



Canadian Nuclear
Safety Commission

Commission canadienne
de sûreté nucléaire

Residual Radioactivity Following Medical Procedures: Guidelines for management of the deceased



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Canada

nuclearsafety.gc.ca

Medical Treatment



nuclear substances → used to treat disease.

Therapeutic nuclear medicine

- unsealed nuclear substance
- administered orally or via injection



Permanent implant brachytherapy

- sealed nuclear substance
- implanted in tissue



Isotopes



Radioisotopes commonly used for therapeutic procedures with some of their properties and applications

nuclear Substance	Half-life (days)	Typical Applications nuclear medicine=unsealed, brachytherapy=sealed
Yttrium-90	3	nuclear medicine, to treat a variety of conditions and diseases (arthritis, cancer, etc.)
Iodine-131	8	nuclear medicine, to treat various types of tumours
Phosphorus-32	14	nuclear medicine, to treat diseases causing increased blood cell production
Palladium-103	17	brachytherapy, to treat prostate or breast cancer
Strontium-89	51	nuclear medicine, to provide pain relief from bone cancer
Iodine-125	59	brachytherapy, to treat prostate cancer

Clarity on Radiation Protection



- If patient dies nuclear substance still in body
- Death care professionals may not understand how to perform work safely
 - apprehensive of the perceived risk
- Radiation safety officers (RSO) receive calls requesting guidance
 - unsure what the CNSC's expectations are on responsibility
- Difficult time for families made worse by confusion

Current Legislation



Province	Legislative instrument	Law/Regulation
Ontario	Regulation 30/11, <i>Funeral, Burial and Cremation Services Act</i>	Prohibits cremating bodies that have a radioactive implant
Québec	S.42 of the <i>Regulation Respecting the Application...Disposal of Human Bodies</i>	Every sealed source must be removed from a body before embalmment or incineration
Saskatchewan	S.28 of the <i>Funeral and Cremation Services Regulations</i>	Prohibits providing human remains to a crematorium with a radioactive implant

All other provinces and territories are silent on the matter

Objective of Guidance



To discharge the CNSC's mandate:



- provide factual information
- describe safe work practices
- respect the wishes of the deceased
- keep doses well below dose limits

What You Need To Know



- If a treatment took place, be sure you have the right information
- Ask the following:
 - what type of radiation treatment was received?
 - when did the treatment take place?
 - what radioisotope was used?



Wallet card



Radiation Implant

Be advised that Mr. Prostate Cancer received a treatment of _____ MBq of permanent I-125 seeds on _____. Before performing surgery or cremation please contact :

**British Columbia Cancer Centre
123 Cancer Dr.
Vancouver, BC Z1Z 1Z1
1 (800) 123-4567**

Radioactive Decay - timelines



Nuclear Substance	Half-life (days)	Autopsy	Embalmmment	Cremation
Yttrium-90	3	6 weeks	2 weeks	6 weeks
Iodine-131	8	2 months	2 months	2 months
Phosphorus-32	14	5 months	2 months	5 months
Palladium-103	17	3 months	1 month	3 months
Strontium-89	51	2 years	2 weeks	1 year
Iodine-125	59	2 years	1 month	2 years

Beyond these times, no precautions are necessary

Autopsy



- **Brachytherapy (sealed)**
 - limit duration
 - tissue around implant remain intact
- **Nuclear medicine (unsealed)**
 - limit duration
 - wear PPE
 - do not handle affected tissue
 - For recent treatments, contact a radiation safety professional

Embalmmment



- **Brachytherapy (sealed)**
 - limit duration
- **Nuclear medicine (unsealed)**
 - limit duration
 - minimize contact with drainage tube
 - use tools to manipulate.

Cremation



For death care professionals:

- **Brachytherapy/Nuclear Medicine**
 - use gloves, face mask, safety eyewear, disposable gown
 - rake cremation chamber thoroughly
 - vacuum and clean work area with wet cloth
 - exhaust fan on at all time
 - avoid pulverizing cremains.

Cremation



For the family/public:

- **Brachytherapy/Nuclear Medicine**
 - store cremains in a closed container
 - do not directly handle cremains
 - store cremains in unoccupied area
 - do not scatter cremains
 - label cremains with safe scatter date
 - no keepsake jewelry or tattoos

Burial



- **Brachytherapy/Nuclear Medicine**
 - minimal hazard
 - can be performed at any time
 - shielded by casket, earth

Waste Handling



- Bodily fluids disposed in normal fashion
- Tissue removed during autopsy returned to body for cremation or burial

Path forward



- Public consultation – coming soon!
 - Get involved! subscribe to the CNSC mailing list, check CNSC website or social media platforms for updates
- To subscribe:
 - nuclearsafety.gc.ca → “Stay Connected” section

Case Study - Details



- Man from BC received brachytherapy but did not inform family
- Died ~235 days after treatment (less than 1 year)
- Family proceeded with autopsy and cremation
- While cleaning out his house, found documents about treatment
- Hospital was informed and came to assess situation
- 11 other cremations had happened since

Case Study - Results



- Scan of facility indicated no radiation above background
- Description of autopsy received from the pathologist
- Dose rates in the retort were slightly elevated but no seeds were found
- 35 intact and 23 ruptured seeds recovered from patients cremains
- Even with seeds removed still some residual radioactivity
- Loose seeds also found in some cremains from cremations after the brachytherapy patient

Case Study – Dose Consequences



- Dose to pathologist during autopsy
= 7% of dose limit
- Dose to funeral director during cremation
= 0.1% of dose limit
- Dose to family from cremains if kept for 1 year
= 6% of dose limit

Conclusion



- Take-away message:
 - regardless of scenario, doses are low
 - universal safety precautions apply
 - 2 year time frame for precautions
 - looking forward to your feedback



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