Research MRI Safety Committee Standard

SAFE SCANNING WITH ANIMAL SUBJECTS

Category: Magnetic Resonance Imaging (MRI)

Standard #: MR.014

Applies to: Investigators, study personnel, MRI staff

PURPOSE:

The purpose of this procedure is to ensure the safety of both animal subjects and personnel working within the surgical and magnetic environments. (See also *Safe MRI Scanning* MR.SOP.11*)*.

DEFINITIONS:

Research Study Personnel
Study personnel are individuals including a student, staff member or laboratory assistant for whom the PI of the study is responsible, and who are at the MR scanner site during the study or may be recruiting subjects for the study.

Research Subject
A research subject is a human or animal participant who is placed into the bore of the MRI scanner for research purposes.

Research MRI scanner operator is an individual who is an employee of the Medical College, has completed the MRI safety training and is specially trained in the operation of one or more of the MRI scanners. There are two levels of scanner operators:

- Individuals who may operate the scanner for phantom and/or animal studies
- Individuals who may operate the scanner for human research subjects studies. These individuals must have current documentation as to valid Red Cross or equivalent basic life support cardiopulmonary resuscitation (CPR) training.

POLICY

All personnel working within the magnetic environment are required to complete MRI safety training (see *MRI Safety Training*, MR.SOP.08). When scanning animal subjects, the procedures outlined below must be followed.

PROCEDURES:

A. The appropriate steps for using anesthetic gases (e.g. isoflurane) are as follows:

1. Check all gas levels prior to the start of the procedure and record the levels

in the log.

2. Use the provided anesthesia hookups without modifying the connections. Modification(s) can cause user exposure.

3. Wait until the animal is in the nosecone before turning on the isoflurane.

4. Monitor the animal subject continuously for proper respiration. Isoflurane is a respiratory depressant. (Refer to B.1-6 for monitoring guidelines.)

5. Check the isoflurane level on the Poet IQ2 gas monitor.

6. Maintain proper vacuum flow on the rotameter to ensure correct air balance.

7. Turn off the isoflurane flow before removing an animal from an induction box or nosecone.

8. After scanning, ensure the anesthesia flow is off before removing the animal to prevent exposure.

B. Animal subjects should be monitored continuously during MRI Scanning.

1. Physiologic parameters that **must** be continuously monitored
   a. SpO_2 and heart rate using a pulse oximeter **or** heart rate and ECG trace.
   b. Respiratory rate and trace
   c. Core/rectal body temperature

2. Additional physiologic parameters may be required **by the IACUC** based on review of the Animal Use Application (AUA) (e.g. blood pressure by either cuff or invasive arterial line when paralytic agents such as gallamine or pancuronium are used).

3. Monitoring equipment must be MRI-safe or stationed sufficiently outside of the magnet such that it does not pose a potential hazard to animals or personnel using the MRI suite. In addition, the equipment must be positioned such that values recorded/displayed are readily viewable to the personnel conducting the procedure.

4. A record of monitoring must be documented for each animal at no more than 10-minute intervals during animal imaging.

5. Personnel observing the monitoring devices/parameters must be appropriately trained to detect deviations from normal values and to perform interventions such as altering anesthesia delivery or halting the session.

6. Situations that require interruption or termination of the imaging session and removal of the animal from the magnet:

   a. A rise in core body temperature exceeding 39°C for rodents and more than 1°C above normal in other species.
   b. Any monitoring values indicating animal distress such as significant (~25%) increases or decreases in respiratory rate or heart rate or blood pressure or decreasing SpO_2.

c. Loss of ability to perform required monitoring through equipment failure or any other reason, unless monitoring can be reestablished within 5 minutes of the time at which monitoring was lost. Scanner interference with ECG signal during functional MRI using echoplanar imaging is a known issue and shall **NOT** require session termination as long as other monitoring is available to indicate normal function and signal is reestablished immediately following the scan.

C. Oxygen sensors, present at the MACC and Daniel M. Soref Imaging Research Facility scanners emit a very loud, piercing sound. If alarm sounds:
   1. Do Not Enter the scanner room
   2. Turn on the Emergency Exhaust Fan (wall switch)
   3. Call MCW Public Safety (414-955-8299) Public Safety will notify Environmental Health and Safety (EHS)
   4. Do Not Enter the scanner room until cleared by EHS
   5. Notify EHS (x8007) if you observe 02 percentage trending downward; recalibration is needed; normal 02 level is 20.9%
   6. No entry is allowed into the scanner room if 02 is 19.5% or less.

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