

Advice for the Safe Drawing up and Administration of ²²³Ra Radium-Chloride (Xofigo)

UK Radiopharmacy Group, IPEM NM SIG and BNMS

This product is the first licensed therapeutic alpha emitter to be introduced in the UK for the treatment of metastases from castration resistant prostatic cancer. Xofigo is likely to reach a much wider therapeutic patient population than previously served by Nuclear Medicine departments so it is likely that many Nuclear Medicine departments and radiopharmacies will be ordering, dispensing and administering a therapeutic product for the first time. This document has been produced in conjunction with the IPEM Nuclear Medicine Special Interest Group and BNMS.

Drawing up advice

- The preparation is a single dose vial and should be drawn up as close to the injection time as possible. The vial should be used for one patient only, and any residual solution is disposed of following local procedures. When the dose is drawn up from the vial immediately prior to administration, the drawing up is considered to be part of the administration process.
- If the dose is drawn up in advance, or if more than one injection is drawn up at a time, then it becomes a separate dispensing activity which should be undertaken in a controlled pharmaceutical environment. If injections are not administered immediately, there is an increased risk of error and of microbial contamination that can lead to infection [1,2]. It is now generally accepted that such activities are best performed centrally within the pharmacy or radiopharmacy department where appropriate aseptic facilities are usually found. This was one of the principal recommendations of the Breckenridge report [3] (and subsequently reinforced for all parenteral medicines by the NPSA in Patient Safety Alert 20 [4]).
- If used immediately (for example, within 30 minutes of drawing up), radiation protection is the most important consideration, and the dose can be drawn up in a suitable contained workstation. If drawing up in advance, aseptic considerations should be taken into account and it should be dispensed in suitable aseptic facilities, e.g., a Radiopharmacy.

- Appropriate aseptic precautions – i.e. no touch technique – should be adopted when drawing up the dose.
- A 5 or 10ml luer lock syringe and cap with a blind hub should be used to ensure no leakage during transport to the end user.
- Ensure the dose calibrator is calibrated for both the delivery vial and for patient syringe.
- Measurement of the dose can be done using a validated vial/syringe factor or by vial subtraction (i.e. measuring the vial before and after drawing up). However the evidence is that <1% of activity remains in the syringe (<http://www.hindawi.com/journals/bmri/2015/324708/>).

Note that there may be a geometry effect depending on the volumes in the syringe.

- Each patient dose must be within +/- 10% of the prescribed dose.
- Dispose of waste separately from other radiopharmacy radioactive waste using local procedures.
- Use a suitable syringe shield (tungsten or lead/glass) The typical syringe surface dose rates are: 90 uSv/h/MBq (unshielded), with 45% attenuation per mm shield thickness (tungsten), 8.5% (Pb/ glass) and 1.1% (Polycarbonate).

Administration

- Administration should be performed within a unit which has dedicated facilities appropriate for radionuclide administration as identified in local risk assessment. Ideally this should be performed in a designated treatment / injection room.
- The Medical Physics Expert (MPE) shall be present during initial treatments to confirm appropriateness of preparatory work e.g. local protocols and risk assessments. Subsequently the MPE shall be available for consultation as required.
- It is recommended to cannulate the patient to reduce chance of extravasation. The site of cannulation should be chosen carefully to best allow identification of extravasation.
- The dose should be administered parenterally by slow injection (generally up to 1 minute) by a person authorised to handle therapeutic radiopharmaceuticals in designated clinical settings. The intravenous access line or cannula should be flushed with isotonic sodium chloride 9 mg/mL (0.9%) solution for injection before and after injection. **Note:** A butterfly can be

used instead of cannulation, as this may make it easier to identify extravasation.

- If determining the administered dose by vial subtraction, an on-site dose calibrator will be required for measurement both before and after administration to ensure accurate quantification of administered activity.
- Throughout the drawing up and administration processes, the vial and syringe should be handled in a manner which satisfies radiation safety and pharmaceutical quality requirements.
- Optimisation of the administration to ensure that it is in keeping with the principles of ALARP (“As Low As Reasonably Practicable”)

Monitoring and decontamination

- ^{223}Ra radium is predominantly an alpha emitter - the external radiation exposure associated with handling of patient doses is considerably lower in comparison to other radiopharmaceuticals for therapeutic purposes (the administered radioactivity will usually be <8MBq.) However users should be aware that a beta particle is also emitted as part of the decay process and may contribute to the radiation dose of the operator.
- Monitor the workstation/administration area after use with a specific contamination monitor which has been confirmed as being appropriate for use with this radionuclide and is appropriately calibrated.
- Should a spillage occur it may be dealt with following standard radiation protection measures.
- Contaminated areas may be decontaminated following local procedures, using an appropriate agent.
- Dispose of waste separately.

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References

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