UAB SAIF ISSUE 5 2020
SMALL ANIMAL IMAGING FACILITY

NEWS & UPDATES

CYCLOTRON SYNERGY

Molecular imaging has enabled great advances in basic science, translation research and patient care. In an effort to advance this exciting area, UAB aimed to develop a new program which blends preclinical studies and research trials with patient care advances. Shared, centralized spaces were constructed as part of a molecular imaging master plan that assists with patient care for both in-patients and out-patients while encouraging research efforts alongside clinical applications.

In the spring of 2013, a new TR24 cyclotron (nicknamed Blue) was installed in the lower level of Wallace Tumor Institute. The cyclotron is a unique negative ion accelerator, which allows for a high yield extraction proton beam between 18 and 24 MeV. Possessing four beam lines leading to solid, liquid, and gas targets, the TR24 is capable of producing a wide variety of isotopes from the short lived [^{15}O] (T½ = 2 minues) to [^{89}Zr] which has a 3-day half-life. The cyclotron and associated radiopharmaceutical development areas have quickly proven to be essential tools for researchers and clinicians.

The UAB Cyclotron Facility works closely with both clinical faculty and researchers to provide access to radiopharmaceuticals for clinical and preclinical use. Additionally, the facility provides educational resources which allow investigators to understand the significance and meaning of the information provided by molecular imaging. The Small Animal Imaging Facility makes use of a number of these radiopharmaceutical PET-tracers, including the following:

- [^{18}F]FMISO
- [^{18}F]FLT
- [^{18}F]DPA
- [^{13}N]Ammonia
- [^{89}Zr]Oxine
- [^{89}Zr]-Pertuzumab
- [^{89}Zr]-Trastuzumab

Fluorimisonidazole (FMISO) labeled with Fluoride-18 (T½ = 110 minutes)([^{18}F]-FMISO) accumulates in hypoxic but viable cells. It is frequently used to monitor tumor hypoxia and is also able to detect hypoxia in ischemic stroke. Fluorothymidine (FLT) labeled with Fluoride-18 ([^{18}F]-FLT) is a radiolabeled analog of the DNA base thymine. It is taken up preferentially by cells that are replicating DNA and is used as a marker of cell proliferation. Together, both agents can be used to provide insight into tumor response to therapy.

The radiopharmaceutical [^{18}F]-DPA-714 can be used to detect brain inflammation by targeting translocator protein (TSPO) expressed by microglia. TSPO is expressed at low levels by healthy microglia, and expression increases as a response to inflammation and injury in the brain. In addition to imaging brain inflammation, TSPO imaging has also been used to as a marker of inflammation in other organs such as the lung and liver.

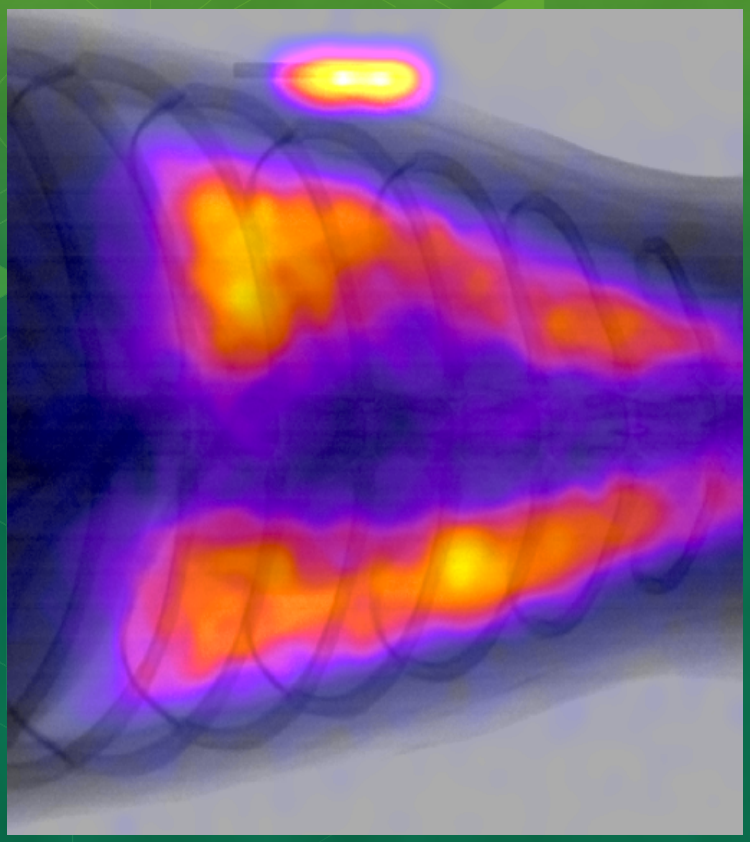
Another useful radiopharmaceutical is Nitrogen-13 (T½ = 10 minutes) labeled ammonia. After injection, [^{13}N]-ammonia distribution is indicative of organ perfusion and flow. [^{13}N]-ammonia has been utilized by the SAIF staff to monitor cardiac blood flow and function in rats.

Zirconium-89 (T½ = 3.27 days) oxine can be used to radiolabel a variety of cells including white blood cells, cancer cells, and T-cells for longitudinal study. It is ideal for in vivo cell-tracking and analyzing cell function. Additionally, [^{89}Zr] can be used to radiolabel antibodies. When the HER2 targeting antibodies Pertuzumab and Trastuzumab are labeled with [^{89}Zr], these compounds can be used to monitor expression level of the HER2 receptor on cancer cells, and their response to treatment.

If you would like more information regarding the UAB Cyclotron Facility and available radiopharmaceuticals, please contact Dr. Suzanne Lapi, or visit the **main website**.

*If you have received services through the SAIF core for grants and publications, please acknowledge support by citing UAB Comprehensive Cancer Center's Preclinical Imaging Shared Facility Grant P30CA013148. For published data obtained with the IVIS Lumina III systems, please cite S10 instrumentation grant 1S10OD021697.

FEATURED IMAGE OF THE QUARTER



CYSTIC FIBROSIS IN FERRETS

One of the primary defense mechanisms of the lung is the mucociliary escalator, in which motile cilia propel mucus (and the trapped particulate, debris, and pathogens) up the airways and out of the lungs. In airway diseases such as cystic fibrosis (CF), the mucus is pathologically viscous like maple syrup rather than watery and the mucociliary escalator does not work properly. Through in vivo, dynamic SPECT imaging of the mucociliary escalator in a genetically engineered ferret model of CF, the effects of CFTR modulator drugs on mucus clearance can be better visualized.

Subject was intubated and underwent nebulization using Tc99m-DTPA into the lungs, followed by 1-hour dynamic SPECT imaging alongside a capillary reference to assess clearance.

IMAGE CREDIT: Dr. Scott Phillips and Jacelyn Peabody (*Dr. Steven Rowe's lab*), Erika McMillian (*SAIF*)

FEATURED INSTRUMENT

The **9.4 TESLA BRUKER BIOSPEC 94/20** is a horizontal bore small animal imager capable of providing high resolution *in vivo* images comparable to those obtained in human MRI studies, including T1, T2, DWI, and DCE. It can be used to observe biological systems in small-animal species such as mice, rats, rabbits and even ferrets. The Bruker 9.4T MRI system can acquire images essential for preclinical studies that focus on soft tissue regions. It can provide images for both qualitative and quantitative assessment of traumatic brain injuries, tumor morphology, cardiac functioning, and integrity of circulatory vasculature. It has also been used to observe responses to external stimuli in kidneys, liver, prostate, and adrenal glands. The Bruker 9.4T is a cost-effective system for longitudinal, non-invasive imaging without reliance on radio-compounds, or X-rays. With the help of prospective respiratory and ECG gating features, the complementing ParaVision acquisition software works to limit motion artifact and provide efficacious, high-resolution images suitable for research analysis.

USEFUL LINKS

↗ PRE-CLINICAL IMAGING CALENDAR
Check for any available time slots for imaging modalities.

↗ TRAINING FORMS
Download training material for submission prior to scheduling imaging.

↗ PERKIN ELMER RESOURCES
Educational material related to the IVIS Lumina III.

↗ DEPARTMENT OF RADIOLOGY
Homepage for UAB's Department of Radiology.

↗ O'NEAL COMPREHENSIVE CANCER CENTER
Homepage for O'Neal Comprehensive Cancer Center at UAB.

↗ O'BRIEN CENTER
Homepage for O'Brien Center for Acute Kidney Injury Research.

↗ UAB CYCLOTRON FACILITY
Homepage for UAB's Cyclotron Facility.

DID YOU KNOW?

SAIF MODALITIES CAN BE USED FOR MORE THAN *IN VIVO* IMAGING.

Modalities within the Small Animal Imaging Facility can be used to acquire data essential for studies beyond *in vivo* systems. They can be used to visualize specified regions in *ex vivo* studies (such as observing the integrity of skeletal structures in coral) or emphasizing key areas in *in vitro* studies (such as bioreactor and cellular activity, and cell-accumulation in excised organs).

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MAIN LAB

Volker Hall Laboratory
1670 University Blvd.
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IMAGING FACILITIES

WTI Imaging Suite
WTI 630D

MRI 9.4T Imaging Suite
LHL B15, 934-0265

Volker Hall Imaging Suite
VH B21A, 975-6466

SAIF MODALITY PRICING

*Labor charges are $40 per hour (for each personnel), when assisted during imaging.

Prices effective 11/1/2018.

*Training is available on some modalities, free of charge.

MODALITY	COST	INSTRUMENT
Bioluminescence	$7/mouse OR $55/hour (re-agent dependent)	IVIS Lumina III
Fluorescence	$55/hour	Custom Leica microscope with Nuance CRI spectral camera
		IVIS Lumina III
Ultrasound	$75/hour	Vevo 660
MRI	$125/hour	Bruker 9.4T
SPECT/CT	$100/hour + dosing	XSPECT system
PET/CT	$200/hour + dosing	Sofie GNEXT PET/CT
Gamma Camera	$20/hour + dosing	Picker Camera with Numa computer
Specialty Fluorescent Imaging	$100/hour	Li-Cor Pearl Impulse
		Luna/SPY Systems
Staff Image Analysis	$40/hour	

*NON-CANCELLATION POLICY:
If user is not present at scheduled appointment time without prior notification of cancellation, user will be charged an hourly-use fee for that instrument.

IMAGE SUBMISSIONS

Submit images that you would like featured in the newsletter to erikanmc@uab.edu. Please include PI's name, modality, brief experiment summary, and species.

PUBLICATION REFERENCE

If you have received services through this core for grants and publications, please acknowledge support by citing UAB Comprehensive Cancer Center's Preclinical Imaging Shared Facility Grant P30CA013148.

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