Bioscan NanoSPECT/CT
Philips Mosaic PET
Li-Cor Pearl Imager
Caliper IVIS 100

The UMMS Small Animal Imaging Core, operated by the Department of Radiology, is located in the School in SA-107A. Nuclear images may be acquired on the Bioscan NanoSPECT/CT and/or the Philips Mosaic PET small animal cameras. Proteins, peptides, oligomers, nanoparticles, and other biomarkers of interest labeled with SPECT radionuclides such as ^{99m}Tc, ^{111}In , ^{123}I, ^{125}I and PET radionuclides such as ^{18}F, ^{64}Cu, ^{68}Ga may be imaged to follow the biodistributions in mice, rats or other small animals. The CT component of the NanoSPECT camera will provide registration for both cameras and, in addition, can be used without radioactivity for high resolution anatomical imaging.

A table inside provides some of the characteristics of both nuclear cameras.

Optical images of light emitting cells or fluorescent biomarkers in vitro or in small animals may be acquired on Caliper's IVIS 100 for bioluminescence and fluorescence from 500-760 nm or with Li-Cor Biosciences' Pearl Imager labeled with near infrared fluorophores (em 700-800 nm).

A table inside provides some of the characteristics of the optical cameras.

The availability of SPECT, PET, CT, and optical imaging singly or in combination provides investigators at UMMS and elsewhere with the tools needed for research at the forefront of molecular imaging in translational medicine.

In vivo imaging enables one to evaluate in situ the presence of tumors or disease and assess therapy or treatment in the living animal.

Small Animal Imaging Core
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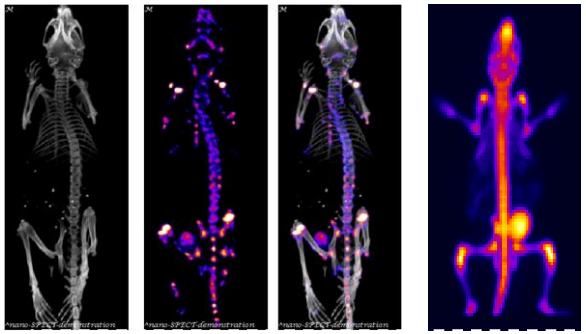
Operationally managed by:

Research Core Administration
Rev. 2/11

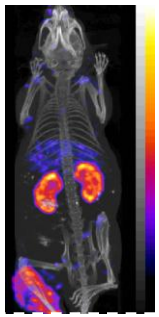
University of Massachusetts
UMASS Medical School

Small Animal Imaging Core Facility

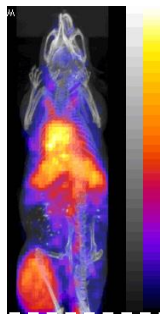


SPECT/CT bone images

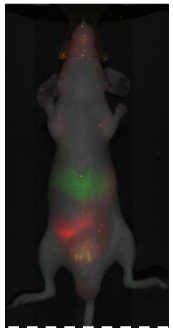
PET bone image



SPECT/CT and



PET/CT tumor images



NIR image

OPERATION:
Core staff members operate the SPECT/CT and PET cameras for investigators. Certain UMMS investigators with proper training may be afforded this privilege – especially in off hours. Images may be transferred to user by DICOM or web via iPACS software. The optical cameras are run by the users after a brief training.

CHARGES:
Charges for the PET and SPECT/CT include animal handling within the facility and data management. At present: $100/hr for UMMS faculty, $200/hr for extramural faculty, and $350/hr for industry. The optical camera charge when operated by the user is $44/hr with a maximum of $400/month.

RADIATION & ANIMAL USE:
Investigators are required to obtain IACUC approval for imaging studies on live animals and may be required to obtain a radioactivity license.

RADIOLABELING:
Staff members are available to consult with potential users on how best to label their agents for imaging studies. The Core will provide a labeling service if requested.

	NanoSPECT/CT	Mosaic PET
Examples of radiolabels	^{99m}Tc, ^{111}In, ^{123}I, ^{125}I simultaneous acquisition possible	^{18}F, ^{68}Ga, ^{64}Cu
Bore size	5 and 8 cm SPECT, 10 cm CT	18 cm
Field of view	5 by 10 cm (parallel hole collimators)	11.9 cm
Achievable radioactivity spatial resolution	1.0 mm	1.6 to 1.9 mm
CT resolution, Field of view	40 µm, up to 24 cm	---------
Quantification accuracy	10%, possibly 5% for ^{99m}Tc	Pending
SPECT and PET Co-registration accuracy	1 mm	---------
Typical tomographic imaging times	3 min CT/15 min with 1 mCi ^{99m}Tc	10 min with 0.2 mCi ^{18}F

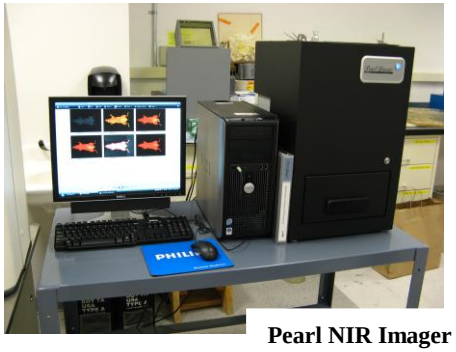
SPECT and PET tomographic images may be acquired simultaneously and co-registered, typical X-ray exposures for 1 min are 15-20 mGy, dual isotope SPECT imaging may be performed with quantitation of both isotopes, planar images of up to three rats or six mice may be obtained simultaneously, many PET and especially SPECT radioactive contrast agents are available commercially (e.g. ^{18}F-FDG, ^{99m}Tc-MDP, ^{111}In-Octreoscan), others may be prepared in house, the mice/rat bed fits both cameras and is heated.

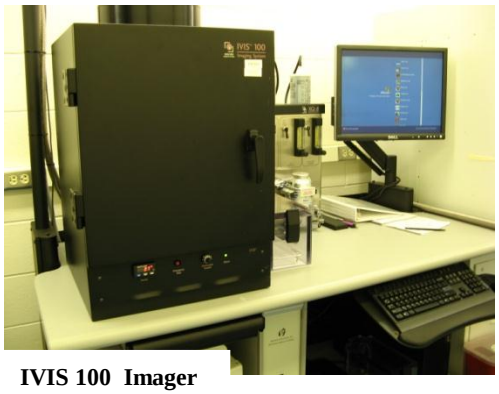
	Pearl NIR Imager	IVIS 100 Imager
Examples of optical agents	NHS esters of IRDye 680 and 800CW, labeled 2-deoxyglucose, streptavidin	Luciferin, green fluorescent protein, red fluorescent protein, Cy3, Cy5
Excitation/Emission)	685/720nm; 785/820 and white	Ex 445-750 nm Em 515-875 nm
Field of View Vertical clearance	11.2 cm W x 8.4 cm D 3.8 cm	Stage settings of 10, 15, 20, or 25 cm
Resolution	85 or 170 µm	
Capacity	One animal	5 mice or 2 rats
Typical imaging times	30 sec	30 sec


NanoSPECT/CT


Mosaic PET

The Pearl NIR Imager is designed for fluorescence in vivo imaging in the near-infrared (NIR) spectral region where tissue autofluorescence and light scattering are low. Animals may be illuminated by a 685 nm and a 785 nm laser for excitation and LED white light for registration and all three images may be overlayed in the display. By permitting deeper penetration, smaller targets can be visualized at greater depths, allowing earlier detection. The imaging bed is temperature controlled to maintain body temperature. The sensitivity is exceptional for small animal receptor and transport targeting, structural and vascular/lymphatic imaging and biodistribution.
The Xenogen® IVIS 100 from Caliper Life Sciences can be used for both bioluminescence and fluorescence. The filter set of four covers the excitation range of 445-750 nm and emission of 500-875 nm. The systems light-tight imaging chamber has a heated platform and portals for delivery of gaseous anesthesia to five mice or two rats at a time. Image acquisition takes only about 30 sec and therefore can serve as a high-throughput screening method. Both the Pearl and IVIS 100 optical cameras are user friendly and do not require a dedicated operator.


Pearl NIR Imager


IVIS 100 Imager