



# MCW MRI Safety Standard Operating Procedures

## Safe Scanning with Animal Subjects

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Category: Magnetic Resonance Imaging (MRI) Safety

Procedure #: MR.SOP. 014

Applies to: Investigators, study personnel, MRI staff

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### **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.011).

### **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 are allowed to operate the scanner for phantom and / or animal studies
- Individuals who are allowed to operate the scanner for human research subjects studies

Individuals who are allowed to operate the scanner for research participant studies must have current documentation as to valid Red Cross or equivalent basic life support cardiopulmonary resuscitation (CPR) training.

### **PROCEDURES:**

- A. All personnel working within the magnetic environment are required to complete MRI safety training. (See *MRI Safety Training*, MR.SOP.08)
- B. When using anesthetic gases (isoflurane) the following is proper procedure:
  1. Use the provided anesthesia hookups without modifying the connections. Modification(s) can cause user exposure.
  2. Monitor the animal subject continuously for proper respiration. Isoflurane is a respiratory depressant.
  3. Turn off the isoflurane flow before removing an animal from an induction box or nosecone.
  4. Wait until the animal is in the nosecone before turning on the isoflurane.
  5. Check the isoflurane level on the Poet IQ2 gas monitor.
  6. After scanning, ensure the anesthesia flow is off before removing the animal to prevent exposure.
  7. Maintain proper vacuum flow on the rotameter to ensure correct air balance.

- C. Oxygen sensors, present at the MACC and Daniel M. Soref Imaging Research Facility scanners emit a very loud, piercing sound. If alarm sounds
- Do Not Enter the scanner room
  - Turn on the Emergency Exhaust Fan (wall switch)
  - Call MCW Public Safety (414-955-8299) Public Safety will notify Environmental Health and Safety (EHS)
  - Do Not Enter the scanner room until cleared by EHS
  - Notify EHS (x8007) if you observe O<sub>2</sub> percentage trending downward; recalibration is needed; normal O<sub>2</sub> level is 20.9%
  - No entry is allowed into the scanner room if O<sub>2</sub> is 19.5% or less.
- D. The standards for monitoring animal subjects during MRI scanning are intended to keep animal subjects safe and to conduct research studies within regulations and guidelines. A combined effort of the IACUC, the BRC and the MRI Safety Committee the standards are defined in the policies below established October 28, 2008.

### **Standards for Monitoring Animal Subjects During MRI Scanning**

- Physiologic Parameters to be Monitored
  - When MR imaging is performed on animal subjects, the following parameters are to be monitored routinely:
    - SpO<sub>2</sub> and heart rate using a pulse oximeter **or** heart rate and ECG trace.
    - Respiratory rate and trace
    - Core/rectal body temperature
  - Some procedures, e.g., when paralytic agents such as gallamine or pancuronium, are used, blood pressure monitoring may also be required. This will be determined by the IACUC within the context and review of the applicable Animal Use Application.
  - Based on their review of the AUA, the IACUC may require additional monitoring.
- Equipment:  
Monitoring equipment must be MRI-safe, or stationed sufficiently outside of the magnet such that they do 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.
- Frequency of Monitoring:  
***Continuous monitoring of SpO<sub>2</sub> or heart rate, respiratory rate and core/rectal temperature is required while animals are in the magnet. When appropriate, intervals for blood pressure monitoring by either cuff or invasive arterial line shall be determined by the IACUC.*** During animal imaging a record of monitoring must be documented for each animal. Values must be documented at no more than 10-minute intervals.
- Personnel  
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.
- Interruption of the Imaging Session and Removal for Animal Welfare Reasons:  
The following situations require interruption or termination of the imaging session and removal of the animal from the magnet:
  - 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<sub>2</sub>.
- 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.

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Approved By: MRI Safety Committee