

Standard Operating Procedures for Imaging Animals on MRI Scanners used for Human Research Studies

Summary:

- At no time should human subjects have any contact with animal subjects. This includes:
 - No visual contact
 - They should not be able to hear the animal
 - They should not be able to identify anything associated with animal experiments
- All waste and supplies brought in and used in the animal experiment must leave with the animal
- All surfaces where animals had contact (this will usually be limited to inside the magnet only) must be disinfected by the MR technologist with an EPA-registered disinfectant
- Imagers may only be operated by the MR technologists trained in the MRRC procedures
- Animals cannot use the same medical gas or scavenging equipment as humans
- Everyone involved in animal handling must review and complete the animal handlers health questionnaire.
- Any person who is required to enter the magnet room must complete the training requirements for MRRC safety.

1. General Overview

The main principle to safely operating a dual-subject use facility is to ensure physical and temporal separation between human subjects and animals. Human subject and patient use must be the first priority. Animal use of the scanners can occur only when it will not conflict with human subjects being scanned.

Human subjects should never be able to directly see or hear, or otherwise identify that animals are nearby or were or are about to be used in the facility. This means that all supplies for animal work, and any wastes generated from animal work, must be removed before the facility is returned to human use. It also means that animals, especially non-human primates, must be anesthetized prior to transport into the facility.

The MR technicians will coordinate all movement of human subjects and animals in the MRRC magnet area.

Transport:

- Animals transported into the MRRC must enter through the rear entrance of the facility.
- The MR technologists must be contacted prior to arrival at 785-6699, or 785-6410.

- Upon entering the rear hallway in the MRRC, one transport personnel must go and check with the technologists to ensure that the magnet space is clear of human subjects.
- Upon getting clearance from the technologist, the animal may be moved into the magnet bay without delay.
- At no time should the animal be stationed outside the magnet control rooms.
- No equipment associated with the animal should remain in the hallway outside the control room.
- The control room doors should remain closed while the animal is in the control room.
- Upon completion of the MR imaging session the technologist will first ensure that no humans are in the hallway and that all the other technologists are aware the animal will soon be transported out of the magnet area.
- When the hall is clear, the animal and all associated equipment can be transported out the rear entrance following the path it came in.

2. Room air ventilation

Yale BS&P/Project Mgt confirms that the entire MR suite in TAC operates on 100% exhaust, meaning that none of the air is re-circulated back to either patient, animal, or other space inside the building.

Air clearance requirements:

- a) Sheep: it is required that 99.9% of the air is replaced in the room following a study imaging sheep. This currently requires 41 minutes of clearance time after the animal has been removed. No human subjects are allowed to enter the magnet room until that time has elapsed.
- b) Dogs, pigs, rabbits, monkeys, and rats: the requirements are not as severe and following animal removal and cleaning as outlined below the room may be used after 20 minutes of circulation.

3. Surface protection

All surfaces that animals come in contact with inside the facility must be covered with impermeable drapings or covering. Equipment and devices that will regularly be used for animals such as trays and carts should be dedicated to animal use only, labeled as such, and stored elsewhere.

4. Technologists

Technologists must wear gowns, masks, and gloves when dealing with sheep. Gowns and gloves are sufficient with dogs, pigs, rabbits, monkeys and rats.

5. Disinfection

All surfaces where animals had contact, even with impermeable coverings, must be disinfected after use with 10% bleach (1 part bleach + 9 parts water, made at least weekly). This is followed by a wipe down with water or 70% alcohol.

Responsibility for the disinfection of used surfaces lies with the MR technologist that ran the scan.

6. Wastes

Animal excrement, blood or body fluids, hair, and any medical waste generated during the procedure or while in the dual use area must be appropriately packaged and removed from the facility after animal procedure is completed. This also applies to sharps containers, so that no potentially infectious materials from the animal(s) remain after they are removed. If any of these materials are spilled or otherwise contaminate areas inside the MR facility, the surface must be cleaned and decontaminated as for a human blood spill.

All the above waste should be transported out of the MRRC with the animal.

7. Medical Gases and Vacuum

Animals can use the same medical gas, scavenging, or vacuum systems used for humans as provided that different hoses and apparatus from the wall box out to the subjects are kept separate and dedicated to either human or non-human use. In all cases hoses must not be re-used and in the case of animals the hoses must be removed from the MRRC with the animal at the end of the experiment.

8. MR Equipment Operation

Operation of MR equipment must be limited to knowledgeable and authorized persons from the MRRC. All individuals involved must be trained in MR safety and understand other health and safety issues related to the facility.

9. Lab Animal Allergy Issues

Everyone involved in animal handling must review and complete the animal handlers health questionnaire, distributed through either YARC or the Employee Health Office. Since LAA's are fairly common, steps to minimize exposure to potential animal allergens must be considered in all aspects of animal work, including imaging and preparatory steps for imaging.

10. Non-Human Primates

NHPs pose unique and potentially more serious issues than many other lab animals, including physical assault injuries and bites, and infectious disease transmission. Individuals working directly with or around NHPs are encouraged to seek additional training and advice from YARC, especially regarding restraint systems, emergencies, and TB. For the MRRC, all non-human primates must arrive and leave under anesthesia.