

Environmental radiation monitoring in and around a radioisotope therapy suite

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Background.

Environmental radiation monitoring is a key part of ensuring compliance with IRR17 [1]. IRR17 regulation 20 IRR17 requires adequate monitoring of designated areas, and within the IRR17 ACOP [2] it is stated that “monitoring is needed both inside and outside the boundaries of controlled and supervised areas”.

Methods.

Environmental radiation monitoring was performed in, and around an inpatient molecular radiotherapy suite comprising three en-suite rooms used for I-131 and Lu-177 treatments. Luxel® OSL dosimeters were used to measure the external radiation exposure by Optically Stimulated Luminescence (OSL) technology. The minimum measurable dose by the dosimeters is 0.01 mSv. Monitoring is normally performed every two years; however, it was noted that previous monitoring had not considered areas situated above and below the therapy suite. In this instance dosimeters were placed in, around, above and below the therapy suite for between 47 and 71 days depending on access. TADR2000 values were calculated from the measured values.

Additional dose-rate measurements were performed in one of the areas below the inpatient rooms to ascertain whether the radiation exposure detected on the dosimeters was from the patients above the area, or the soil pipes from the therapy rooms which exits the building through a neighbouring duct. Measurements were performed with a patient treated with I-131-NaI in a patient room in a known location and then using the bathroom.

Results.

In the areas above the therapy suite measurements were all <0.01 mSv. Within the therapy suite itself measured doses varied from 0.17 mSv to 0.89 mSv over 69 days. In the area below the therapy suite doses varied from 0.01 to 0.92 mSv over 69 days, with the highest measurement of 0.92 mSv in a kitchen. The calculated TADR2000 values for this room was 0.009 μ Sv/hr respectively, equating to a dose per annum of 18 μ Sv.

Dose-rate measurements within the kitchen increased during patient excretion to 2.5 μ Sv/hr, 2 and a half hours after administration of 1.1 GBq of I-131 NaI. The highest dose-rates were found at the position of the soil pipes.

Discussion.

The TADR2000 calculations for the staff room and kitchen below the therapy suite were below the 0.15 μ Sv/hr threshold for a supervised area [3]. Dose-rate measurements showed an increase in the dose-rate at the position of the soil pipes during patient excretion. Soil pipes from the three rooms merge to one pipe through a ducting to leave the building, thus the measured dose-rate will be higher when all three rooms are occupied.

Conclusion.

Area designations within the ward will remain as they are currently. Any further development in the area underneath the therapy suite will have to involve the Radiation Protection Advisor (RPA), and a full review of the radiation risk assessment will be required. The RPA has advised that the pipes are boxed in with lead for any change in room occupancy.

Key references.

1. Ionising Radiation Regulations 2017, UK Statutory instruments No. 1075. 2017. <https://www.legislation.gov.uk/uksi/2017/1075/contents>
2. Work with Ionising Radiation, Ionising Radiation Regulations 2017, Approved Code of Practice and guidance, HSE, 2018. <https://www.hse.gov.uk/pubns/priced/l121.pdf>
3. Medical and Dental Guidance Notes, Institute of Physics and Engineering in Medicine, 2002

