INDIANA UNIVERSITY

PUBLIC SAFETY Environmental Health and Safety

29 April 2022

Administrator U.S. Nuclear Regulatory Commission – Region III 2443 Warrenville Road, Suite 210 Lisle, IL 60532-4352

Re: Written Report to Follow-up Notification of Loss of Material on 1 April 2022

NRC License No. 13-02752-03 Notification No. 55817

To Whom it May Concern:

This letter is to satisfy the written report requirement of a notification of loss of material, as outlined in 10 CFR 20.2201. On April 1st, 2022, I notified the NRC Headquarters Operations Center by telephone of a loss of material requiring immediate notification. Details are provided below.

Licensee Name: Indiana University-IUPUI/IU Medical Center Campus (NRC License No. 13-0252-03)

Description of Event: On 31 March 2022, a package containing two individual doses of Xofigo (²²³RaCl₂) was received at the nuclear medicine department of University Hospital. These two doses were prescribed for two separate patients; one scheduled to receive a dose on 31 March, and the other scheduled to receive a dose on 1 April. The first dose was successfully delivered. At the time of intended administration on April 1st, the second dose could not be located. It was also noted that package in which the doses were received was not present. Upon further investigation, it was discovered that a Nuclear Medicine Technologist had thrown away the box containing the second dose at the end of the day on March 31 without realizing a dose was still inside the box. The activity at time of loss was approximately 126 μCi.

Why the Event Occurred: There are several contributing factors to why this loss occurred. It is unusual to receive a dose of Xofigo a day in advance; they are usually delivered the day of administration. The technologist that threw the package away would have expected a new package on the following day. As Xofigo is primarily an alpha-emitter, the external dose rate is fairly low, and doses do not require lead shielding. Therefore the technologist would not have realized by the weight of the package that there was still a dose within the package. A picture of a syringe within the plastic holder is shown in Fig. 1 for reference. Additionally, due to relatively low level of photon emissions, the material was not detected within the trashcan when performing the end of day direct survey with a GM detector, nor was it detected via portal monitor at the waste facility. As noted below, the expected dose rate at 1 m at time of loss was approximately 0.02 mrem h⁻¹, which is the usual background exposure rate in the nuclear medicine area.



Figure 1. Typical Xofigo syringe and syringe holder.

Probable Disposition of Material: The material was very likely disposed of at the municipal waste facility along with other hospital waste.

Exposures to Individuals: The external dose rate of ²²³Ra and daughters in equilibrium is given as 0.0469 μSv h⁻¹ per MBq at 1 m, or 0.173 mrem h⁻¹ per mCi at 1 m (Cho et al., JNM 56 supplement 3, pg. 2638, May 2015). The unshielded external dose rate from the lost source would have therefore been approximately 0.022 mrem h⁻¹ at 1 m at the time of loss. Taken to decay

(infinity), this gives a cumulative dose of only 8.5 mrem at 1 m. It is therefore extremely unlikely anyone would have received 100 mrem from external exposure of this source.

- Actions to Recover Source: There have been no actions to recover the source, as it is mixed with other waste at the waste facility and is not readily detectable with hand held survey meters.
- Actions to Prevent Further Occurrence: The procedure in nuclear medicine has been updated such that Xofigo doses for future days will be placed in the existing rack system (see Fig. 2) or adjacent to the dose calibrator. This rack system is used to hold radiopharmaceutical doses within their shielding container, and is typically use to hold doses in use for any given day. Now, doses for future days will also be placed in this rack to prevent inadvertent disposal of the dose.



Figure 2. Radiopharmaceutical dose organizational rack.

Please do not hesitate to contact me if you require further information.

Sincerely,

T. Michael Martin Date: 2022.04.29 09:21:58 -04'00'

T. Michael Martin, PhD, DABHP

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