ADDRESSING THE CHALLENGES NUCLEAR MEDICINE DEPARTMENTS FACE WHILE HANDLING LU-177

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Introduction

- Lu-177 Dotatate, also known as Lutathera, (a beta-emitting radiopharmaceutical) is used as the therapeutic dose for the treatment of gastroenteropancreatic neuroendocrine tumors.
- Lu-177 has a half-life of 6.7 days and can randomly decay into Lu-177m, its daughter, which has a half-life of 161 days.[1,2]
- The purpose of this literature review is to discuss how the random decay of Lutathera into its daughter can cause regulatory issues in nuclear medicine departments.

Methods

- Online searches were performed using two database known as OVID and PubMed. Keywords used were the following: lutetium 177, NRC, radioactive decay, half-life, Lutathera, radioactive storage, and neuroendocrine tumors.
- 17 different articles were reviewed, however, only 11 articles were utilized for this literature review.

Background

- After use, residual Lutathera is stored in decay-in-storage
- The possibility of Lutathera randomly decaying into its daughter can affect the nuclear medicine department by interfering with Nuclear Regulatory Commission (NRC) regulations
- NRC was created to ensure the safe use of radioactive materials for people while protecting them and the environment.[3]
- Regulations involved include:
  - 10 CFR 20 – Waste Disposal
  - 10 CFR 35.92 – Decay-in-storage
  - 10 CFR 35.315 – Safety precautions

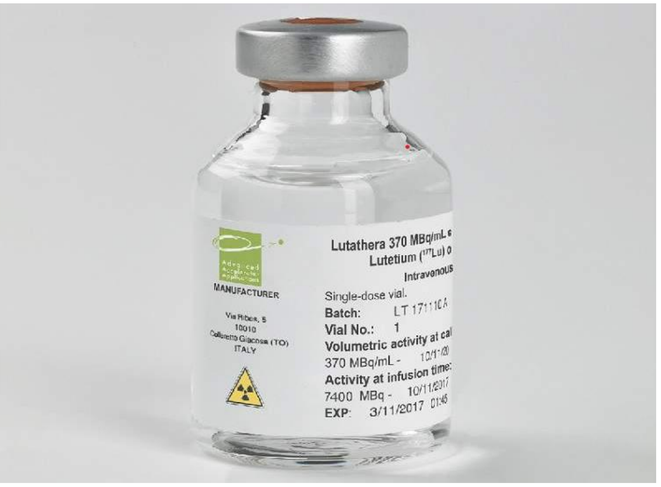

Figure 1: Vial of Lutathera[7]

Discussion

- When discussing storage procedures, if Lu-177m is detected, a technologist must dispose of the waste as low-level radioactive waste and refer to 10 CFR 20 Subpart K, "Waste Disposal"[4] because the technologist will no longer be able to hold the Lutathera dose according to 10 CFR 35.92.[5]
- According to 10 CFR 35.315, if for some reason the patient is not able to leave, the technologist is responsible to find a private room with a private sanitary facility.[6]
  - A therapy room would provide the nuclear medicine staff a specific room to prepare accordingly for the procedure and confine the potential of contamination into one specific room that is designed for only scheduled therapies, thus making clean-up and monitoring more efficient.

Conclusion

- Lutathera treatments are beneficial to patients with neuroendocrine tumors, however these treatments offer logistical challenges to nuclear medicine departments
- It is important that nuclear medicine departments and other staff members understand the possibility of Lutathera randomly decaying into its daughter and affecting these regulations.
- By preparing staff and developing protocols for the handling of Lu-177 and Lu-177m, nuclear medicine departments can eliminate any surprises and become a safer environment to patients and staff.

References

1. Nuclide safety data sheet lutetium-177. http://www.hpschapters.org/northcarolina/NSDS/177LuPDF.pdf. Accessed on 2021 Mar 14.
2. Clark TV. Licensing of lutetium-177. *NRC*. https://www.nj.gov/dep/rpp/rms/agreedown/lic_of_lu-177.pdf#:~:text=Lu-177m%20cannot%20be%20decayed%20in%20storage%20under%20the,of%20detectable%20Lu-177m%20waste%20as%20low-level%20radioactive%20waste. Published 2018 June 21. Accessed on 2021 Mar 5.
3. About NRC. *NRC*. https://www.nrc.gov/about-nrc.html. Published 2020 Nov 25. Accessed 2021 Mar 20.
4. Waste disposal. *NRC*. https://www.nrc.gov/reading-rm/doc-collections/cfr/part020/part020-2001.html. Updated on 2018 Nov 1. Accessed on 2021 Mar 9.
5. Decay-in-storage. *NRC*. https://www.nrc.gov/reading-rm/doc-collections/cfr/part035/part035-0092.html. Updated 2017 Aug 29. Accessed on 2021 Mar 6.
6. Safety precautions. *NRC*. https://www.nrc.gov/reading-rm/doc-collections/cfr/part035/part035-0315.html. Updated on 2017 Aug 29. Accessed on 2021 Mar 30.
7. https://www.clinicaltrialsarena.com/wp-content/uploads/sites/33/2019/07/Image-1-Lutathera.jpg