

Extremity Dose Assessment for Mr. Russell Cain

June 10, 2009 Administration

1. Provided below is a description of Mr. Cain's activities, and dose calculations, in handling 154.9 mCi (5730 MBq) NaI dose.
 - a) Mr. Cain used a shielded 5-mL syringe to draw up the dose from the shielded source vial provided by the manufacturer/supplier. It took approximately 10 seconds to perform this task. The thickness of the tungsten syringe shield used is 2 mm (the HVL for I-131 is 1.7 mm).
 - b) Mr. Cain placed the dose (in the syringe/syringe shield) into additional shielding in Room 4059. The dose contribution of this activity is negligible due to shielded conditions.
 - c) Mr. Cain removed the syringe from the syringe shield, using the flanges at the end of the syringe, and placed the dose into the dose calibrator (using the dipper) within approximately 5 seconds. The estimated distance from fingertips to dose is 3 centimeter.
 - d) After removing the dipper from the dose calibrator, Mr. Cain returned the syringe to its syringe shield (using the flanges at the end of the syringe) and placed into a lead transport caddy within approximately 5 seconds. The estimated distance from fingertips to dose is 3 centimeter.
 - e) Mr. Cain used the shielded 5-mL syringe to inject the dose into the patient's g-tube. It took approximately 5 seconds to perform this task.
 - f) The gamma ray constant for I-131 is 7.65 E-5 mSv/h/MBq. With respect to the mass attenuation coefficient for I-131 in soft tissue, 30 % of the energy is deposited within 3 cm (this is the average thickness of a human hand). The dose rate is calculated as 4.5 Gy/h at 1 cm or 1.4 E-4 Gy/s at 3 cm.
 - g) For a handling time of 10 s in item a) above, the dose to Mr. Cain's hand was 1.4 E-3 Gy or 140 mrem, multiplying it by the shielding provided by 1.18 HVLs, we obtain 62 mrem for this task.
 - h) For a total handling time of 10 s in items c) and d) above, (similar to g, but with no additional shielding), the dose to Mr. Cain's hand was 1.4 E-3 Gy or 140 mrem for these tasks.
 - i) For a time of 5 s in item e) above, (similar to g, but half the time), the dose to Mr. Cain's hand was 31 mrem for these tasks.
 - j) Therefore the total calculated extremity dose from his handling of the 154.9 mCi dose of NaI is less than **233 mrem**.

September 21, 2009 Administration

2. Provided below is a description of Mr. Cain's activities, and dose calculations, in handling the 194 mCi (7176 MBq) NaI dose.
 - a) Mr. Cain used a shielded 5-mL syringe to draw up the dose from the shielded source vial provided by the manufacturer/supplier. It took approximately 10 seconds to perform this task. The thickness of the tungsten syringe shield used is 2 mm (the HVL for I-131 is 1.7 mm).
 - b) Mr. Cain placed the dose (in the syringe/syringe shield) into additional shielding in Room 4059. The dose contribution of this activity is negligible due to shielded conditions.
 - c) Mr. Cain removed the syringe from the syringe shield, using the flanges at the end of the syringe, and placed the dose into the dose calibrator (using the dipper) within approximately 5 seconds. The estimated distance from fingertips to dose is 3 centimeter.
 - d) After removing the dipper from the dose calibrator, Mr. Cain returned the syringe to its syringe shield (using the flanges at the end of the syringe) and placed into a lead transport caddy within approximately 5 seconds. The estimated distance from fingertips to dose is 3 centimeter.
 - e) Mr. Cain did not handle the syringe any further.
 - f) The gamma ray constant for I-131 is 7.65 E-5 mSv/h/MBq. With respect to the mass attenuation coefficient for I-131 in soft tissue, 30 % of the energy is deposited within 3 cm (this is the average thickness of a human hand). The dose rate is calculated as 5.64 Gy/h at 1 cm or 1.75E-4 Gy/s at 3 cm.
 - g) For a handling time of 10 s in item a) above, the dose to Mr. Cain's hand was 1.75 E-3 Gy or 175 mrem, multiplying it by the shielding provided by 1.18 HVLs, we obtain 77 mrem for this task.
 - h) For a handling time of 10 s in items c) and d) above, (similar to g, but with no additional shielding), the dose to Mr. Cain's hand was 1.75 E-3 Gy or 175 mrem for these tasks.
 - i) Therefore the total calculated extremity dose from his handling of the 194 mCi dose of NaI is less than **252 mrem**.
3. The combined dose for the June and September therapies is **485 mrem**.