**Small Animal Imaging Core:** The Small Animal Imaging Core (SAIC) is directed by Dr. David Colcher and staffed by Desiree Lasiewski (Core Manager) and Junie Chea (Imaging Specialist). Dr. Colcher serves as a co-Investigator for this project. The SAIC currently supports nuclear (γ and positrons), X-ray and optical (bioluminescence and fluorescence) imaging in small animals. Imaging systems in hand include:

* 1 unit for optical bioluminescence (IVIS 100, Perkin-Elmer)
* 1 unit for either optical bioluminescence or fluorescence imaging (IVIS 100, Perkin-Elmer)
* 1 gamma camera ($γ$-IMAGER; Biospace, Inc.)
* 1 PET scanner (Inveon,Siemens)
* 1 SPECT/CT scanner (Inveon,Siemens)

The two IVIS 100 instruments are used to image and quantify *in vivo* expression of bioluminescence and fluorescence in mice. Each instrument is supplied with a cooled charge-coupled device (CCD) camera system that captures the bioluminescent and/or fluorescent image(s) for the quantitative analysis of the acquired emissions. Living Imaging 4.2 software supports the IXIS 100 hardware. The SAIC also houses a trimodal small animal Inveon scanner capable performing positron electron tomography (PET), X-ray computed tomography (CT), and single photon emission (SPECT), computed tomography (microPET/CT/SPECT, Siemens) for the *in vivo* biodistribution and pharmacokinetic (PK) analyses of radiolabeled therapeutics. The SAIC microPET/CT/SPECT scanner has been used for 124I-labeled antibody constructs as well as 64Cu- or 89Zr-conjugated to the antibody constructs using an appropriate chelate linker (*e.g.* DOTA or deferoxamine), 18F-labeled deoxyglucose and other commercially available compounds labeled with short-lived positron-emitting radioisotopes can be imaged. Labeled constructs are evaluated in biodistribution and tumor uptake studies in murine transgenic and xenograft models. The Inveon PET module has 10 mm thick LSO crystals with 1.59 mm × 1.59 mm detector pixel spacing resulting in an absolute sensitivity of 10% at the center of the field of view. The system has an axial field of view (FOV) of 12.7 cm that is extended to 30 cm with continuous bed motion. The Inveon CT module has a detector with 3072 × 2048 pixels and may be configured for a FOV as large as 8.4 cm × 5.5 cm. The CT has a variable-focus X-ray source with a maximum resolution is 20 microns. The Inveon SPECT detectors have sub-millimeter resolution it detects gamma rays from 30 keV to 300 keV. The head has 2 mm × 2 mm × 10 mm detector crystals and a 150 mm × 150 mm field of view (FOV). The system is controlled by a PC running under Windows XT. It includes a fully developed image analysis package that supports volumetric regions of interest and fusion of the images from the different modalities. The γ-IMAGER is a high-resolution planar scintigraphic camera that combines a customized single 120 mm diameter, 4 mm thick CsI scintillation crystal with a position-sensitive photomultiplier tube to provide to a circular 100 mm diameter field of view. The thickness and composition of the crystal were optimized for use with111In. The $γ$-IMAGER can be used with a parallel hole collimator designed for the gamma ray emissions of various radioisotopes as well as for various combinations of sensitivity and resolution. We have a collimator designed specifically for imaging mice injected with111In.