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

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

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

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?
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

<table>
<thead>
<tr>
<th>Nuclear Substance</th>
<th>Half-life (days)</th>
<th>Autopsy</th>
<th>Embalmment</th>
<th>Cremation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yttrium-90</td>
<td>3</td>
<td>6 weeks</td>
<td>2 weeks</td>
<td>6 weeks</td>
</tr>
<tr>
<td>Iodine-131</td>
<td>8</td>
<td>2 months</td>
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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
Embalmment

- **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.
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