. The materials may be taken by the patient either as a radiopharmaceutical that is selectively taken up by a target organ (such as iodine-131 which is naturally taken up by the thyroid and is commonly used for treating hyperthyroidism), or the radioactive material may be sealed in small metal capsules and injected (such as iodine-125 "seeds" used to treat prostate cancer). The therapeutic process will continue for days or weeks depending on the half-life of the material. The patient is given instructions on any precautions that may be necessary during this time to ensure radiation exposures of other people are minimised. However, there is always the possibility that the patient may die before the radioactive material has decayed away, either from the disease being treated, or from an unrelated cause. This may give rise to some risk of radiation exposure for anyone who comes in contact with the body or remains.

### **How do you know whether a dead person has been treated with radioactive material?**

In New Zealand each year 500 - 600 patients are treated with radioactive material for medical therapy. The treatments are only given to patients who are expected to get well or at least live for more than a year, so only a very small fraction of these patients die while they are still significantly radioactive. The chance of encountering one, among all the people who die, is therefore very small. If a patient does die soon after treatment, someone from the hospital where the treatment was given should make sure everyone who needs to take precautions is advised. The clinician responsible is required by law to ensure this happens. Also, the person may have been carrying a warning card, or wearing a bracelet, giving details and a contact for further information. The next of kin should also know, because the hazards to them from the radiation should have been discussed with them. And the doctor signing the death certificate

should be aware through the details in the medical notes, if these were available at the time. If there is still some concern then an enquiry should be made to the hospital where the person was treated.

### **Attending a body lying in state**

Most of the radioactive materials used for therapy do not generate very much radiation external to the body. So once a body has been embalmed and is lying in state there is usually no significant hazard from spending hours or even days nearby. The possible exception would be if the death occurred only a day or so after a large activity of iodine-131 had been administered to treat thyroid cancer. In this case the amount of time spent very close (less than 1 metre) should be restricted to no more than a few minutes. The exposure rate is much less at greater distances and there is no problem remaining in the same room at a distance of a few metres. More detailed advice can be sought from a medical physicist at the hospital where the treatment was given.

### **Post-mortem or embalming**

Depending on the type of radioactive material and how it has been administered, the body fluids and some tissues or organs may contain sufficient radioactive material to warrant special precautions.

- Sealed sources implanted in the prostate (or any other organ) do not release any radioactive material into the body fluids. As long as there is minimal contact with the organ itself the exposure will be small. If a post-mortem requires removal of the organ it should be handled as briefly as possible, preferably with tongs or forceps.
- For unsealed radioactive materials, in most cases the activity will have been largely eliminated in the first few days from all but the target tissue. So unless death occurred very soon after the treatment, the use of surgical gloves to protect from skin contamination, together with due haste to minimise the exposure time, will provide good protection.

If a body is known to be radioactive, the clinician responsible should be contacted first to confirm whether any precautions are necessary. If they are, the clinician or a medical physicist from the hospital will advise on this.

### **Cremation**

There may be some potential for exposure both for the staff at the crematorium handling the ashes, and for the recipient of the ashes after treatment with strontium-89 or iodine-125.

- Strontium-89 is used to ease the pain from cancer metastases in the bones, as it can be effective when other pain control measures do not work. The strontium is taken up in the bones and when a body is cremated most of the bone mass remains in the ash. So most of the radioactive material will also remain in the ash.
- Iodine-125 seeds used to treat prostate cancer also remain intact in the ashes after cremation.

NRL advises against cremation of corpses containing a high enough activity of radioactive material to make the ash hazardous. Guidelines are given in a Code of Safe Practice which deals with the medical use of radioactive material (*NRL C3*). If the relevant activity is exceeded, the clinician responsible must ensure that either the cremation is carried out safely, or an alternative method is used. In the case of prostate implants, if death occurs within a year of treatment, the prostate should be removed post mortem and disposed of separately by the hospital that provided the treatment. If there is any doubt, either the hospital or NRL should be consulted. In any case, crematorium staff should use gloves and masks as standard protective equipment, and routinely handle the ashes with implements rather than by hand. Then, even if a body is radioactive, any possible hazard will be minimised. Once the ashes are in an urn, if they are significantly radioactive it may be necessary to restrict where they can be kept, or to set a date before which they cannot be scattered. Either the hospital or NRL will be able to advise on this. But if there is any doubt, as long as for the first year the urn is kept so it is not *continuously* closer than 1 metre to anyone, and the ashes are not scattered, then there will be negligible risk.

## Burial

Conventional burial is safe and is the procedure recommended by NRL for a body that contains sufficient radioactive material to be a problem for cremation. Even after cremation, careful burial of the ashes may be the best option.

## Who is responsible for safety?

From the point of view of radiation safety legislation, the licensed clinician who prescribed the treatment is responsible for managing the safety of anyone who may be exposed to radiation as a result. The clinician must take all reasonable steps to do this. However, even with all reasonable care it is not always possible to keep track of every patient, so there is a small chance of unknowingly coming in contact with a body that is radioactive.

Health and safety in the workplace legislation requires the employer in a funeral service or crematorium to take due care to ensure the safety of workers by instigating reasonable safety checks and procedures. Individual workers in turn must apply due diligence on the basis of the safety training and procedures set up by the employer.

Provided all parties carry out their responsibilities then the number of times someone is unknowingly exposed to a body that is radioactive will be very small, and in the rare case that it happens the chances of any serious exposure will be minimal.

## What are the consequences of accidental contact with a radioactive corpse?

If all the safeguards fail the worst scenario is that a very radioactive patient dies, is embalmed, is cremated, and the ashes are scattered. In this event there may be a number of people who get a dose of radiation. Depending what the radioactive material is, the dose may arise through ingestion of material on the hands, inhalation of dust, or from exposure to gamma rays. However, the magnitude of the dose will not be anywhere near the level that causes “radiation sickness”. There will be no immediate effects. It will very probably be no greater than the amount of radiation received over a short period from natural sources of radiation, or from a medical x-ray. Under normal circumstances the highest dose that could be received from a body would not be more than the dose from a small number of conventional medical x-rays.

However, it is generally accepted that any exposure to radiation entails a degree of risk. The risk in this case is small, but not negligible, and should be avoided if it is reasonable and practical to do so.

For further information contact:

National Radiation Laboratory  
PO Box 25099  
Christchurch  
New Zealand

Phone: +64 3 366 5059  
Fax: +64 3 366 1156  
Internet: <http://www.nrl.moh.govt.nz>

Information Sheet IS 26

Reviewed October 2009