
❖ BRL BULLETIN ❖

Volume 34 No. 2

2019

Housing and caring for research animals is just one function of the BRL. The BRL also contains several areas to assist with research needs. The purpose of this *Bulletin* is to inform investigators about the surgical facility and diagnostic laboratory at the BRL, and imaging equipment available through the BRL and the RRC.

Surgical Facilities

The BRL's surgical facility supports investigators whose research includes surgical procedures on any non-rodent mammal. The operating rooms in the surgical facility are dedicated rooms that are maintained in a manner that allows them to support surgical procedures using strict aseptic technique. The rooms are fully equipped with anesthetic machines, monitors, cautery units, IV pumps, and other necessary items. The facility stocks a wide range of medications, suture materials, surgical instruments, and supplies for investigator use. The surgical facility is staffed by several certified veterinary technicians who are trained and experienced at inducing and monitoring anesthesia, delivering analgesics, and preparing and recovering a variety of animal species.

When an investigator needs to conduct research that involves a surgical procedure, approval must first be obtained from the Animal Care and Use Committee (ACC). Following ACC approval, if the work involves a non-rodent mammal, the investigator should contact Dr. Kelly Garcia, the veterinarian who oversees the surgical facility (kellygar@uic.edu). The veterinarian and one of the veterinary technicians will meet with the investigator and discuss the needs for the project. Information obtained during this meeting is used to create a surgical procedure form. The surgical procedure form contains detailed information about the support needed to perform the procedure. It includes how many surgeons will participate, the types of medications an animal will receive, the instruments that will be

used, and any special equipment that will need to be set up. On the day of a procedure, the technical staff uses the form to get the animals and the room ready, and make sure the investigator has the supplies and instruments needed to focus on the procedure and the research.

The surgical facility supports between three hundred and four hundred procedures annually, thus it is important to schedule procedures well in advance. In the past, the facility has hosted investigators from not only UIC, but also the University of Chicago, Rush University, and Northwestern University. The facility has supported a wide range of procedures including cardiac bypass, organ transplantation, and vascular, orthopedic, and ophthalmic procedures. By managing perioperative care, the technical staff minimizes complications, which improves animal welfare and maximizes research results.

Attached please find a fee schedule for common surgery and radiology services.

Diagnostic Laboratory

Like the surgical facility, the BRL diagnostic laboratory is a full-service unit. The diagnostic laboratory is operated by certified veterinary technicians with oversight from the senior veterinary staff. The laboratory provides clinical diagnostic support to the veterinary staff to help manage clinical cases and the preventative health program. The laboratory is also available to investigators to submit samples for research purposes.

Investigators interested in submitting samples for any test the lab currently runs or obtaining a price quote should contact the technical staff member or veterinarian listed at the end of this section.

Below is an overview of the specialized diagnostic equipment and assays available. This is not an exhaustive list. If you are interested in testing a specific entity not listed below, please reach out to us.

Beckman Coulter AU480 Clinical Chemistry System

The Beckman Coulter AU480 is a fully automated workhorse that uses spot-photometry to measure a large number of metabolites, electrolytes, proteins, and/or drugs in samples of serum, plasma, urine, cerebrospinal fluid, or other body fluids. There are over one hundred different tests that can be run with this piece of equipment. We use the unit primarily to run serum chemistries. Serum chemistries are groups of tests used to evaluate animal health. They are often among the first tests analyzed when an animal becomes ill because of the relative low cost of the test and the breadth of information provided. Routine serum chemistries provide information on electrolytes, enzymes, and other substances in the blood, including total protein, albumin, calcium, cholesterol, blood urea nitrogen, glucose, potassium, creatinine, triglycerides, amylase, alkaline phosphatase, and iron. This information can be used to help evaluate the function of most organ systems. The AU480 also detects substances not routinely tested as part of a health assessment. For example, the unit can be used to measure the concentration of various drugs in the blood including buprenorphine, methamphetamine, and digoxin.

Advia 120

The Advia 120 is an automated hematology analyzer. Hematology is the branch of medical science that deals with blood and blood forming tissues, including morphology, physiology, and pathology, and hematology tests assess abnormalities in the formation of blood and blood disorders. The Advia 120 is a laser-based analyzer with software that allows it to be used with blood from a number of species. Results from the Advia 120 include complete blood cell counts and information on the amounts of various cells and platelets in the blood and their morphology. Specific tests routinely run on the Advia120 include white blood cell count, red

blood cell count, hemoglobin, mean corpuscular volume, mean corpuscular hemoglobin concentration, and platelet count.

ACL Top 300 Hemostasis Testing System

Hemostasis is the physiological process that stops bleeding at the site of an injury while maintaining normal blood flow elsewhere in the circulation. The ACL Top 300 takes coagulometric (turbidimetric), chromogenic (absorbance), and immunological measurements to evaluate parameters of hemostasis including prothrombin time, activated partial thromboplastin time, D-dimer, and fibrinogen. This equipment can also be used to measure coagulation factors.

Beckman Coulter Access 2 Immunoassay System

An immunoassay is the test of choice to identify substances present at such low concentrations that they cannot be detected by other less expensive tests. The Access 2 is an automated immunoassay system with tests that cover a range of diseases. These tests include, adrenal disorders, anemia, bone metabolism, cardiac-related conditions, diabetes, infectious diseases, reproductive health, endocrinology, and thyroid and tumor markers. This is the newest piece of equipment in the lab and the one we are anxious to use to expand our repertoire of tests.

Please contact Kelly Garcia (312-996-8619, kellygar@uic.edu) or Heather Charles (312-996-2404, haa@uic.edu) if you would like more information on submitting samples for laboratory tests. Attached please find a fee schedule for tests commonly run by the diagnostic laboratory.

IMAGING EQUIPMENT

A variety of imaging procedures can be performed on research animals inside the BRL and at the Research Resources Center (RRC) Preclinical Imaging Core. Use of BRL imaging equipment can be arranged by contacting the surgery office at 312-996-6857.

Radiography

Standard radiographs and dental radiographs

are available through the BRL Surgery Department for a fee. X-rays are emitted from an x-ray tube in the form of electromagnetic radiation. The x-rays pass through the body and are trapped on film or a digital detector. The image that is visualized on the radiograph is due to the different absorptive characteristics of various tissues. For example, bone absorbs more radiation leading to an increased opacity compared to soft tissue, which allows more radiation to pass through resulting in decreased opacity. Radiographs are often used clinically to diagnose thoracic, abdominal, and skeletal pathology and can be helpful in evaluation of other structures. Dental radiographs can be used to identify dental pathology and also to image small anatomical structures such as rodent limbs. Radiography can often be performed quickly, sometimes without the use of anesthetics. However, there are safety concerns that need to be addressed regarding personnel exposure to x-rays. This includes use of proper shielding and limiting exposure to the lowest reasonable amount.

Fluoroscopy

Fluoroscopy continually emits x-rays allowing for real-time visualization of structures. This not only allows for assessment of anatomy but can also assess function. In addition, fluoroscopy can be a helpful aid during surgery to ensure appropriate anatomic location and assist in interventional procedures. Contrast agents are often used to highlight areas of interest to visualize function. An example is the use of angiography, where contrast is injected into the blood vessels and abnormalities in vasculature can be detected. In the research setting, fluoroscopy is often used for cardiac studies and interventional procedures in larger species. The duration and requirement for anesthetics is based on the specific procedure. Because this modality uses continual emission of x-rays, there are safety concerns about x-ray exposure to personnel. If fluoroscopy is used during a surgical procedure, it is imperative that protective shielding is worn underneath the appropriate surgical attire.

The BRL has a Philip's BV Pulsera Mobile C-Arm for fluoroscopy. This unit is a high power

system intended for orthopedic, neurologic, and abdominal surgery, vascular procedures, thoracic and cardiac surgery, and cardiac imaging. It is available for investigator use on a fee-for-service basis.

The basic system is composed of a C-arm stand and a mobile view station. The C-arm stand includes an X-ray tank, which has a rotating anode for increased X-ray penetration, a collimator, which focuses the X-ray beam to the actual field of interest and decreases scattered radiation, an image intensifier, an energy storage unit, a hand switch, and a footswitch. The C-arm can be adjusted up and down, rotated, and angulated. The mobile view station is equipped with two LCD monitors. One monitor displays live images, while the other displays reference images. Images can be transferred to a USB storage device.

Magnetic resonance imaging

Magnetic resonance imaging (MRI) uses powerful magnetic fields, radio waves, and computers to produce clear and detailed pictures of organs, soft tissues, and other internal structures. Unlike conventional x-ray or CT imaging, MRI is noninvasive with no radiation. MRI provides exquisite images with excellent contrast detail of soft tissue and anatomic structures like gray and white matter in the brain or small metastatic cancer lesions in the liver. In addition, by manipulating the various imaging contrast mechanisms, MRI can both generate anatomical images and evaluate function of tissues and internal organs. MRI has a wide range of applications in medical research and to help diagnose a variety of diseases including tumors, inflammatory diseases of the brain and spinal cord, cardiovascular disorders, musculoskeletal diseases, liver and gastrointestinal disorders, and disorders of bones and joints.

The RRC Preclinical Imaging Core facility at UIC houses a 31cm bore size 9.4T Agilent MRI system that can provide full support for MRI studies in small animals, including mouse, rat, rabbit, and guinea pig. This MRI system includes a complete set of three heavy duty and efficient gradient coils (305/210HD, 300A,

600mT/m, 205/120 HD, 300A, 600mT/m; and 115/60 HD, 200A, 1000mT/m). Task designated imaging RF coils are available to improve the MRI quality. An isofluorane anesthesia system, animal holding units with supplemental heat, and a system to monitor vitals (i.e., temperature, respiration and ECG) are available to support the MRI studies. A ^{129}Xe hyperpolarizer can produce hyperpolarized xenon gas, a novel and unique MRI contrast medium that can be used for research of lung disorders and functional studies of other organs.

The MRI is located at the RRC Preclinical Imaging Core Facility (B01 NMRL). Please visit the facility website: <https://rrc.uic.edu/cores/scientific-imaging-nanotechnology/animal-imaging-core/> or contact Dr. Weiguo Li, the facility director, at 312-413-5638 for more information.

Ultrasound

Ultrasound uses high-frequency sound waves to produce images. A transducer emits sound waves at a specific frequency and captures sound waves that are returned. The frequency of the return waves is dependent on the tissues that the waves traverse. The return waves are then digitalized into dots on the screen. This is a continual process so images are acquired in real-time and in a variety of planes. Specific transducers are used for evaluation of different soft tissue structures. For example, the transducers that are used for echocardiography to assess the heart may differ from the transducers used to visualize the liver. There are several advantages to this imaging modality. Ultrasounds are considered very safe and do not emit radiation. They can be performed quickly, and animals may not need to be anesthetized to undergo this procedure.

A VisualSonics Vevo 2100 ultrasound machine is available for use with a fee through the RRC Cardiovascular Research Core (CVRC). There are anesthesia systems and transducer probes (MS550, MS250, MS400) available for echocardiography in both mice and rats. For more details, visit the RRC Scientific Imaging and Nanotechnology Division website at <https://rrc.uic.edu/cores/scientific-imaging->

nanotechnology/ or contact Jiwang Chen at 312-355-2918 or chenjw@uic.edu. CVRC staff can perform parasternal short, long axis, apical 4-chamber, pulmonary outflow, aortic arch, and TAPSE imaging for rodent echocardiography.

A portable SIUI 1100 ultrasound machine is available through the BRL Surgery Department for a fee. This ultrasound includes most working modes and color Doppler. Standard microconvex and linear probes are available for general diagnostic use in larger species.

IVIS® Spectrum

The IVIS® Spectrum in vivo imaging system combines 2D optical and 3D optical tomography in one platform. The system uses leading optical imaging technology to facilitate the noninvasive longitudinal monitoring of disease progression and cell trafficking in living animals. An optimized set of high efficiency filters and spectral unmixing algorithms allows the system to take advantage of bioluminescent and fluorescent reporters across the blue to near infrared wavelength region. Moreover, the system offers true 3D tomography for both fluorescent and bioluminescent reporters, which can be analyzed in anatomical context.

The IVIS® Spectrum in vivo imaging system is located in the BRL; however, its use must be scheduled on a fee for service basis through the RRC Cardiovascular Research Core (CVRC). For more details, visit the RRC Scientific Imaging and Nanotechnology Division website at <https://rrc.uic.edu/cores/scientific-imaging-nanotechnology/> or contact Maricela Castellon at 773-406-6855 or mcaste4@uic.edu.

Announcements

Welcome Aboard – The staff of the BRL would like to welcome Dr. Lorissa Lamoureux who started our postdoctoral training program in laboratory animal medicine in July. Lorissa is from the Chicago area and received her doctorate in veterinary medicine from the University of Illinois at Urbana-Champaign College of Veterinary Medicine.