

IVIS[®] Imaging System 200 Series

In vivo Molecular Imaging in small animals (SAIVI)

What is it?

Imaging bioluminescence, fluorescence or radioactive signals in live animals

Provide information on molecular activity and interactions, a specific Molecular pathway e.g. protein, in a biological process, which can not be detected by the traditional imaging.

Real-time and dynamic.

In vivo Molecular Imaging in small animals

What can it be used for?

Applications have been listed in the references including:

- Tumor growing
- **Angiogenesis**
- Gene transfection and expression
- **Enzyme activity**
- Infection
- **Inflammation**
- Receptor expression and distribution
- **Metabolism (Drug, Amyloid Deposits...)**
-
- Others you imagine

Types and limitations

Depending on the reporters

- Fluorescent system

fluorescent probes

autofluorescent background

- Bioluminescent system

luciferase

gene transfection or transgenic animals

Positron emission tomography (PET)

radioligand or probes

resources and the half life of the tracer

What do we have?

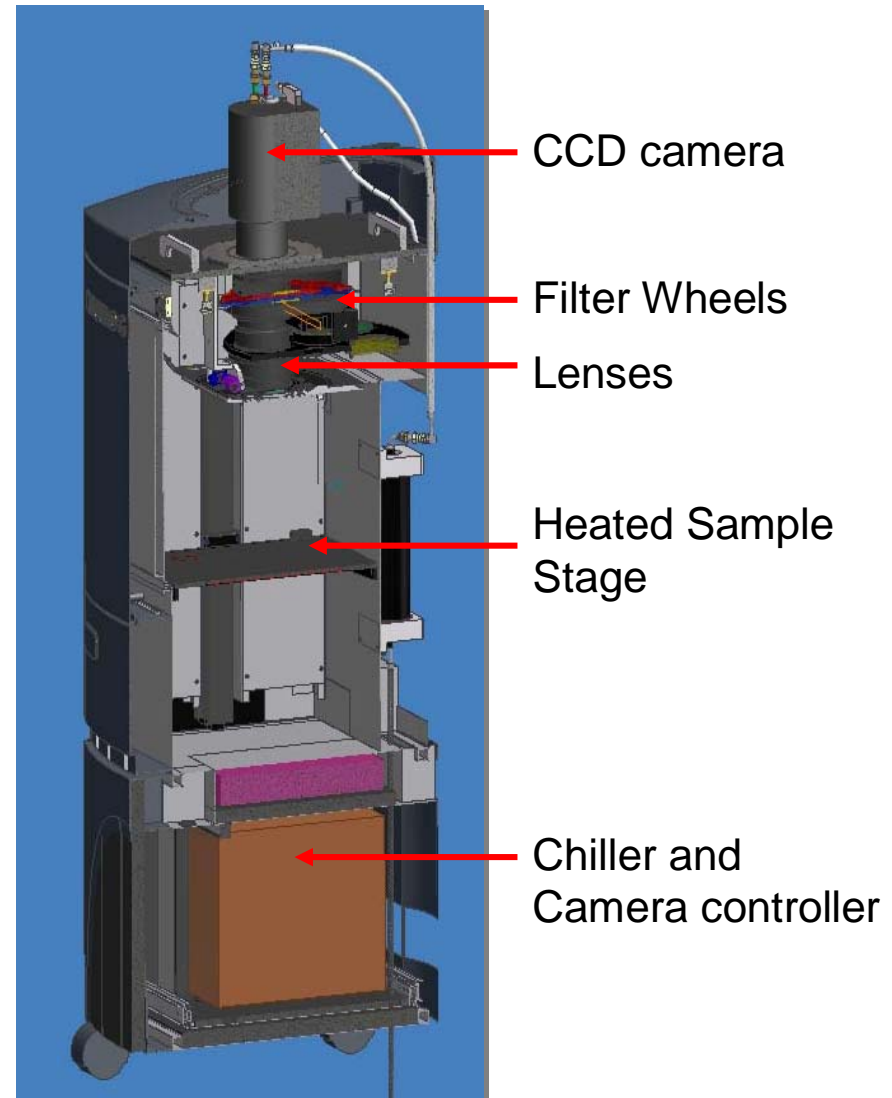
IVIS[®] Imaging System 200 Series

Both bioluminescent and fluorescent imaging

(Located at Room 619, Smith)

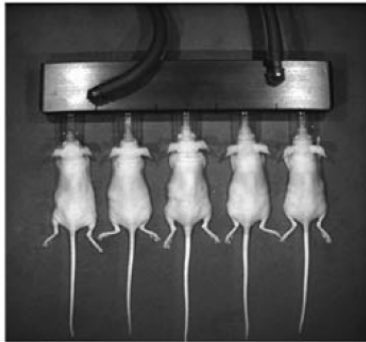


- High sensitivity of bioluminescence or fluorescence
- High throughput (to total 5 mice each view)
- High resolution (to 20 microns)
- Living Image[®] software

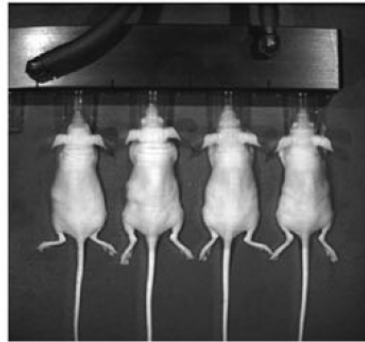


The *IVIS*® Imaging System 200 Series

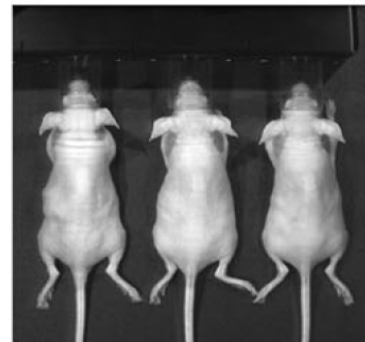
26 cm



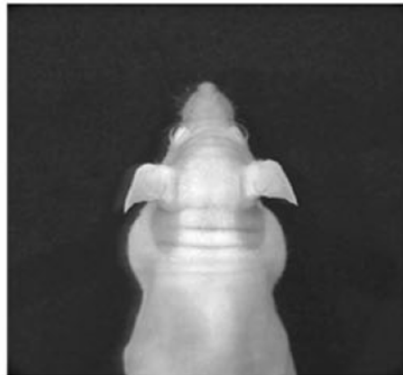
19.5 cm



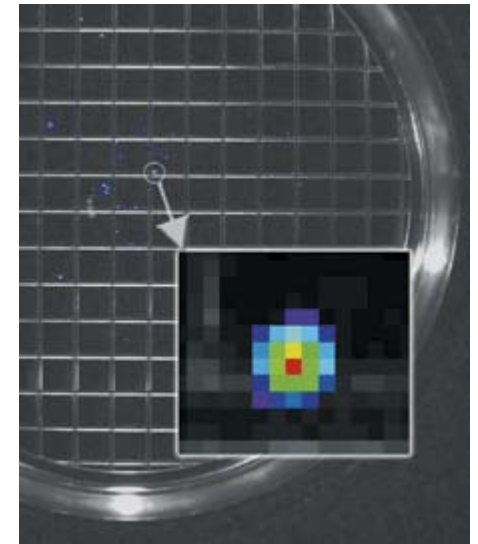
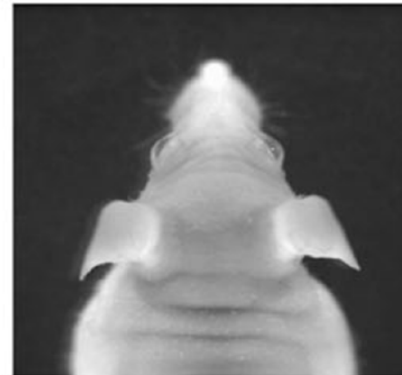
13 cm



6.5 cm



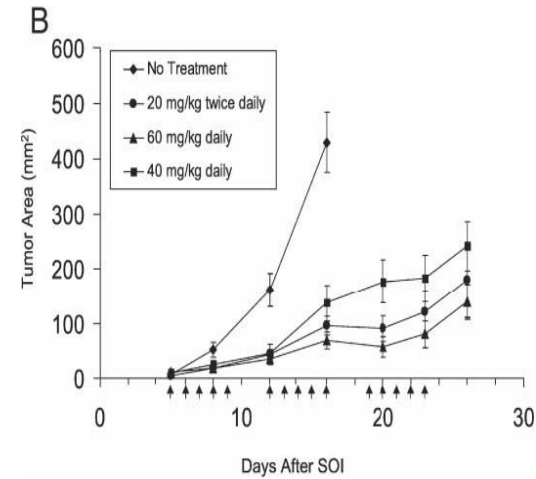
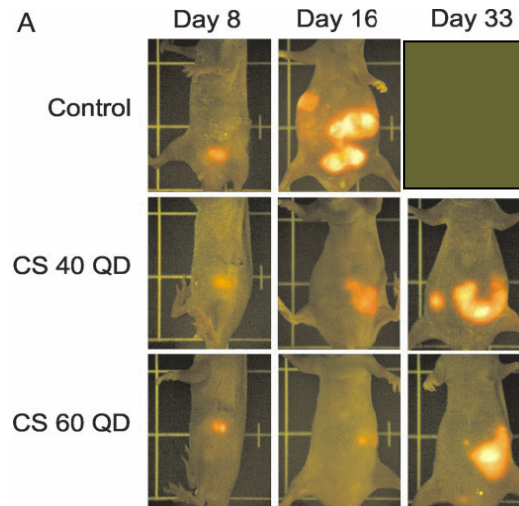
3.9 cm



Field of view allows for single cell resolution up to 5 mice per image

Examples of applications of SAIVI

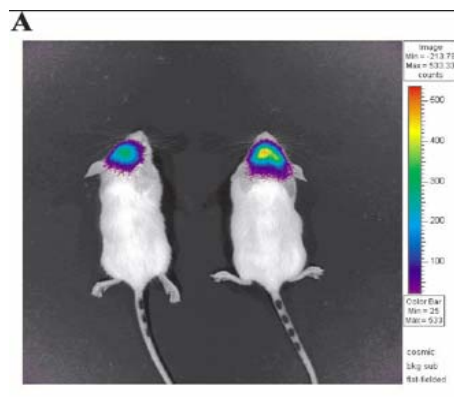
Implantation of tumor cell line that expresses fluorescent protein into nude mice



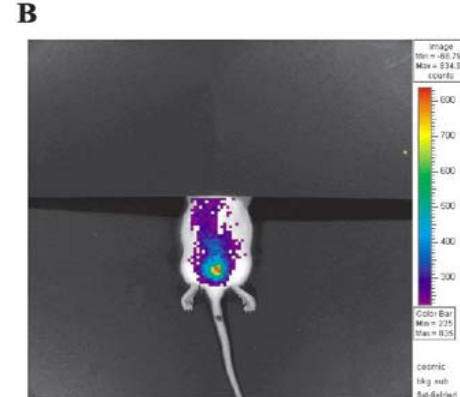
Luciferase Imaging of a Neurotropic Viral Infection in Intact Animals

Virus engineered to express firefly luciferase,

Brain

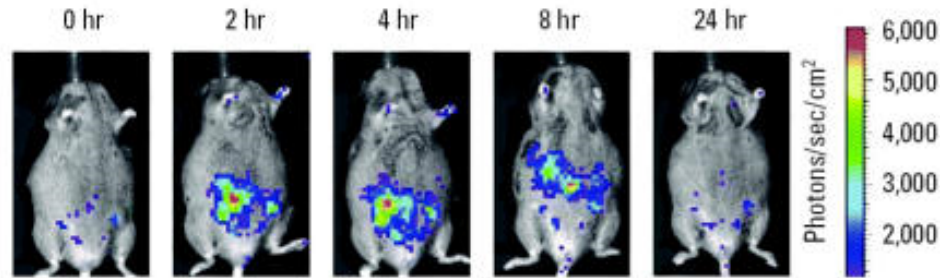


Spinal cord



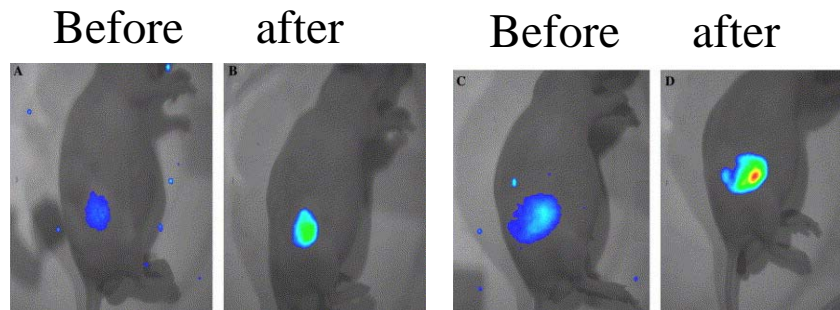
Estrogen receptor activation

A *in estrogen reporter mice*



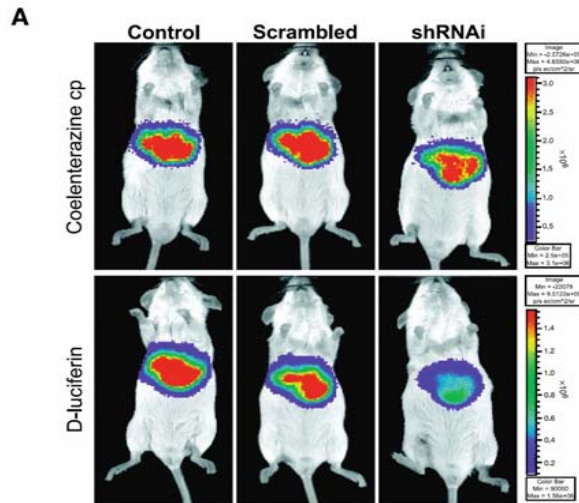
Time after injection of estrogen and luciferin

Estrogen activity: *response to estrogen in Xenografts cells that expressing luciferase*



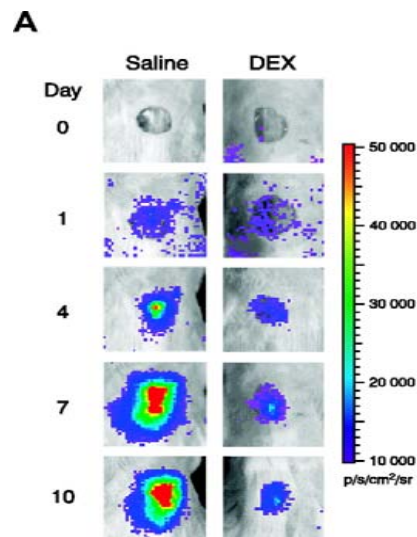
Down-regulation of MDR1 protein by siRNA

Transfection of a gene encoding a protein, MDR1-Firefly luciferase fusion construct, into mouse liver. Then treating animals with MDR1 siRNA



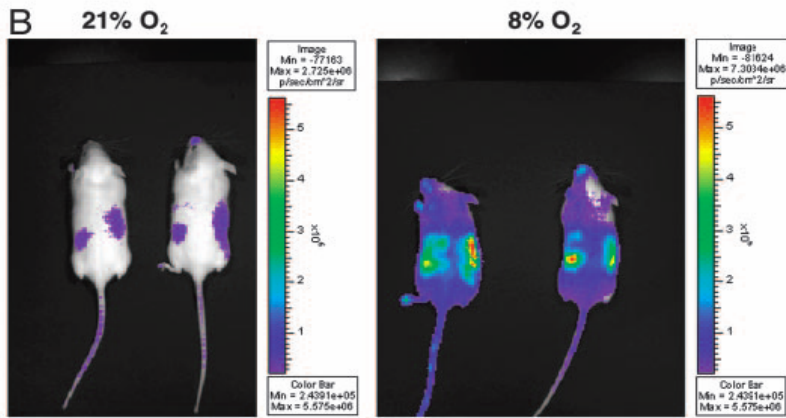
Tracking angiogenesis induced by skin wounding in VEGF2-luciferase transgenic mouse

Vegf2-luc expression is induced during wound healing and is inhibited by DEX

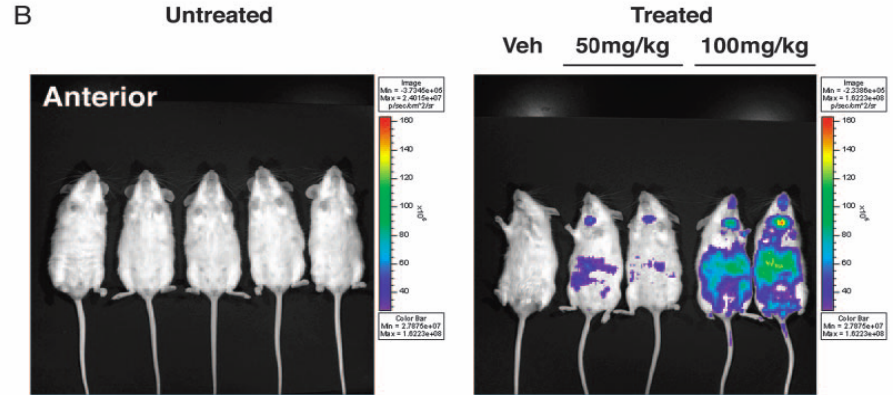


Assessment of an oral agent that stimulates erythropoietin production

Using a mouse model: firefly luciferase fused to a region of HIF



Hypoxia up-regulate HIF

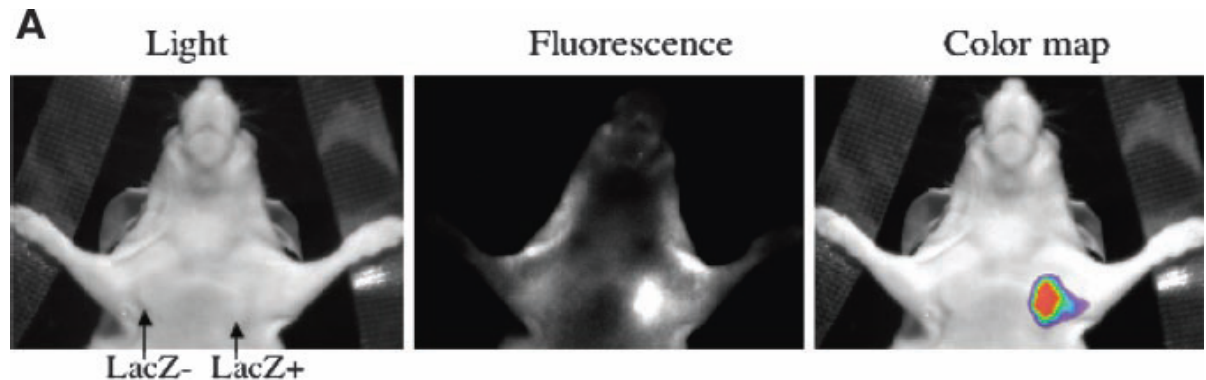


PHD inhibitor up-regulate HIF

In Vivo Imaging of β -Galactosidase Activity Using Far Red Fluorescent Switch

Fluorogenic Substrate

β -D-galactopyranoside



Molecular Probes: *NIR (near-infrared) SAIVI™ Imaging Reagents (fluorescent dyes) and Antibody/Protein Labeling Kits*

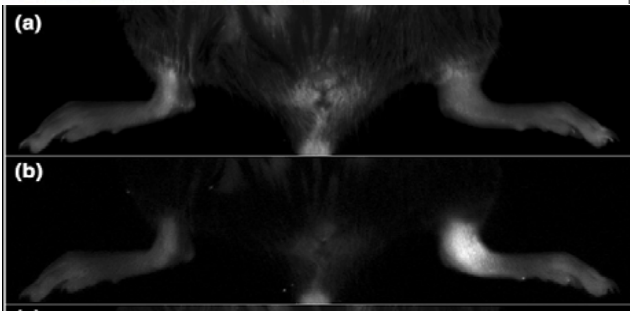
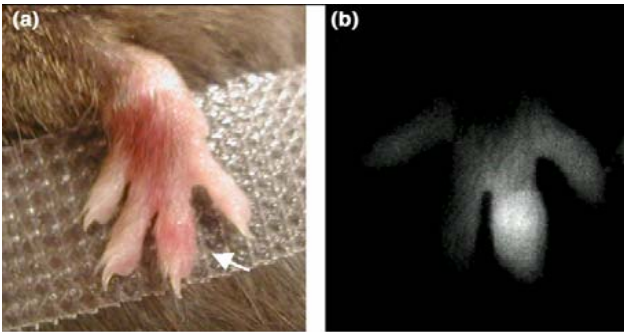
Quantum Dot Corp: *Antibody Conjugation Kit to label Ab with quantum dot. QD: Nanometer-sized semiconductor particles have been covalently linked to biorecognition molecules such as peptides, antibodies, nucleic acids or small-molecule ligands for application as fluorescent probes*

Arthritis: *NIR fluorochrome Conjugate folate Detect the Folate Receptor- β in activated synovial macrophages*

Cancer targeting fluorescent probe
Antibody-conjugated QDs to target a prostate-specific membrane antigen detected the cancer

Bright light

Fluorescence



Control

Disease

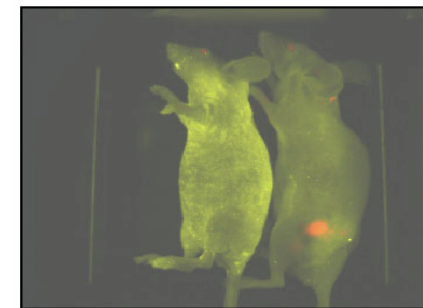
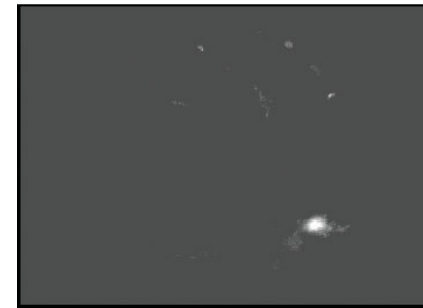
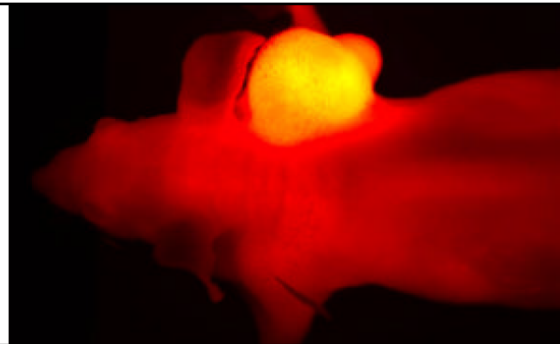
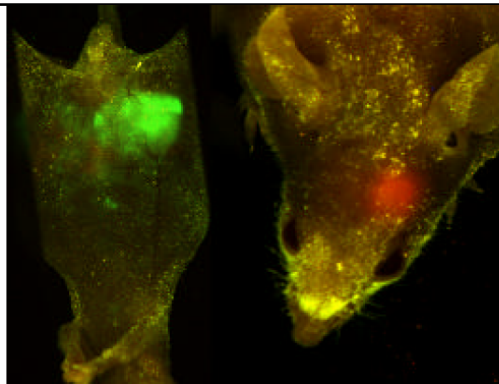


IMAGE EXAMPLES

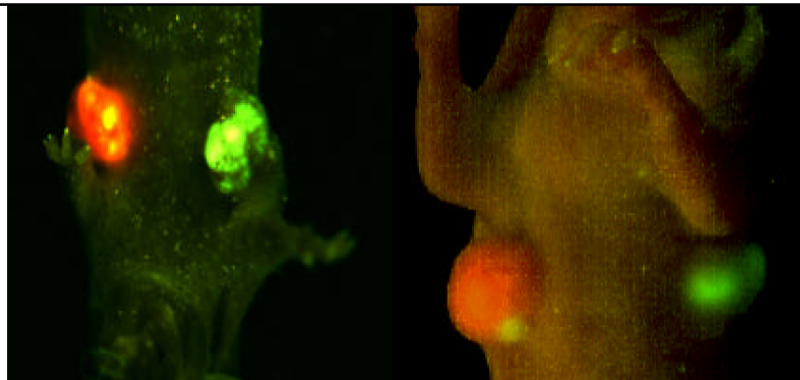
<http://www.lighttools.com/>



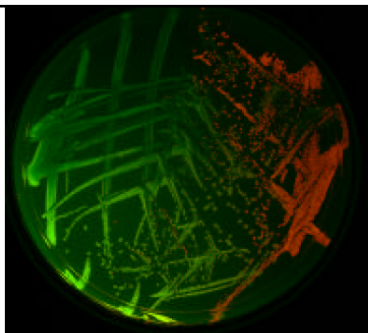
FAST NEAR IR IMAGE of MOVING MOUSE This mouse was injected 24 hours earlier with a Cy5.5 labeled RGD peptide targeted against integrin receptors, which are involved in tumor angiogenesis. This image was recorded with the Macro-Imaging System Plus Cooled, exposure time under a 1/10 sec., Cy5.5 excited at 660/40nm with the Illumatool Dual Lighting System, LT- 99D2. The mouse was not anesthetized. Courtesy of James Bading, Ph.D. Molecular Imaging Laboratory, University of Southern California.



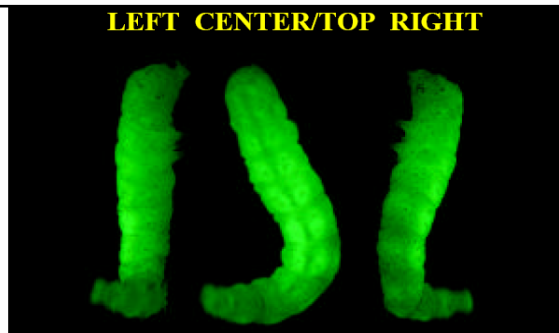
Top image RFP-tumor in brain of nude mouse. Bottom GFP-tumor growing on colon. Both whole body images recorded with the Macro-Imaging System. Excitation light provided by the Illumatool BLS. Courtesy of Anticancer, Inc.



DUAL EMISSION EGFP/RFP-TUMOR in nude mouse. Whole body image recorded with the Macro-Imaging System with a 515nm emission filter. Excitation light 470/40nm provided by the Illumatool BLS. Courtesy of Anticancer, Inc.



DUAL EMISSION. RFP/EGFP expressed in bacteria on culture plate. Recorded with the Marco-Imaging System.



LEFT CENTER/TOP RIGHT
Pan-A-See-Ya Panoramic Imaging System image of GFP expressing worm. Note the top and side views all in a single image. Image recorder in real time with Marco-Imaging System Plus Cooled and the Pan-A-See-Ya Panoramic Imaging System.