uOttawa

Standard Operating Procedure

SOP CODE AND TITLE	EXP-4 Anesthesia, In-Scan and Recovery Monitoring during MRI procedure
DATE APPROVED BY ACC	July 15, 2014
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PURPOSE: To describe the procedures for the induction and maintenance of anesthesia and monitoring of animals being scanned with the General Electric / Agilent MR901 7T small-animal MRI scanner, in combination with a SA Instruments Inc. (SAII) physiological monitoring system.

LOCATIONS AFFECTED: Pre-Clinical Imaging Core – Roger Guindon Hall suite1327

PERSONNEL INVOLVED/ RESPONSIBILITY: Pre-Clinical Imaging Core staff, MRI physicist, Laboratory Animal Technician (or ACVS delegate)

MATERIALS:
Isoflurane USP
Anesthesia Induction Chamber
Isoflurane vaporizers/ delivery systems
Compressed oxygen
Physiological saline 0.9% NaCl (warmed to ~ body temperature)
Heated platform
SA Instruments monitoring components
Eye ointment (such as tear gel)

GENERAL:
MRI of live animals may only be performed by the designated laboratory animal technician for the pre-clinical imaging facility, optionally assisted by an MRI physicist. "Visitors" are allowed in the animal prep area (1327) and MRI console area (1327A-B).
Warning: The magnet room (1327C), is potentially extremely dangerous – only the designated imaging staff may enter. Personnel entering the magnet room need to remove metal jewelry, watches and security access cards prior to entering this room.

PROCEDURES: Each animal is anaesthetized with inhalant isoflurane throughout the imaging procedure. The SAII system may be used to monitor the animal's vital signs and maintain body temperature via warm air delivery into the MRI bore.

1. Ensure the air within the MRI bore has been warmed using the SAII T1 thermistor control system.

2. Ensure that isoflurane vaporizers, delivery systems and the anesthesia induction chamber are properly set-up. Ensure that the isoflurane levels in the vaporizers are filled. When the indicator level drops to less than half, refill the vaporizer using the precision key. Verify that the online gas system is pressurized to approximately 40 PSI. Check gas pressure on the inline oxygen gauge intermittently to ensure the gas delivery is not interrupted.

   Note: Oxygen tanks supplying this area are located in room 1329 and have an automated tank switch over system, with a bank of 4 H cylinders. The supply tank status should be verified each week to ensure at least one tank is in active use and a second is ready for switch over.
   Warning: Ensure that the scavenge system has been turned on and is actively providing suction to both the induction station and the MRI bed anesthetic delivery station. Verify scavenge hook-up. Failure to do so may result in personnel having an occupational exposure to anesthetic waste gas.

3. Animal preparation: Once animal subjects have been received in the MRI animal preparation area, remove the selected scan subject from its home cage, verify and record the animal identification and place it in the anesthesia induction chamber.

4. Open the oxygen valve for the induction chamber and set the vaporizer to 2-3% isoflurane, at a flow rate of 0.75-1LPM for mice, 1 LPM for rats.

5. Place the home cage on the heated platform, to warm the cage in preparation for return of the animal.

6. Observe the animal for anesthetic effect/recumbency, and turn the vaporizer setting to <OFF> and the oxygen flow to <OFF>for the induction chamber. Remove the animal from the chamber and promptly transfer to the MRI bed. Verify the depth of anesthesia.

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7. Set the MRI anesthetic bed station vaporizer to 2-2.5 % and flip the Power switch toggle to <ON> on the Vetequip RC2+ and ensure the MRI fresh gas delivery interface is also toggled to <ON>.

8. Place the nose of the animal into the isoflurane nose cone on the MRI bed.

9. Ensure that the animal is breathing regularly. Position the animal as per the procedural requirement and apply any required SAII physiologic monitoring components. (Refer to points 12 below).

10. Apply eye ointment to prevent corneal drying and damage.

11. Transfer the MRI bed to the MRI bore, verifying that the bore temperature has been appropriately set to maintain optimal body temperature.

12. The length of the procedure will determine the level of monitoring required.
    a. Short scan: MRI imaging less than 10 minutes with a maximum total anesthesia time of 15 minutes (e.g. routine brain, whole-body fat) – No physiologic equipment needs to be used. Confirm that the animal is stable at time of bed transfer. Observe for quick recovery upon return to warmed home cage.

    b. Regular scan: MRI imaging which will last more than 20-25 minutes with a maximum total anesthesia time of 30 minutes or more.

        i. Arrange/attach the vital sensors to the subject. Standard sensors include: (1) a lubricated rectal temperature probe set up in a feedback loop with the heated ventilation to ensure proper temperature regulation, and (2) a pressure sensor that non-invasively registers the respiration rate, allowing monitoring of the respiration rate and rhythm, SPO_2 and core temperature.

        ii. Affix Monitoring components as necessary with medical tape and secure the animal into position with gauze and masking tape to ensure that movement of the bed location will not change orientation of the animal. Note: To prevent injury to the animal, ensure gauze is protecting the fur from the tape.

        iii. When monitoring is being conducted, verify that respiration rate and temperatures have stabilized within acceptable ranges (37-38 degrees Celsius and respiration rates between 95-165 breaths per minute), the scanning procedure may begin. Observe the respiratory rhythm to ensure no aberrant movement that may indicate that the subject is not appropriately anesthetized.

13. Remove the animal from the scanner and scan bed and return to the recovery home cage. Record the date and procedure and any fluid therapy onto the cage card. NOTE- animals that have been anesthetized for 30 minutes or longer should receive warmed subcutaneous saline at the time of return to the recovery home cage. Standard fluid administration of 1 mL/mouse, 5 mL/rat.

14. Allow the animal to recover under close observation until fully awake. After the recovery period, make a final assessment to ensure that the animal is healthy and awake before transferring the animal back to its original housing room.

15. Upon completion of the scan session, turn off the vaporizers, flow meters and delivery systems.

16. Turn off the heated platform.

17. Clean the recovery chamber with appropriate disinfectant and paper towels. Clean counters, sweep and wash floor.

18. Return all animals to the housing room.

19. Record technical service charges on the appropriate logs for cost recovery. Submit to administrative support staff.