PerkinElmer
For the Better

In Vivo Imaging– IVIS Spectrum

活體分子影像系統之原理及其應用

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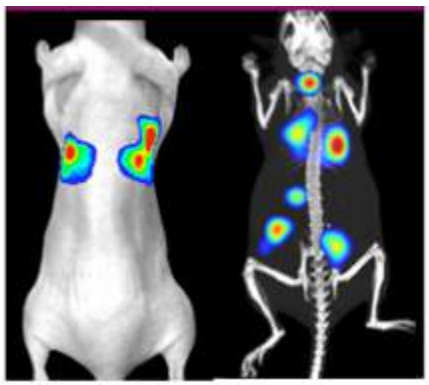
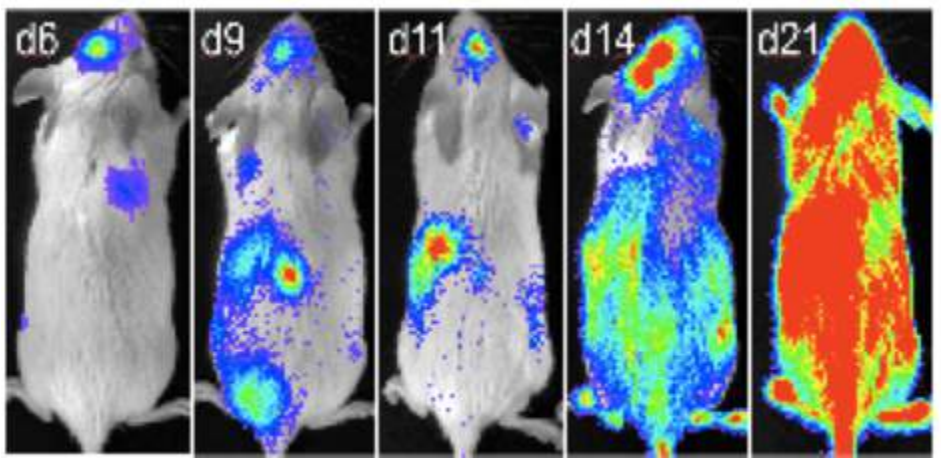
Features

Non-invasive monitoring of disease progression, cell trafficking and gene expression patterns in living animals.

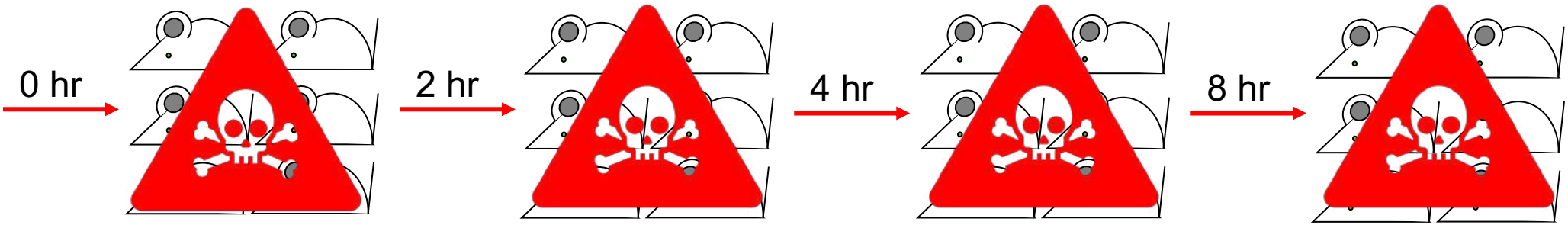


- 2D and 3D **Bioluminescence** imaging.
- 2D and 3D **Fluorescence** Imaging.

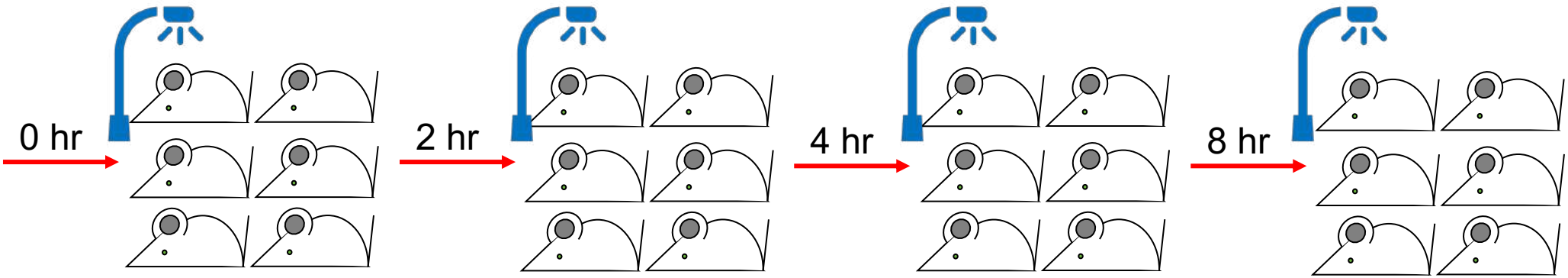


Current vs. BPI methodology

Current Methodology

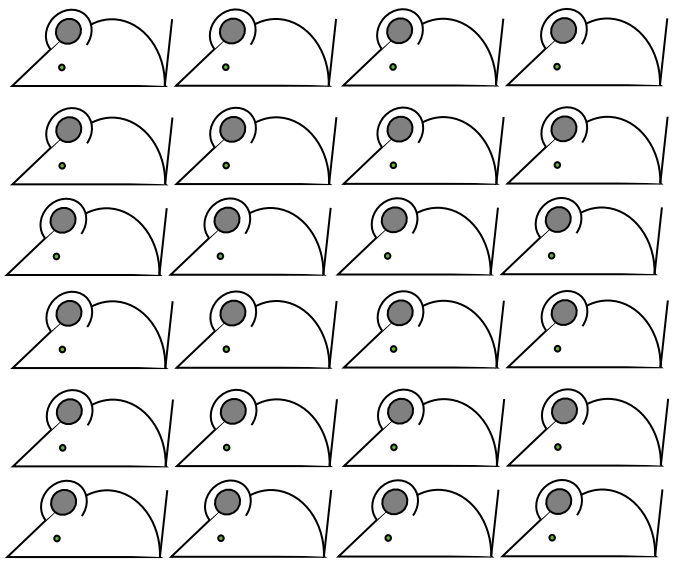


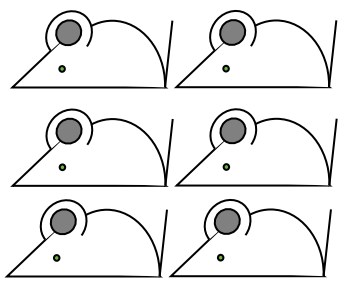
Biophotonic imaging (BPI) Methodology



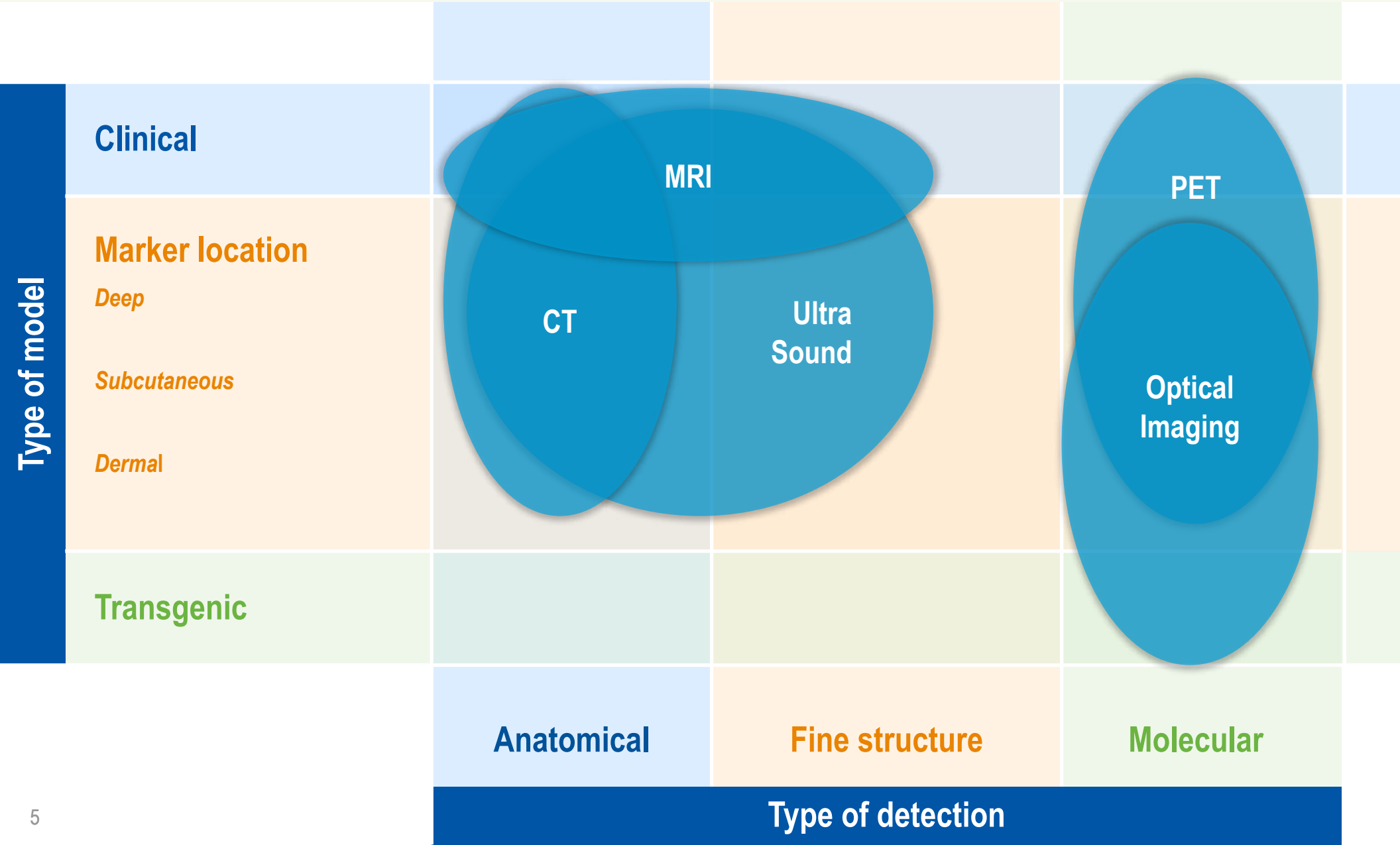
Current vs. BPI methodology

24 VS 6





In Vivo Imaging Landscape



What Will Be Covered?

Introduction

- Principles of Optical In Vivo Imaging
- Key IVIS® Hardware Components
- Overview of Living Image® Software

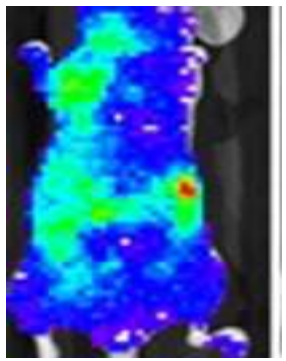
Training

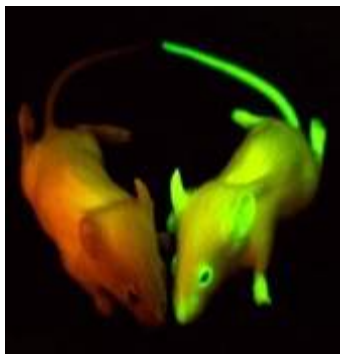
- Hands-on Training

Optical Imaging Approaches

Bioluminescence & Fluorescent Proteins

- Powerful approach using animals/cells with modified genetics
- Uses promoter systems for deep understanding of underlying mechanisms

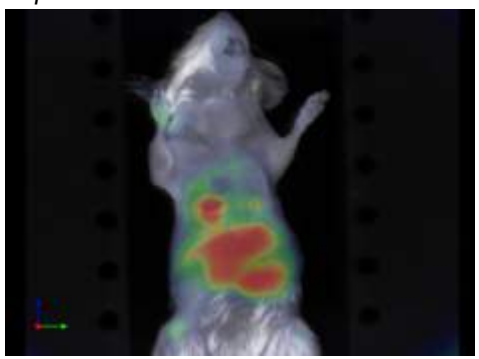




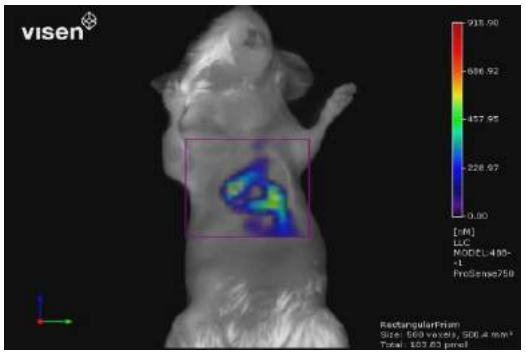
Fluorescent Agents (Red/NIR)

- Standard disease biology/models
- Injectable drug-like imaging agents to view biology

Epifluorescence

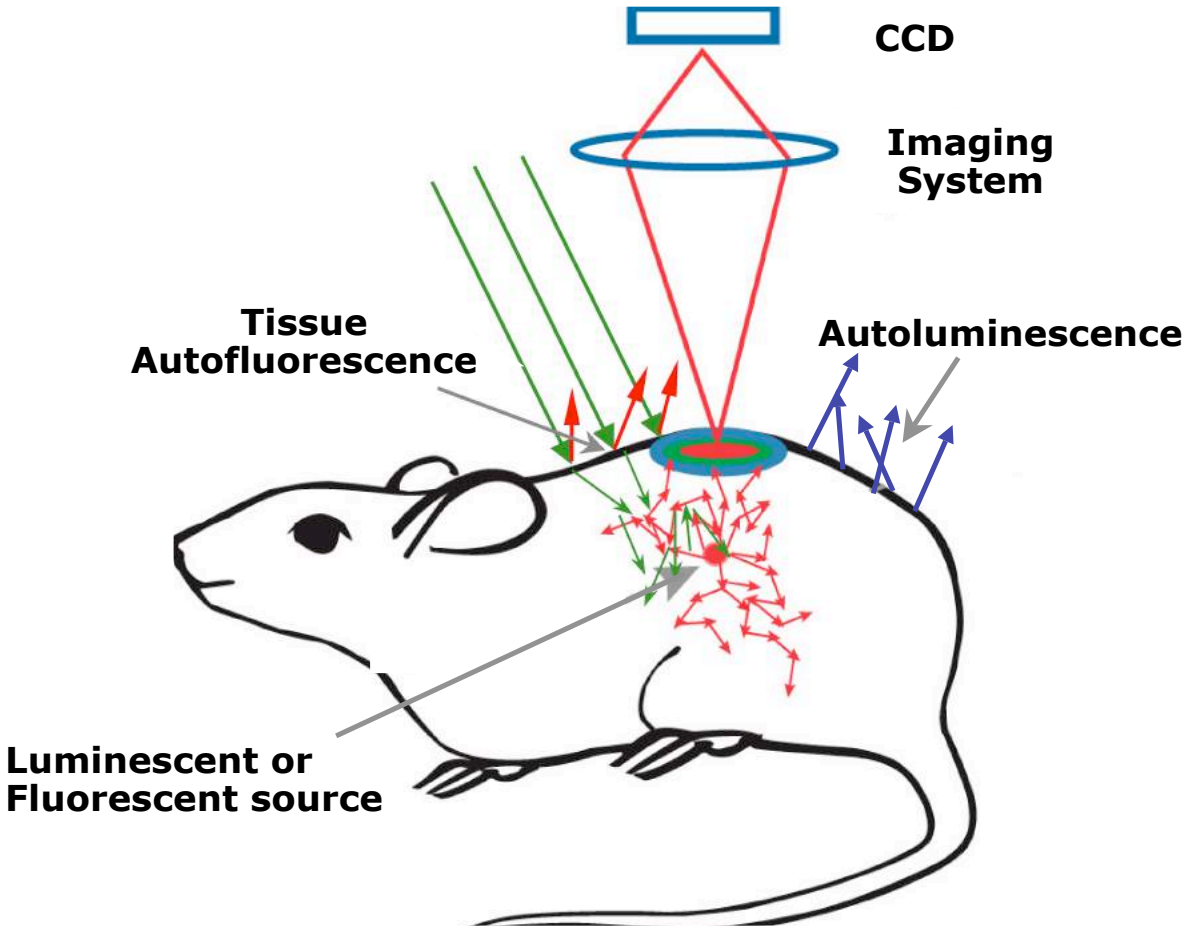


Tomography

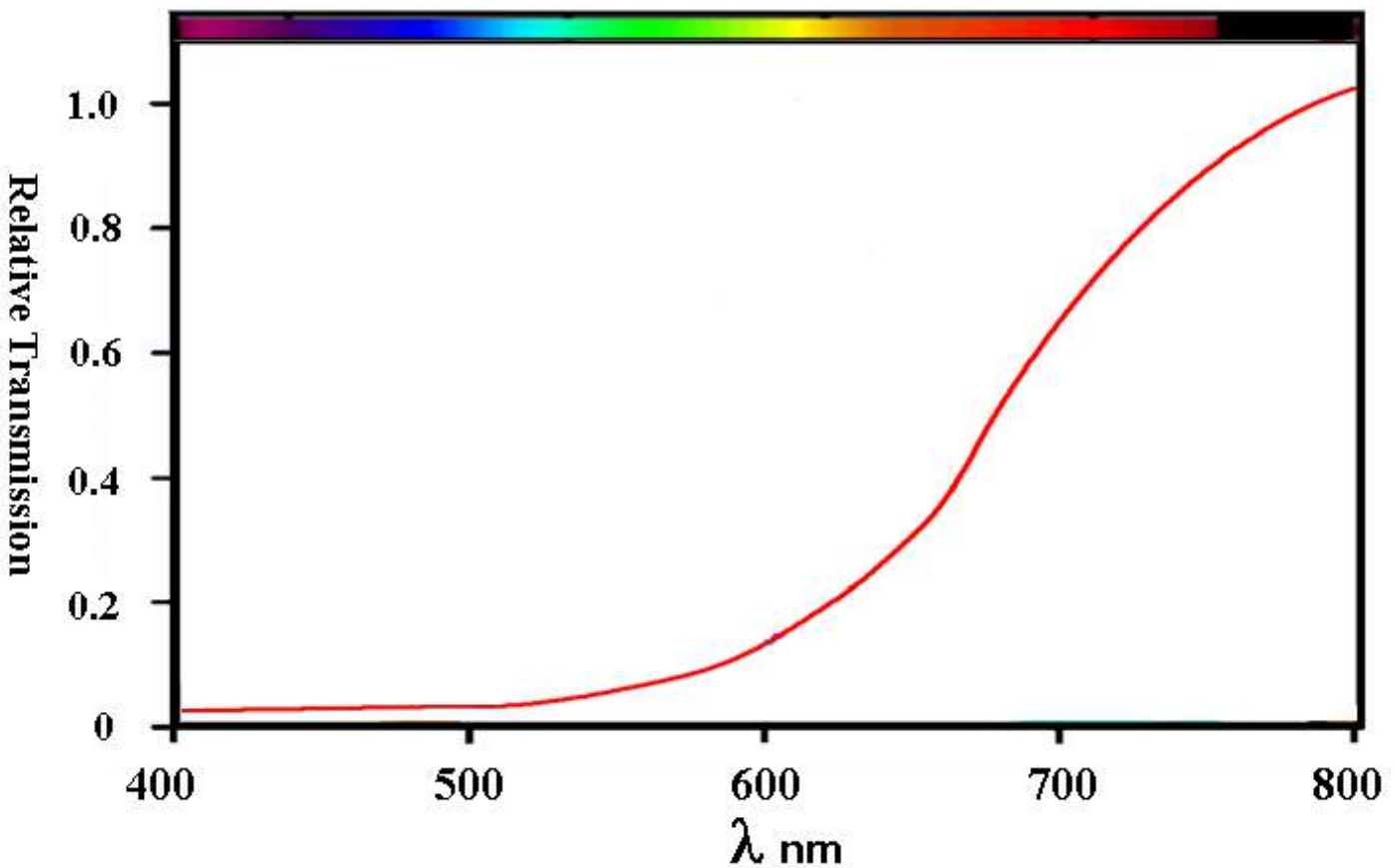


The physics of light in tissue

- Photons are absorbed and scattered in tissue
- Surface signal depends on source depth
- Tissue is both autoluminescent and autofluorescent
- Autofluorescence levels are much higher than autoluminescence

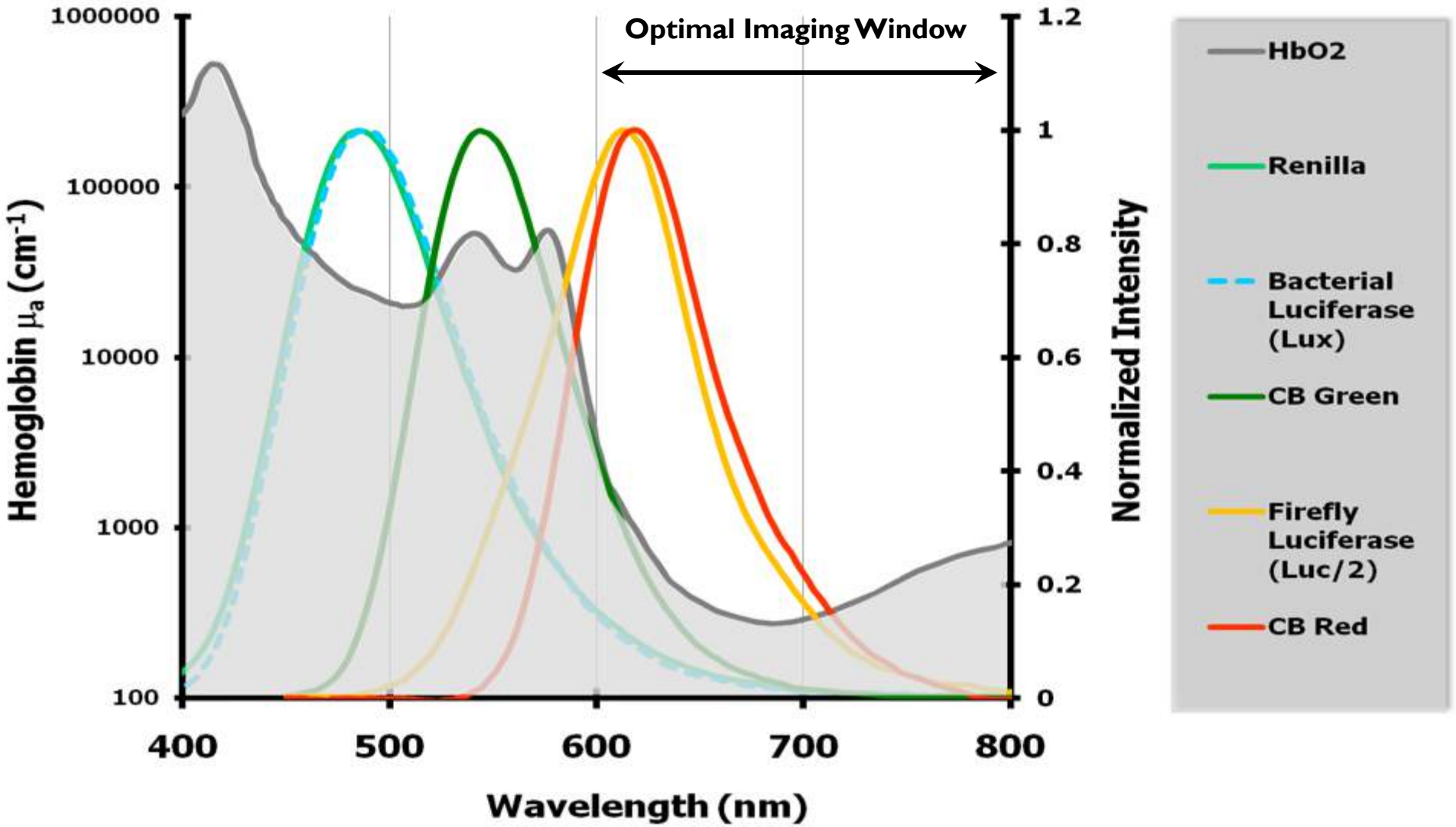


Tissue Is Not Transparent – Light Absorbance Depends on Wavelength

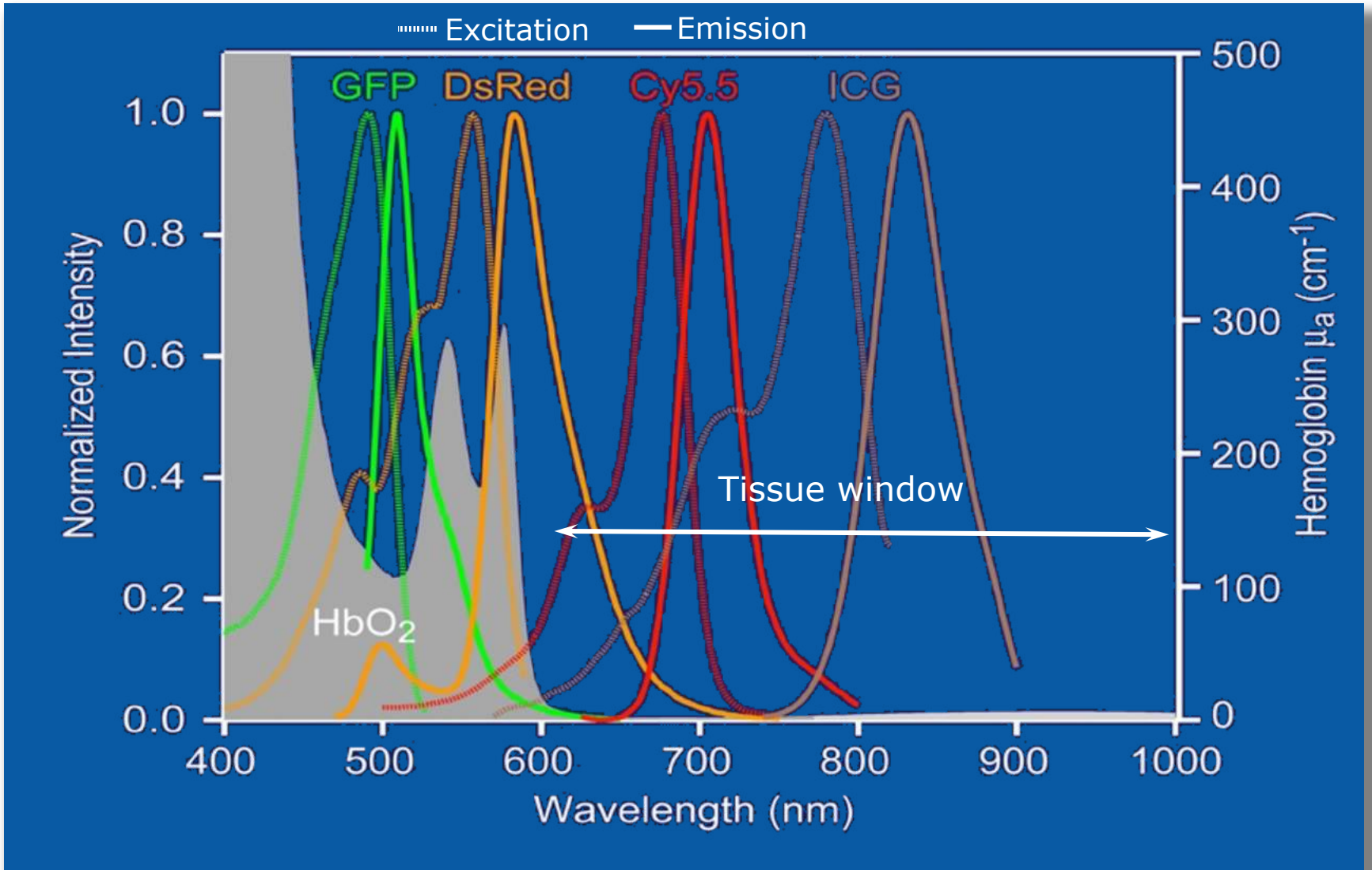


Transmission of light through 1 cm of tissue

Bioluminescent Spectra and Tissue Penetration



Emission Spectra of Common Fluorophores



Why Optical In Vivo Imaging?

- Non-invasive
  Does not require subject to be euthanized
- High throughput
  IVIS spectrum take 10 mice at one time
- Multi-function
  Bioluminescence、fluorescence & Cherenkov
- Easy for operation

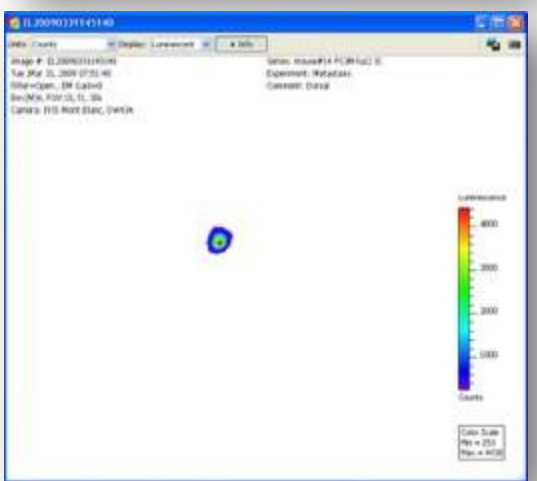
IVIS® Spectrum

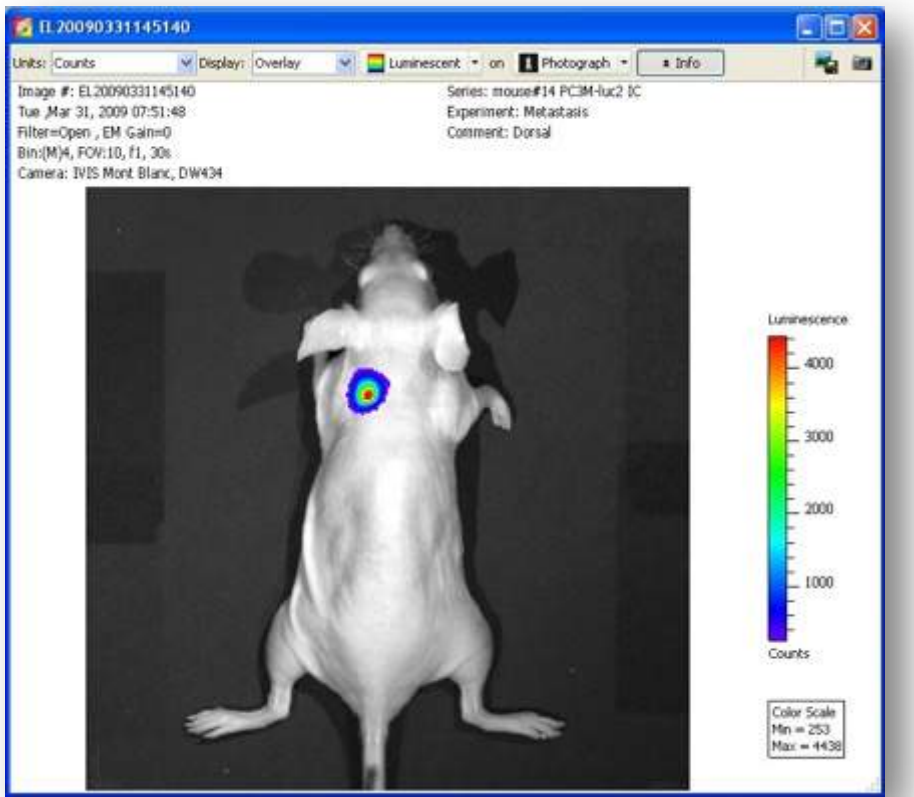
- High sensitivity CCD for bioluminescence or fluorescence imaging
- High throughput with 23 cm field of view
- 28 filters, wavelength ranges from 490 – 850 nm
- Reflection (Epi)- or transmission-mode fluorescence
- Ideal for imaging multiple probes/reporters
- Software controlled settings and analysis tools

Living Image® Software

- **Controls all settings** in the IVIS® system (fully computer controlled)
- Provides advanced cataloging and browsing tools
- Provides analysis tools for quantification
- Instrument settings are analogous to photography
- Images are acquired in a two-step process

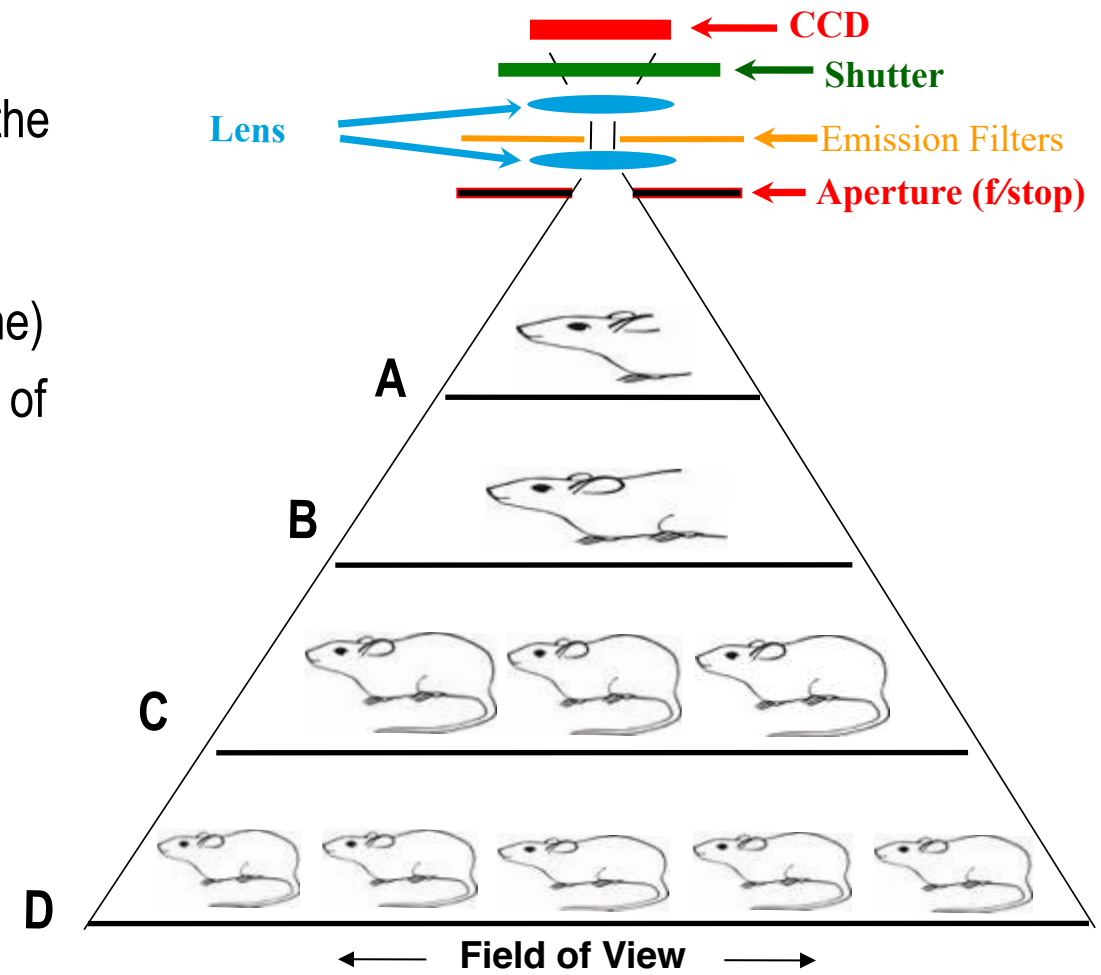
Photographic + Luminescent = Overlay



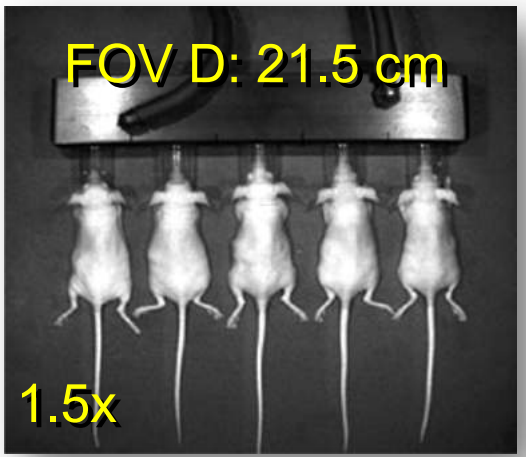


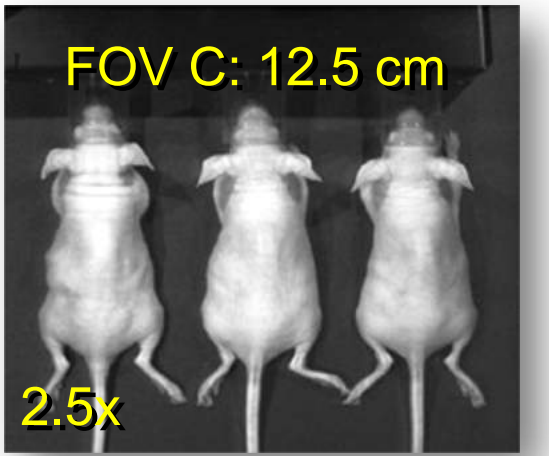
Camera and Lens Settings are Analogous to Photography

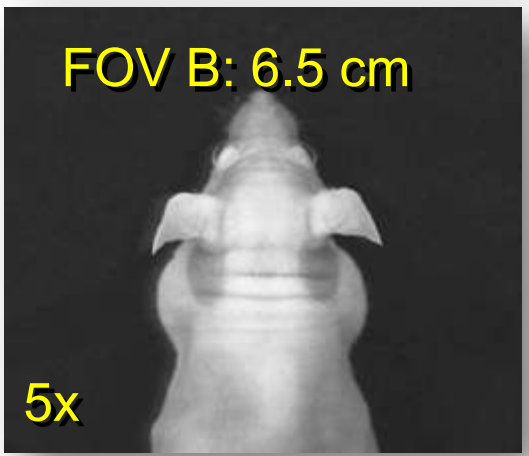
- Field of View (FOV) is dependent on the distance from the lens to the sample
- Light collected is proportional to how long the shutter is open (exposure time)
- Aperture (*f*/stop) controls the amount of light collected
- Digital pixel binning is possible on the CCD – alters sensitivity/resolution

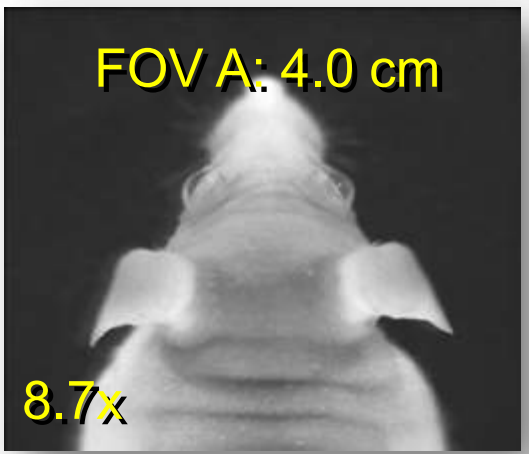


Field of View Options







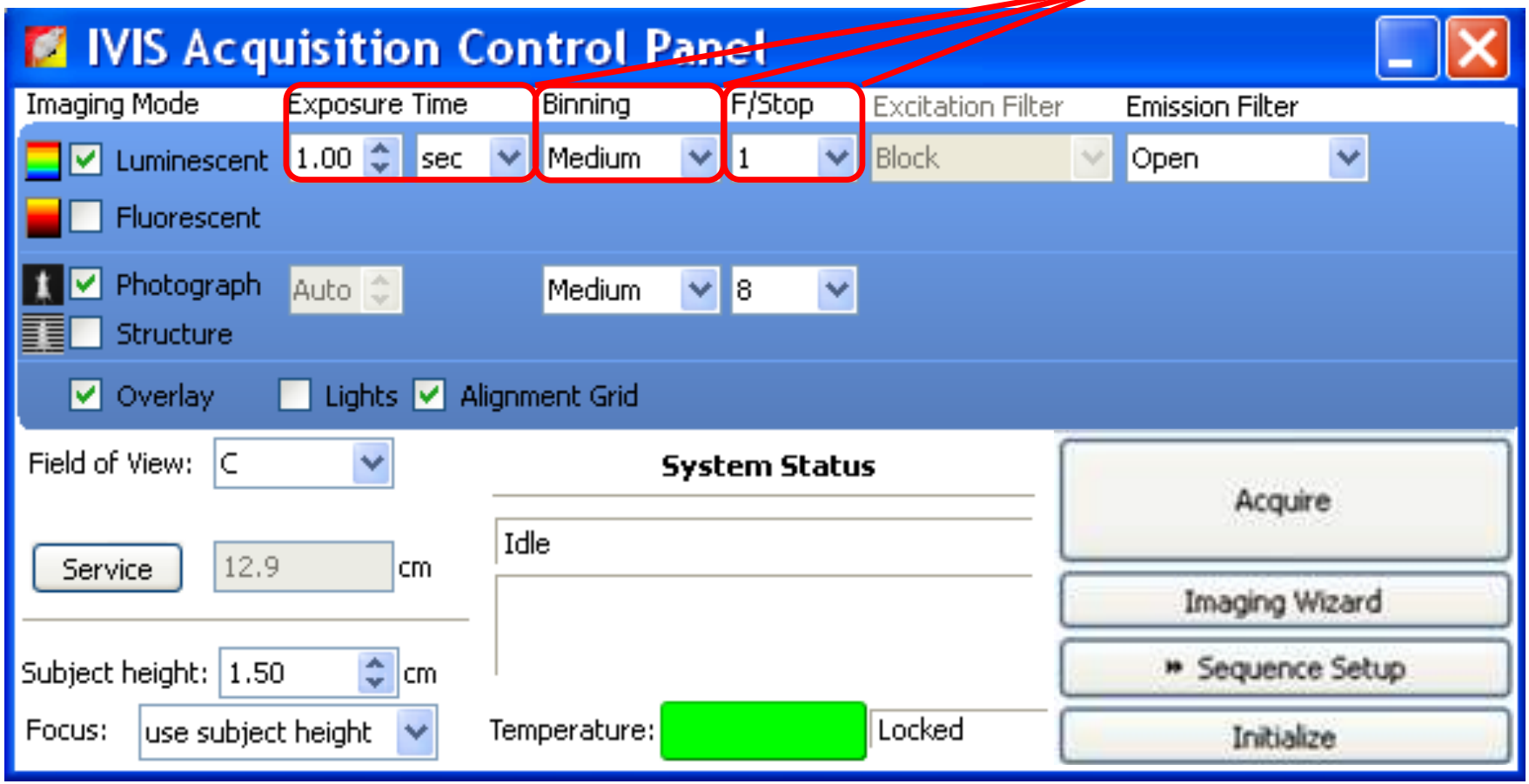


Setting Sensitivity – Signal Level

- The IVIS® CCD camera has a raw signal range of 0 to 65,535 Analog to Digital counts (2^{16} or 16-bit)
- Adjust camera settings to obtain a signal level of **600 to 60,000 counts** to be within the linear range of the detector
- Settings that control signal level are:
  - Exposure time
  - Pixel binning (CCD resolution)
  - *f*/stop (aperture)
- Instrument is calibrated to automatically compensate for changes in sensitivity settings when count levels are within the linear range

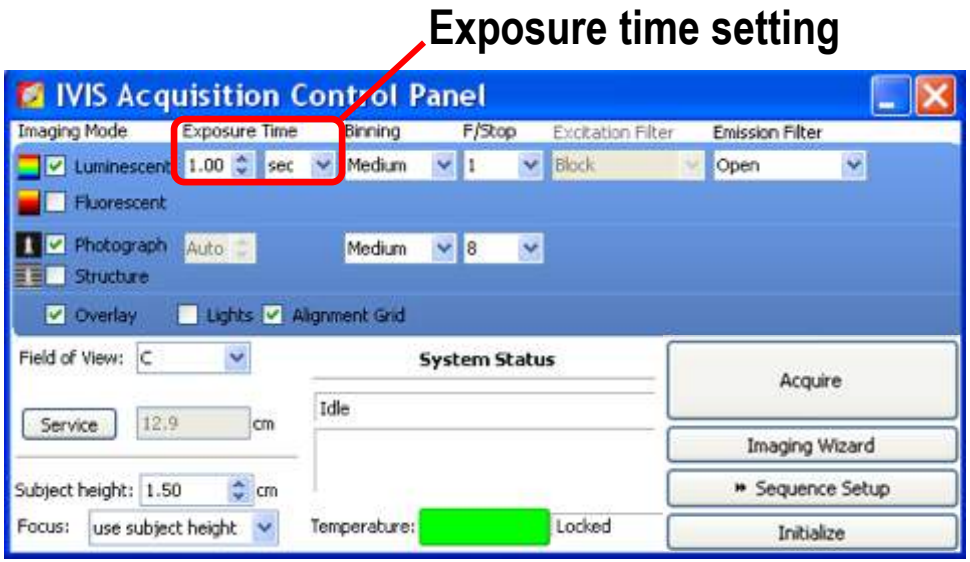
Living Image® Control Panel

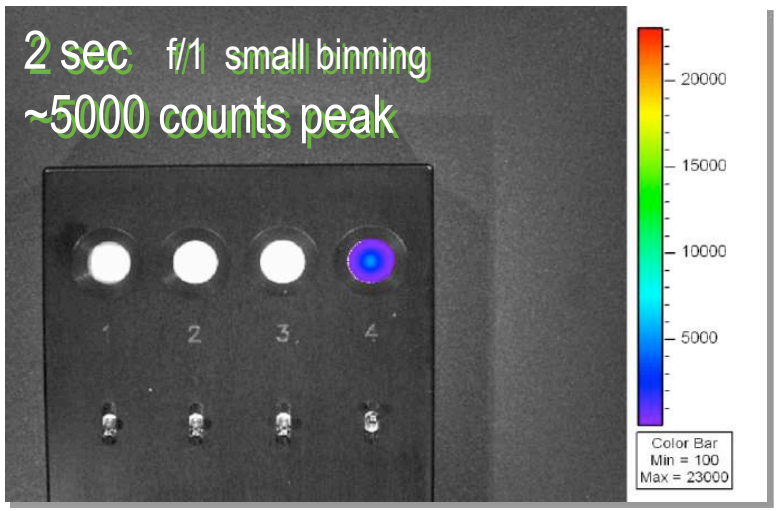
Controls Sensitivity

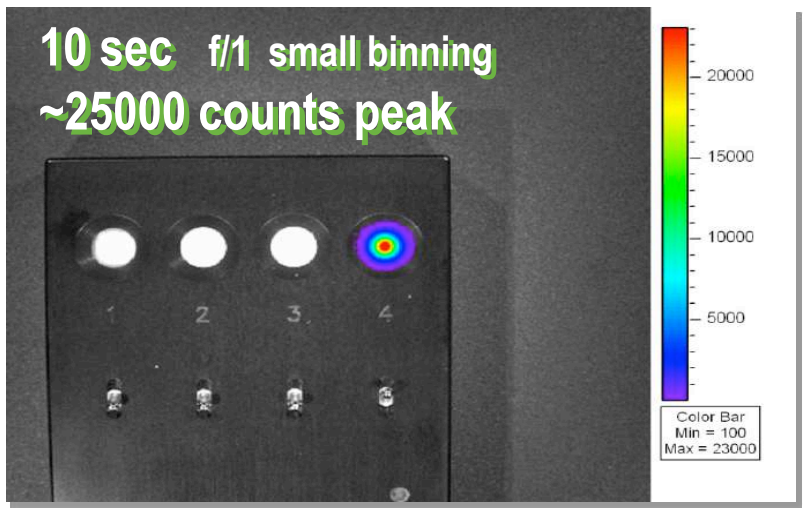


Exposure Time

- Signal level is directly proportional to exposure time (1:1)
- Shorter exposure time improves throughput
- Recommended minimum exposure time > 0.5 seconds
- Longer exposure times increase signal intensity
- Recommended maximum exposure time < 5 minutes



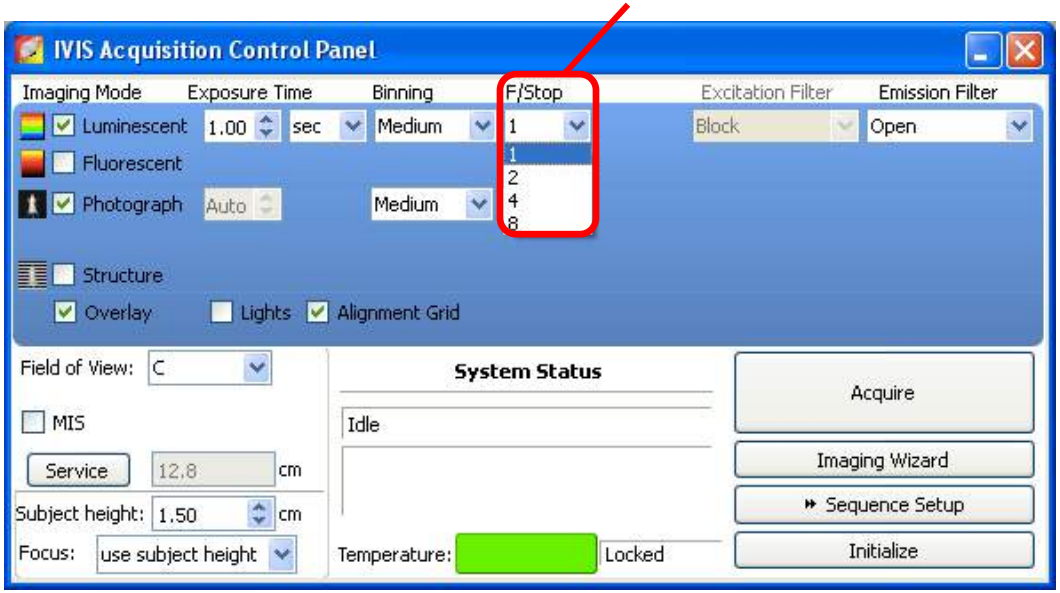




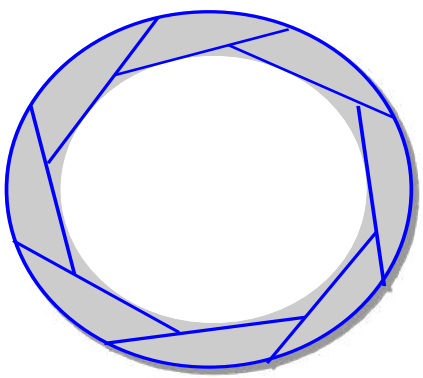
f/stop (Lens Aperture)

- *f*/stop controls the amount of light received by the CCD detector
- *f*/1 is wide open, maximum light collection – default for luminescent
- *f*/8 is smallest aperture, best resolution – default for photo
- Changing f/stop changes counts by a factor of 4

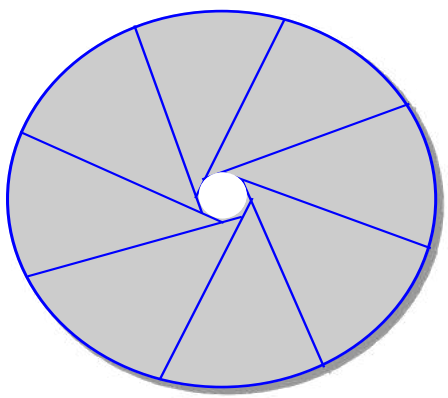
***f*/stop (aperture) setting**



***f*/1**

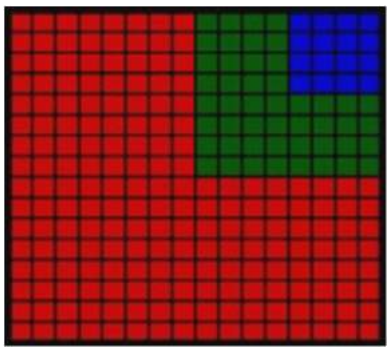


***f*/8**

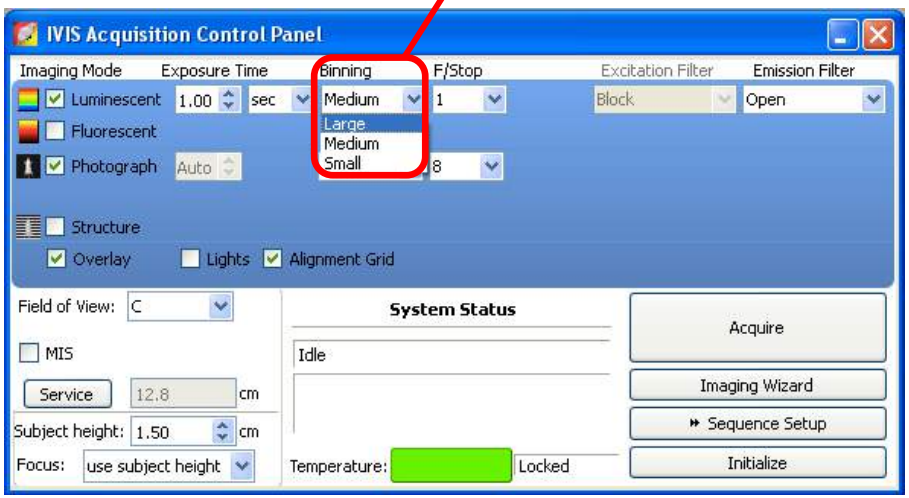


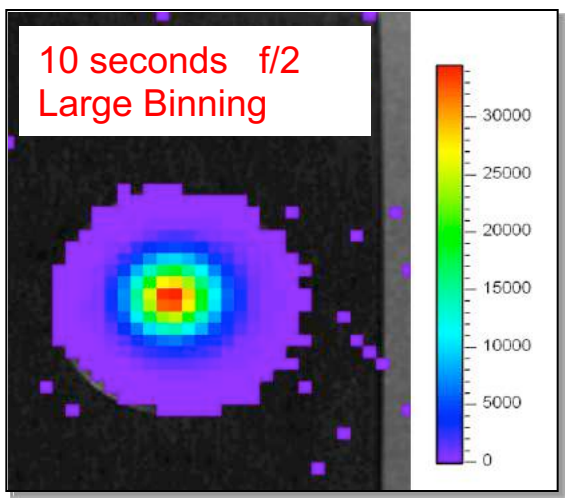
Pixel Binning (CCD Resolution)

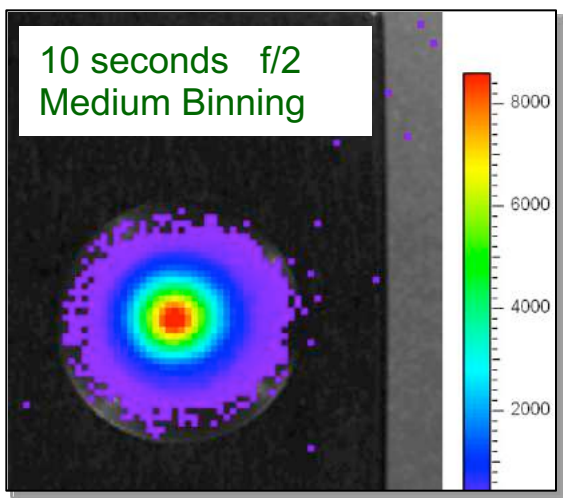
- Binning refers to the grouping of pixels into a larger super-pixel
- Changing binning settings changes counts by a factor of 4
- Large Binning (16)
  Higher Sensitivity/Lower Resolution
- Medium Binning (8)
- Small Binning (4)
  Lower Sensitivity/Higher Resolution

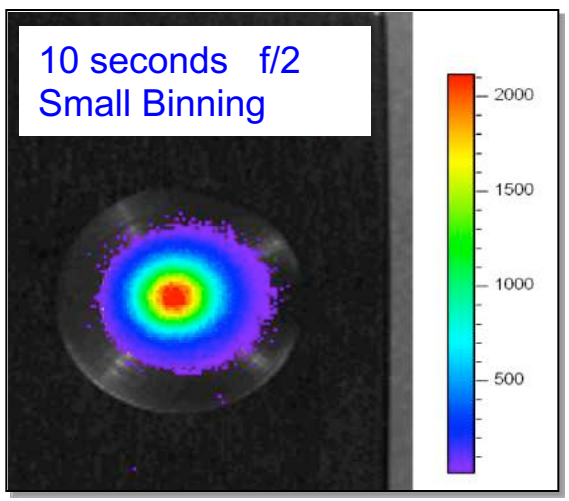


Pixel binning setting



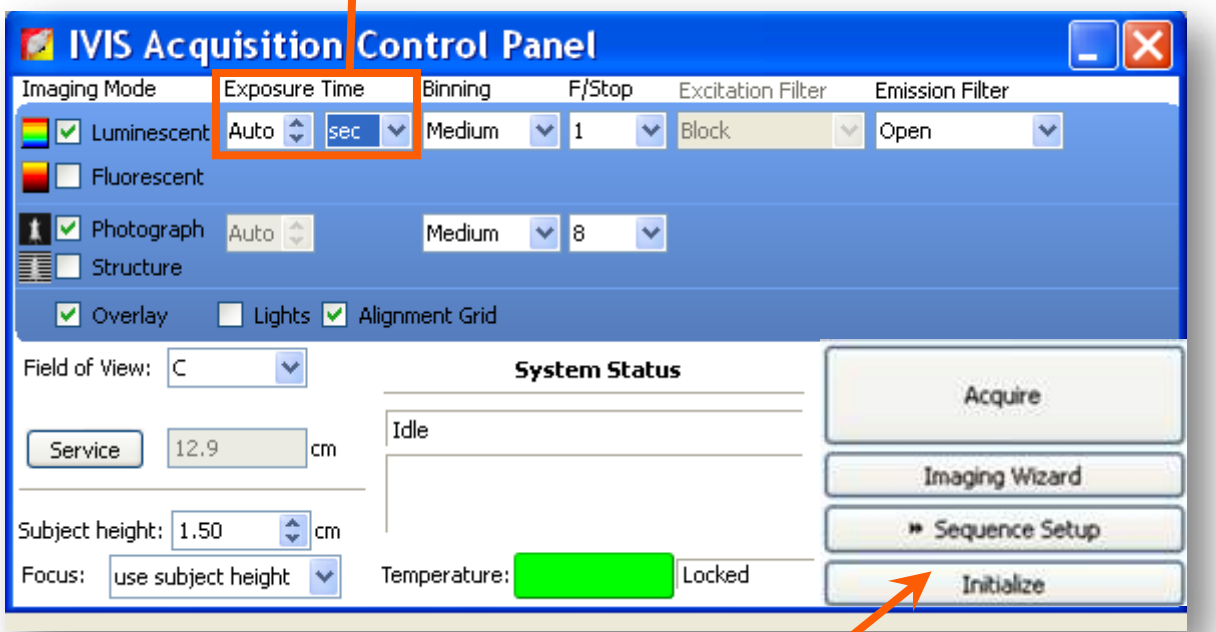






Auto-Exposure

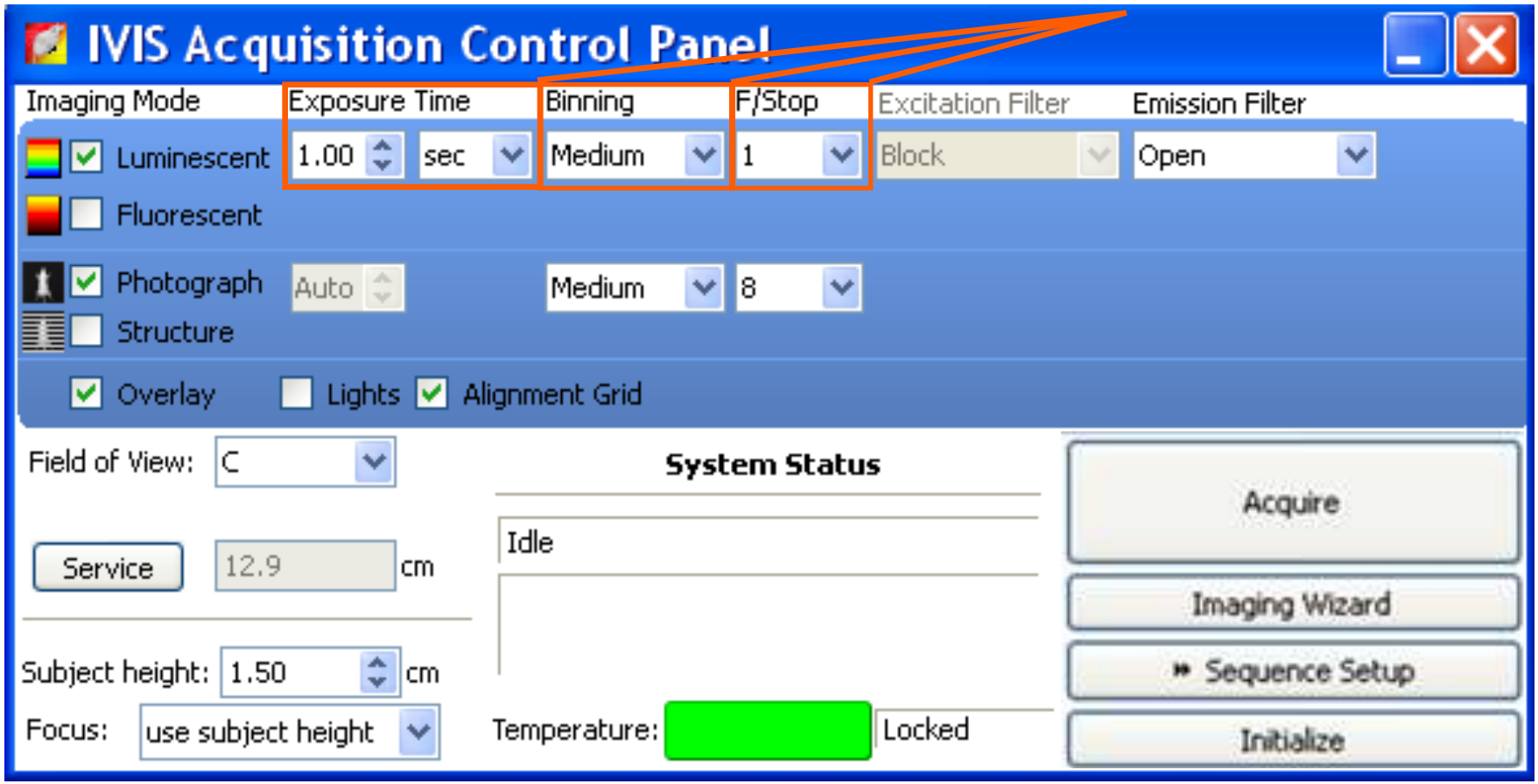
Auto-exposure feature available for bioluminescence and fluorescence



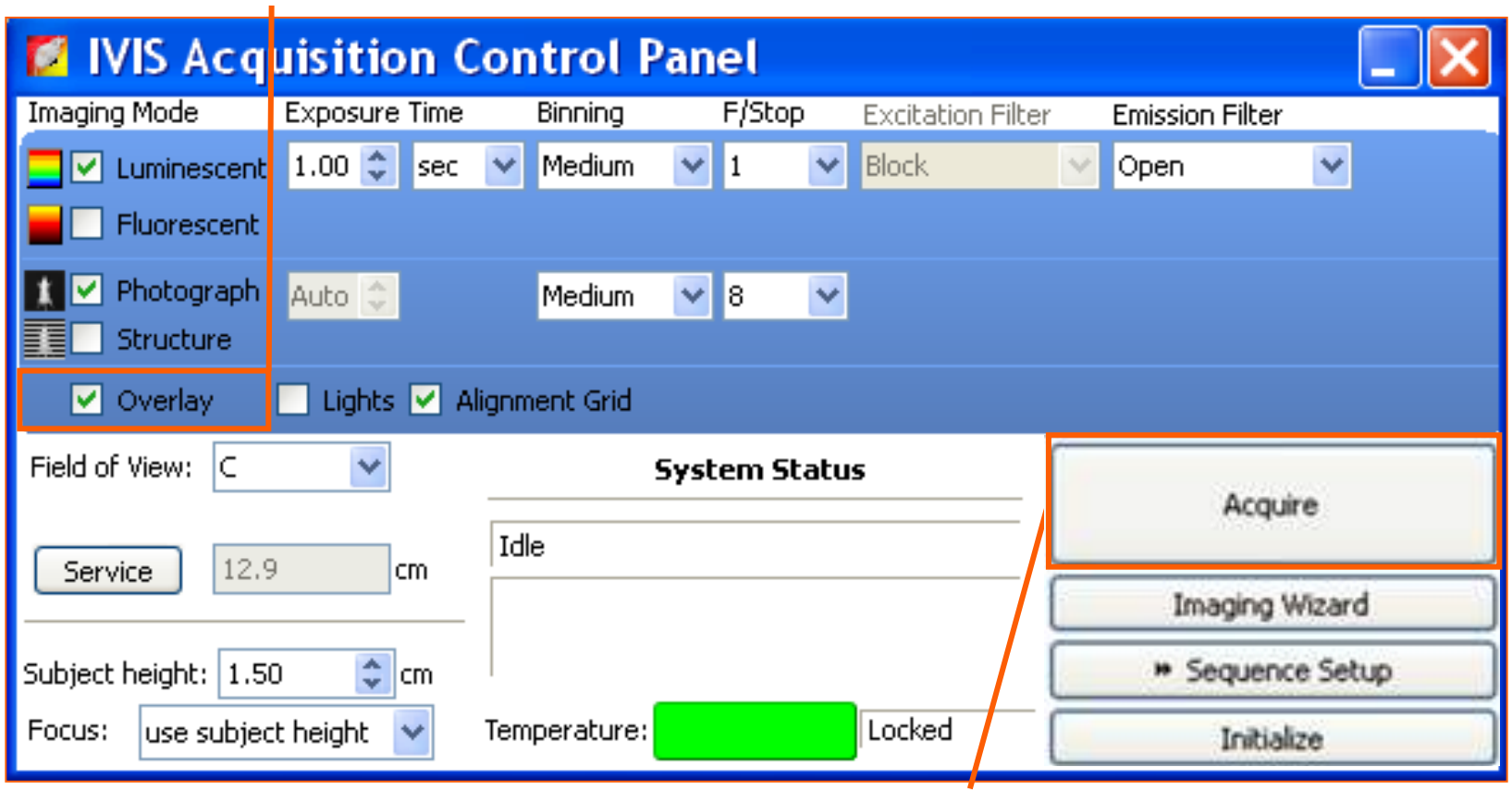
User definable settings

Summary – Basic Camera Settings

Controls Sensitivity



Overlay will automatically take Photo + Luminescent

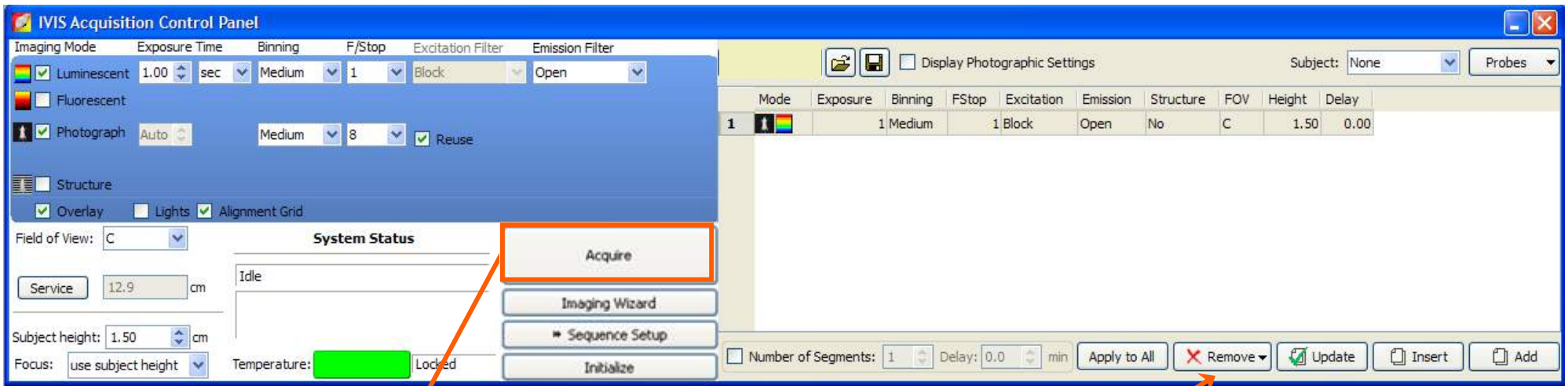


Single Image Acquisition

Sequence (or Imaging Wizard) Acquisition

Allows automatic acquisition of a series of images separated by fixed time points.

(useful option for kinetic studies and DLIT 3D reconstruction)



Starts Sequential Image Acquisition

User Friendly Sequence Editor

Living Image

- User-friendly interface
- Setup wizards assist in option selections
- Auto-exposure assists in selecting the best exposure settings
- Newly-expanded probe library

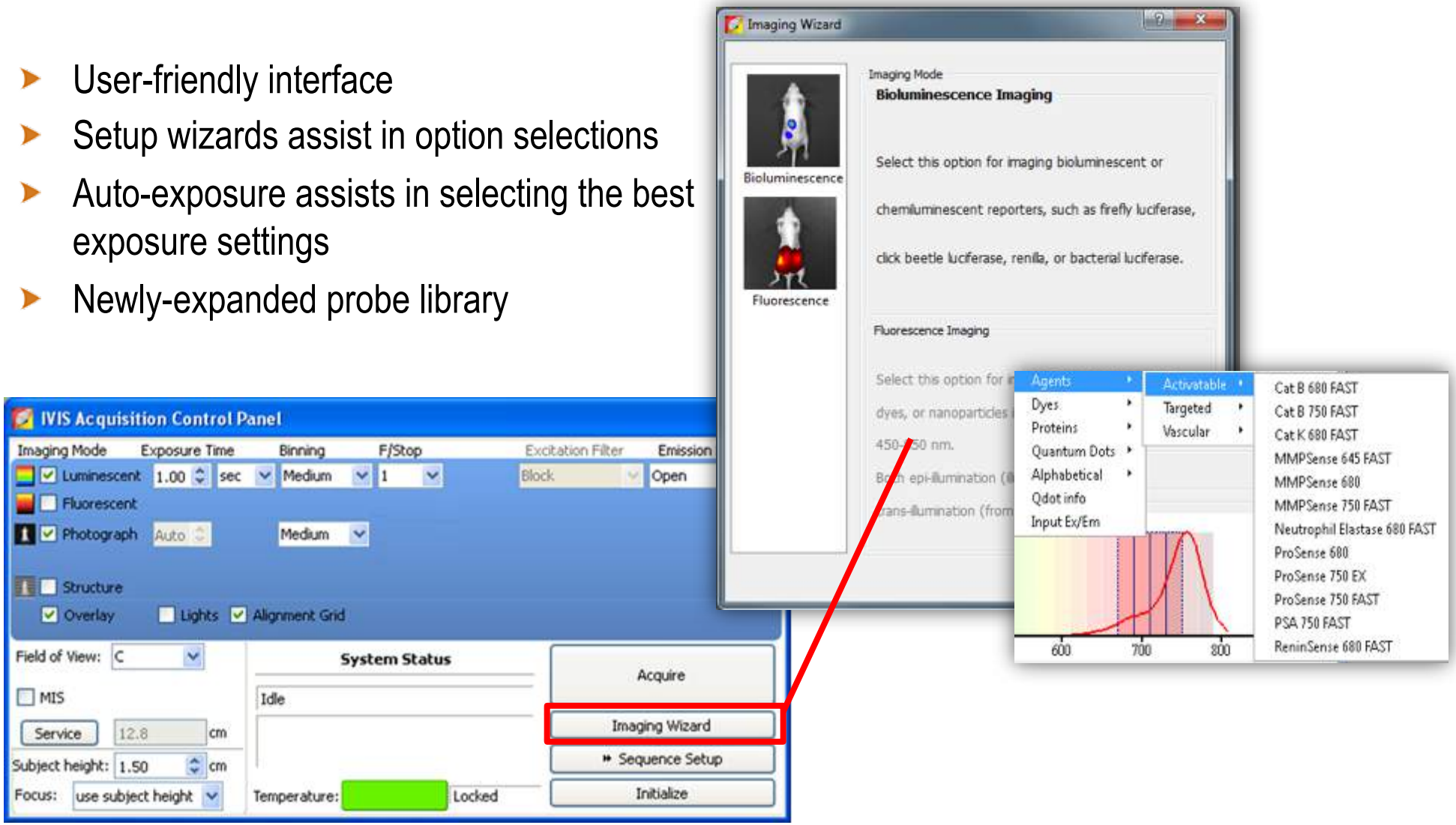


Image Labeling

- Good labeling practices are necessary for effective data browsing
- Easily label your image while acquisition is taking place

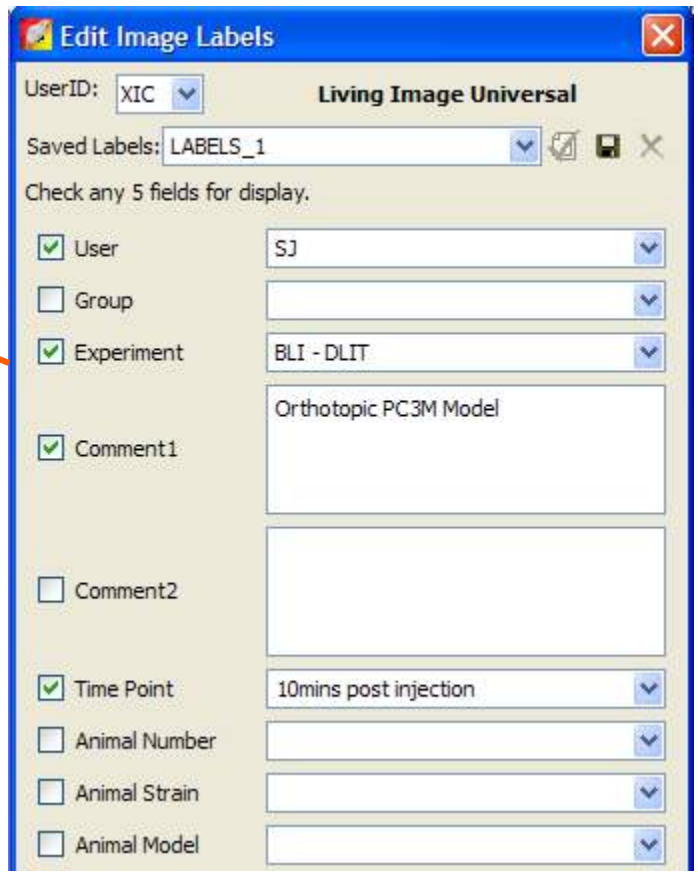
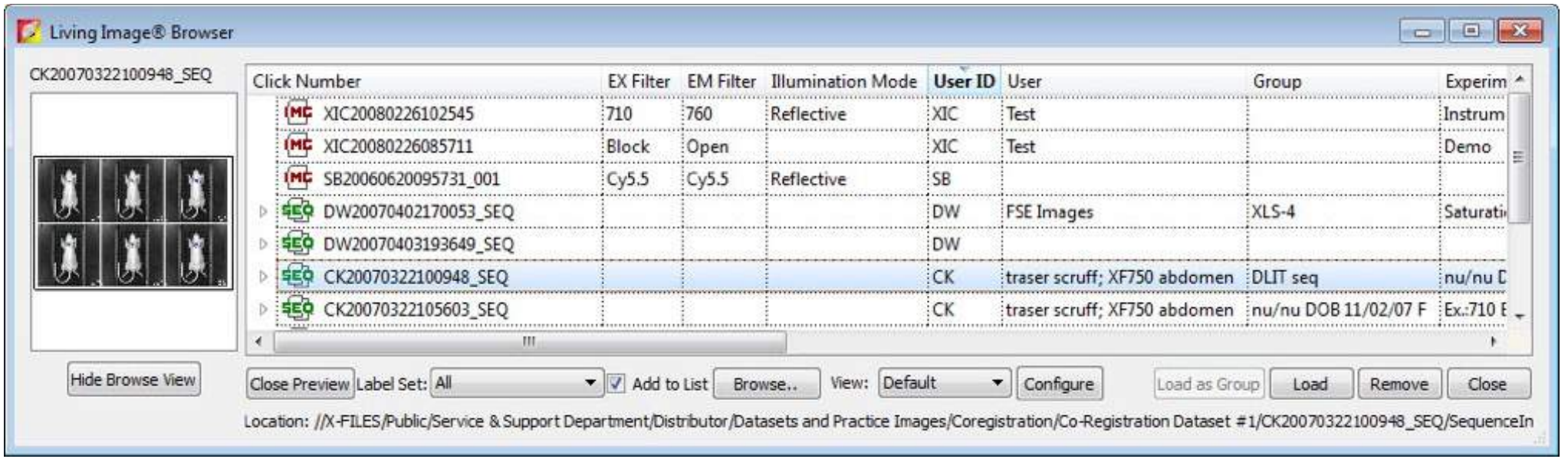


Image Cataloging and Browsing Tools

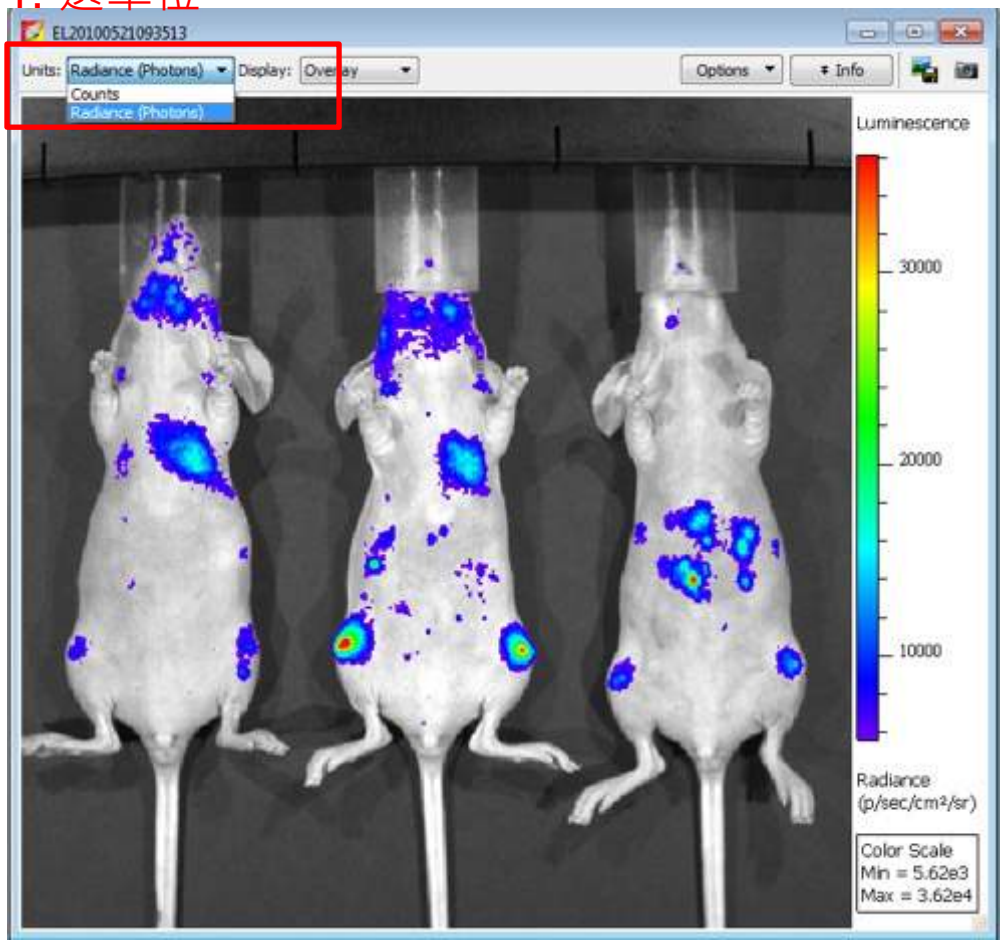


- Convenient preview window
- User defined labels listed with corresponding click number
- Sort by one or multiple columns
- Open multiple images in a single window for easier analysis with Load as Group

Quantification

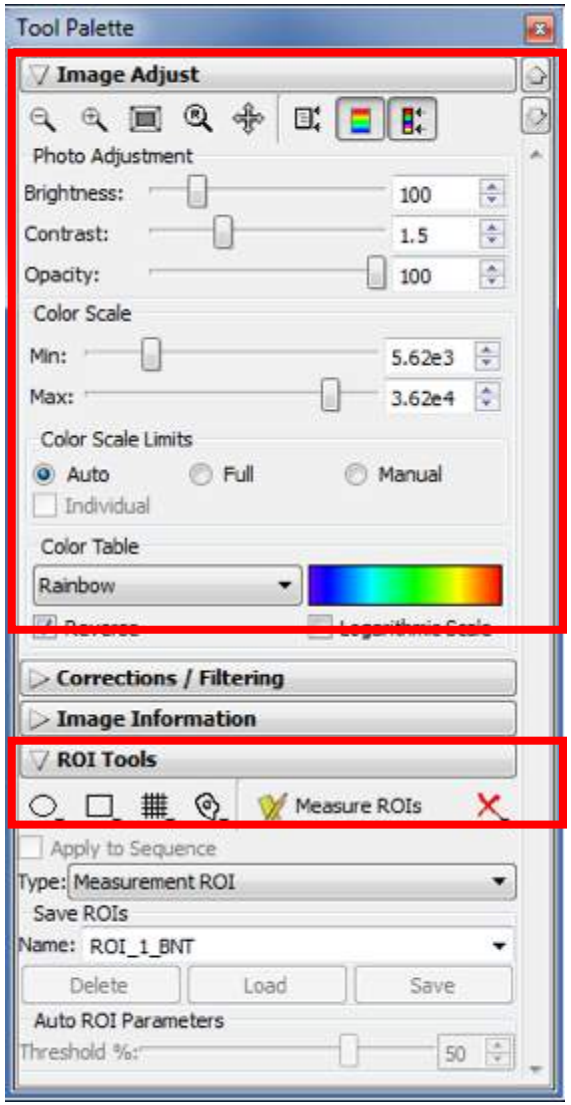
- Tool palette for adjusting scale/opacity etc.
- Region of interest (ROI) tools to measure surface intensities

1. 選單位



2. 調整 scale

3. 畫ROI

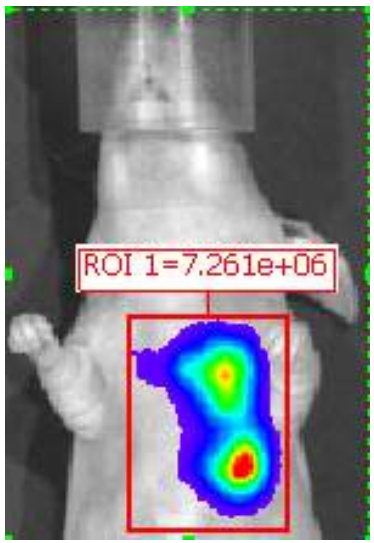


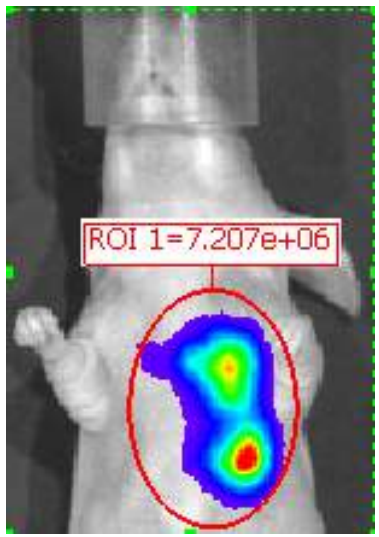
Region of Interest (ROI) Tools

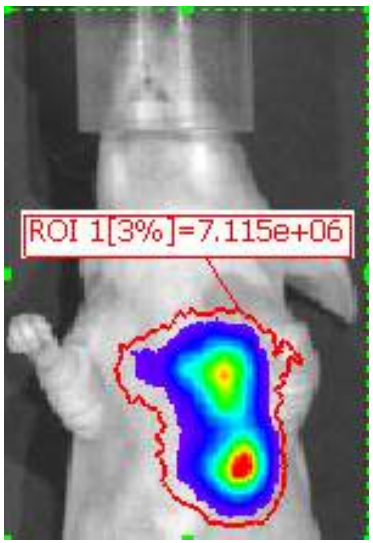
- ROI shapes available:
  - Square
  - Circle
  - Contour
  - Grid

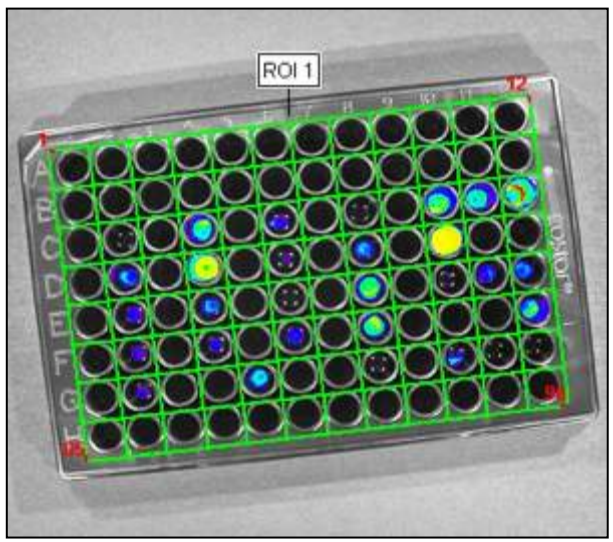
ROI's can be created:

- Manually
- Automatically
- Free Draw

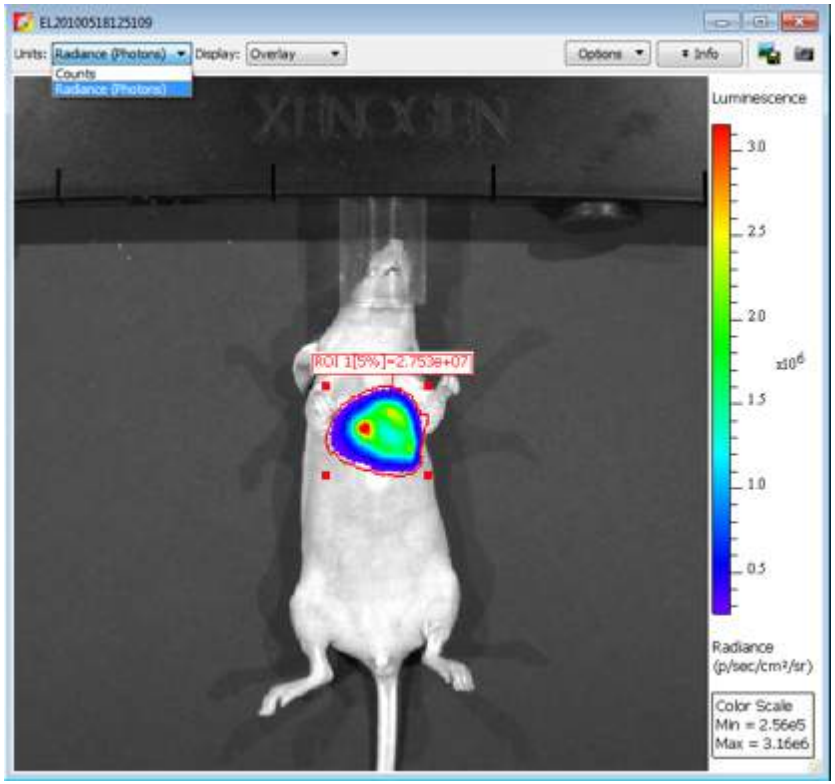


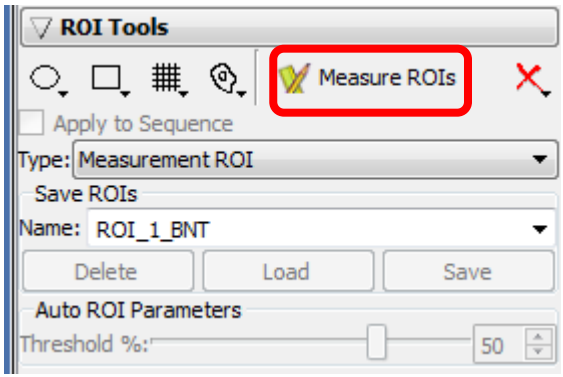




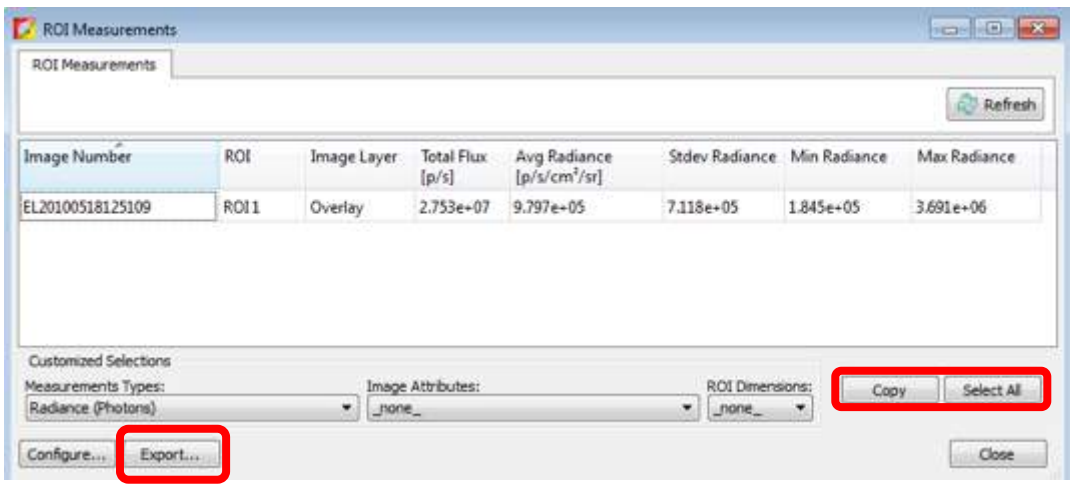


Measurement Table



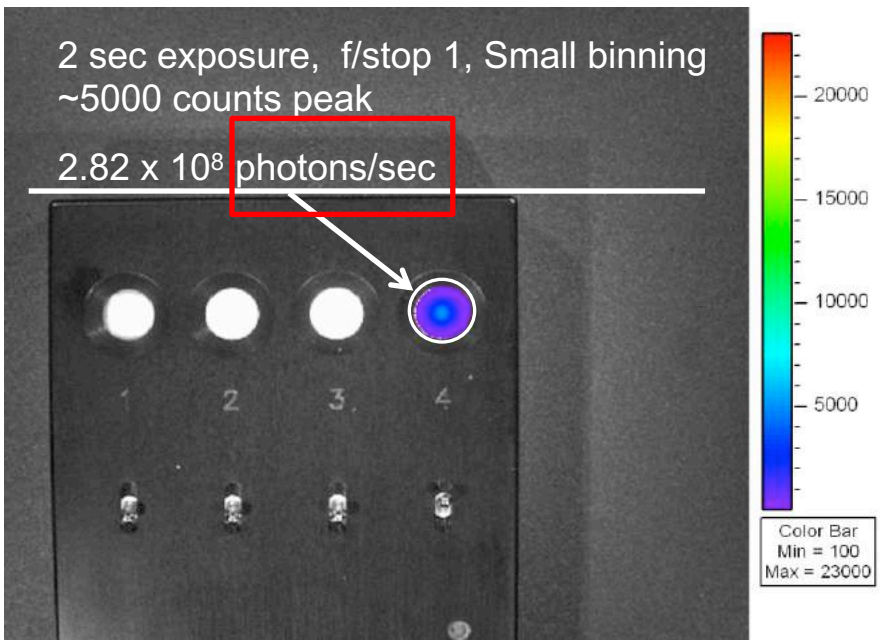


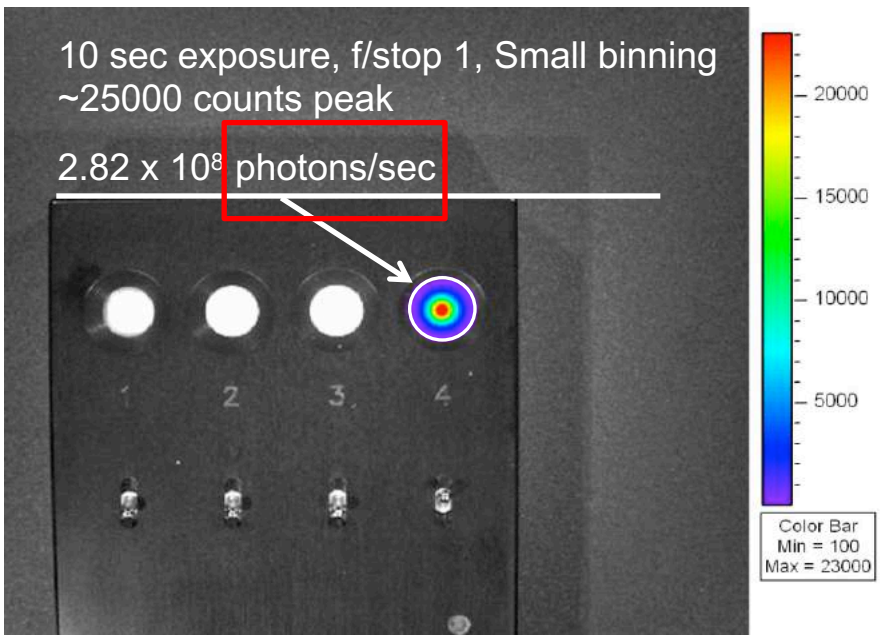
- Measurement table displays information about each Region of Interest (ROI)



Calibrated Physical Units

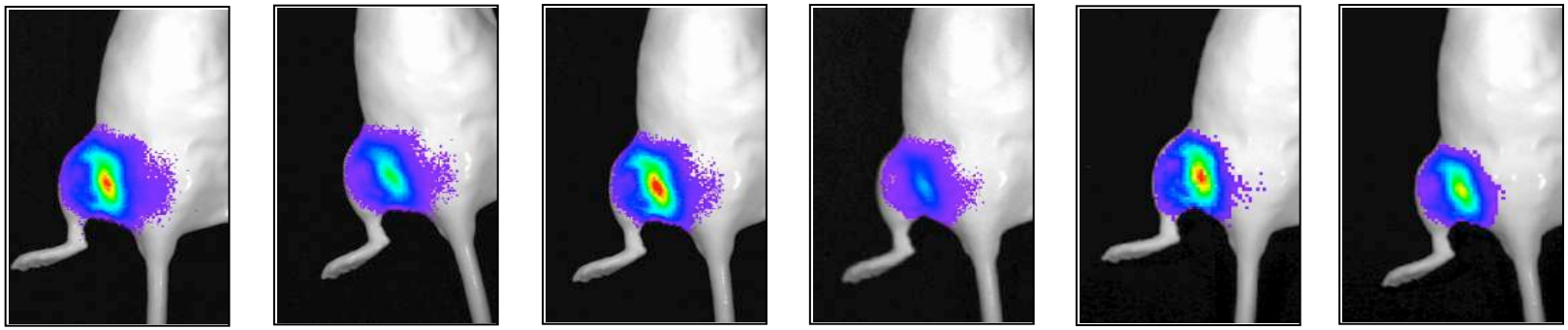
- Living Image® automatically compensates for device settings: Exposure time, *f*/stop, binning and field of View.
- Calibrated units are Photons per Second, representing the flux radiating omni-directionally from a user-defined region





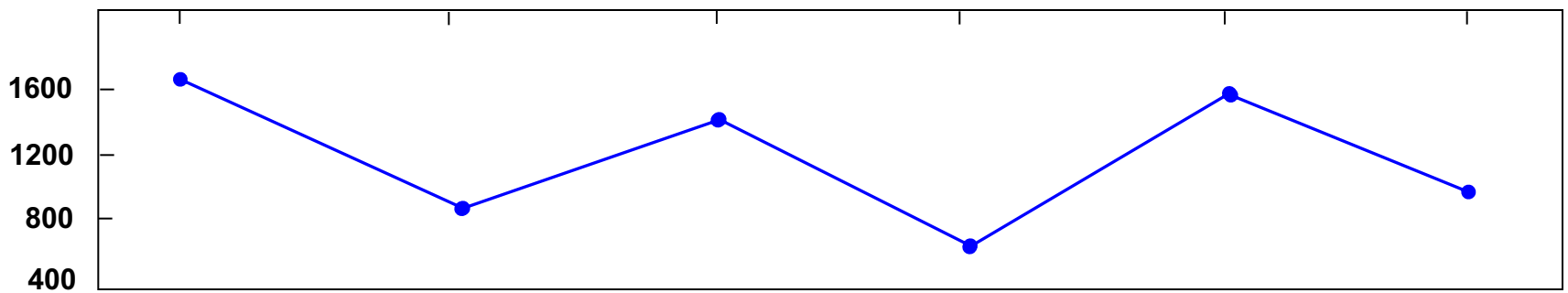
Calibrated Physical Units vs. Raw Signal

Raw Signal (*Counts*)



Exp time:	30 sec	30 sec	60 sec	60 sec	60 sec	60 sec
Binning:	small	small	small	small	medium	medium
Day:	1	2	3	4	5	6

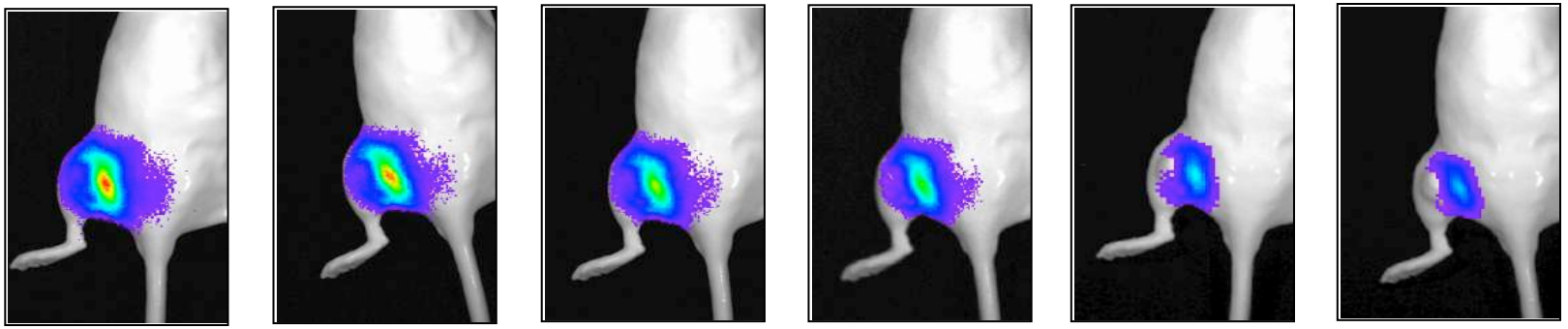
Peak Counts



Calibrated Physical Units vs. Raw Signal

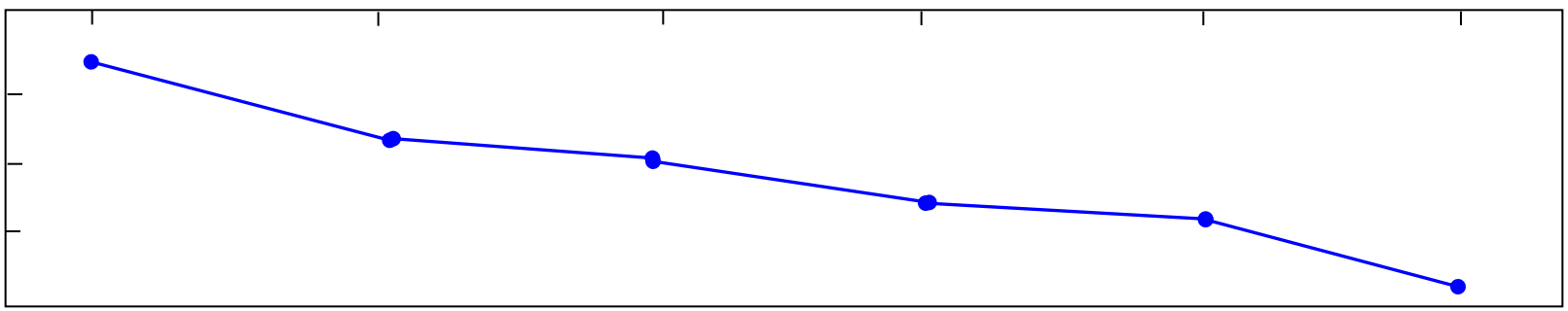
Calibrated Signal

(Photons per second)

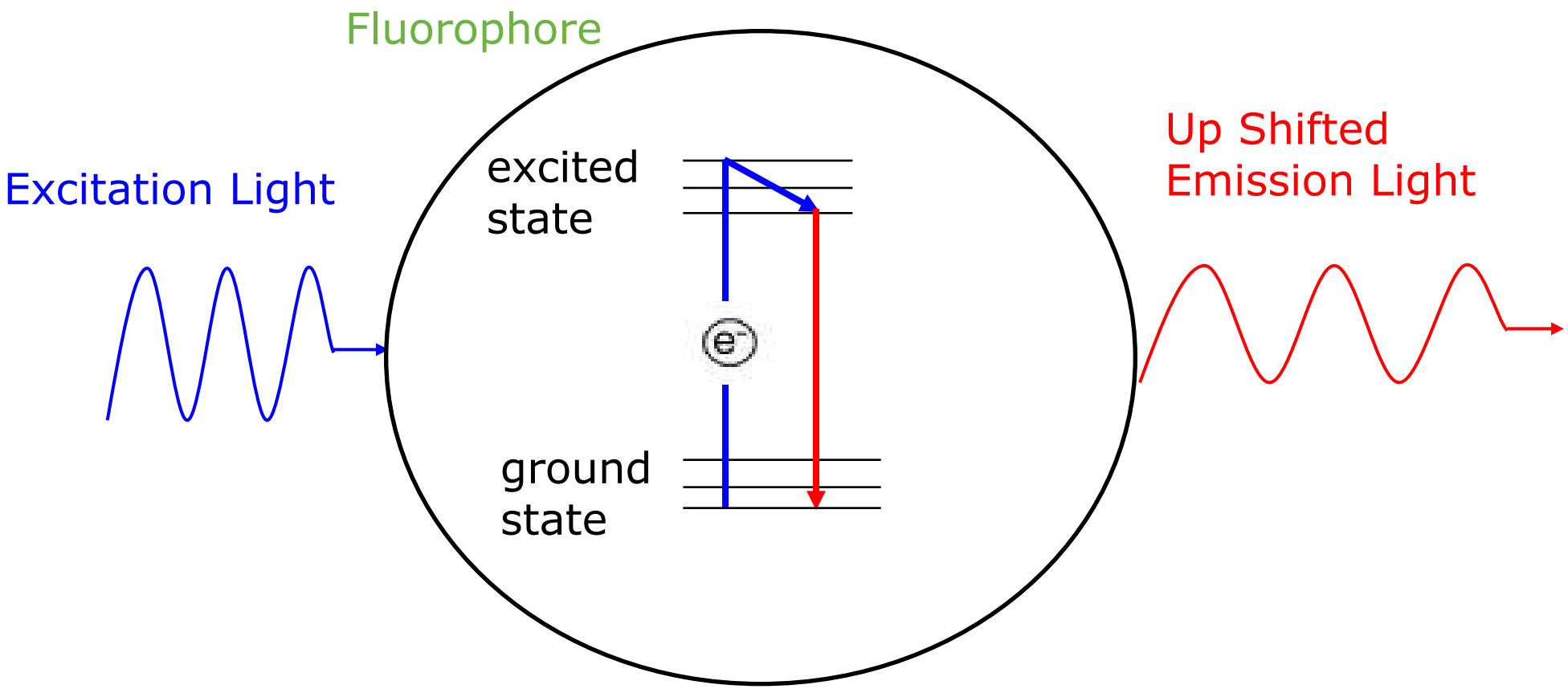


Exp time:	30 sec	30 sec	60 sec	60 sec	60 sec	60 sec
Binning:	small	small	small	small	medium	medium
Day:	1	2	3	4	5	6

Radiance:
Photons per second

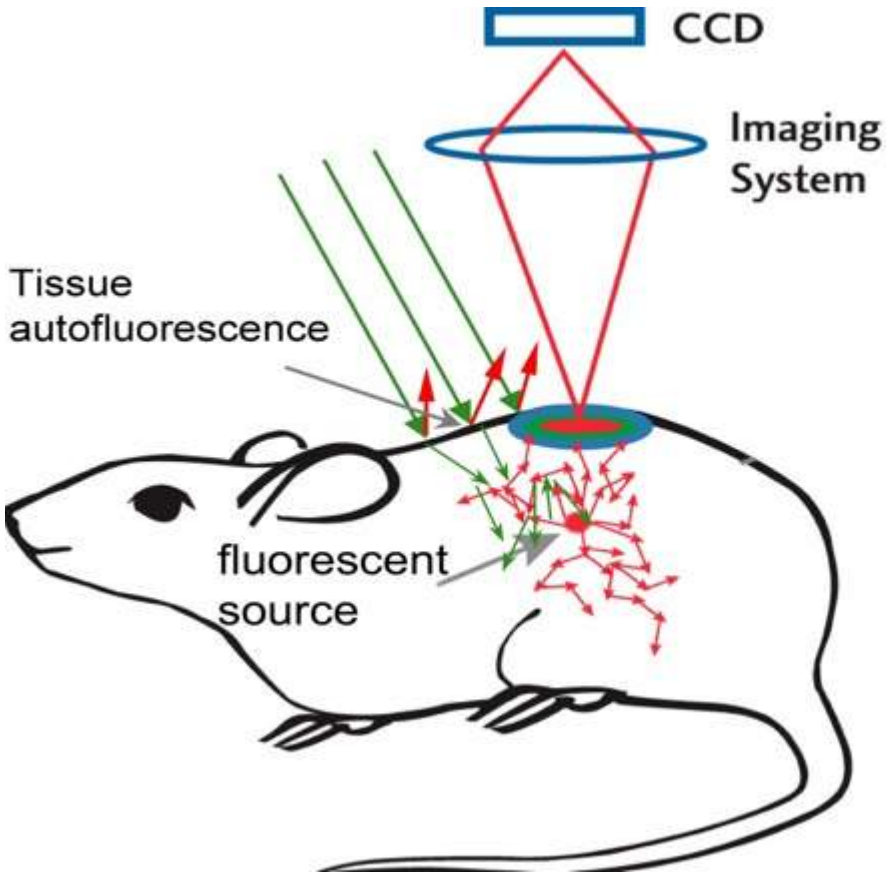


Fluorescence Process

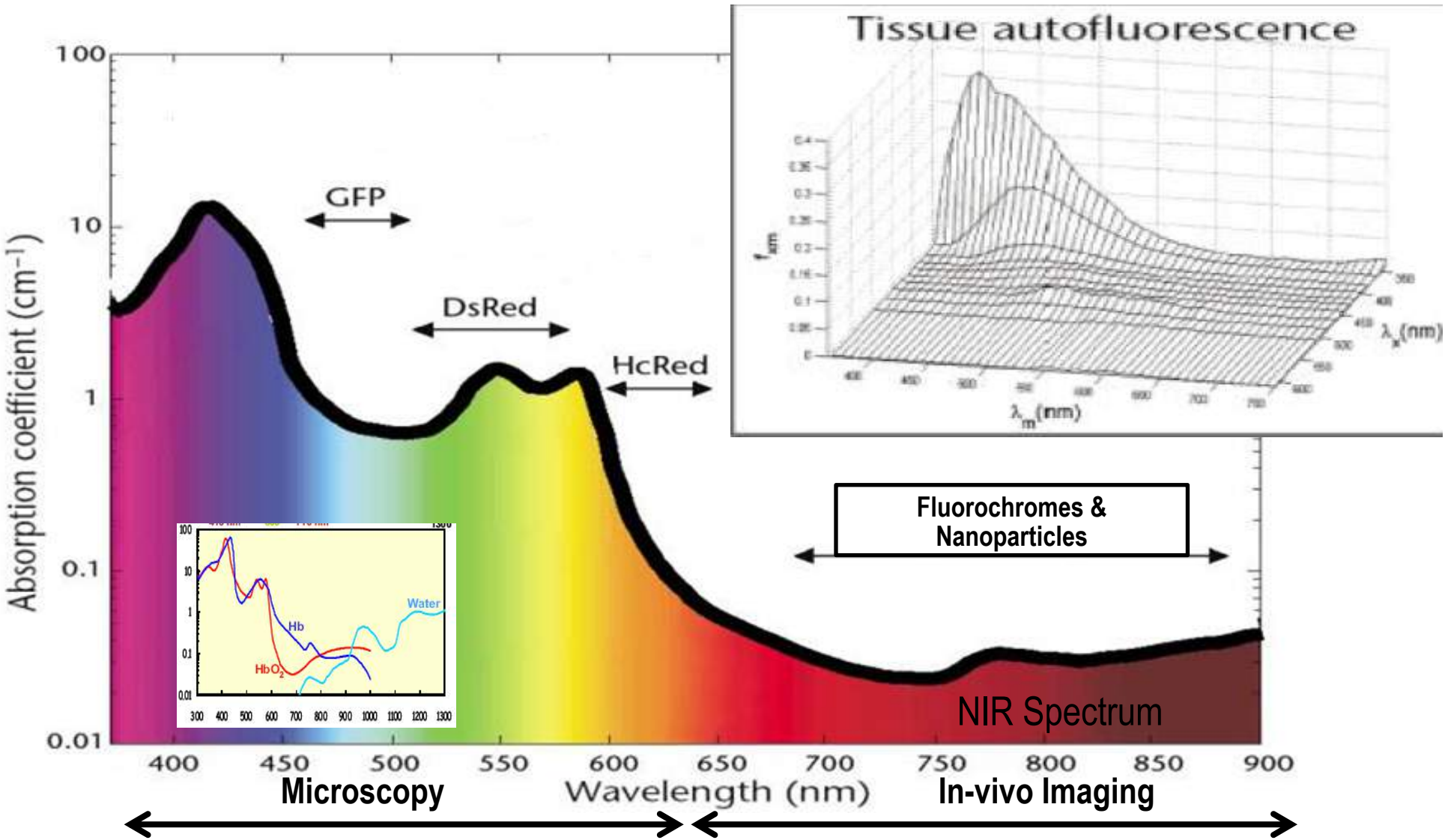


Challenges of Fluorescent Imaging

- Absorption
- Tissue Autofluorescence

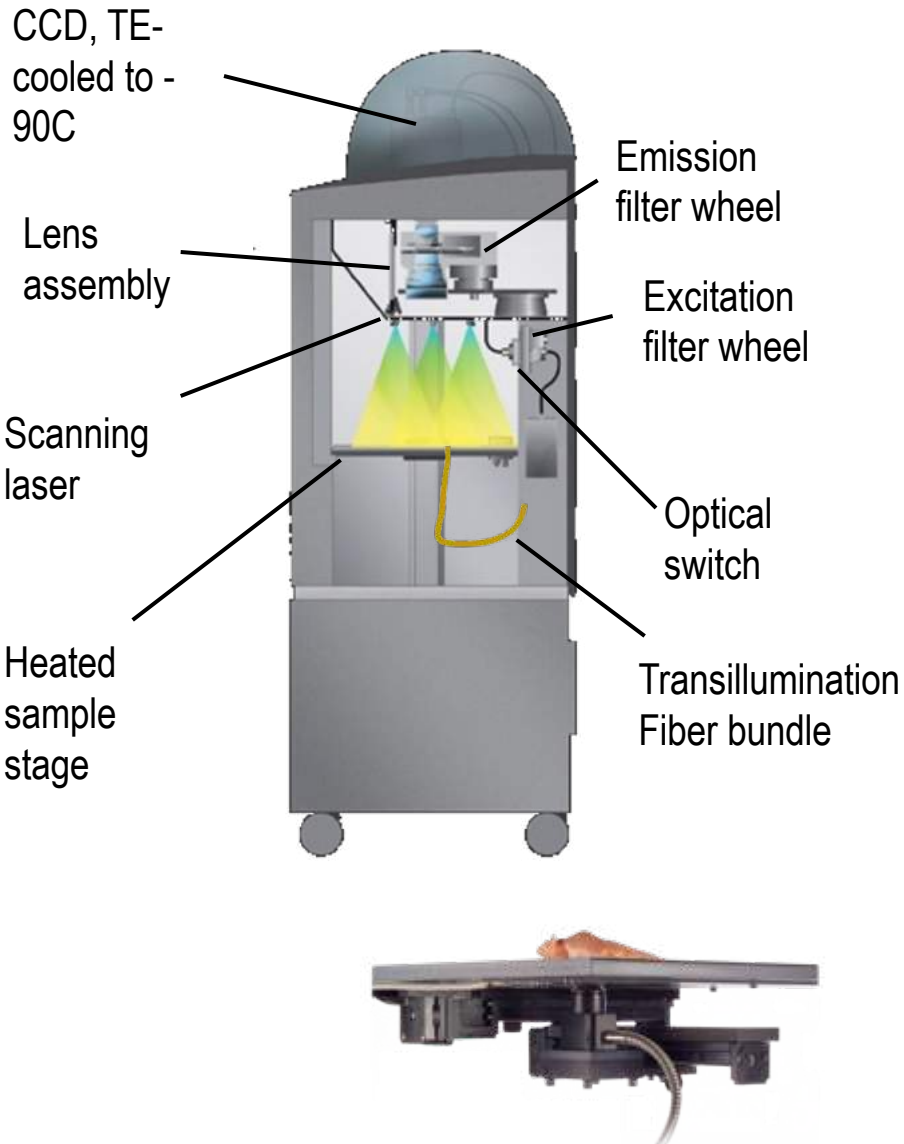


Advantages of Imaging in the NIR Spectrum

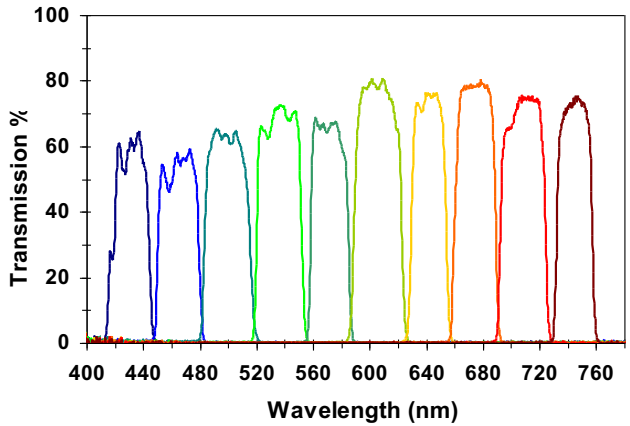


The absorption spectrum for tissue in the visible and near infrared (NIR) regions

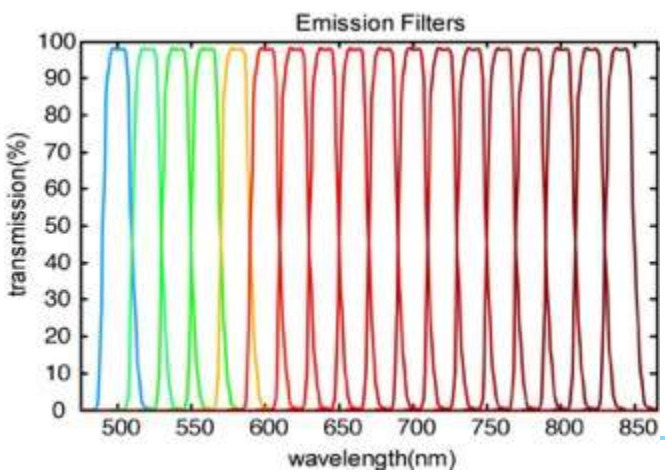
IVIS® Spectrum



10 excitation filters



18 emission filters

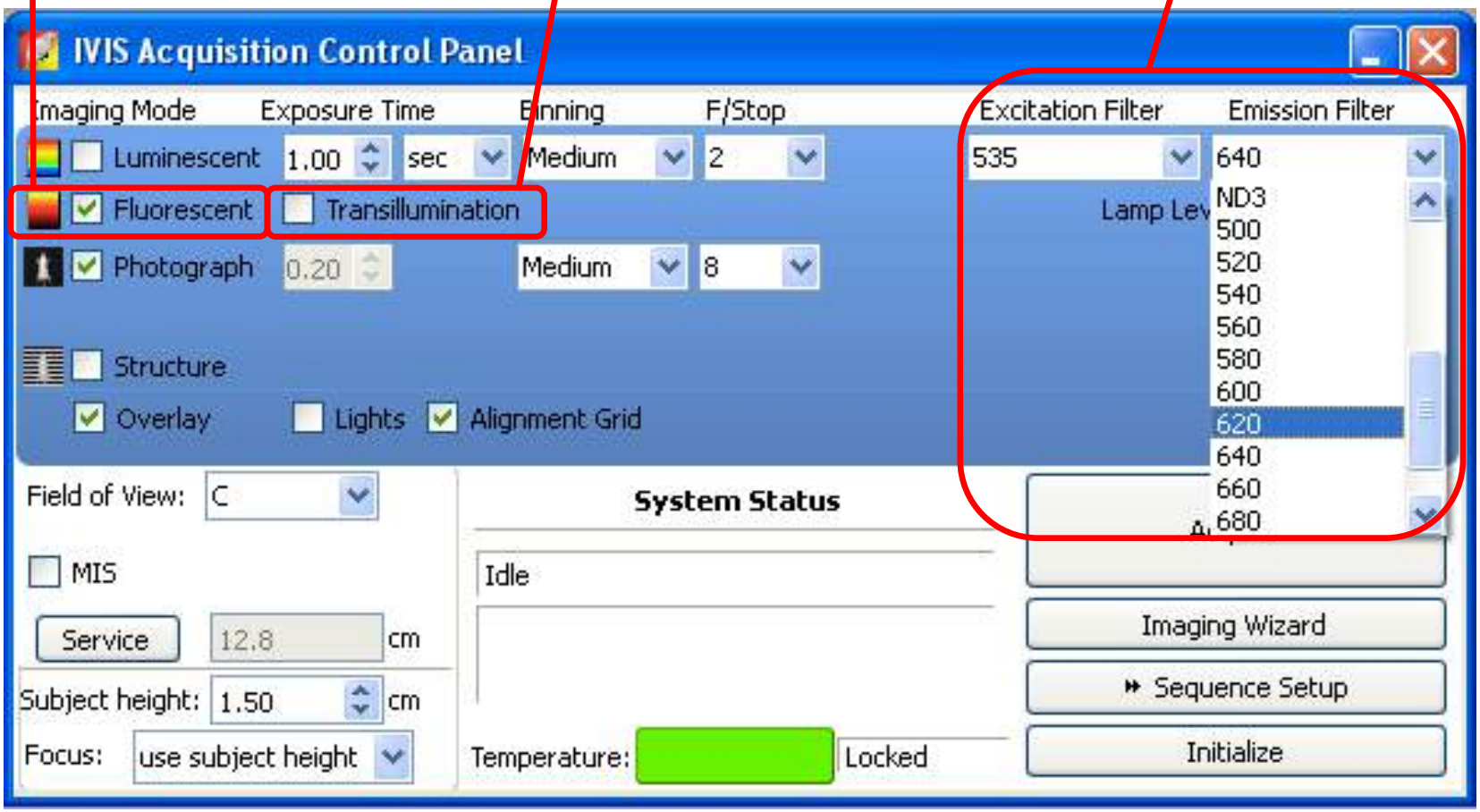


Fluorescence Acquisition

Select Fluorescent Imaging Mode

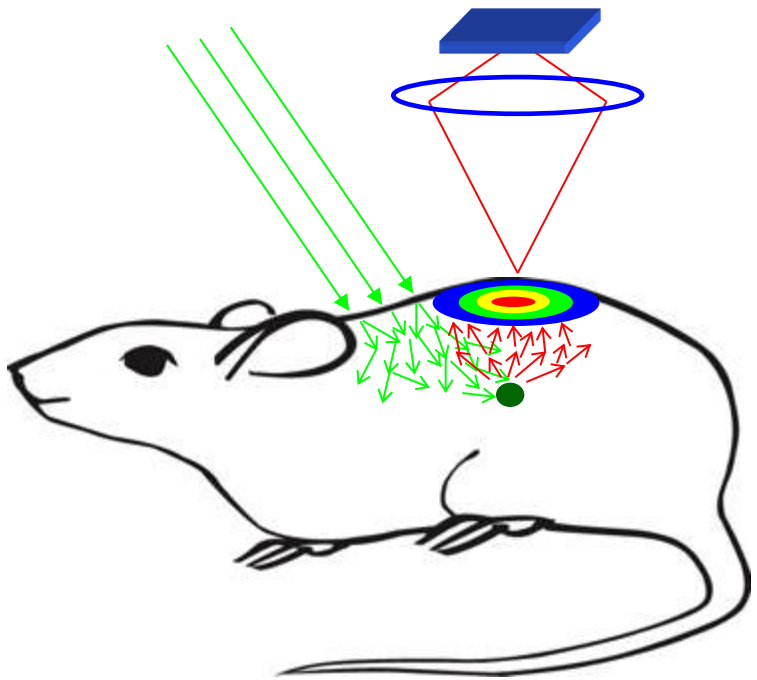
Trans-illumination

Select filters



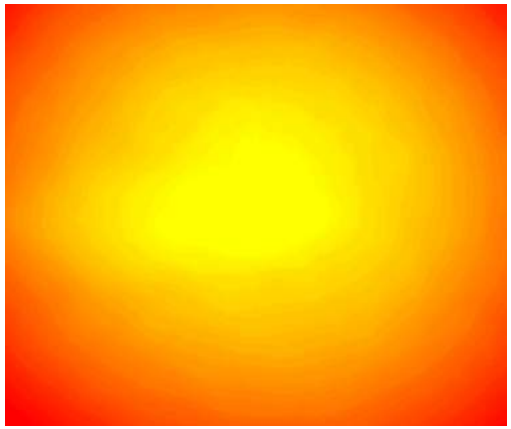
Epi-illumination Unit

$$\text{Radiant Efficiency} = \frac{\text{Emission Light (photons/sec/cm}^2\text{/sr)}}{\text{Excitation Light (}\mu\text{W/cm}^2\text{)}}$$



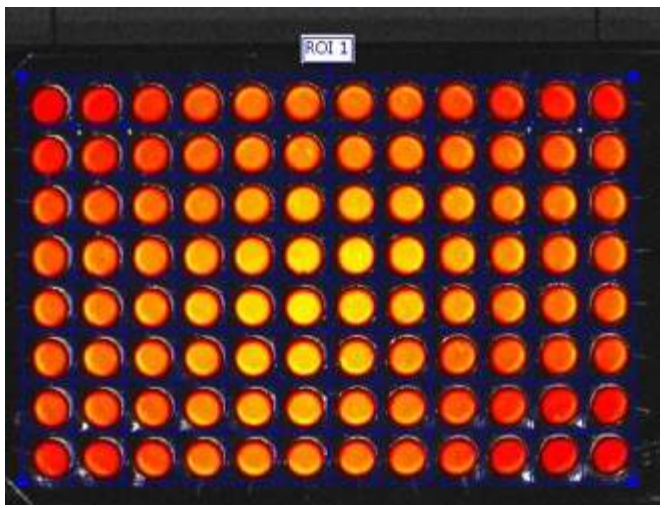
Fluorescent Calibrated Units: Radiant Efficiency

Excitation Light Pattern



Units of 'Radiant Efficiency' compensates for non-uniform excitation light pattern

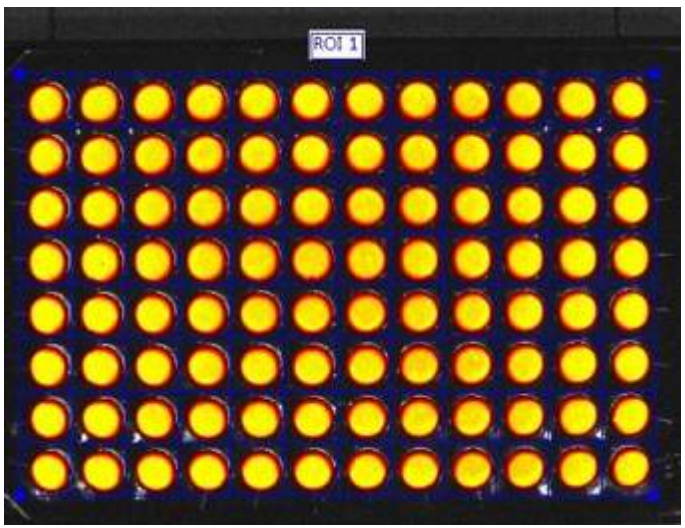
GFP Well Plate Uncorrected



Counts

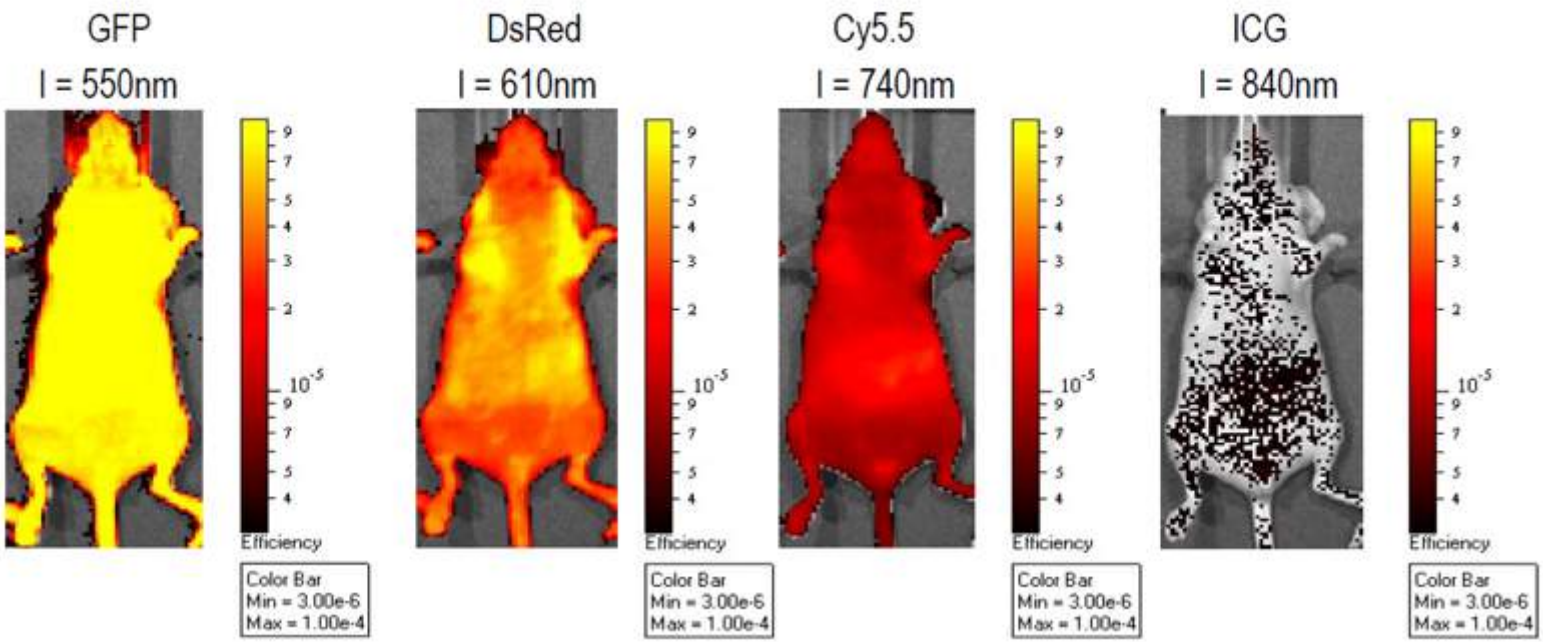
vs.

GFP Well Plate Corrected

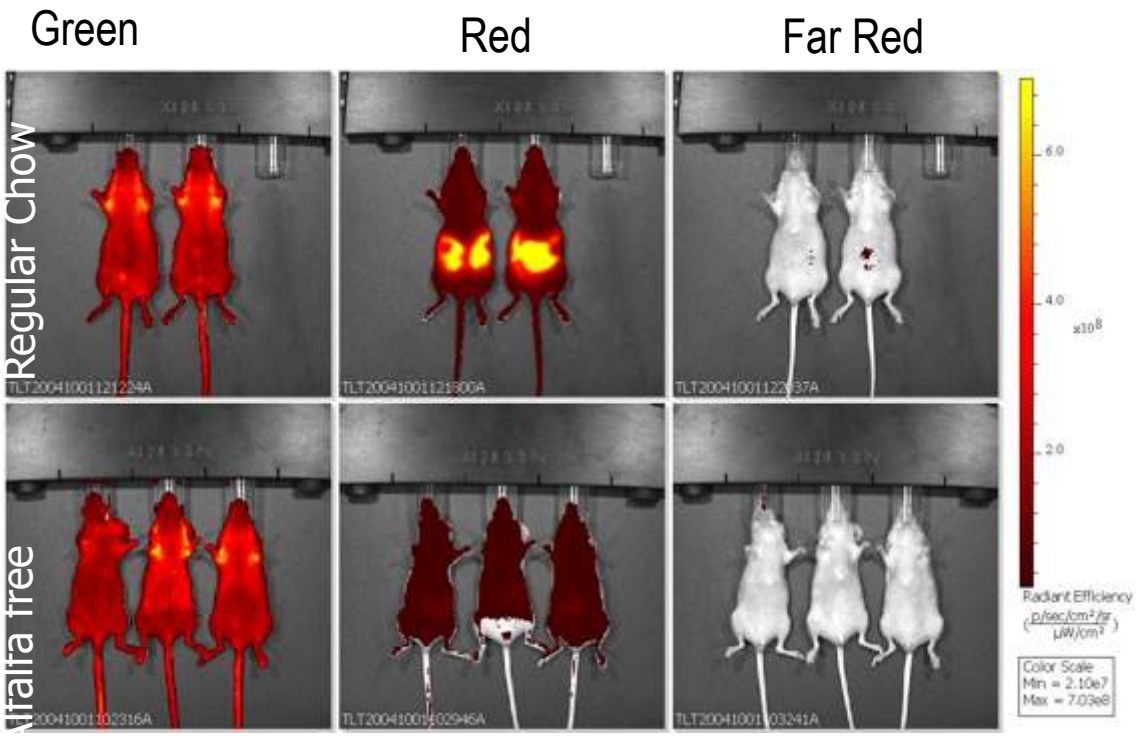


Radiant Efficiency

Autofluorescence in Negative Control Mice



Animal Diet Autofluorescence in Control Mice



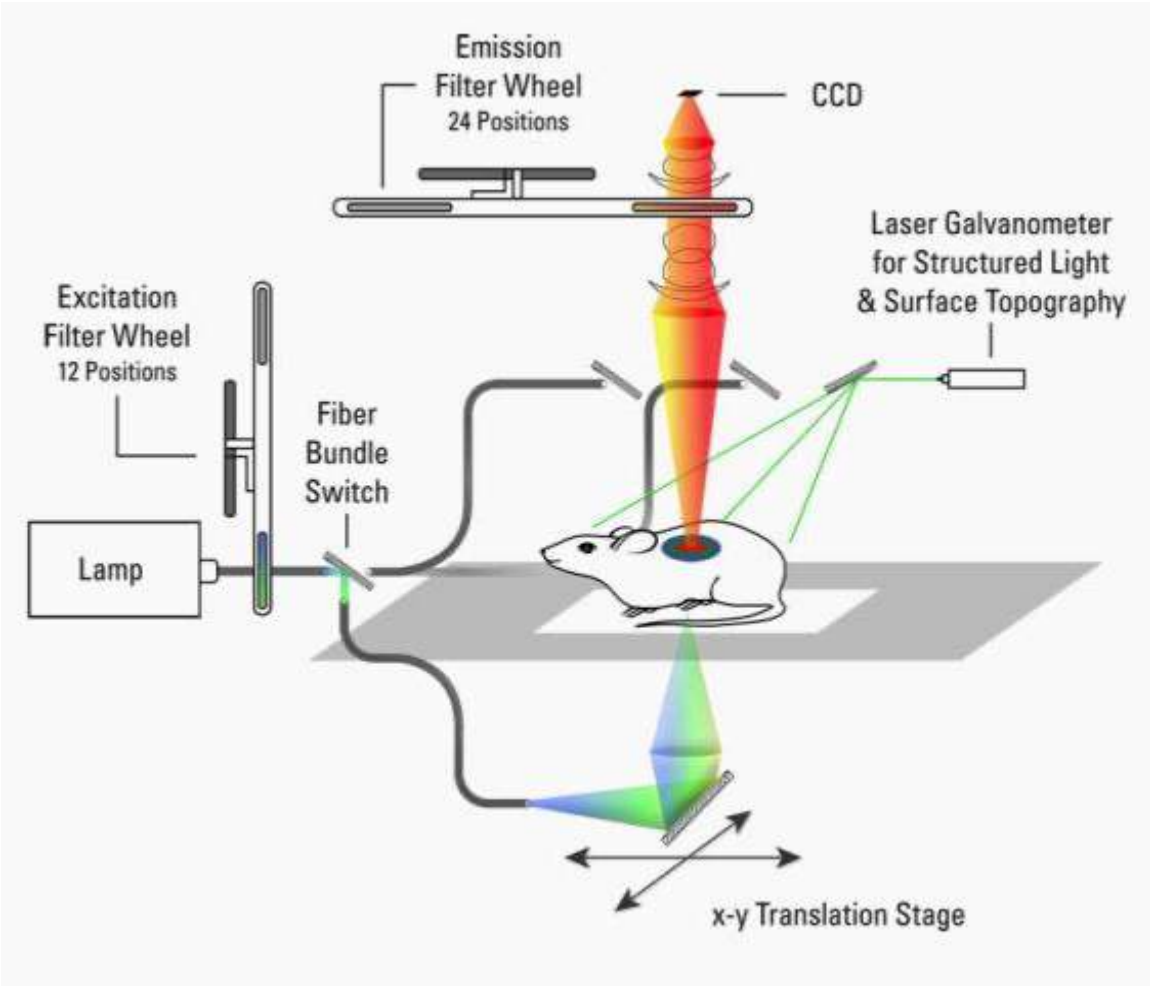
- **Unrefined chlorophyll-containing ingredients, particularly alfalfa, responsible for gut signal**

3D Optical Reconstruction

Depth

Size

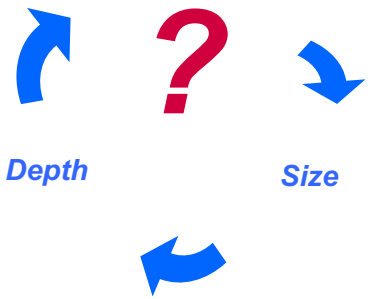
?



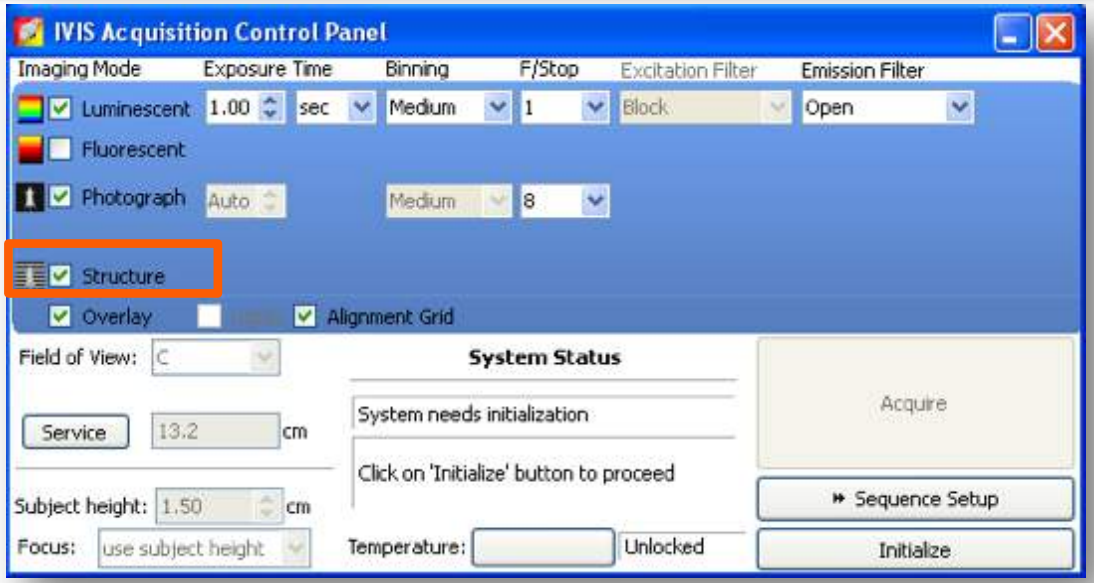
Why 3D Optical Tomography?--2D versus 3D imaging

- 2D成像獲得信號到達體表的相對强度
- 是否需要比較不同深度信號的强度？3D成像能比較不同深度的信號强弱
- 是否要對信號進行定位和绝對定量？3D成像能夠定位，還原信號的體積訊息，並且絕對定量

Concentration

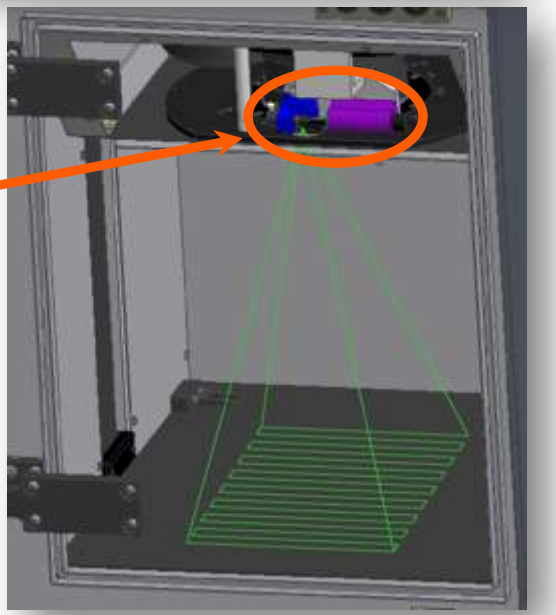


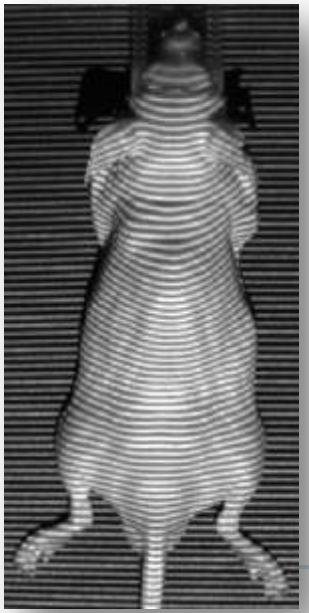
Surface Topography Reconstruction



Structured Light Image provides single-view surface topography for DLIT and FLIT

- Laser Galvonometer
- ✓ Structured Light Projector
- ✓ FOV Projector

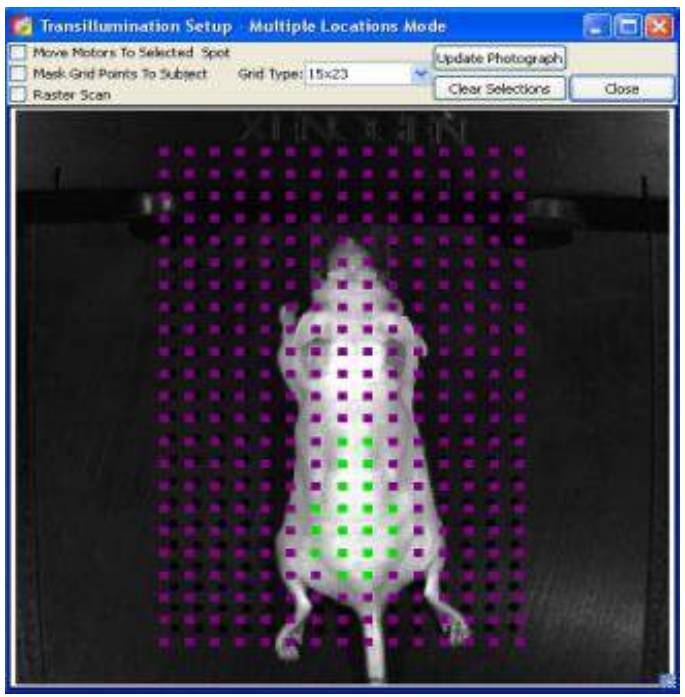


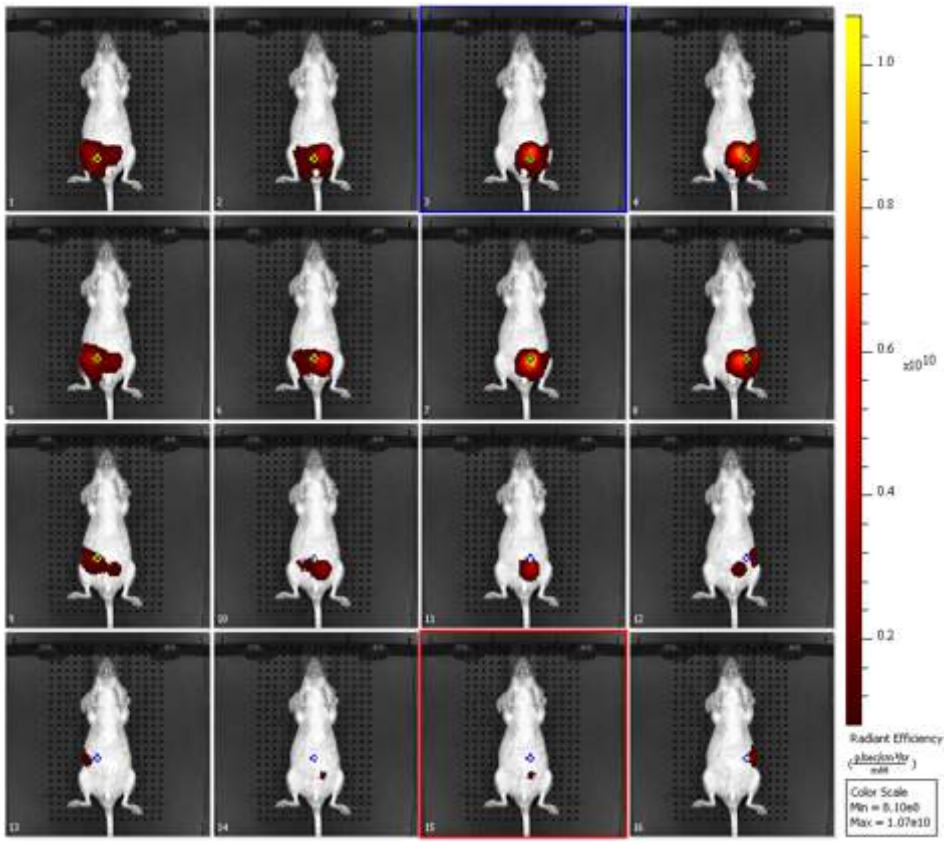


- Structured Light Image

FLIT--Fluorescence Multipoint Transillumination

Spectrum



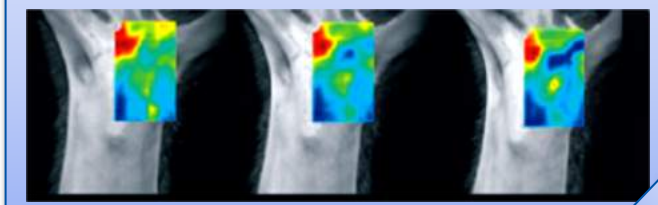


Solve Diffusion Equation for Source Location/Quantification

- Setup photon diffusion equations from each excitation source point to each image surface element
  - Assumes homogeneous tissue properties

Excitation Meas.

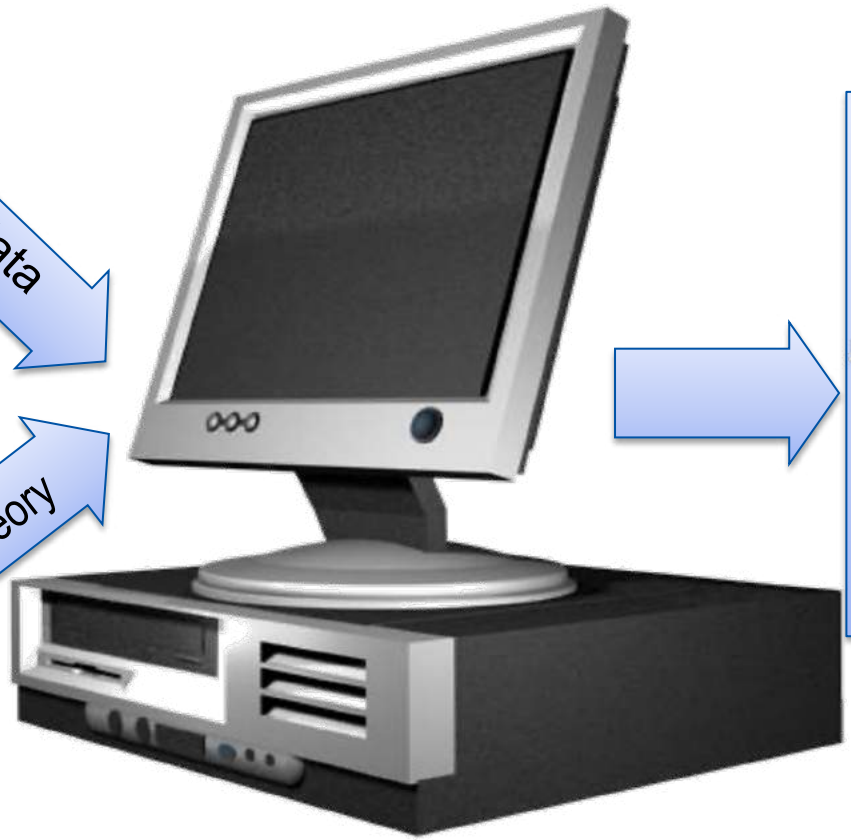
Fluorescence Meas.



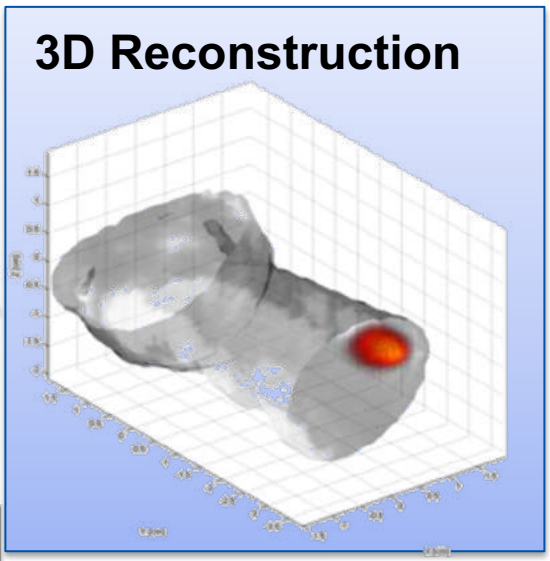
data

theory

Model



3D Reconstruction



- Solve system of equations for source location, shape, brightness
  - Non-negative least squares or algebraic reconstruction methods

DLIT Reconstruction

Spectral Measurements Provide Information on Depth of Source

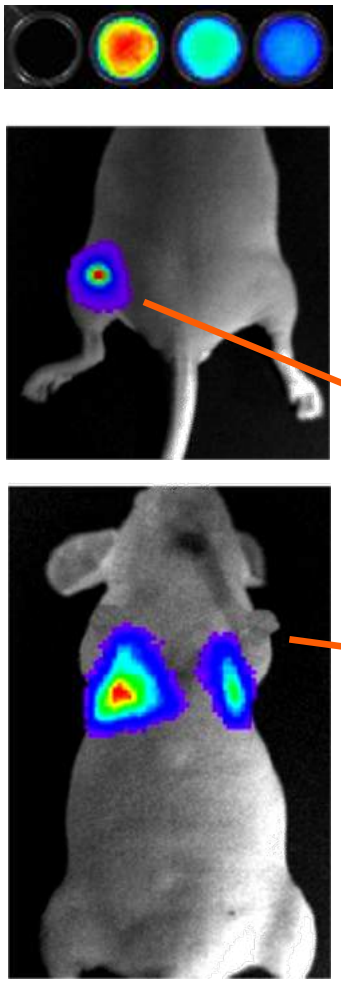
In vitro

In vivo

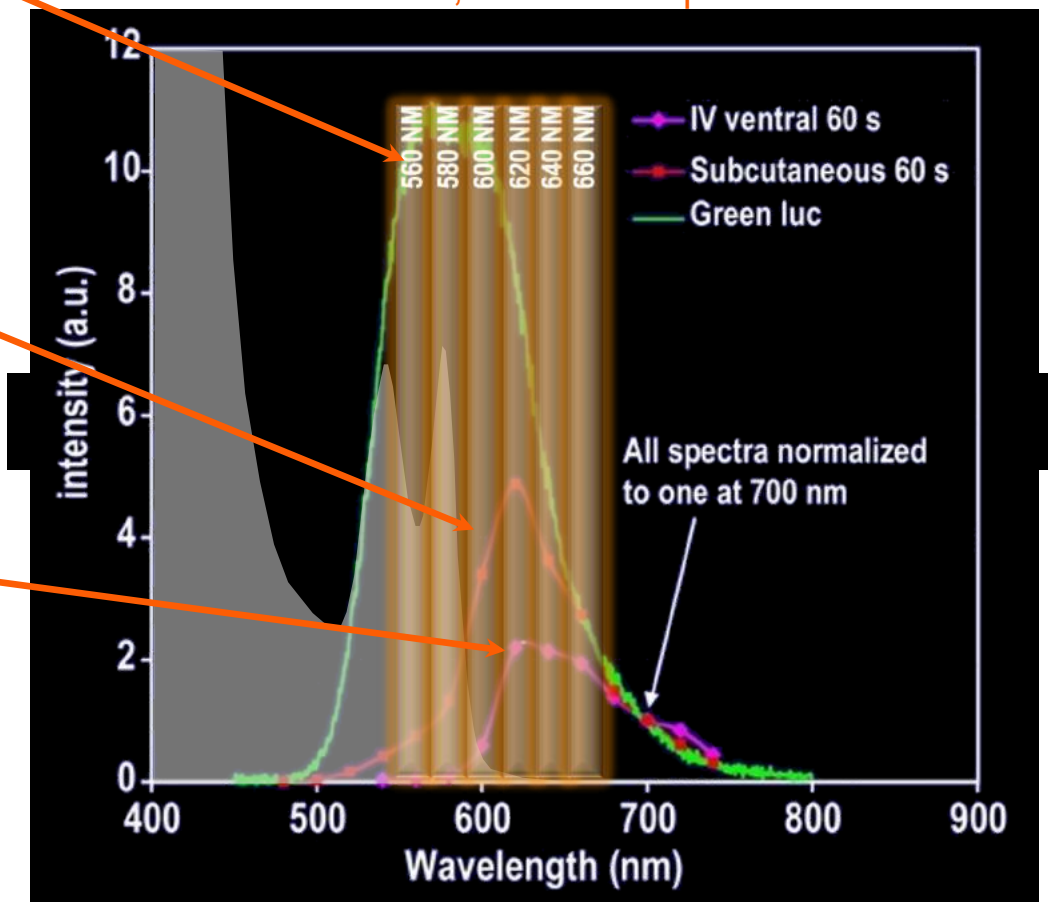
Subcutaneous

In vivo

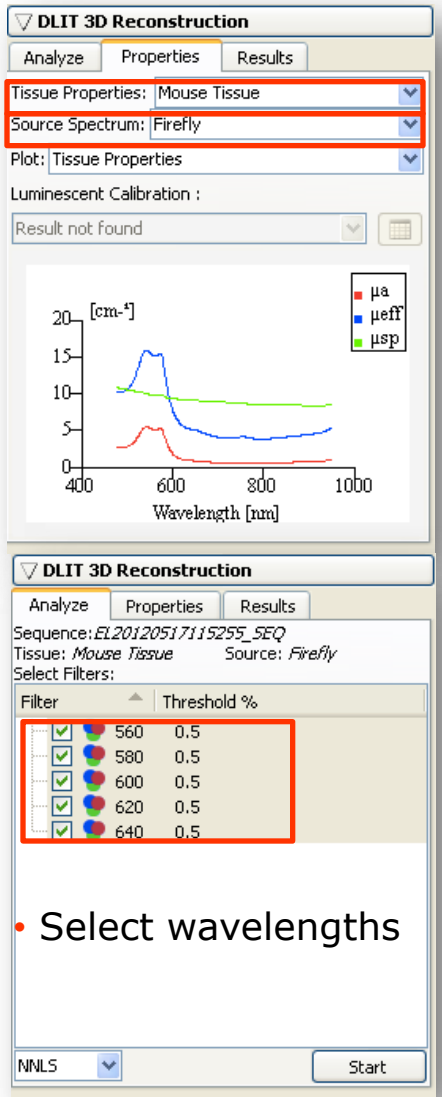
Chest Cavity



ROI data, 20 nm bandpass filters

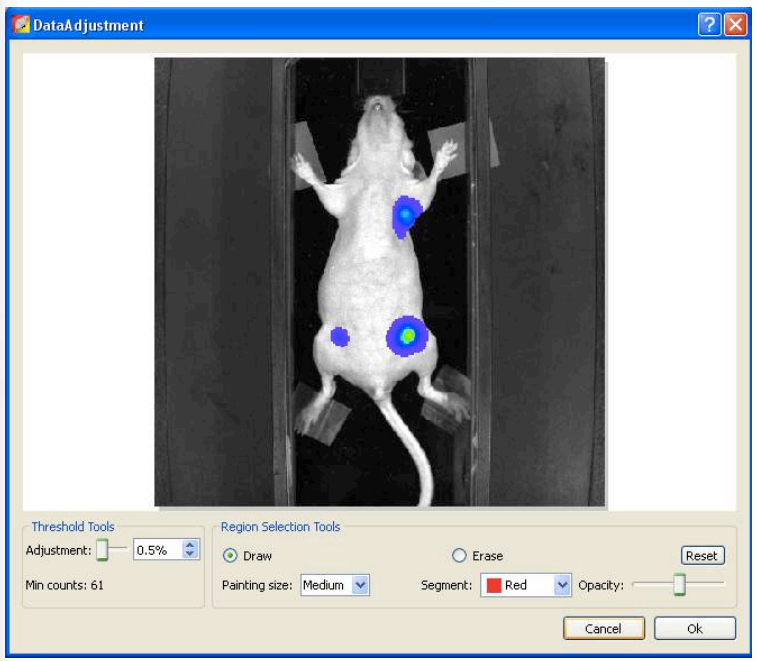


DLIT Reconstruction

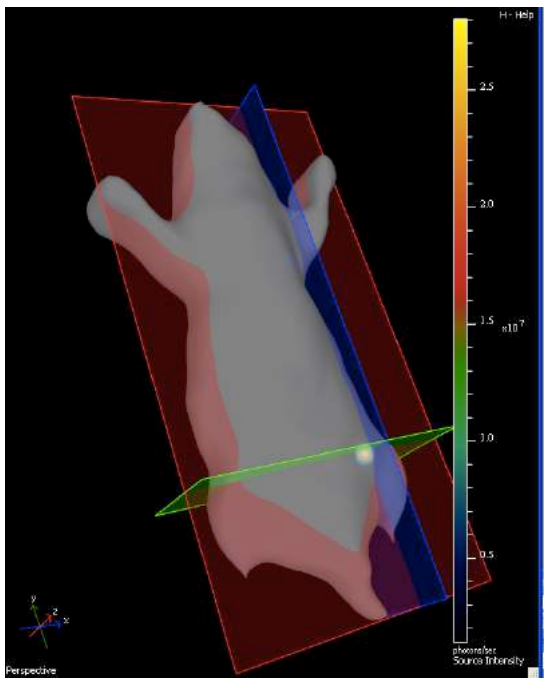


- Select wavelengths

- Select tissue properties
- Select source spectrum



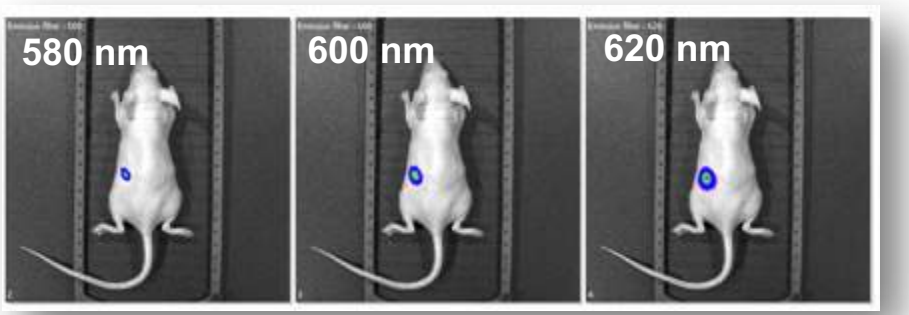
- Threshold your data



3D Imaging from a Single View is a Two-Step Process

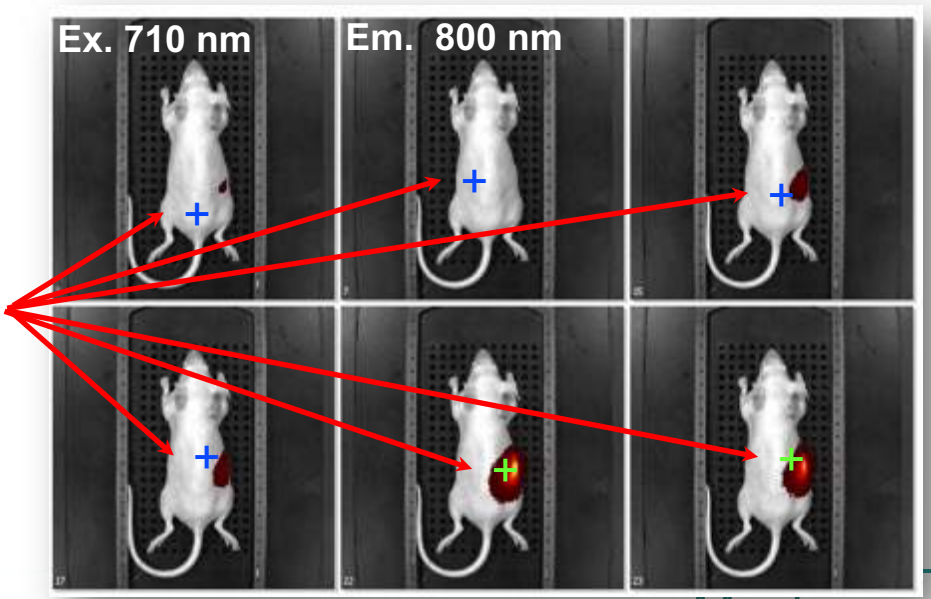
Bioluminescence (Diffuse Light Imaging Tomograpy ™):

- Step 1: **Surface Topography**
- Step 2: Obtain images using **multiple emission filters** for **Tomographic** mapping of source location



Fluorescence (FLuorescence Imaging Tomography):

- Step 1: **Surface Topography**
- Step 2: Obtain images using **multiple transillumination points, same excitation and emission** for **Tomographic** mapping of source location



PerkinElmer
For the Better

HUMAN HEALTH | ENVIRONMENTAL HEALTH

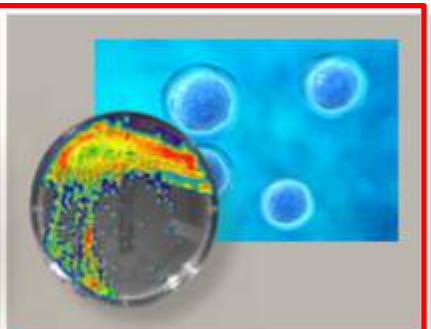
Optical In Vivo Imaging Applications

Pre-clinical *in vivo* Imaging Agents

Optical Reagents

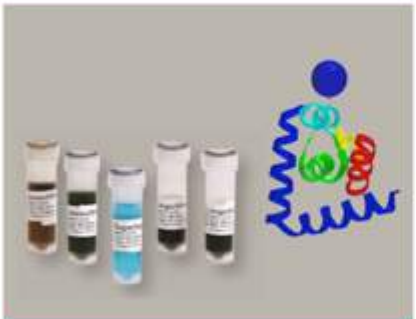
Bioluminescent Substrates

- Xenolight® D-Luciferin K+ Salt+
- XenoLight RediJect™ D-Luciferin
- XenoLight RediJect D-Luciferin Ultra
- XenoLight RediJect Ceolenterazine



Bioluminescent Cells and Bacteria

- Bioware® Brite oncology cell lines with enhanced Red-Fluc vector
- Bioware Brite Dual optical oncology cell lines with Red-Fluc and Green Fluorescent Protein (GFP)
- RediFect Lentiviral Particles
- Bacteria labeled with luciferase



Fluorescent Agents*+

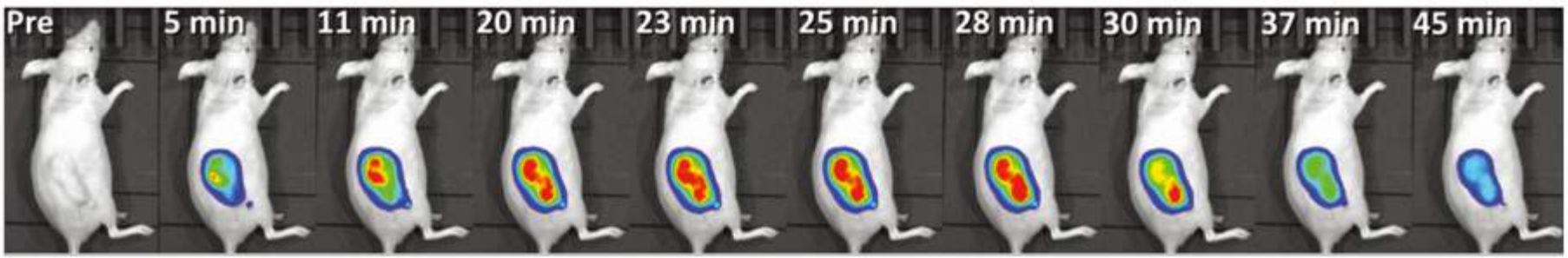
- Imaging of a broad range of biomarkers and pathways
  - Activatable
  - Targeted
  - Vascular
- Fluorescent Panels prepackaged and targeted for your research also available

NIR Fluorescent Labels and Nanoparticles*

- Labeling kits and dyes
- Nanoparticles (645, 680, 750, 800 nm)

XenoLight Bioluminescenct/ Chemiluminescenct Substrates

Product	Product Description	Catalog Number
XenoLight RediJect D-Luciferin (50 injections)	Pre-formulated in PBS, batch controlled D-Luciferin (K+ salt) ready for *in vivo* use	770504
XenoLight RediJect D-Luciferin Ultra (50 injections)	Pre-formulated in PBS, batch controlled D-Luciferin (K+ salt) for *in vivo* use Includes a fluorescent marker to validate substrate injection	770505
XenoLight RediJect Coelenterazine h (50 injections)	Pre-formulated in PBS, batch controlled Coelenterazine h for *in vivo* use	760506
XenoLight RediJect Inflammation Probe, Explorer kit (5 injections)	Pre-formulated in PBS, chemiluminescent probe for monitoring inflammation	760535
XenoLight RediJect Inflammation Probe, Standard kit (20 injections)	Pre-formulated in PBS, chemiluminescent probe for monitoring inflammation	760536
XenoLight D-Luciferin (K+ Salt) (1 g)	Lyophilized bioluminescence substrate for *in vivo* imaging with Firefly Luciferase	122799



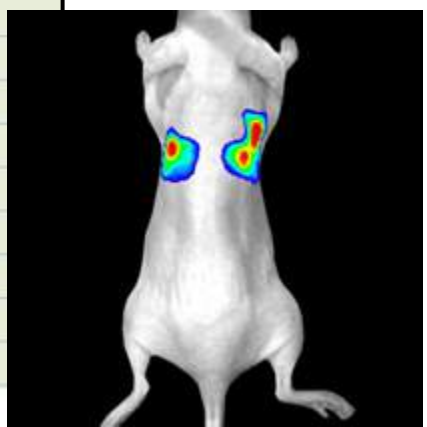
Kinetics of XenoLight® RediJect™ D-Luciferin bioluminscence imaging in a flank 4T1 mouse breast adenocarcinoma.

Bioluminescent Oncology Cell Lines

PerkinElmer For the Better

Bioware® Brite cell lines labeled with enhanced Red-Fluc vector

Product	Product Description	Catalog Number
HT1080-Red-Fluc	Human Fibrosarcoma Cancer Cell line.	BW 128092
4T1-Red-Fluc	Murine Breast Cancer Cell line	BW 124087
GL261-Red-Fluc	Murine Glioma Cell line	BW 134246
HepG2-Red-Fluc	Human Hepatic Cancer cell line	BW 134280
PC-3-Red-Fluc	Human Prostate Cancer Cell line	BW 128444
LnCaP-Red-Fluc	Human Prostate Cancer Cell line	BW 125055
B16-F10-Red-Fluc	Murine Melanoma Cancer Cell line	BW 124734
HCT-116-Red-Fluc	Human Colorectal Cancer Cell line	BW 124318
HT-29-Red-Fluc	Human Colorectal Cancer Cell line	BW 124353
Colo205-Red-Fluc	Human Colorectal Cancer Cell line	BW 124317
U-87 MG-Red-Fluc	Human Brain Cancer Cell line, ideal for glioblastoma models	BW 124577
NCI-H460-Red-Fluc	Human Lung Cancer Cell line, ideal for orthotopic lung tumor models	BW 124316
K-562-Red-Fluc	Human Leukemia Cell line	BW 124735
BxPC3-Red-Fluc	Human Pancreatic Cancer Cell	BW 125058
MCF-7-IRed-Fluc	Human Breast Cancer	BW 119262
A549-Red-Fluc	Human Lung Cancer	BW 119266
LL/2-Red-Fluc	Murine Lung Cancer	BW 119267
SKOV3-Red-Fluc	Human Ovarian Cancer	BW 119276

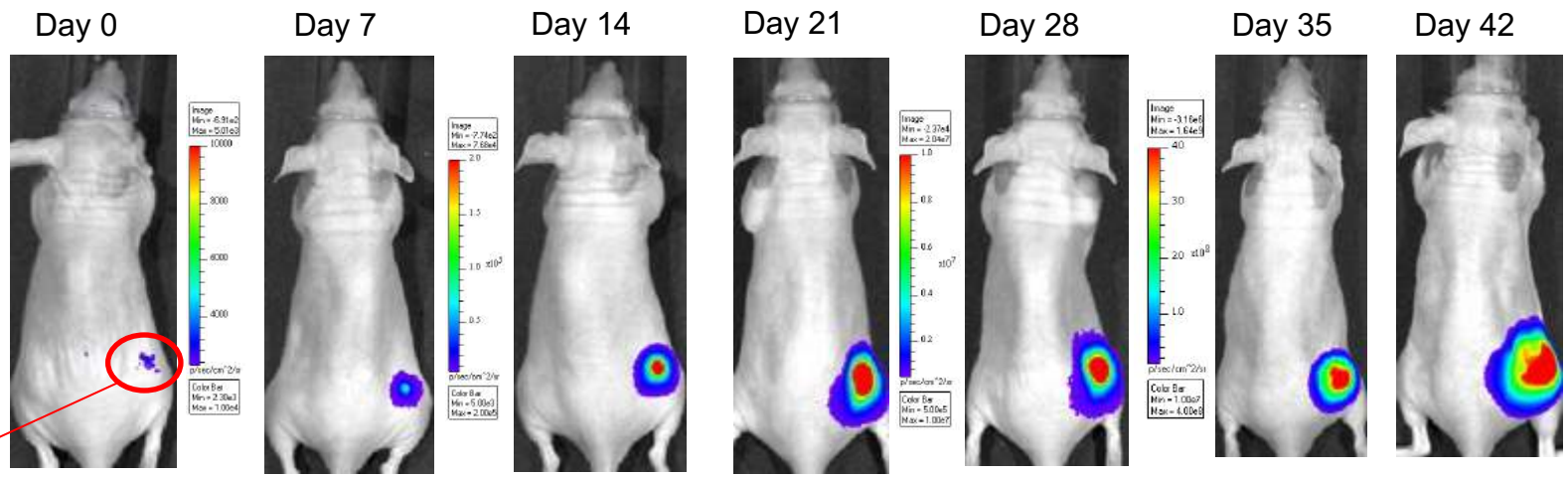


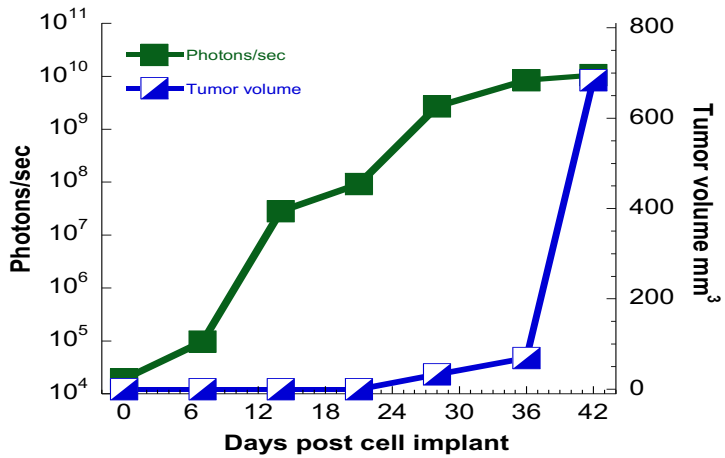
Bioware® Brite Ultra Green cell lines dual-labeled with enhanced Red-Fluc vector and Green Fluorescent Protein

Product	Product Description	Catalog Number
4T1-Red-Fluc-GFP	Murine Breast cancer cell line dual labeled with Luciferase and GFP	BW 128090
PC-3-Red-Fluc-GFP	Human Prostate cancer cell line dual labeled with Luciferase and GFP	BW 133416

Longitudinal monitoring of tumor development

Bioware Ultra: 4T1-luc2





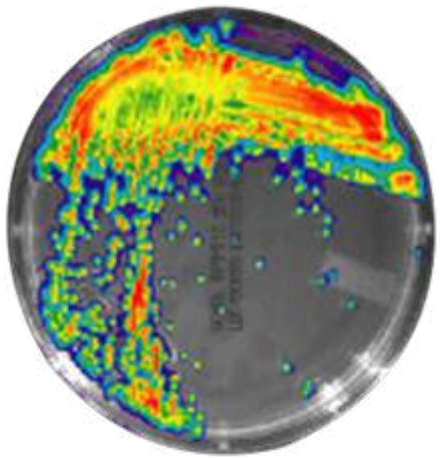
With Bioware Ultra one can start collecting data from Day 0, while with caliper measurements one has to wait at least 28 days to see any tumor growth

Bioluminescent Bacteria

Bacterium	Parental strain	Catalog No.
E. coli	EPEC WS2572 (Xen14)	119223
L. monocytogenes	ATCC 23074 (Xen19)	119237
	10403S (Serotype 1/2a wild-type strain) (Xen32)	119238
P. aeruginosa	ATCC 19660 (Xen5)	119228
	PAO1 (Xen41)	119229
P. mirabilis	ATCC 51286 (Xen44)	119236
S. dysenteriae	88A6205. Clinical isolate (Xen27)	119231

Bacterium	Parental strain	Catalog No.
S. typhimurium	FDA1189 (Xen33)	119235
Y. enterocolitica	91A1854 Clinical isolate (Xen24)	119232
	WS2589 (Xen25)	119233
S. aureus	8325-4 (Xen8.1)	119239
	ATCC 12600 (Xen29)	119240
	ATCC 33591 (Xen31)	119242
	ATCC 49525 (Xen36)	119243
	UAMS-1 (Xen40)	119244

Gram-positive and Gram-negative pathogenic bacteria expressing bacterial luciferase (*lux*), which can be used for *in vitro* and *in vivo* studies.



Pre-clinical *in vivo* Imaging Agents

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- XenoLight RediJect™ D-Luciferin
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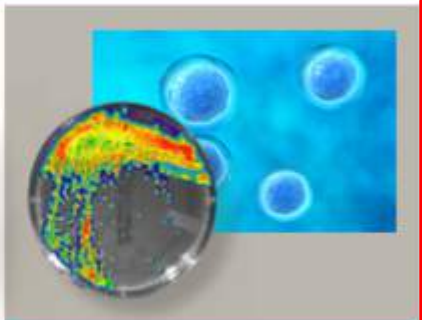

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NIR Fluorescent Labels and Nanoparticles*

- Labeling kits and dyes
- Nanoparticles (645, 680, 750, 800 nm)

In Vivo Imaging Agent Platforms:

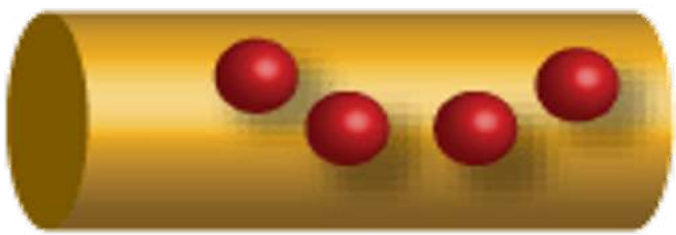
Agent Categories

	Vascular	Targeted	Activatable
Mechanism			
Detection	***Physiology***	***Biological Structure/Expression***	***Biological Function***
Value	Vascular permeability Angiogenesis…	Tumor cell marker Apoptosis-related marker…	Disease-associated proteases

Increasing value of molecular information

Vascular Agents

- A range of highly fluorescent Physiologic Agents
- Remain stable and localized in the anatomy for various periods of time
- Always fluorescent, circulate with blood or move through GI tract
  - Designed for in vivo use
  - Limited in vitro applications



Monitor the integrity of the vascular system

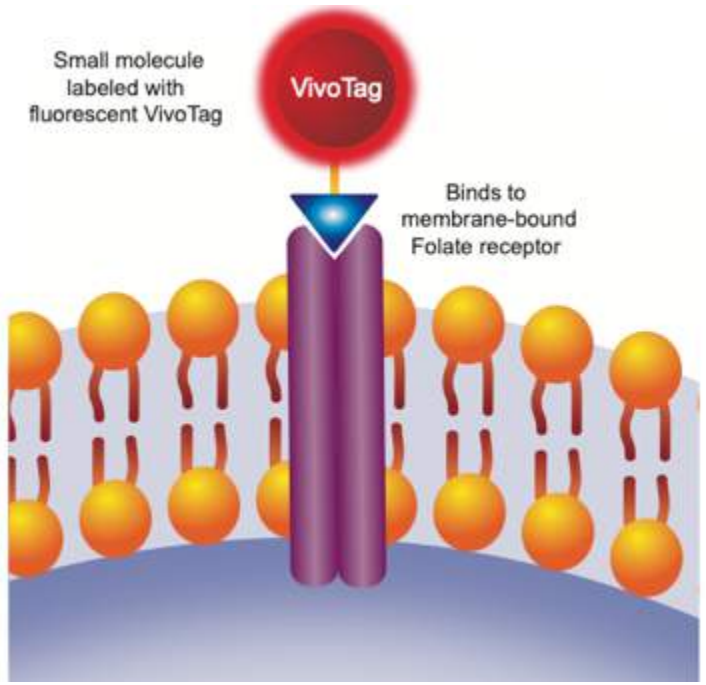
Vascular Agents – Target Biology

AngioSense	680 750	Agent that remains localized in vasculature for 0-4 h; accumulates in tumours and arthritic joints at 24 h.	● Angiogenesis ● Arthritis ● Cardiovascular ● Infectious ● Inflammation ● Oncology ● Pulmonary ● Neurological ● Vascular
AngioSense IVM	680 750	Agent that remains in vasculature for 0-4 h; optimized for intraVital microscopy.	● Angiogenesis ● Arthritis ● Cardiovascular ● Vascular ● IntraVital Microscopy formulation (2 Photon Microscopy)
AngioSPARK	680 750	Pegylated fluorescent nanoparticles (5 doses); remains localized in vasculature.	● Arthritis ● Atherosclerosis ● Hypertension ● Inflammation ● Oncology ● Neurological ● Vascular
Genhance	680 750	Small molecule fluorescence agent. Use as a control or in vascular permeability imaging.	● Vascular
Superhance	680	Small molecule agent. Binds to albumin in blood for extended (30 m-1 h) vascular imaging.	● Angiogenesis ● Arthritis ● Inflammation ● Neurological
GastroSense	750	Agent to monitor gastric emptying and the impact of various drugs on gastric motility.	● Gastric Emptying ● Anatomical reference marker for the gastrointestinal tract

Monitor the integrity of the vascular system

Targeted Agents

- Optimized agents that actively target and bind to specific biomarkers
  - Designed for *in vivo* use
  - *Emerging In vitro applications*



Target specific biomarkers

Targeted Agents – Target Biology

IntegriSense	680 750	Targets integrin αvβ3 expressed in oncology, atherosclerosis and angiogenesis disease models	● Angiogenesis ● Atherosclerosis ● Oncology ● Neurological
Annexin-Vivo	750	Selectively membrane-bound phosphatidylserine exposed during the early stages of apoptosis	● Apoptosis ● Atherosclerosis ● Inflammation ● Oncology ● Neurological
OsteoSense	680 750 800	Bisphosphonate fluorescent bone agent for optimizing bone turnover through binding of hydroxyapatite Detect microcalcification and measure osteogenic (bone remodeling) activity	● Arthritis ● Atherosclerosis ● Bone Turnover ● Skeletal ● Oncology
HypoxiSense	680	Image Carbonic Anhydrase IX overexpression in tumours in response to regional tumour hypoxia	● Oncology
FolateR-Sense	680	Targeting Folate Receptor (**Folate receptor** Upregulated in highly metabolic cells (cancers and inflammatory cells)	•cancer and inflammation
BacteriSense	645	Combine to the membrane of Gram Positive and Negative bacteria	

Target specific biomarkers

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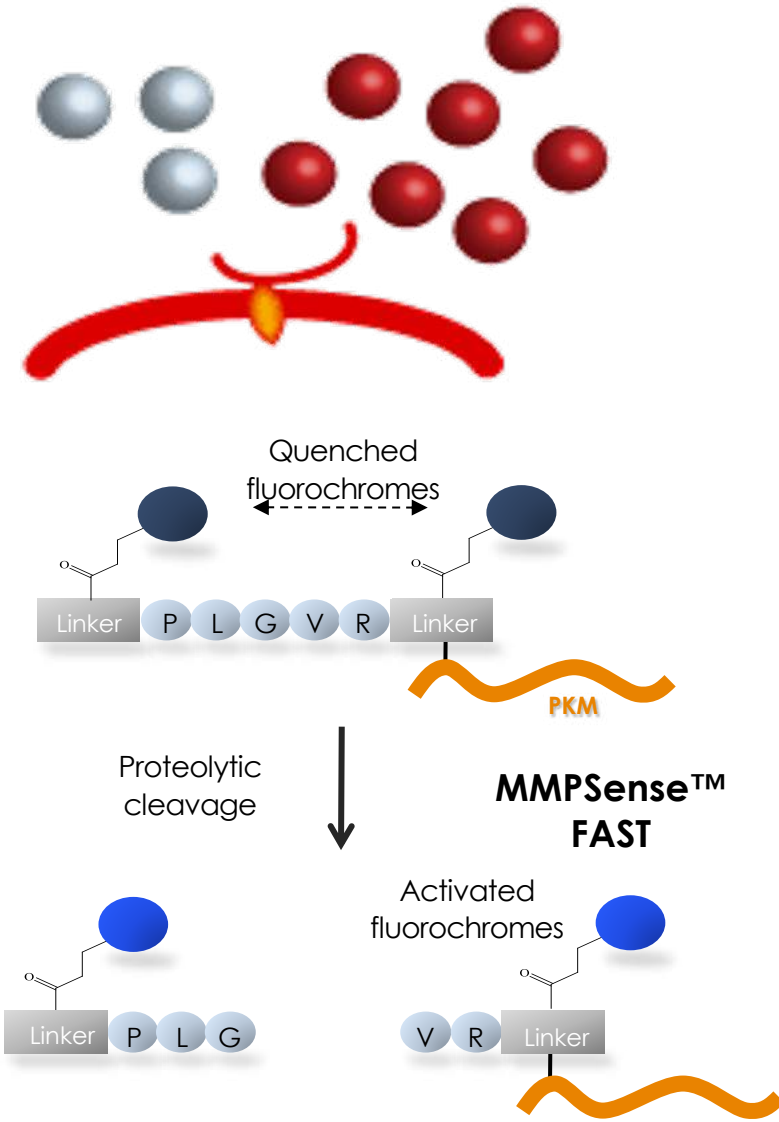
Targeted Agents – Target Biology

TLectinSense™	680	Tomato lectin employs a gold standard for vascular labelling, Highly sensitive to endothelial cell glycoproteins expression and ideal for labelling of tumour vascularization.. Enables the quantitation of vascular burden across different tumour cell lines. Broad imaging window from 6-24 hours. High correlation between signal when used ***in vivo* and *in vitro.***	
GFR-Vivo 680	680	GFR-Vivo 680 is a near infrared (NIR)-labeled inulin molecule designed for determination of glomerular filtration rate through detection and quantification in the blood	●kidney disease •kidney drug toxicity.

Target specific biomarkers

Activatable Agents

- Activatable Agents
  - Protein type
  - “Quenched” in their native state
  - Activated by a select panel of disease-associated proteases
    - Designed for *in vivo* use
    - *Emerging In vitro applications*



Monitor protease activity associated with disease state

Activatable Agents – Target Biology

ProSense	680 750	Activated by **cathepsin B, L, S** and **plasmin**
ProSense Control	680 750	**Non-activatable analog** of ProSense for use as a negative control
ProSense FAST	750	**FAST version of ProSense**, with faster kinetics and a broader imaging window.
Cat B FAST	680 750	**Cathepsin B** selective **FAST** activatable agent
Cat K FAST	680	**Cathepsin K** selective **FAST** activatable agent
MMPSense	680	Activated by **MMP** (matrix metalloproteinases, including MMP-2, -3, -9 and -13)
MMPSense FAST	750	**MMP FAST** activatable agent
Neutrophil Elastase FAST	680	Activated by **elastase** produced by neutrophil cells using FAST
ReninSense FAST	680	A **renin-angiotensin FAST** activatable agent

Monitor protease activity associated with disease state

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Activatable Agents – Applications

ProSense	680 750	● Arthritis ● Oncology
ProSense Control	680 750	Negative control in ● Arthritis ● Oncology
ProSense FAST	750	● Oncology ● Inflammation
Cat B FAST	680 750	● Cardiovascular disease ● Oncology ● Inflammation ● Certain neurological diseases
Cat K FAST	680	● Oncology applications involving metastasis to the bone ● Broad range of bone applications including osteoporosis and bone changes following arthritis
MMPSense	680	● Oncology
MMPSense FAST	750	● Oncology ● Inflammation ● Pulmonary ● Cardiovascular disease
Neutrophil Elastase FAST	680	● Acute lung Injury Models ● Acute respiratory distress syndrome ● Emphysema ● Cystic Fibrosis ● COPD ● Wound Healing ● Rheumatoid Arthritis ● Ischemia-reperfusion
ReninSense FAST	680	● Cardiovascular disease ● Certain models of impaired renal function ● Chronic hyperthyroidism ● Hypertension ● Some neurological diseases

Monitor protease activity associated with disease state

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PerkinElmer's Fluorescent Imaging Agent Portfolio

PerkinElmer offers four categories of fluorescent *in vivo* imaging agents:

LABELS and NANOPARTICLES

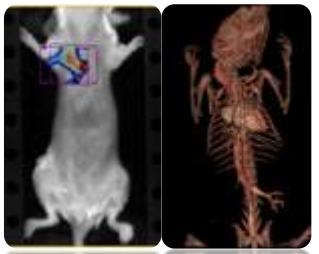
VivoTag™ 680XL Protein Labeling Kit : designed for preparing fluorescently labeled antibodies, proteins or peptides for small animal in vivo imaging applications.

VivoTrack 680 : cell labeling agent that intercalates into the plasma membrane of primary cells and cell lines.

Applications

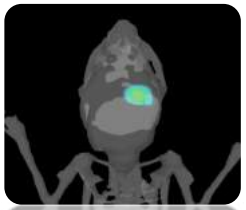
Inflammation

Oncology



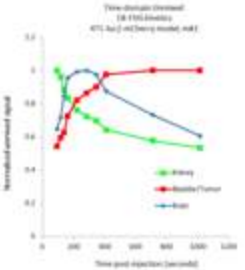
Cardiovascular Disease

Infectious Disease

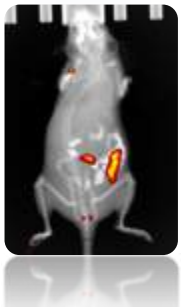


Neuroscience

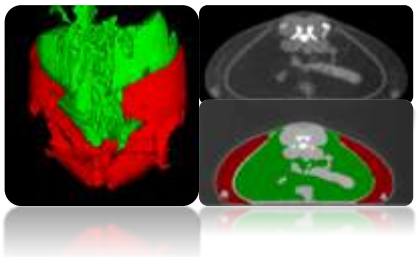
Biodistribution
PK/PD



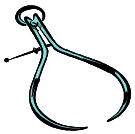
Gastrointestinal

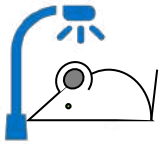


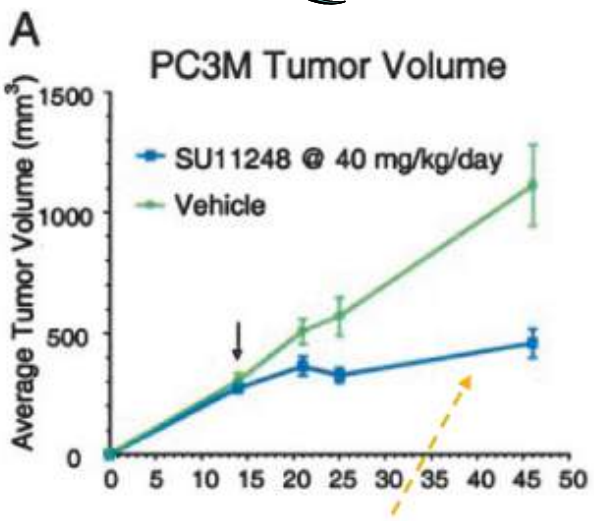
Metabolic



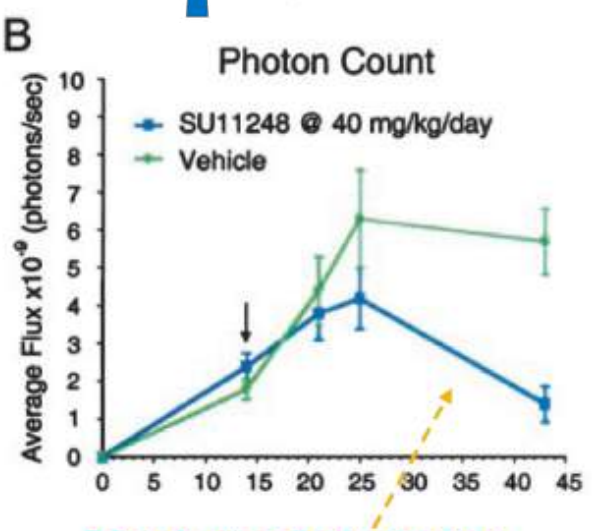
Sutent – Fast Tracked FDA Approval



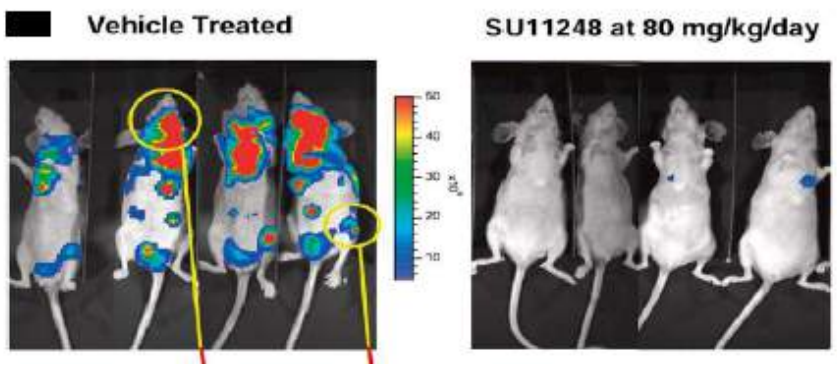




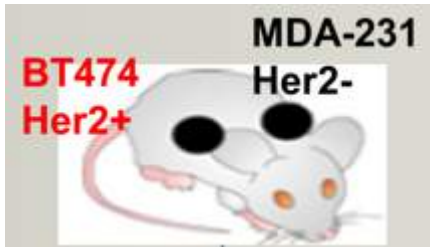
Physical measurement
(tumor still getting bigger)

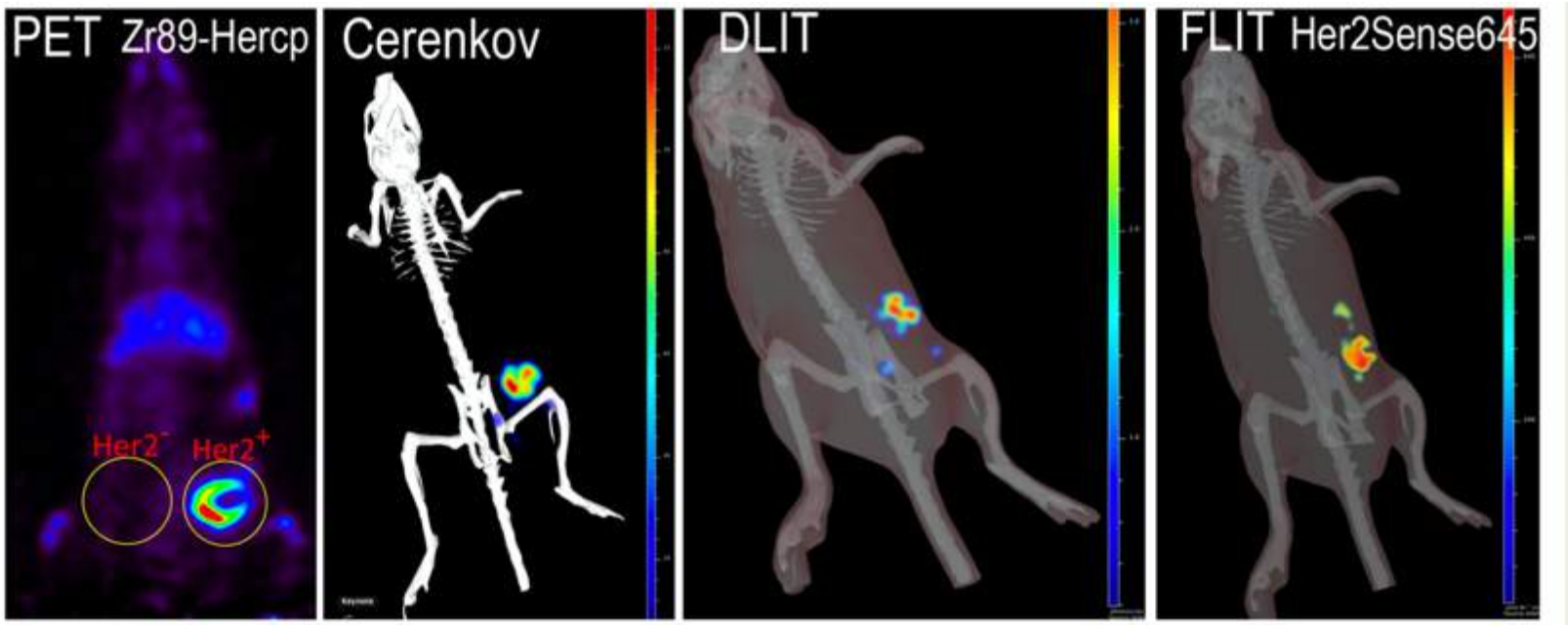


Biophotonic imaging
(tumor cells being killed)



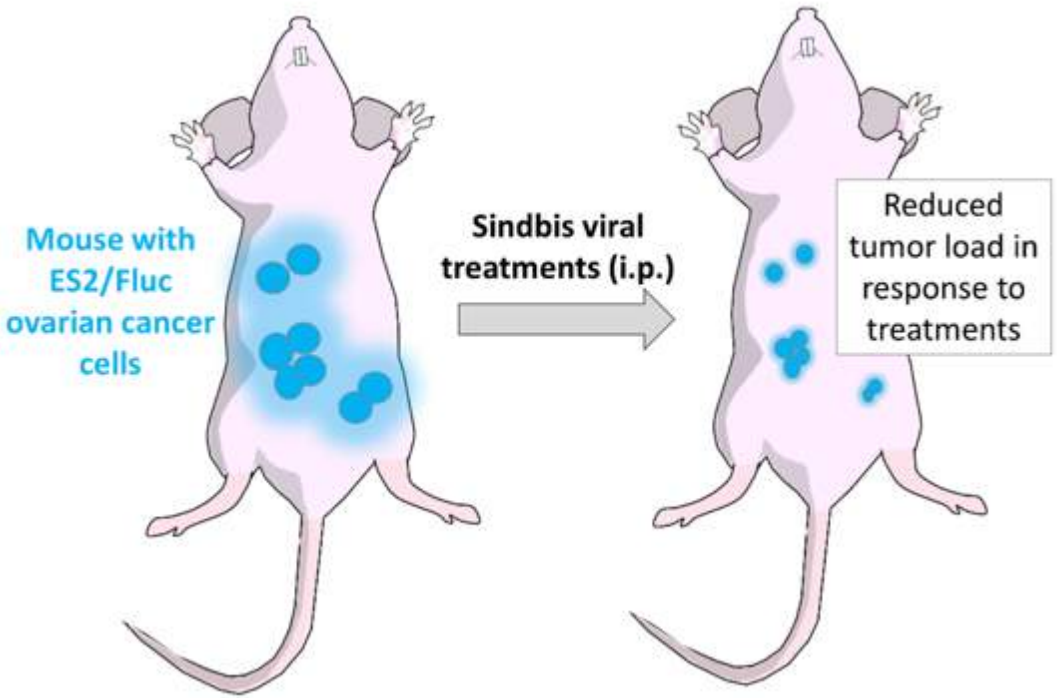
Assessing drug biodistribution and efficacy in a breast cancer xenografts



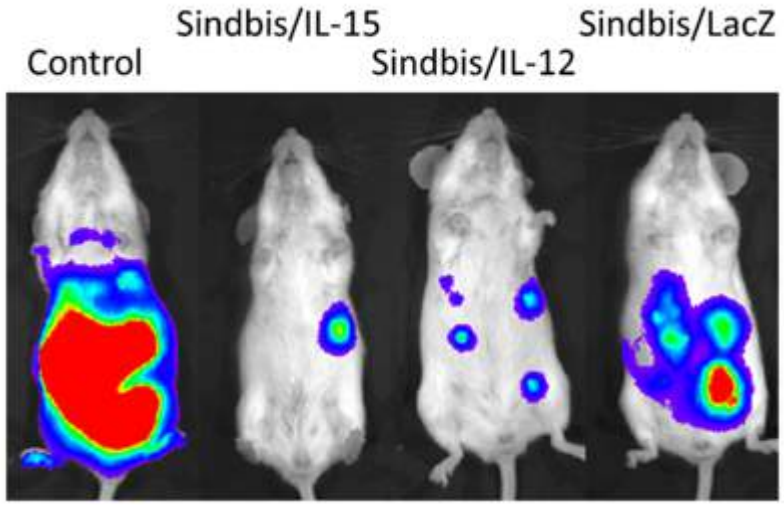


Accumulation of the Herceptin agent in the HER2⁺ tumor.

Oncolytic Virus Therapy– Imaging Oncolytic Virus Infection in Cancer Cells

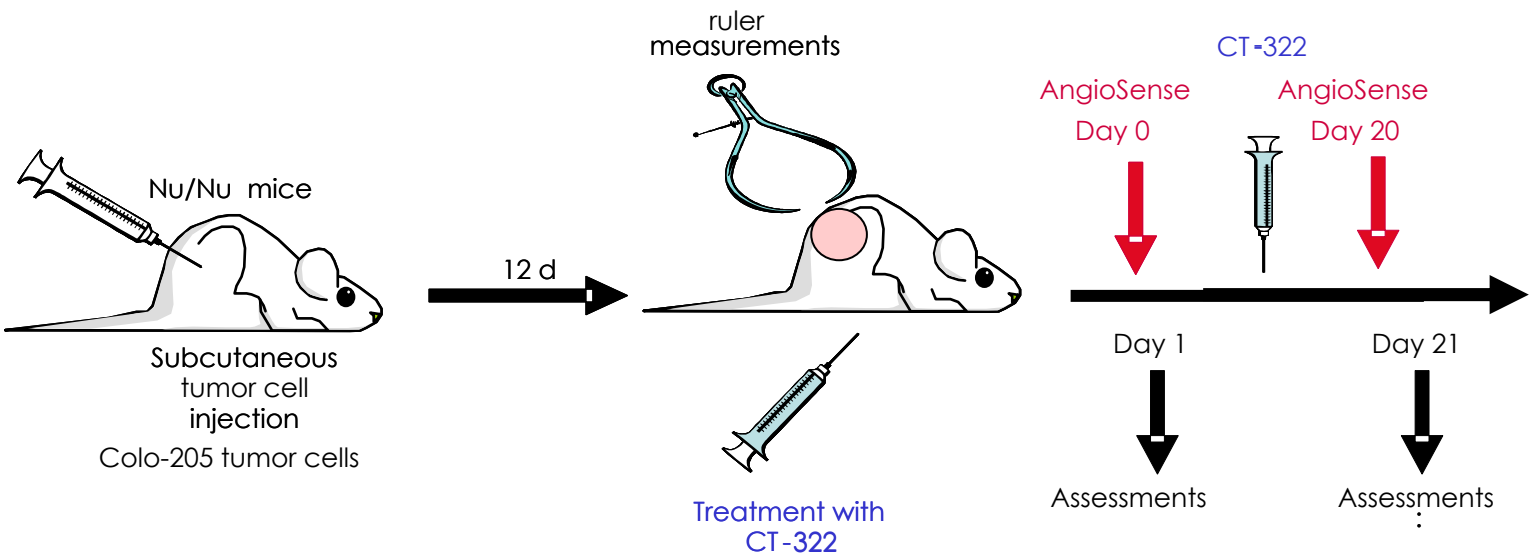


After 13 daily treatments



In Vivo Quantification of Therapeutic Response

- Therapeutic effect of anti-Angiogenic Adnectin, CT-322, on tumor vascularity in a xenograft model



Assessments:

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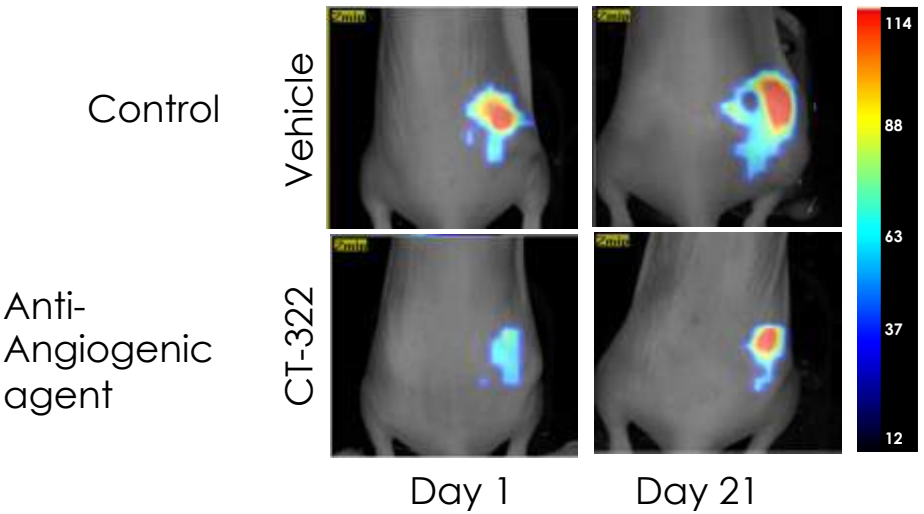
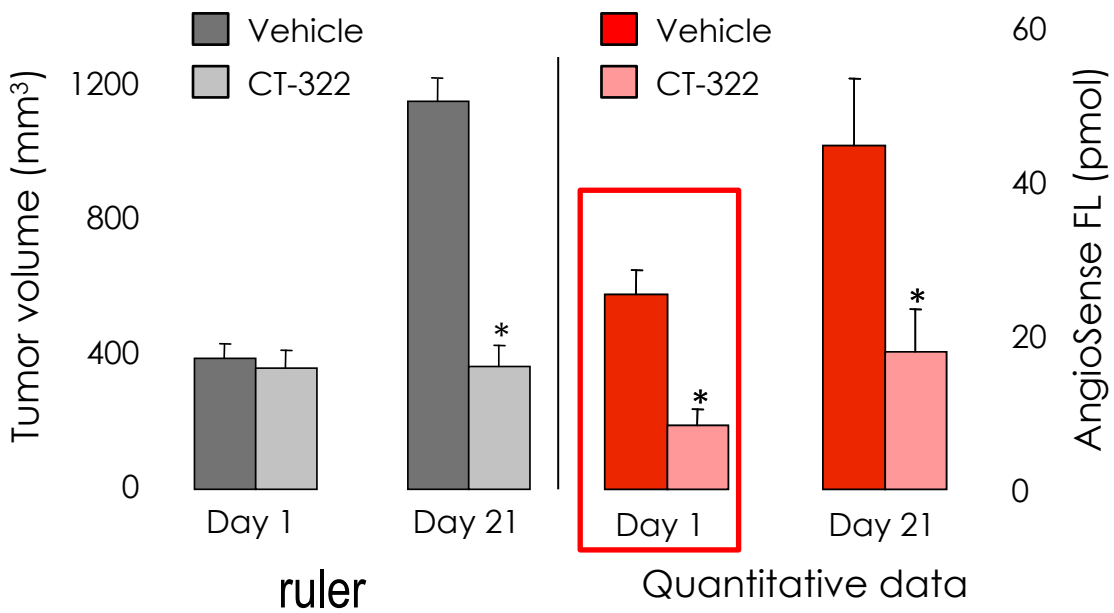
Evaluating Anti-Angiogenic Agent in Tumor Model





Adnexus
A Bristol-Myers Squibb R&D Company

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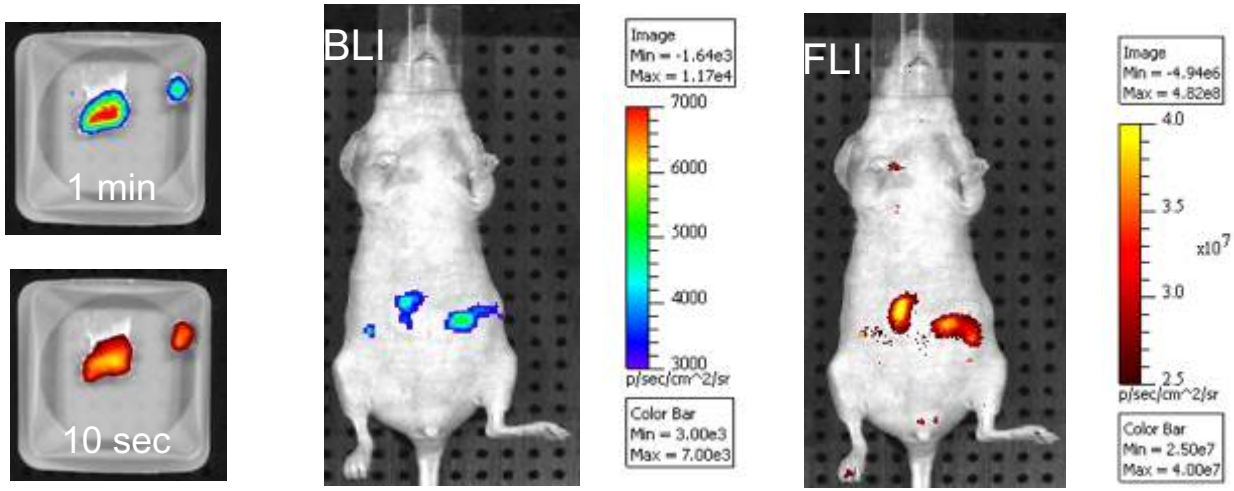
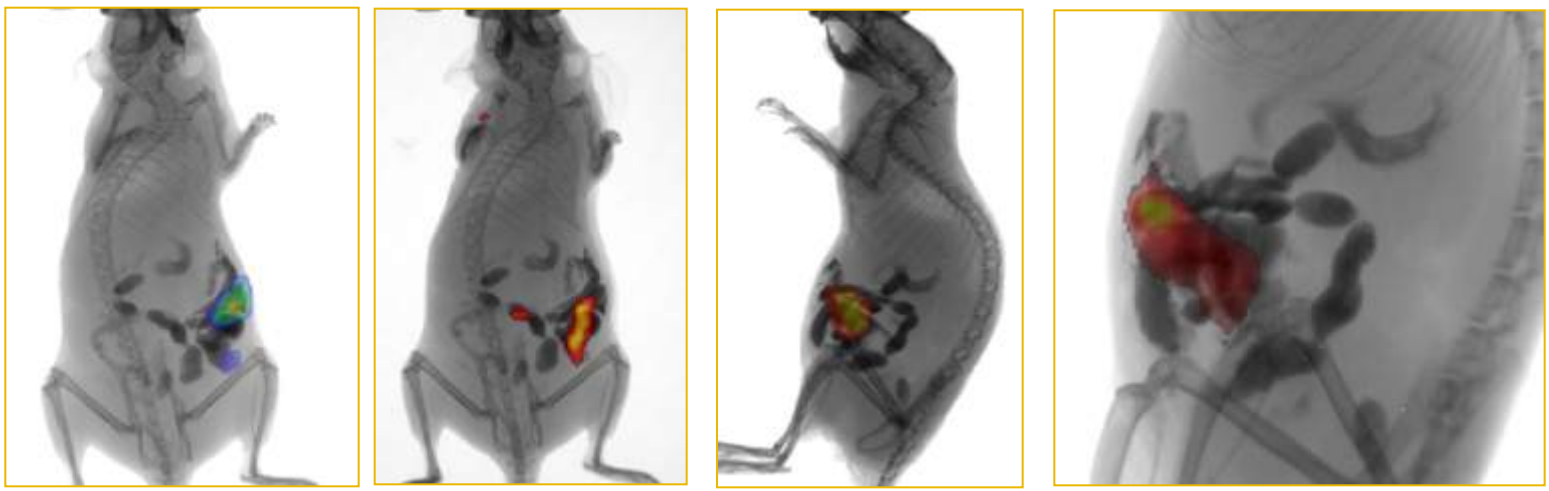
Gastrointestinal tract infection model

A.

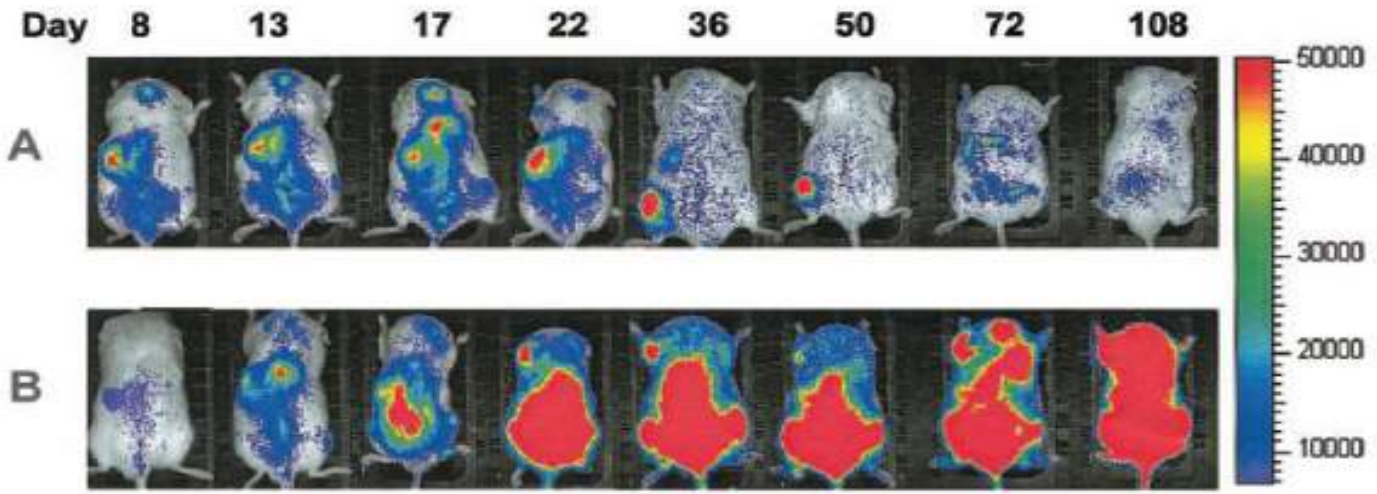


B.



A GI tract infection model was established by feeding a mouse with contaminated peanut butter, which contained bioluminescence and fluorescence dually labeled *Salmonella typhimurium* (Xen26-lux-cherry). Bioluminescence and fluorescence (Ex605/Em660 nm) images were taken at 3 hours (A). At 5 hours, tri-modality imaging was performed and the overlaid images were shown (B). The GI tract was highlighted due to the presence of barium sulfate (150 mg) in the peanut butter.

Cell Transplantation and Trafficking Patterns

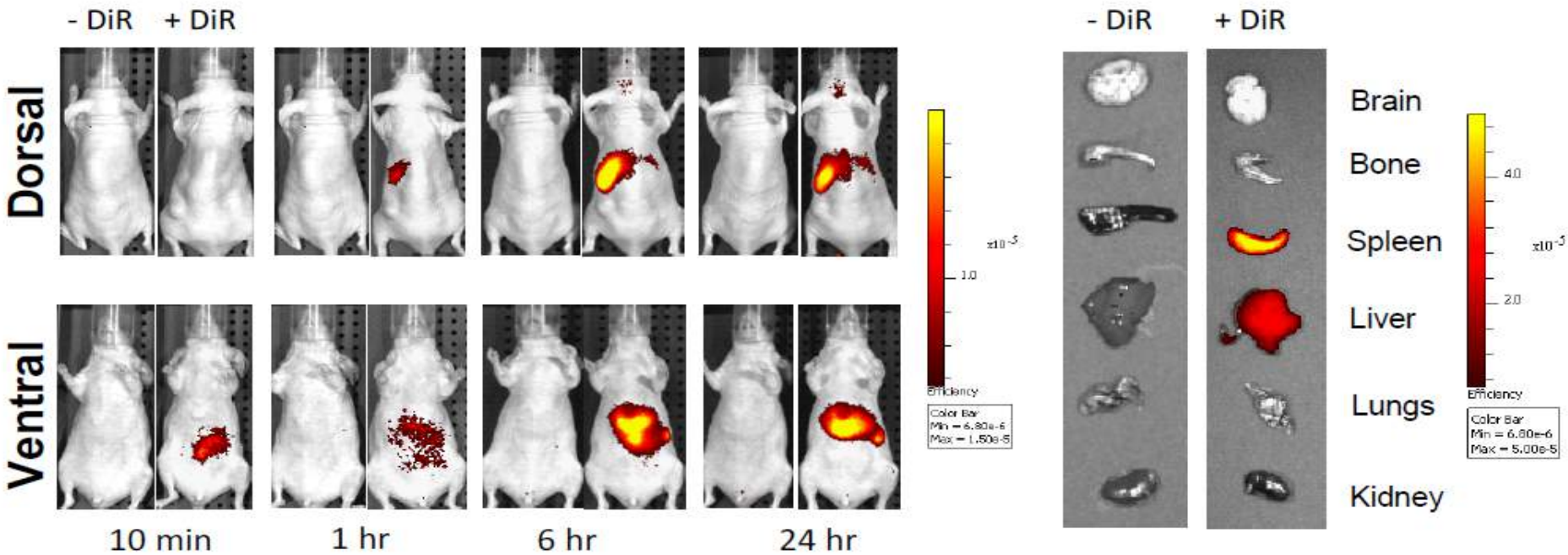


CD34+ HSC-luc(A)
or CD34+CD38- HSC-luc(B)
Tail vein inject to NOD/SCID mice
Monitor the viability and proliferation of the cells

Blood,2003

Cell tracking with a lipophylic cell labeling dye

- *In Vivo* Imaging of DiR Stained Spleen T-cell Distribution

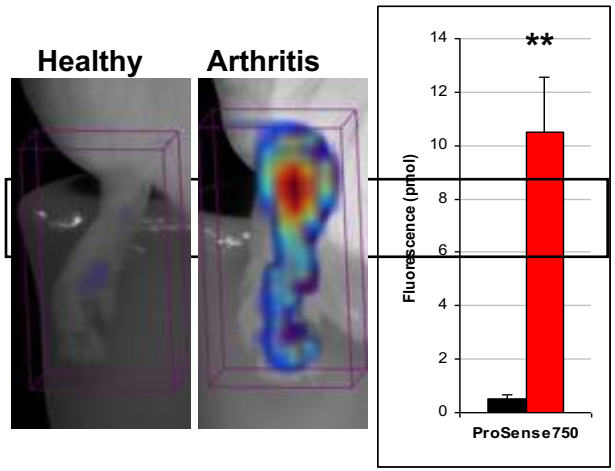


T-cells isolated from the spleen were fluorescently stained with DiR and i.v. injected ($5x10^6$ cells/mouse) into a Nu/Nu mouse. Images above taken 24hrs post injection with IVIS Spectrum show cells homing to the spleen

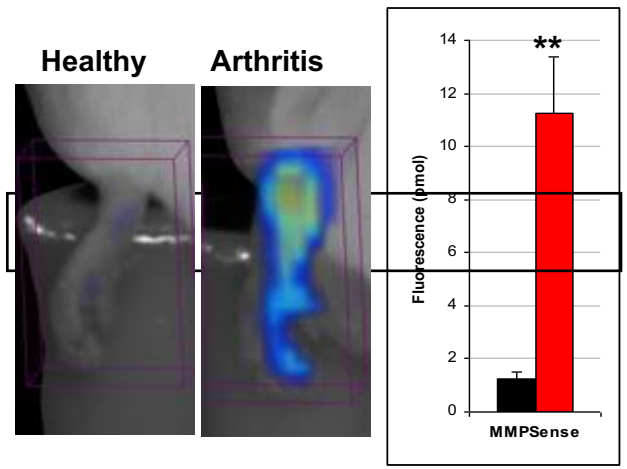
Different Fluorescent Agents for Imaging Arthritis

Inflammation Protease Activity

ProSense

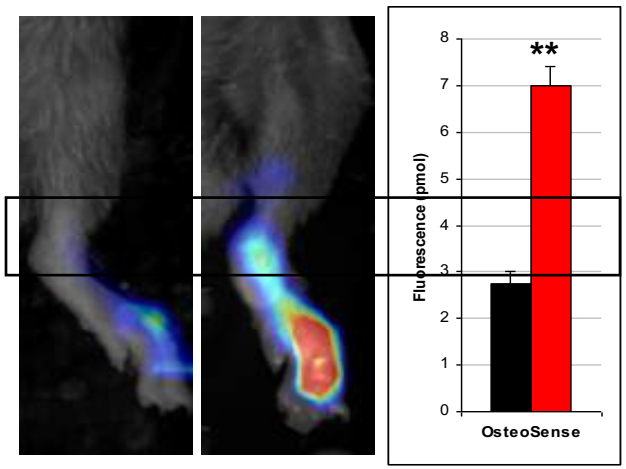


MMPSense



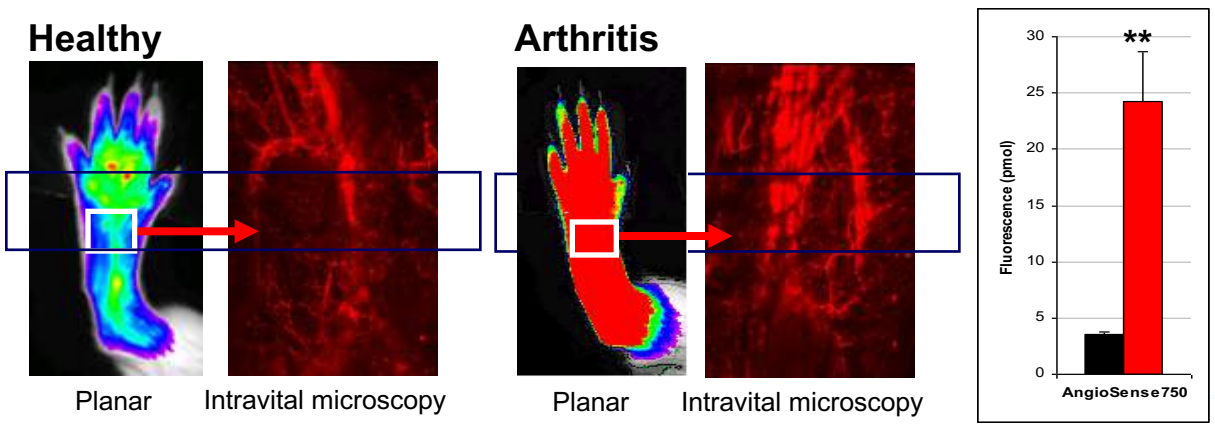
Bone Changes

OsteoSense

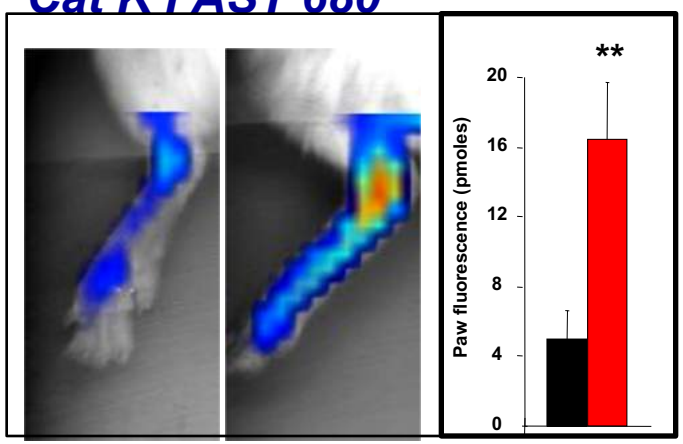


Vascular Leak

AngioSense



Cat K FAST 680



Top Ten Tips for Optical Imaging

1. Choose reporters that maximize signal-to-noise (S:N) ratio
2. Consider the appropriate control groups and imaging time points necessary
3. Use hairless mice or white-furred animals and depilate or shave
4. Switch to autofluorescence-free mouse diet
5. Closely map the kinetics of your biological bioluminescent model
6. Animal handling can significantly affect kinetics
7. Image in the animal orientation that yields the highest signal intensity
8. Cover intense signal to allow dimmer signals to dictate auto-exposure
9. Utilize guards to prevent reflection off neighboring animals
10. Use black well plates when doing in vitro experimentation

PerkinElmer
For the Better

HUMAN HEALTH | ENVIRONMENTAL HEALTH

Thank you for your attention!

J & H 博克科技股份有限公司

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