AMRIS Facility

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MRI, DTI, Neuro
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Instrumentation / RF

Administration
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AMRIS - Preclinical and NMR

Human Translational

Additional 14.1 T (600 MHz) in Chemistry Building

https://amris.mbi.ufl.edu/education/amris-facility-tours/
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Safety is important at the AMRIS Facility

Remember all of these tools in your safety toolkit

**FOLLOW**
- The ISM Process
  - For safer job planning

**IMPLEMENT**
- The Stop Work Policy
  - To enforce safety protocol

**REPORT**
- Unsafe Conditions
  - To UF EH&S
At the AMRIS Facility, we use **Integrated Safety Management (ISM)** to ensure safe, quality work.

1. Define scope of work  
   - What will the work/job/experiment involve?

2. Analyze hazards  
   - What are the hazards associated with this job?

3. Develop/implement hazard controls  
   - What can be done to mitigate those hazards?

4. Perform work within controls

5. Feedback and improvement  
   - Were all of the hazard mitigations followed?  
   - Was there anything that could have been changed to improve the quality and safety of the work?
Use residual risk categories after all controls are in place to decide how the work will proceed:

- **Low**: Proceed using ISM
- **Low Medium**: Proceed with caution using ISM. A second worker is in the vicinity.
- **Medium**: Seek guidance from EH&S department before proceeding.
  
  Two authorized workers must be in place before work can proceed.
  
  Limited number of authorized workers as maintained by the safety department.
- **Medium High**: Seek guidance from EH&S department before proceeding.
  
  Two authorized workers must be in place before work can proceed.
  
  Limited number of authorized workers as maintained by the safety department.
  
  Work can only proceed if authorized by the Director or his designee.
- **High**: Work will not be performed.
Anyone can call for a “Stop Work” if you notice something that just doesn't look safe, even if you are just passing by. When an employee/user notices an unsafe condition, he/she should:

• Notify the affected worker/user(s) first.

• If appropriate actions are not taken by the affected worker/user to resolve the concern, the supervisor or designee of the affected worker/user(s) must be notified.

• The supervisor or designee must ensure that the issue is resolved before proceeding with the work.

• Users are also expected to report any activity or condition which he/she believes is unsafe to AMRIS Staff

• If a “Stop Work” issue is not resolved through the steps above, the EH&S Department should be contacted (352) 392-1591 or http://www.ehs.ufl.edu/programs/hazard_ergo/forms/condition-report/

Remember, if someone asks you to “Stop Work” they are doing so because they care for your safety. What better reason could there be?
The magnetic field is always on even when the magnet is NOT in use.

Even if the electrical portion of the machine is off, the magnetic field is still on.
Magnetic Field Safety

• The force of the field is greatest at the center of the magnet.

• The magnetic force **INCREASES** as you move closer to the center of the magnet.
  • What is not attracted to the magnet outside the fringe field can be attracted to the magnet as you move closer to the center of the machine.

• The AMRIS magnets produce strong magnetic fields both inside the magnet and outside (fringe field).

• Tape marks the 10 gauss **(yellow)** and 50 gauss **(red)** fields from each system. Additionally, chains are used to mark some 50 gauss regions (specifically around the *unshielded* 800 Mhz).
- Two 3 T Human MRI
- 11.1 T & 4.7 T Horizontal Preclinical MRI
- Two 800 MHz NMR
- Three 600 MHz NMR
- 750 MHz NMR
- 500 MHz NMR
- 3.35 T Polarizer
- 5 T Polarizer
AMRIS Fringe Fields

- Estimated fringe fields of current AMRIS systems
- Both shielded and unshielded have hazardous fringe fields
- Strays fields combine, so the entire facility is >5 gauss
Magnet Safety: Personal Items

The magnetic field can seriously damage or impair personal items. Examples of items at risk include:

- Cameras
- Watches
- Fitness trackers
- Credit cards
- Hearing aids
- Hair accessories
- Belt buckles
- Shoes
- Smartphones
- Jewelry

Please remember to empty ALL pockets before entering the scanning room.
Magnet Safety: Implantied Devices

The magnetic field can seriously damage or impair medical implants or cause metallic objects to be dislodged from the body. Users with the following devices should not enter the AMRIS Facility:

- Pacemakers
- Aneurism clips
- Electronic implants
- Neurostimulator
- Iron filings
- Embedded shrapnel or other metal
- Implanted stents

**WARNING - STRONG MAGNETIC FIELD**

If you have any **ELECTRONIC IMPLANTS** such as a **PACEMAKER** or a **NEUROSTIMULATOR**
YOU MAY NOT ENTER THE FACILITY

If you have any **METALLIC IMPLANTS** such as
**ANEURISM CLIPS**
**PLATES** or **PINS**
Please advise your host before entering the facility
To prevent metal objects from accelerating toward the magnets, **no magnetic material may be taken into the magnet rooms.** Do not assume that an object is non-magnetic.

**This potential harm cannot be over emphasized.**

- For example, paper clips can travel at a velocity of 40mph @ 3T.
- Larger objects travel at a higher velocity and may be fatal.
Magnet Safety: Flying Objects

There is a metallic objects screening station outside the entrance to the AMRIS Facility. If you are not sure, CHECK your equipment before bringing it into the Facility. This includes:

- Carts
- Canisters
- Cages
- Tools

Examples of non-ferrous metals are:

- Brass
- Aluminum
- Titanium
Severe Hazards: Magnet Quench

If the current carrying coils in the magnet that create the static magnetic field exceed a critical temperature, the coil wire will not superconduct. The heat produced by the electrical current in the coil windings when the wire is not superconducting will quickly turn the cryogenic liquid into gas.

This gas will fill the room and may displace the oxygen. **If a quench occurs, quickly evacuate the area and warn others in the area of the hazard.** Do not take time to remove animals or equipment. Contact AMRIS Facility staff as soon as possible.
Severe Hazards: Magnet Quench

Emergency Ventilation
In the event of a quench in the AMRIS wing, emergency ventilation can be manually triggered with yellow panels outside of each magnet room. It will also trigger an alarm and warning beacon.

Oxygen Monitoring
Oxygen monitors are installed in each room in the AMRIS wing. They detect a low oxygen level near to the ground, and sound alarms are 19.5% and 18% O₂.

This gas will fill the room and may displace the oxygen. **If a quench occurs, quickly evacuate the area and warn others in the area of the hazard.** Do not take time to remove animals or equipment. Contact AMRIS Facility staff as soon as possible.
Emergencies

Certain magnets may be equipped with two emergency buttons:

• Emergency Stop
  • This will stop the scan but not shut down power.
  • The magnetic field however will still be on.
  • Use if there is equipment failure, fire, flood, etc.

• Quench or Emergency Run Down
  • Causes immediate collapse of the superconductive magnetic field within minutes. The magnetic field will dissipate.
  • Has a protective cover to prevent unintentional operation
  • DO NOT PUSH except in real emergency

FAMILIARIZE YOURSELF WITH THESE BUTTONS AND KNOW THE DIFFERENCE!
Magnet Safety: 3 T Considerations

There is no conclusive evidence of permanent or harmful bioeffects in humans below 3.0 T. Most accidents happen because of user error!

**Reversible** abnormalities may include:

- Localized tissue and core body temperature heating
- Tingling sensations
- Peripheral nerve stimulation (involuntary muscle contractions, flashing lights in eyes, strange smells/tastes)
- Burns

**Additional Safety Training is required** for certain users and is provided by Dr. Jens Rosenberg
Magnet Safety: 3T Considerations

SAR – Specific Absorption Rate
Calculated by the 3T spectrometers using patient data

Acoustic Noise Level
Caused by imaging gradients. Patients require earplugs/headsets as can easily reach levels of hearing damage > 99dB

Patient Screening
Screening forms need to check for implants, magnetic cosmetics, etc.; also ask if they work with metal - welding, shrapnel, etc. Tattoos can cause tingling. Some hair gels or dental work may cause image distortions. MRISAFETY.COM can be used to check.

MRI Coils
Coils and cords need to be checked for fraying, damage as can lead to burns on the patient if left in direct contact.
It is REQUIRED that two people be present if anyone is inside the magnet room. The “buddy” can be a guardian at the front of the magnet, or in the outer room, when another person is behind it.

An AMRIS staff member should be consulted before proceeding with any new procedures.

You may experience minor weird sensations when near the bore of the 11T.

Contact myself or Huadong Zeng about training and requesting access to this room.
Main Safety Hazard in AMRIS

- Ladders and Platforms represent the biggest safety hazard in AMRIS based on the number of incidents and near misses which occur.
- While climbing or descending the ladder or platform always maintain **3 points of contact**.
- **Do not turn around** to descend the platform.
- If you cannot reach the sample contact a member of staff.
Isoflurane Safety

- [http://webfiles.ehs.ufl.edu/WasteAnestheticGases.pdf](http://webfiles.ehs.ufl.edu/WasteAnestheticGases.pdf)
- If you can smell it you are being exposed
- Charcoal canisters and scavenging systems should be used at all times
- If you spill any, leave the area until it has evaporated

### Symptoms of Exposure

**Acute:**
- Headache
- Nausea
- Irritability
- Fatigue
- Drowsiness
- Difficulties in judgement and coordination

**Chronic:**
- Liver & kidney disease
- Reproductive effects

### Contributors to Exposure

- Leaks from:
  - Tubing
  - Valves
  - Seals
  - Gaskets
- Poor work practices
- Lack of training
- Poor ventilation
- Ineffective gas-scavenging systems.
- Bell Jar (Open-Drop Method)
Biological Safety

• Individuals who have a potential for exposure to biological threats should take specific training in biological safety.

• Users at the AMRIS Facility may conduct research using human or animal tissue, blood, viruses, bacteria, etc. that can lead to biological safety hazards.

• All applicable IACUC, IRB, and biological containment protocols must be approved through the UF regulation procedures and reviewed by AMRIS staff prior to conducting an experiment.

• A copy of all IACUC, IRB, and biological containment protocols must be on file with AMRIS staff and a copy of the approval letter must be present at each experiment.
There are many different types of chemicals here at the Magnet Lab:

- carcinogens, which cause cancer;
- asphyxiates, which deprive the body of oxygen;
- and corrosives, which cause skin damage.

If you are going to be working with chemicals, you are required to take the chemical hazards safety training before handling or using chemicals.

These are the symbols for various chemical hazards. Look for these symbol on lab safety postings to know when there is a chemical safety risk.
Cryogen Safety

Cryogens (liquid helium and liquid nitrogen) are used in the AMRIS Facility.

- The vapors from these cryogens are colorless, odorless, tasteless.
- They do not cause obvious symptoms as the body cannot detect low Oxygen concentration.
- Cryogens can cause rapid asphyxiation or death if released in confined, poorly ventilated areas.
- Specific cryogenic safety training is required for those people who work with cryogenic substances.

This is the symbol for cryogens. Look for this symbol on lab safety postings to know when there may be a cryogen safety risk.

If contact occurs, seek medical attention immediately and contact AMRIS Facility staff. If you believe there is a problem with a cryogen containing dewar, or any other safety concern, contact an AMRIS Facility staff member immediately.
Primary concerns are **Electric Shock** and **Electrical Fires**.

< 30 mA can kill

**Don’t mess with anything electrical!**

**Pre-Use Inspection of Portable Electric Equipment**

Prior to using portable electrical equipment at the laboratory, the user must first perform a safety inspection.

If there is a defect or evidence of damage that might expose an employee to injury, the defective or damaged equipment shall be removed from service, and no employee may use it until necessary repairs and tests render the equipment safe for use.
Fires are a risk at the AMRIS Facility. Help prevent fires by following this list of tips:

- Ensure that all electrical equipment is properly grounded, insulated and maintained.

- Store flammable and combustible materials in their proper cabinets or areas and away from ignition sources. When using flammable materials, only remove quantities required for the job.

- Control ignition sources to reduce possibility of fire.

- Do not block automatic sprinkler systems or fire extinguishers.

- Make sure portable heaters are turned off at the end of the day.

- Make sure all emergency doors and hallways clear and unobstructed.
If a fire occurs, there should be a sequence of procedures used by everyone:

- Sound the fire alarm right away, no matter how small the fire is.
- If you are trained and the fire is small, attempt to extinguish or control the fire using appropriate fire extinguishing equipment.
- AMRIS’ fire alarm system is directly connected to the local fire department for immediate response.
- If you hear the fire alarm, do not stop to investigate if the alarm is real or false.

There are smoke and fire detectors throughout the building (Note: Most fire alarms are near exit doors.)
Every worker/user at the AMRIS Facility should be familiar with the evacuation route from his/her work area. Learn where the nearest exits are and always have an alternate route in mind in case your primary exit is blocked.

When evacuating the laboratory:

✓ Immediately begin to evacuate the area. Do not use elevators.

✓ If accessible, grab important personal items such as keys, purse, wallet and cellphone do not wait to shut down your computer or retrieve personal belongings from other rooms.

✓ If circumstances permit, secure your area by closing doors.

✓ Never open a door without feeling it first. Use the back of your hand to determine if the door is hot. Never open a hot door.

✓ If the corridor is filled with smoke, stay low and crawl out. If it is too much smoke or too hot return to your office. Call 911 and inform them you are still in the building, provide them floor and room number. Wait for assistance.

✓ Once out of the building meet in the pre-designated area, which is the area across Newell Dr. from the MBI

✓ Proceed calmly to the assembly area. The AMRIS Facility uses a “Floor Sweeper system to check that all personnel have evacuated.

✓ Do not re-enter the building for any reason until the “all-clear” sign has been given.
In an emergency, it is important to stop and think before you act. When responding to an emergency situation, remain calm and apply the three emergency action principles:

1. **Check the area.** Ensure the area is safe before you attempt to help.

2. **Check the victim.** Try to find out what is wrong so you can relay it to the emergency personnel. Only perform first aid if you are properly trained.

3. **Call for help:**
   - Dial 911.
   - Explain the nature of the emergency (be as specific as possible), location, and extent of the injury or damage, your name and phone number.
   - Deliver First-Aid/CPR (if trained) until emergency medical services arrive.
   - If possible, send an AMRIS staff member to meet the Emergency Medical Services personnel, who will guide them to the injured person.
   - After ensuring that an employee receives emergency medical care, AmeriSys, the State of Florida’s medical case management vendor, should also be notified of any work-related medical emergency as soon as possible by calling **1-800-455-2079**.
Sudden Cardiac Arrest

Automated External Defibrillator (AED)

✓ An AED is used when an individual experiences sudden cardiac arrest.
✓ An AED should only be used when it has been determined that the individual is unconscious, not breathing and shows no signs of life.
✓ The AMRIS Facility has an AED mounted in the following locations throughout the facility:
  • The Phillips 3T (rm LG-114)
  • The Siemens 3T (rm LG 100)
Accidents and Injuries

• All injuries and accidents must be reported to the AMRIS Facility director.

• Injuries and accidents of UF employees must also be reported to AmeriSys by calling 1-800-455-2079. Treatment for any non-life threatening work-related injury or illness must be authorized by AmeriSys prior to obtaining medical treatment.
Simple Safety Tips

Most accidents and injuries are preventable. Try these simple tips to help keep yourself and others safe:

- **Clean up after yourself (your parents don’t work here).**
- Keep hallways clearly marked and free of clutter.
- Clean up spills and leaks promptly.
- Dispose all biological and chemical waste in appropriate containers.
- Keep all cabinets and drawers closed when not in use.
- Keep tools and equipment clean and properly stored.
- Neatly stack storage racks and bins.
- Make sure work areas are well lit.
- Keep fire exits, extinguishers, and sprinklers marked and accessible.
- Rope off maintenance areas to minimize interference.
Foot Protection

Open-toe shoes are not allowed in any areas of the AMRIS Facility.

Visitors touring the lab must also wear closed-toe shoes.
Security

Users:
- Must take appropriate training prior to beginning work.
- Must obtain clearance before working in the facility.
- Must be approved and receive a key fob before working after hours.

Security Incidents:
- The MBI is equipped with various security cameras located throughout the facility.
- Any lost or stolen property should be reported to the UF Police Department (352-392-1111)
- Please remember that the AMRIS Facility is frequented by many users. All unattended valuables should be kept in a secure location.
- If you see someone suspicious let an facility manager know
Clean-up

• Clean-up time must be included in the requested instrument time, and the instrument must be clean and ready to use by the end of a user’s scheduled time.

• Users are responsible for cleaning up trash, samples, and personal items before leaving the facility.

• All users are expected to follow proper chemical and biological hygiene protocols.
User Supplies - AMRIS

• User supply cabinet in AMRIS
  • Paper, Kimwipes, Paper Towels, Masking tape, Nitrile Gloves, FAIR canisters, Alcohol wipes, Isopropyl Alcohol, Foam Kit, Trash bags, Cleaning supplies

• We don’t provide
  • Isoflurane, eye lubricant, special connectors for animal cradle, surgical tools, syringes, etc.
Safety Review

• The magnets in the AMRIS facility are **always turned on**. This poses several **SERIOUS DANGERS**.

• Metallic objects should never be brought around the magnets. They can become flying projectiles and can severely damage the magnet and injure or kill a person.

• Heart pacemakers will stop functioning and surgically implanted metallic devices can be dislodged around the magnets.

• Magnets occasionally quench. A magnet quench is the rapid loss of liquid nitrogen and liquid helium into the room. People can die of asphyxiation, by freezing, or both if proper precautions are not taken during a magnet quench. In the event of a quench in the AMRIS facility, it is important to leave immediately.
This concludes the General Safety Training.

Don’t forget that there are additional safety trainings that may be required depending on your area of work.

Separate 11 T safety training is required.

Please check with your supervisor or the AMRIS Staff to find out more information on how to work safely at the AMRIS Facility.

https://emergency.ufl.edu/takeaction/