

Influence of the source of Lu-177 on radiopharmacy waste management –an estimate

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Introduction: When radiopharmaceuticals are procured, it is tempting to select based on the cost of the product. In the case of Lutetium-177 for radiopharmaceutical therapy, this may have considerable practical consequences. The radionuclide can be produced using a direct (NCA Lu-177) or an indirect method (CA Lu-177), yielding products with different specific activities and different levels of contamination with Lu-177m, which has a half-life of 160 days. We asked ourselves what the implications for waste management would be if we switched from NCA to CA Lu-177.

Methods: Data from 73 Lu-177 therapy doses prepared and dispensed in our hospital were reviewed. Doses were individually prepared, starting with approximately 7.4 GBq Lu-177. The activity of waste from the radiosynthesis procedure (production waste, P) and from dispensing and administration of the patient dose (dispensing waste, D) were calculated. These values were used to estimate potential levels of Lu-177m in waste.

Results: Waste P contained an average of 885 ± 336 MBq and waste D 183 ± 106 MBq Lu-177. Assuming that 0.05 kBq Lu-177m is present per 1 MBq CA Lu-177 (Bakker et al, 2006), the waste contents of the longer-living isotope would be 44 kBq and 9 kBq respectively (Table 1).

Discussion: In South Africa, radioactive substances with activities less than 100 Bq/g and total activity less than 4 kBq can be disposed as normal waste. On the day of synthesis and administration, all our production waste would have exceeded the 4 kBq limit, while only 10 lots of dispensing waste would fall below that level. In our worst case scenario, even if a facility were to receive a ready-to-use Lu-177 radiopharmaceutical containing Lu-177m, waste from dispensing may have to be stored almost 2 years before disposal.

In this study we only considered waste and we excluded patient excreta. For radiosynthesis and therapy, other aspects of the radionuclide, like the effect of low specific activity, should also be carefully considered.

Conclusion: The decision regarding Lu-177 procurement should not be based on cost only. If long-living contaminants are likely in a radiopharmaceutical product, waste management and storage facilities will be an important consideration.

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