

LAB_046 Stereotactic irradiation of live rodents

I. OBJECTIVE

To ensure safe and humane stereotactic irradiation of live mice and rats, within TRI.

II. DEFINITIONS

Competent - “the consistent application of knowledge and skill to the standard of performance required regarding the care and use of animals. It embodies the ability to transfer and apply knowledge and skill to new situations and environments.” (as per, Australian code for the care and use of animals for scientific purposes, 2013)

Stereotactic irradiation - delivering highly focused radiation beams (eg high energy X-ray) to precise anatomical targets such as tumours, brain or bone. Also commonly known as “stereotactic radiosurgery” or “imaging-guided external beam targeted irradiation”.

III. COMMENTS / RECOMMENDATIONS

- The procedure must be performed by a TRI Preclinical Imaging Facility personnel, or a trained operator individually approved by the Senior Preclinical Imaging Scientist / Facility Manager.
- A Personal Use radiation licence from Queensland Health is not required to operate the system, as it is classified as a cabinet X-ray unit. However, operators must have completed relevant radiation safety training as stipulated by TRI.
- Stereotactic irradiation involves three broad steps: 1) computed-tomography (CT) imaging (to obtain anatomical information), 2) designing an irradiation plan on a treatment planning software (eg defining radiation beam size, angle, dosage etc...), and 3) radiation execution. The animal needs to be under general anaesthesia for the entire procedure, which is typically for 20-30mins. If the animal’s position significantly changes after the CT scan, the treatment plan will no longer be relevant.
- Inside the irradiator, the animals will be resting on a heated pad, with respiration continuously monitored. They can be visually monitored by the operator looking through the lead-lined glass door.
- After irradiation, the animals must be monitored continuously until recovered (conscious ambulatory movement).
- If contrast agents are used to enhance visualisation of soft tissue for targeted irradiation, details must be provided in the AEC application (name, type, volume, route, needle gauge). However, contrast agents are usually not required for this procedure.
- Additionally, the following must be described in the individual ethics application: anatomical area of interest (for imaging and irradiation), the frequency and dose of irradiation, any expected adverse events, and any variation to this SOP.

IV. EQUIPMENT

- Vaporous isoflurane anaesthetic unit, including:
 - Precision isoflurane vaporiser
 - Induction chamber
 - Nose cone
 - Anaesthetic circuit
 - Isoflurane scavenging system
- Stereotactic irradiation unit
 - Heated bed
 - Respiration sensor

Conditions:

- Investigators named in an animal ethics application, relative to this SOP, must be competent to implement the SOP
- Any variation to this SOP must be described in the relevant animal ethics application
- If this SOP has not been reviewed and approved by a UQ AEC within the last three years it is no longer valid and cannot be used in animal ethics applications until reapproved (see “AEC Reviewed/Approved” date in this document’s header).

- Contrast agents (if relevant)



Figure 1. Stereotactic irradiation unit

V. PROCEDURE

1. Ensure all workspaces and equipment are clean using surface disinfectant
2. Fill the anaesthetic induction chamber with 3-5% isoflurane and oxygen gas mixture (~1L/min is appropriate, given a 2-5L induction chamber)
3. Place the rodent into the anaesthetic induction chamber.
4. Once adequately anaesthetised, move the animal onto the heated animal bed inside the irradiator, maintaining anaesthesia (~2% isoflurane, ~400mL/min gas flow rate) via use of a nose cone.
5. Position the respiration sensor on the animal to enable continuous monitoring of respiration rate.
6. Perform CT scan.
7. On the computer, design the irradiation plan using the treatment planning software.
8. Execute irradiation plan.
9. Once entire procedure is complete (typically 20-30mins), remove animals directly to a heated cage with access to feed and water and monitor continuously until completely conscious and able to walk normally.
10. Ensure isoflurane vaporiser and oxygen gas supply are turned off.
11. Clean imager, workplaces and any other equipment with surface disinfectant.

Version #	Reviewing AEC (note: all other relevant AECs ratify the approval)	AEC Review Date	Approval To Date
1	ABS	09/03/2022	

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