

**EQUIPMENTS AND SERVICES
CARDIOVASCULAR PHÉNOTYPING**

| Equipment | Manufacturer | Model | Equipment Self-service | Equipment with service |
|----------------------|--------------------------------|---------------------------------|-------------------------------|-------------------------------|
| Skyscan1176 | Bruker microCT | Sky1176 | yes | yes |
| ART Optix MX2 | Advanced Research Technologies | ART Optix MX2 | yes | yes |
| EchoMRI Analyzer-700 | EchoMRI™ | EchoMRI Analyzer-700 | yes | yes |
| Telemetry | Data sciences International | PA-C10, PA-C40, PA-C50, ETA-F10 | no | yes |
| Metabolic cages | Harvard Apparatus | 52-6715, 52-6731 | yes | yes |

Skyscan 1176

The SKYSCAN 1176 is a high performance in vivo micro-CT scanner for preclinical research. The large format 11 megapixel x-ray camera gives an unrivalled combination of resolution, image field size and scan speed - everything that is required in a busy and demanding biomedical research laboratory. Image field width up to 68 mm allows full body mouse and rat scanning. Selectable image resolutions of 9, 18 and 35 µm are available. Variable x-ray applied voltage and filters provide scanning flexibility to allow imaging of a wide range of samples from lung tissue to bone with titanium implants. The full range of SKYSCAN software is available, including fast volumetric reconstruction, software for 2D / 3D quantitative analysis and for realistic 3D visualization.

This instrument is commonly used to image solid tissues such as bones and cartilages but can also be applied to soft tissues. The followings present various Micro-CT applications for preclinical research that will interest several CRCHUM research teams:

Cardiometabolic

- To evaluate congenital heart defects, cardiac function and infarct size in rodents.
- To visualize the 3D coronary circulation *ex vivo* & micro vascular alterations in progressive renal disease

Cancer

- To evaluate the effects of treatments on tumor growth.
- Cancer cell tracking in live animal.
- To evaluate the breast microcalcifications from human breast cancer biopsy samples.

Immunopathology

- To track immune cell during immune cell therapy
- To evaluate lung function in acute and chronic animal pulmonary disease models
- To monitor angiogenesis and anti-angiogenic therapy efficiency in liver fibrosis & lung fibrosis.

Neuroscience

- To track stem cell within the brain and mesenchymal stem cells therapy for retinal degeneration.
- Use of targeted gold nanoparticles can highlight specific brain regions.
- Serial quantitative visualization of post-stroke blood–brain barrier dysfunction in mice.

Explore Optix Mx-2 ART (Advanced Research Technologies)

In vivo imaging of targeted molecular probes, or molecular imaging, is an emerging field for studying animal models. Optical imaging is particularly suited for molecular and *in vivo* cellular imaging, as fluorescent probes are safe, sensitive and can be specifically conjugated to small molecules, antibodies and other proteins. The Optix system provides accurate recovery of depth and relative fluorophore concentration and enables true 3D representations of fluorophore distribution for whole-body imaging.

Possible applications:

- 1) Non-INVASIVE apoptosis research in mouse xenograft model;
- 2) As a novel diagnostic tool to non-invasively assess molecular changes associated with atherosclerosis;
- 3) Quantitative analysis of multiple tumor targeting agents using fluorescence lifetime;
- 4) Time-resolved fluorescence imaging of blood-brain barrier disruption in living mice;
- 5) Fluorescence lifetime imaging of renal ischemia/reperfusion injury;
- 6) Assessing murine lung tumor burden with fluorescent mAb therapy;
- 7) *In vivo* ADME/Tox profiling with a novel targeted tumor NIR Fluorescent optical probe;
- 8) 3D *in vivo* imaging of gene delivery using red fluorescent protein.

EchoMRI Analyzer-700

The EchoMRI-700 is a self-contained quantitative nuclear magnetic resonance system that provides precise measurements of whole body composition parameters: total body fat mass, lean mass, free water

and total body water in live rats and mice without the need for anesthesia or sedation. The systems' daily tuning and calibration are automatic. Fast, very reproducible, no ionizing radiation.

Numeric results are stored and can be extracted either into Excel and ASCII files or into Access database.

Telemetry

Ambulatory blood pressure, heart rate, temperature, locomotor activity, EKG, EEG/ EMG can be monitored through the use of a telemetry system developed by Data Sciences International.

Implantation of radiotelemetry transmitters and physiologic signals recording

Data provided at study end:

- Summary report including surgery, survival, implant information and recording dates;
- Spreadsheets of scheduled sampling times, physiologic signals recording data;
- Ascii files of complete data sets upon request
- Pharmacological injections during study, organ harvest, training in data interrogation, spectral analysis of heart rate.

Possible applications:

Cardiovascular toxicology: ECG, systemic arterial pressure, left ventricular pressure, , temperature, activity level

Central nervous system: EEG, EMG, EOG, temperature, activity level

Breathing and exercise: temperature and activity level, intra-pleural cavity pressure, EMG, ECG & BP

Cancer research: temperature in up to 2 localizations – tail and tumor, ECG & BP

Surgery service

Renal ischemia/reperfusion and UUO

Jugular venous catheter for systemic injection of various drugs

Carotid artery catheter

Metabolic cages

Results analysis

Data analysis for telemetry data (recent or not)

Data analysis provided by the Skyscan 1176 (software NRecon, CTvox, CTan, Data viewer).