SOP FOR MR IMAGING PERFORMED WITH THE 9.4T

Overview/Purpose

The objective of this SOP is to describe the procedure for conducting Magnetic Resonance Imaging (imaging or spectroscopy) performed with the BioSpect 94/30US system (Bruker BioSpin; Billerica, MA) located in BRT - 0084.

Owner of SOP and Responsibilities: ***Kimerly Powell*** is responsible for ensuring that the SOP is followed, updated as needed (including personnel changes) and that personnel conducting the procedures are appropriately trained.

Species – Mice, rats and rabbits

Agent Administration

Agent Name	Vehicle **	Dose	Route	Volume	Frequency
Isoflurane	O2/air/ (95% O2 + 5% CO2) or medical air	.5-5%	Inhalation	as needed	1x/imaging
Ketamine & Xylazine	Sterile saline or water	50-70mg/kg & 5-10mg/kg (rabbit)	Subcutaneous	<2mL/kg	1x/imaging
Ketamine	Sterile saline or water	25-35 mg/kg (rabbit)	Subcutaneous	< 2 ml/kg	1x /imaging for redosing if needed
Acepromazine	Sterile Saline or water	0.5-2 mg/kg (rabbit)	Subcutaneous	<2ml/kg	1x/imaging
Depilatory Cream	none	as needed	Topical	as needed	1x/imaging
Gadolinium-based contrast agent	sterile saline	0.05 mM-0.2 mMol/kg	Subcutaneous	< 40 ml/kg mouse, rat < 2 ml/kg rabbit	1-2x/ imaging
Gadolinium-based contrast agent	sterile saline	0.05 mM-0.2 mMol/kg	Intraperitoneal	< 50 ml/kg mouse, rats	1x/imaging
Gadolinium-based contrast agent	sterile saline	0.05 mM-0.2 mMol/kg	Intravenous	< 5ml/kg mouse, rat, rabbit	1x/imaging
Iron-based contrast agent	sterile saline	50 microL-1.5 mL	Intravenous	< 5ml/kg mouse, rat, rabbit	1-2x/ imaging
Fluorine-based contrast agent	sterile saline	5-10% of total blood pool	Intravenous	Up to 10% of blood pool	1x/imaging
Developmental contrast agent *	As defined in protocol	As defined in protocol	As defined in protocol	As defined in protocol	1-2x\ imaging
Heparin	Sterile Saline or water	10-100 U/ml	Intravenous	As needed	1x/imaging

(*) Details will be provided in PI protocol

Procedure

1. Animals will be anesthetized prior to imaging and then positioned as needed. Depth of anesthesia will be monitored by lack of response to noxious stimuli, such as toe pinch, corneal reflex (rabbit) and loss of spontaneous movement, and adjusted accordingly.

Additional information:
- Rabbits will be sedated prior to anesthesia if not contraindicated by the study.

2. Fur may be removed, prior to imaging, over appropriate part of animal body (e.g. for ECG electrode placement).

Details of hair removal:
- Animals will be kept under isoflurane anesthesia for this procedure. Hair will be removed using an electrical animal shaver and/or depilatory cream (e. g. Nair®). After 30 to 90 seconds, the depilatory cream will be wiped off and any remaining agent will be thoroughly removed using wet tissue to prevent burns.

3. The animal will be secured on an animal bed and placed in the MRI scanner for imaging. The animal will remain in the MRI system for 10-150 minutes (depending on the study requirements).

4. Physiological monitoring during MRI imaging is as follows:

- *Respiration* will be monitored during all imaging sessions.
- *Temperature*: A rectal thermometer or temperature probe with body-contact will be used (depend on study requirements) for imaging session longer than 15 min.
  Body temperature will be maintained using a bed with warm water circulation or warm air blower, based on species specific needs.
- *Heart rate* of the animals may be monitored.
- *ECG* signal: will be obtained by placing surface ECG leads. Leads are reusable and will be disinfected with Opti-cide between each animal.
- Parameters will be monitored using Small Animal Monitoring System (e.g. Model 1025, Small Animals Instruments, Inc. stony Brook, NY) or similar system.

5. If necessary, pharmaceutical grade gadolinium-based contrast agent (as Magnetovist or Multihance etc.) or iron-based contrast agent will be injected prior to or during the MRI imaging. Agents not available in a pharmaceutical grade formulation including fluorine based (e.g. V-sence) and developmental contrast agents will be used in accordance with the IACUC policy http://orrp.osu.edu/files/2011/10/Use-of-Pharmaceutical-and-Non-Pharmaceutical-Grade-Compounds-in-Animals-and-Labeling-Expectations.pdf

6. Placement of I.V. catheter
An I.V. catheter may be required for some MRI imaging (according to imaging requirements) and will be placed following induction of anesthesia.

- Tail will be cleaned with 70% alcohol prep pad and slightly warmed up using the warm pad prior to catheter placement.
- Sterile tubing and needle of required size (e.g. PE10 for mice) will be used for tail vein catheterization and secured in place. Tubing will be sterilized prior to use according to ULAR veterinary recommendation (i.e. autoclave or gas sterilization)
- Heparinized saline (0.1-1 ml heparin [1,000 USP units/ml] in 10 ml of sterile saline) will be used as an anticoagulant agent.

7. Following imaging, animals will be monitored until fully recovered from anesthesia (walking, active, etc.) prior to return to routine husbandry/housing.

8. In case of poor recovery from anesthesia or any unexpected issue with animal the PI will be notified. PI will be responsible for further animal monitoring, treatment or euthanasia as per the IACUC protocol.

Personnel conducting procedure must be up to date on all IACUC study team requirements. Personnel not associated with an active protocol must create a profile that is up to date on IACUC study team requirements including a training narrative providing detail on experience for the techniques described in the SOP.

1. Kimerly Powell
2. Anna Bratasz
3. Michelle Williams
4. Surya Gnyawali

Potential adverse effects

None anticipated related to activities covered on this SOP.

Novel contrast agents or alternative dosing schedules must be covered by a research protocol including potential adverse effects.

Early Removal Criteria
In case of unexpected issues with animals at any time the PI/study team will be notified by the core staff and will be responsible for further animal monitoring, treatment or euthanasia as per the IACUC protocol.

Any unusual/unexpected symptoms or anesthetic deaths will be reported to the ULAR veterinary staff for consultation.

History of Revisions

400-00 - new SOP approved by IACUC on 08/17/2018