

THE UNIVERSITY OF BRITISH COLUMBIA



UBC MRI Research Centre



7T Facility

SAFETY POLICY

June 13, 2007

The following document contains important safety information with respect to the 7T Facility at the UBC MRI Research Centre. Please read this entire document thoroughly and retain a copy for your records.

Outline

1. Introduction.....	2
2. Overview of Safety Policy.....	2
4. Screening and Approval of Researchers and Visitors.....	5
5. MRI Safety Training.....	5
7. Access for Custodial Staff.....	6
8. Emergency Procedures.....	6
9. Safety Officer.....	6
10. Incidents.....	7
Appendix A: MRI Screening Form and Visitor Safety Checklist	8
Appendix B: Operator Training Checklist	11
Appendix C: Emergency Procedures	13

1. Introduction

This manual outlines the specific safety policies to mitigate the risks and occupational safety hazards unique to the MRI environment within the 7T facility at the UBC High Field MRI Centre. The 7T facility is installed with a Bruker Biospec 7 Tesla MRI system, with animal handling, data analysis and electromechanical shop capabilities.

The safety procedures outlined herewith are intended to complement other University safety protocols that apply to the 7T facility (e.g. chemical safety, laboratory safety, animal handling, machine shop safety).

2. Overview of Safety Policy

The facility is divided into a number of “Safety Zones”, each with a different degree of stringency in the rules and regulations that apply to that area (see Figure 1). An overview of safety requirements in relation to these Safety Zones is given in Table 1 – please read this carefully.

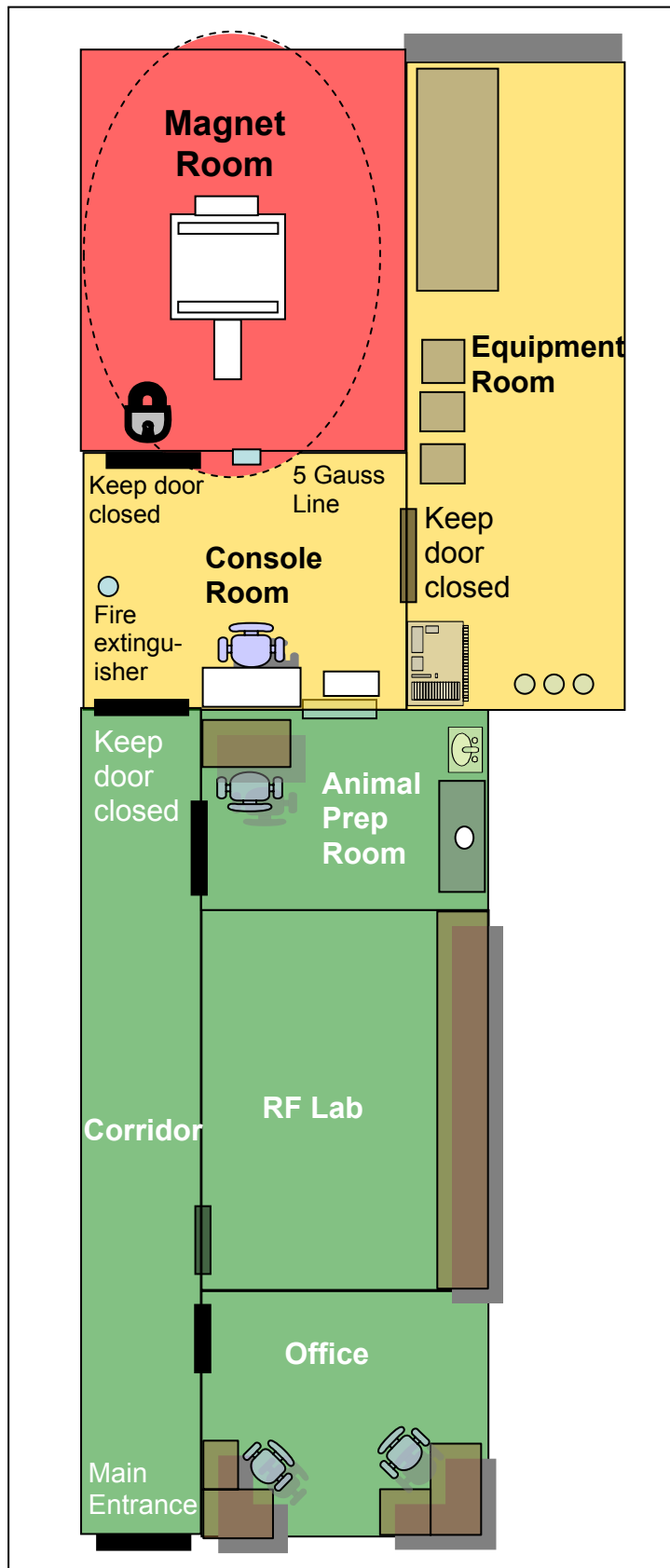


Figure 1 – 7T MRI area access and safety zones

Table 1 – UBC MRI Research Centre 7T Facility Safety Zones

I would like to...	Then you must...	Centre staff must...
<p>... visit the lab but not past the door into the console room</p> <p>Green Zone</p>	<p>... refrain from entering the console room. If you are pregnant then access to animal prep room is denied if anesthetic is being used)</p>	<p>... make sure that the visitor does not enter the console room</p>
<p>... enter the console room and equipment room for a short visit, but not the magnet room</p> <p>Yellow Zone, short-term</p>	<p>... complete a MRI Screening Form or be allowed temporary unscreened access at the discretion of Centre staff, refrain from entering magnet room</p>	<p>... require and review the completion of the MRI Screening Form, or allow temporary unscreened access while ensuring that visitor does not enter magnet room</p>
<p>... enter the console room and equipment room for prolonged periods (e.g. to help out with a MRI experiment), but not the magnet room</p> <p>Yellow Zone, long-term</p>	<p>... complete a MRI Screening Form and Visitor Safety Checklist, refrain from entering magnet room</p>	<p>... require the visitor to fill out MRI Screening Form and Visitor Safety Checklist, conduct screening, and ensure that he/she does not enter magnet room</p>
<p>... enter the magnet room for a short visit</p> <p>Red Zone, short-term</p>	<p>... complete a MRI Screening Form and Visitor Safety Checklist, abide by MR Safety rules, and refrain from entering the magnet room without the presence of Centre staff</p>	<p>... require the visitor to fill out MRI Screening Form and Visitor Safety Checklist, conduct screening, and escort visitor while inside magnet room</p>
<p>... enter the magnet room for prolonged periods (e.g. to help out with a MRI experiment)</p> <p>Red Zone, long-term</p>	<p>... complete a MRI Screening Form and Visitor Safety Checklist, complete the Safety Orientation given by Centre staff (including video), and abide by MR Safety rules, and notify Centre staff if your screening status changes</p>	<p>... require visitor to fill out MRI Screening Form and Visitor Safety Checklist, conduct screening, and conduct Safety Orientation</p>
<p>... operate the scanner and run MRI experiment independently of Centre staff</p> <p>Red Zone, long-term operator</p>	<p>... be certified by Centre staff, read the 7T Facility Safety Policy, complete an Operator Training Session and the Operator Training Checklist, and be responsible for the safety of any laypersons under your care</p>	<p>... ensure that user is trained properly and be in constant communication about scanner and safety issues</p>

3. Screening and Approval of Researchers and Visitors

MRI Screening of visitors and other researchers is often necessary (see Table 1 for specific situations). It is the sole responsibility of Centre staff to perform the screening. Personnel will be asked to complete and sign an MRI Screening Form and undergo a screening interview with 7T Facility staff, after which a decision will be made about the individual's suitability to safely enter a high magnetic field environment. If some contraindications are revealed during the screening process, the individual will be restricted from the Red Zone (magnet room).

Although screening interview and access decisions are the responsibility of 7T Facility staff, the Centre's MRI technologists and radiologist should be available for advice when there is some uncertainty about a person's screening status.

Individuals are only required to fill out the screening form once; however, they must inform Centre staff if their screening status changes (e.g. possibility of pregnancy, recent installation of a pacemaker) for ongoing access to the facility. Centre staff may review an individual's screening status from time to time and update their screening form on file, especially if the applicant is returning from a long absence (6+ months) away from the facility.

4. MR Safety Training

Personnel wishing prolonged access to the Yellow and Red Zones (especially for support of an MRI experiment) should undergo some basic safety training. The Visitor Safety Checklist (see Appendix A) attempts to cover the basic safety precautions and rules that a visitor should be aware of in the MRI facility. Those personnel that expect to help with the MRI experiment (but not operate the scanner) should complete at least the MRI Visitor Safety Checklist (which includes the relevant MR safety rules), and undergo a brief orientation conducted by Centre staff which reinforces the rules contained in the Checklist. Persons who expect to enter the magnet room should also watch the Safety Video.

Investigators that wish to operate the scanner independently are subject to a much higher degree of safety awareness and responsibility. Operators will not be allowed to run the scanner without the presence of Centre staff unless they demonstrate a solid understanding of scanner operation and safety procedures, as assessed by the Facility Director or Research Scientist. Operators are also required to complete an Operating Training Session that includes the following topics:

- Precautions when entering the magnet room
- emergency quench procedure
- emergency electronics shutdown
- use of nonmagnetic fire extinguisher
- medical emergency procedures
- fire emergency procedures

Operators are expected to be responsible for the safety of any laypersons directly under their care and to provide leadership in emergency situations, especially when Centre staff are not present. Understanding of safety procedures and expectations of the Operator are documented by a signed Operator Training Checklist, which summarizes the safety responsibilities of an Operator (see Appendix B).

6. Access for Custodial Staff

Custodial staff will have access to the Green and Yellow Zone (will have keys), but will be denied access to the Red Zone. The scanner operator who is the last person to use the MRI scanner for the day should ensure that the magnet room is locked before they leave.

7. Emergency Procedures

Medical, fire and earthquake procedures in the 7T facility are outlined in Appendix C (**editorial note: not developed yet**).

It may be necessary for UBC security, paramedics, and fire department personnel to enter the facility in response to an emergency situation. In the case of an emergency, Centre staff or MRI Operators should be ready to assist and inform emergency responders, especially in regards to potential hazards in responding to situations inside the magnet room, and initiating a magnet quench if required.

In general, a person that is incapacitated inside the magnet room should be removed from the magnet room without magnet quench to facilitate treatment by emergency personnel. A definite exception to this rule would be the pinning of a person between the magnet and a magnetic object. Where head and neck injury is suspected, emergency responders should be consulted first before moving the person out of the magnet room.

8. Safety Officer

One member of the 7T facility should be appointed as the Safety Officer to oversee all elements of the safety policy. The Safety Officer will be responsible for coordinating all safety training and screening, monitoring safety compliance, liaising with emergency personnel and custodial staff, and maintaining records of screening activities and safety incidents. The Safety Officer should report periodically to the MRI Centre Core Group and should propose any changes to the safety policy as needed. In addition, the Safety Officer should be a member of the Safety Implementation Committee for the B2/B3 levels of the Life Sciences Centre (ref. Pierre Tanguay).

The Safety Officer should ideally conduct the safety screening, training, and record keeping procedures. However, all other 7T facility staff should, at their own discretion, be able to conduct training and screening procedures if the Safety Officer is unavailable. Safety forms, training material, and records will be kept in the corridor bookshelf.

8. Safety Inspections and Oversight

As part of UBC Safety requirements, the 7T Facility should be inspected monthly for potential safety hazards and issues by the Safety Officer. Observations are recorded on a safety inspection checklist (see Appendix D) and are reported to the B2/B3 Life Sciences Centre

Safety Committee. The Safety Officer then attempts to solve any safety issues with the help of other Centre staff and the Safety Committee.

9. Incidents

All operators will report all violations of safety procedures and protocols, all accidents, incidents involving damage to equipment, emergency quench, and any incidents requiring medical attention to the Safety Officer and Centre Associate Director. The Safety Officer must document all accidents requiring medical attention in the incident log contained in the Facility's first aid kit.

An official accident investigation is required (as outlined in the UBC HSE Safety Committee Training Manual) under the following circumstances:

- a death or critical condition with a serious risk of death
- a work related injury requiring treatment by a medical practitioner
- a time loss injury
- an occupational disease or allegations of an occupational disease
- a major structural failure or collapse
- major release of a toxic or hazardous substance; or
- a near miss (did not result in an injury but had the potential for causing serious injury)

An accident report form must be submitted to UBC department of Health, Safety and Environment (fax to 604-822-0572) within 72 hours of the incident. The accident report form can be found at

http://www.hse.ubc.ca/health_promotion/wcb/files/UBC%20Faculty%20and%20Staff%20Incident%20Accident%20Form.pdf

Incidents requiring such investigation should also be reported to the UBC MRI Research Centre Core Group.

Appendix A – MRI Screening Form and Visitor Safety Checklist

MRI Screening Form

(also complete MRI Visitor Safety Checklist on reverse)

Please answer the following questions and explain any marked “yes”

	Yes	No	If yes, explain:
Do you have any of the following items in your body?			
Cardiac pacemaker, wires or defibrillator			
Artificial heart valve			
Brain aneurysm clip			
Electrical stimulator for nerves, bone or brain			
Ear or eye implant			
Implanted drug or insulin infusion pump			
Other electrical implant or device			
Coil, stent, catheter or filter in any blood vessel			
Orthopedic hardware (artificial joint, plate, screws)			
Harrington rod for scoliosis			
Other prosthesis containing metal			
BB pellets, shrapnel, bullets, other metal fragments			
Diaphragm/IUD			
Dentures, braces, retainer			
Are you or could you be pregnant?			
Have you had surgery in the last 6 weeks?			
Have you ever been a machinist, welder, or worked in a machine shop?			
Have you ever had an injury where a piece of metal got in your eyes?			
Do you have any body piercings (other than earrings) or recent tattoos, including tattooed eyeliner?			
Have you had an injection into any joint in the last 4 weeks? e.g. steroid injection or arthrogram			

FILL OUT THE REVERSE SIDE IF YOU INTEND TO ENTER THE MAGNET ROOM

The above information is correct to the best of my knowledge.

Name: _____

Date: _____

Department: _____

Staff Initials/date

Signature: _____

Visitor

MRI User

Operator

MRI Visitor Safety Checklist

The MRI system has a very strong magnetic field (7 Tesla) that may present a serious safety hazard to anyone entering the MRI environment and magnet room. Please answer the following questions if you intend to enter the magnet room:

- Have you completed the MRI Screening Form (on reverse)?** YES NO
- Do you intend to enter the magnet room (past the red line)?** YES NO

If you wish to enter the magnet room, carefully review the safety checklist given below. To indicate your understanding of each safety precaution, **sign your initials beside each item.**

Initials

1. The magnet is ALWAYS ON. Safety precautions must ALWAYS be observed by anyone entering the magnet room. _____
2. You must be accompanied by at least one trained staff or authorized personnel when entering the magnet room. _____
3. Any loose metal object may fly into the magnet and possibly injure anyone in its path. You must not bring any metal object into the magnet room, including the following:
 - hearing aids, beeper, cell phones, keys, hair pins, jewelry (including body piercing jewelry), watch, safety pins, paperclips, coins, pens, pocket knife, nail clipper, scissors, clipboards, steel-toed boots or shoes, tools, screws, credit cards, bank cards, and magnetic stripe cards. _____
 - Metallic brooms, mops, buckets, gas cylinders, carts, buffing machines, and other large metal objects.

Eyeglasses and belt buckles may be allowed into the magnet room but must be screened first with the rare earth magnet outside the console room.

4. You must not be in the magnet room when a MRI scan is being performed. _____
5. If you are or could possibly be pregnant, you must not enter the animal prep room if the door is closed and an animal procedure is being performed. _____

I have read, understood, and will adhere to the entire contents of this form. I have had the opportunity to ask questions regarding the information on this form.

Name: _____ Date: _____

Signature: _____ Staff initials: _____

Appendix B – Operator Training Checklist

MRI Operator Training Checklist

In order to gain access to the magnet room for the purpose of supporting MRI experiments and operating the scanner, please answer the following questions to verify your compliance to these requirements:

- | | | |
|---|------------------------------|-----------------------------|
| Have you completed the MRI Screening Form? | YES <input type="checkbox"/> | NO <input type="checkbox"/> |
| Have you read and understood the 7T Safety Policy | YES <input type="checkbox"/> | NO <input type="checkbox"/> |
| Did you watch the MRI Safety Video? | YES <input type="checkbox"/> | NO <input type="checkbox"/> |
| Did you complete the Operator Training conducted by staff? | YES <input type="checkbox"/> | NO <input type="checkbox"/> |

Indicate your understanding of each statement by signing your initial beside them.

Initials

1. I will refrain from bringing any metallic object into the magnet room unless previously screened and approved, and keep the area around the magnet door free from metal carts and equipment. _____
2. I understand how to initiate the emergency quench procedure. _____
3. I am familiar with emergency procedures in a result of a fire or medical emergency, and I am aware of where these instructions are posted in the facility. I know the location of the nonmagnetic fire extinguisher, fire alarm, and emergency escape routes. _____
4. I have taken note of the emergency contact numbers for Centre staff, UBC Security, First Aid and the Fire department. _____
5. I will notify Centre staff if any of my answers on MRI Screening Form changes. _____
6. I will lock the magnet room door if I am the last one to use the MRI scanner at the end of the day. _____

I have read, understood, and will adhere to the entire contents of the 7T Safety Policy, MRI Safety Video, and the Operator Training Session.

Name: _____ Date: _____

Signature: _____ Staff initials: _____

Appendix C – Emergency Response Procedures

7T Facility – Emergency Contacts and Checklist

One or more of the following personnel must be informed in an emergency:

Andrew Yung

Research Scientist (Safety Officer)

Telephone: 604-822-6938 (office)

604-264-8683 (home)

604-897-9600 (cell)

Piotr Kozlowski

Facility Director

Telephone: 604-827-3974 (office)

604-221-9696 (home)

Contact the relevant authorities in the case of fire, medical or other emergencies:

Emergency (fire, police, ambulance, hazmat):	911
Campus First Aid:	2-4444
(Faculty and Staff only – students call 911 or Student Health Services)	
Student Health Services:	2-7011
UBC Hospital Urgent Care Department:	2-7222
UBC Security:	2-2222
Health, Safety & Environment:	2-2029
Plant Ops Trouble Calls	2-2173
Poison Control Centre	2-5050

You may be asked for the civic address:

2350 Health Sciences Mall, Room B3710

The First Aid Attendant in this area is Andrew Yung.

Location of first aid kit: corridor coat rack

Location of spill kit: cabinet underneath fume hood in animal prep room

Location of MSDS sheets: corridor bookshelf (black binder)

Location of UBC and 7T Safety Policies: corridor bookshelf (red binder)

Emergency Fire Procedure

If you discover a fire:

1. Pull the fire alarm (next to the front door entrance)
2. Ensure your own safety and the people around you
3. immediately notify staff in the facility and describe situation. If they are not present, contact LSC Emergency Director Pierre Tanguay at 7-4127, Rm. 1351 on the first floor.
4. shut off the electronics by depressing the Emergency Off switch located next to the MRI console desk
5. Contain the fire if possible, using the nonmagnetic fire extinguisher mounted on the wall in the console room
6. If the fire is uncontrollable try to isolate it by closing doors (especially the magnet room door) to close the magnet room door. Do not lock doors.
7. Leave through the main entrance of the facility. Do not use elevators. The nearest exit is the stairwell on the right as you exit the facility, leading up to exterior door on B2 level.
8. Do not reenter building until the fire department, Emergency Director, or Floor Warden has given permission to do so

If you hear a fire alarm: follow steps 7 and 8, above.

Emergency Medical Procedure

In the case of a medical emergency:

1. Notify Centre staff immediately (Andrew Yung is the Level 1 First Aid Attendant)
2. Call 911 and UBC Security (2-2222). You may be asked the civic address (give “2350 Health Sciences Mall, Room B3710”).
3. Centre staff should notify contact LSC Emergency Director Pierre Tanguay at 7-4127, Rm. 1351 on the first floor
4. Send somebody to meet emergency services at the entrance of building and assist in escorting them down to the 7T facility
- 5. If the medical emergency occurs in the magnet room:**
 - If the injured person is conscious and able, escort him/her out of the magnet room
 - If the injured person is pinned to the magnet or is otherwise impaled by a metal projectile and is in acute life-threatening danger, initiate an **emergency quench of the magnet** (see below)
 - If the injured person falls unconscious on the floor and mechanical trauma is suspected:
 - i. **DO NOT MOVE** the injured person. Await qualified medical emergency responders and consult with them if it is acceptable to move the patient out of the magnet room for treatment.
 - ii. If the medical personnel require entry into the magnet room with ferromagnetic (or possibly ferromagnetic) equipment, initiate the **emergency quench procedure** (see below)

Emergency quench procedure:

Push the **red quench button just inside the Magnet Room, next to the door**. The magnet will lose its magnetic field in a few seconds. If this button does not work, there is another quench button in the Equipment Room, installed on the BMU on top of the electronics cabinet