Charge Schedule (Internal - UAB)

Modality	Instrument	Cost*
Bioluminescence	IVIS Lumina III	$6/mouse OR $50/hour (reagent dependent)
Fluorescence	IVIS Lumina III	$50/hour
	Custom Leica microscope with Nuance CRI spectral camera	
Ultrasound	Vevo 660	$100/hour
MRI	Bruker 9.4T	$125/hour
SPECT/CT	X-SPECT system	$100/hour + dosing
Micro PET/CT	Sofie GNEXT PET/CT	$200/hour + dosing
Gamma Camera	Picker Camera with Numa computer	$20/hour + dosing
Specialty Fluorescent Imaging	Li-Cor Pearl Impulse	$100/hour
	Luna/SPY Systems	
Image Analysis		***$75/hour***

*$35/hour labor, when assisted
prices effective 10/1/2017

Contact Information

<u>Consultation:</u>

Dr. Suzanne Lapi - PET/CT **lapi@uab.edu**
Dr. Mark Bolding - MRI **mbolding@uab.edu**
Dr. Harrison Kim - SPECT **hyunki@uab.edu**
Dr. Jason Warram - optical **mojack@uab.edu**

<u>Scheduling/billing/technical assistance</u> - 975-6465, 975-6405
Sharon Samuel - scheduling **ssamuel@uab.edu**
Dr. John Totenhagen (MRI) (4-0265, jtotenha@uab.edu)

Additional Personnel:
Sheila Bright **Erika McMillian** **Samuria Thomas**

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

UAB

Preclinical Imaging Shared Facility

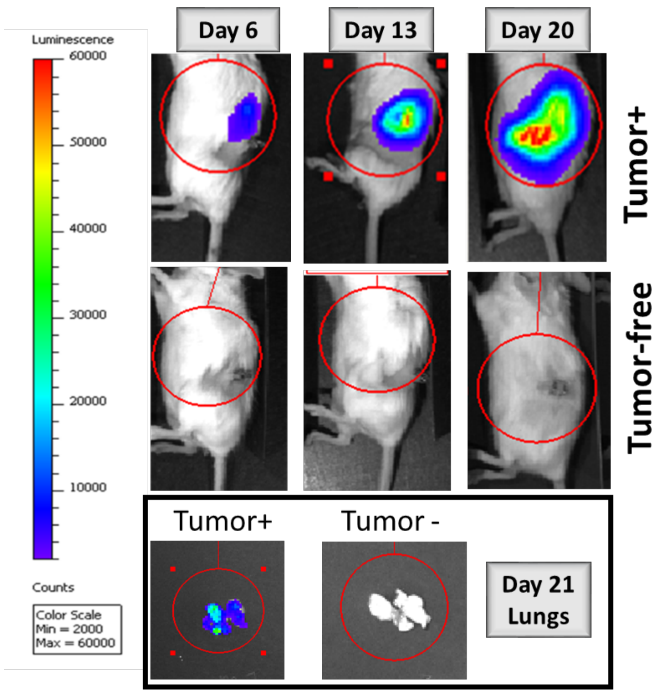
Department of Radiology & Comprehensive Cancer Center

Interim Director: Suzanne Lapi, Ph.D.
Co-Directors: Mark Bolding, Ph.D.
Jason Warram, Ph.D.

Division of Advanced Medical Imaging Research

In Vivo and *Ex Vivo* Bioluminescence Imaging

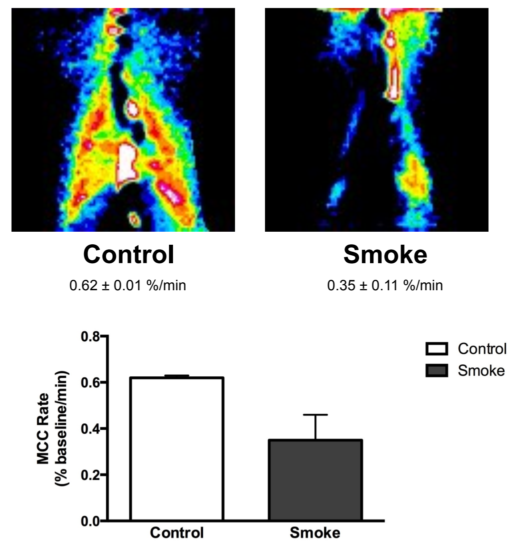
Bioluminescence imaging is an efficient and sensitive method to detect luciferase expression in living animals. Applications include measurement of tumor mass, tumor metastasis, trafficking of injected cells, verification of gene therapy vector targeting, and screening promoter constructs driving luciferase expression in transgenic mice. Images are usually collected 10-15 min after IP injection of 2.5 mg d-luciferin substrate in mice. Imaging may be performed repeatedly on each mouse. Image acquisition times range from 1 sec to 5 min. Light emission from animal regions is measured using Living Image® software, provided by PerkinElmer. The intensity of light emission is represented with a pseudocolor scaling of the bioluminescent images.



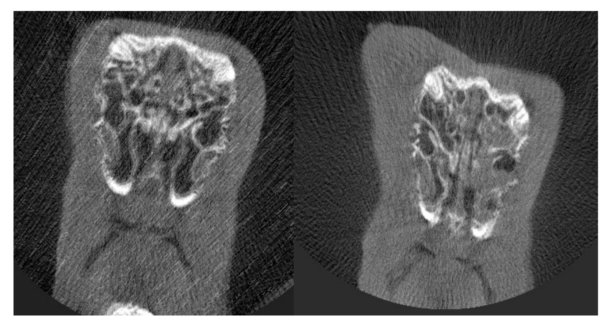
Modeling kidney cancer in BALB/c mice. BALB/c mice were intrarenally injected with firefly luciferase-expressing syngeneic Renca cells or saline. Primary tumor growth was monitored by bioluminescent imaging (BLI) on days 6, 13, and 20 following tumor challenge. Metastases in excised lungs were quantified by BLI on Day 21. (Courtesy of Dr. Norian)

In Vivo SPECT/CT Imaging

Single-photon emission computed tomography (SPECT) is a nuclear medicine tomographic imaging technique that uses gamma rays and provides 3D images of radiotracer distribution. When combined with ***computed tomography*** (CT), anatomic localization can be identified. These powerful modalities can be used individually or in combination to tease out differences in various animal disease models. Traditional radiotracers or novel proteins and antibodies of interest that can be radiolabelled with gamma emitting isotopes, injected into subjects, and imaged to determine organ and/or tumor specificity.



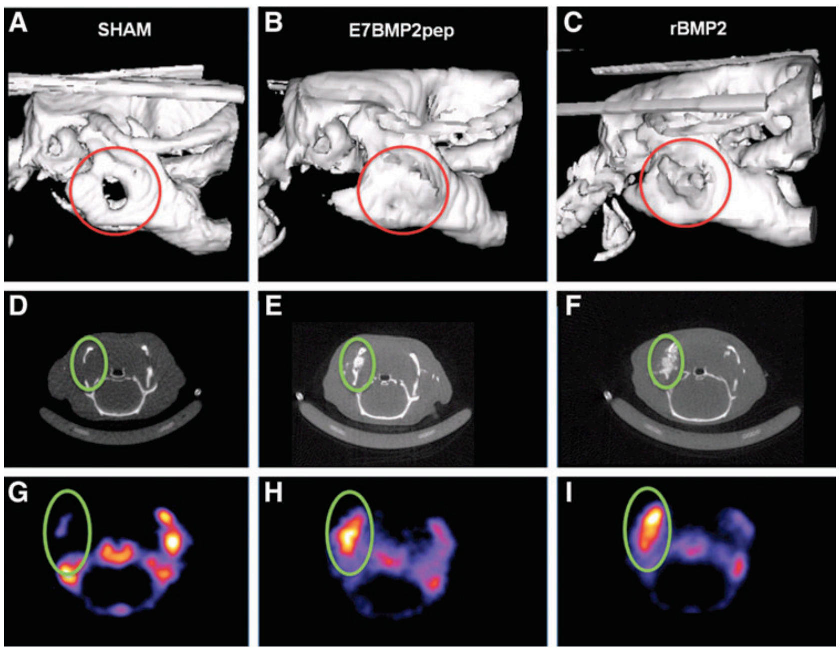
In vivo mucociliary clearance assay imaging in ferret model of chronic bronchitis. Mucociliary clearance is a fundamental defense system of the airways to defend against inhaled pathogens. Investigating mucociliary clearance is critical for understanding and treating several lung diseases. Sedated ferrets are placed in nose-only restraint tubes to receive aerosols of ^{99m}Tc-DTPA. Top: SPECT images of lungs following administration of radiotracer. Bottom: MCC rate graph. (Courtesy of Dr. Rowe)



Rabbit model of chronic rhinosinusitis. Rabbits are imaged at various time points following disease induction. The rabbit on right shows signs of inflammation in its sinus cavity. Imaging of the rabbits was done on a modified imaging bed. (Courtesy of Dr. Cho)

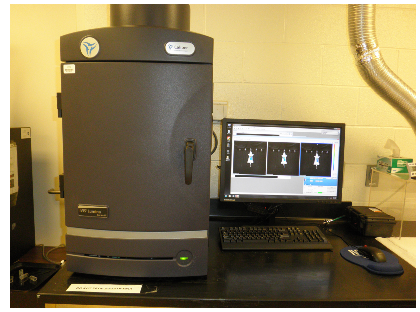
In Vivo PET/CT Imaging

Positron Emission Tomography (PET) is a powerful imaging modality designed to permit the characterization of specific metabolic and physiological processes with high sensitivity and spatial resolution. Various clinically approved and experimental radiopharmaceutical probes are available to characterize cellular processes such as metabolism, hypoxia, and angiogenesis in both normal and disease tissues. In addition to qualitative 3-dimensional views, radiopharmaceutical uptake can be semi-quantified by standardized uptake value (SUV) with reasonable reproducibility enabling serial imaging studies for therapy or diagnostic evaluation.



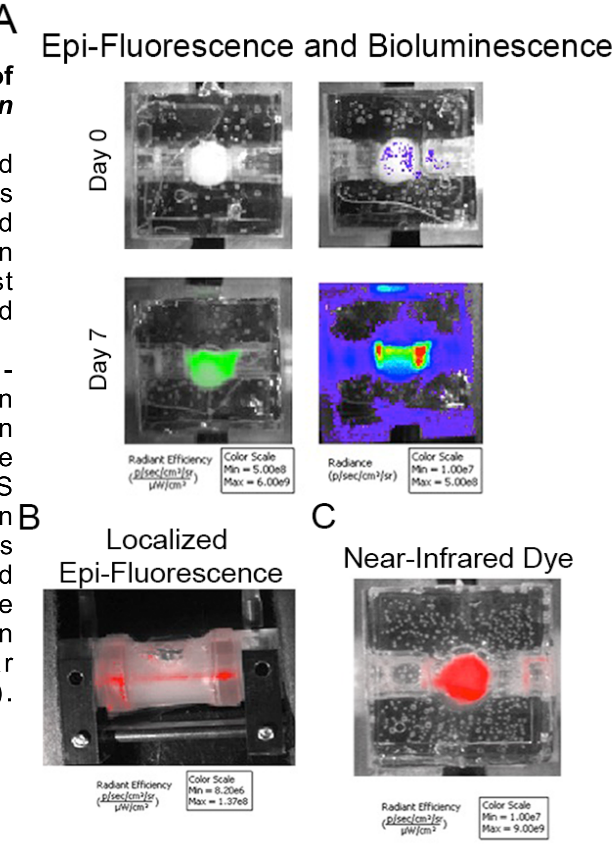
Rat model of bone grafting using specialized osteoinductive peptides conjugated to anorganic bovine bone: Representative examples of CT and PET images. (A-C) 3D reconstruction of CT scan at 12 weeks. (D-F) Cross-section of defect area from CT scan. (G-I) PET images of the defect area showing radioisotope activity. (Bellis, SL, et. al., Enhancement of the regenerative potential of anorganic bovine bone graft utilizing a polyglutamate-modified BMP2 peptide with improved binding to calcium-containing material. *Tissue Engineering: Part A*. Sep: 21(17-18):2426-35, 2015)

In Vitro Fluorescence Imaging



The Preclinical Imaging Shared Facility offers multiple platforms for fluorescent imaging *in vivo* and *in vitro*. In addition to bioluminescent capabilities, a broad spectrum of wavelengths, from 420nm to 845 nm, are available on the IVIS Lumina III system to allow for images to be taken from multiple reporters. IVIS Lumina systems are available in Wallace Tumor Institute and Volker Hall for trained users.

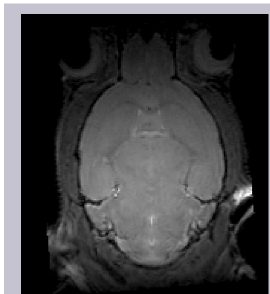
Use of IVIS for Analysis of Tissue Engineered *In Vitro* Models.
A) Epi-fluorescence and bioluminescence signals from a tissue engineered surrogate of estrogen receptor positive breast cancer can be measured and evaluated over time.
B) Localized epi-fluorescence within an engineered microchannel in extracellular matrix can be observed using the IVIS Lumina. **C**) Primary human breast carcinoma cells within a tissue engineered surrogate system can be imaged during culture when incubated with a near infrared dye (IR-783). (Courtesy of Dr. Frost)



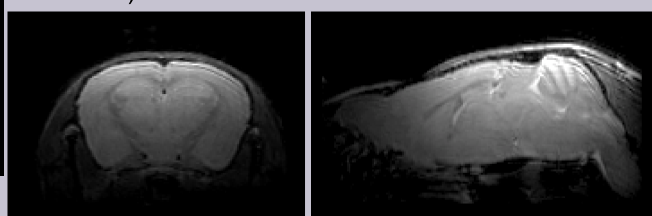
Magnetic Resonance Imaging

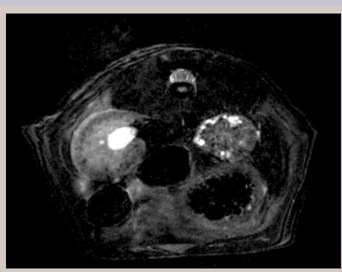
MR Contact: Dr. John Totenhagen

Magnetic Resonance imaging (MRI) is a method for non-invasive imaging that can provide information related to regions of interest and their surrounding environment. MRI can be enhanced by a number of contrast agents to better evaluate treatment outcomes. Their effects can be measured by comparing image sequences pre- and post-contrast administration, or by dynamic measurements of the signal change following administration of the contrast agent (DCE-MRI). Tissue properties can be elucidated in greater detail with advancing MR techniques when used in conjunction with other imaging modalities (see right). Contrast enhanced MR can be used in conjunction with other therapeutic modalities to monitor long-term tumor response. Basic and specialized scans can be performed on the 9.4T MRI located in the basement of LHL, which has a bore size of 20cm.



In vivo mouse brain imaging. High resolution 3D imaging of mouse brain. This can be used to detect small brain tumors. (Courtesy of Dr. Nakano)

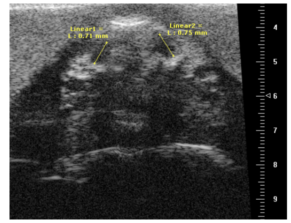




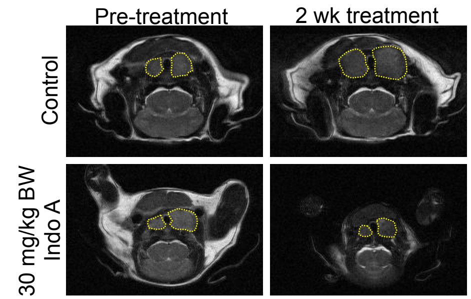
In vivo imaging of rat polycystic kidney disease. Bright spots indicate the presence of cysts. (Courtesy of Dr. Mrug)

In vivo imaging, mouse aorta angiography. A dye is used as contrast to determine any problems that may be present in the aorta of normal vs transgenic mice. (Courtesy of Dr. Agarwal)

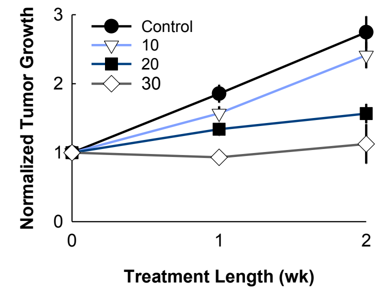
Multimodality Imaging with MRI

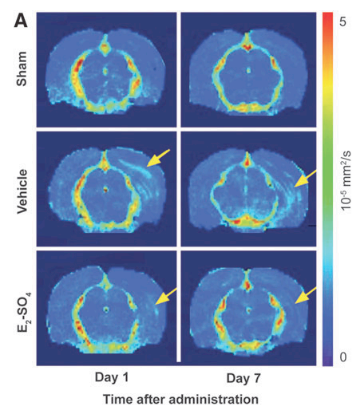


Modalities: Ultrasound and MRI

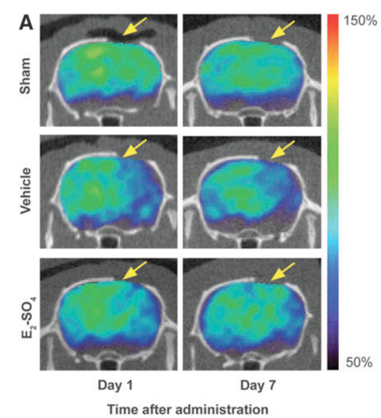


Mouse thyroid tumor imaging. Above: Ultrasound was used to locate and measure mouse thyroid tumor. Above, right: MRI was used to get a higher resolution image of the thyroid and follow treatment progress. Right: Results of tumor growth as measured by MRI for two weeks, following different treatment concentrations. (Courtesy of Dr. Bibb)





Modalities: MRI and PET/CT



TBI injury model in the rat. The images on the left are representative apparent diffusion coefficient (ADC) maps, determined by MRI. Arrows show areas of edema. Images on the right are PET/CT scans showing cerebral glycolysis assessed by ^{18}F-FDG uptake. Arrows show the area that underwent craniectomy. (Chaudry, IH, et. al., Salutary effects of estrogen sulfate for traumatic brain injury. *Journal of Neurotrauma.* 32:110-1216, 2015)