



XENOGEN

Discovery in the Living Organism™

Xenogen Corporation Imaging Technologies

A new technology from Xenogen—*in vivo* biophotonic imaging—allows researchers to monitor and record cellular and genetic activity within a living organism, in real time. With this information, scientists can observe the spread of a disease or cancer, or the effects of a drug throughout the system of a test subject.

Sensitive CCD cameras combined with specially designed imaging chambers and software, now capable of revealing a window into the living organism to assist biotechnology and pharmaceutical R&D



XENOGEN
Imaging Technologies

tagged entities. Data gathered from animal models based on this technology allow researchers to better understand the mechanisms of action of diseases and the drugs that will one day treat them.

Each luciferase reaction emits only a single photon, invisible to the unassisted eye. In order to measure and record the emitted light, Xenogen created the IVIS® Imaging System which combines an extremely sensitive camera, a specially designed imaging chamber, and specially designed software to run it all. Living Image® software designed by Xenogen analyzes, organizes,

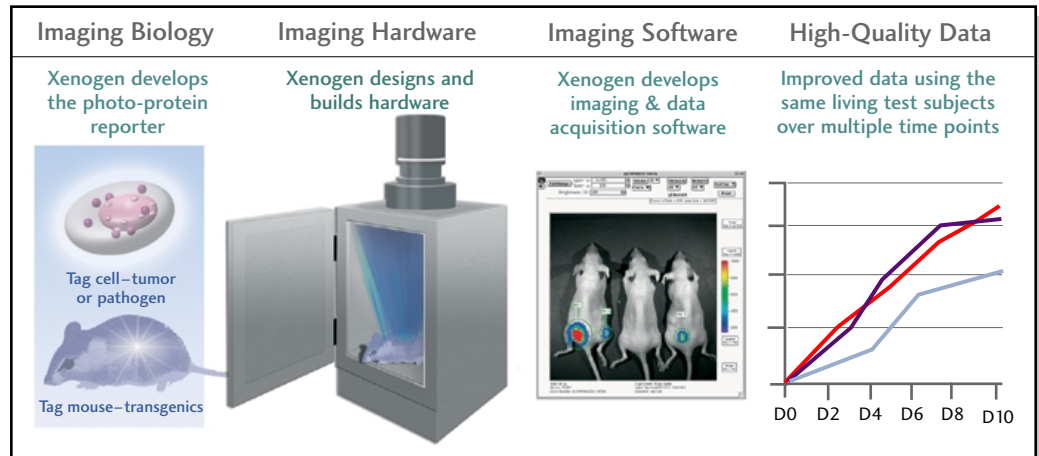
Specific genes, cells, or organisms are "tagged" with the gene for luciferase—the enzyme that lets some insects and animals glow. When the tagged entity is active, it glows. The emitted light corresponds to the number and location of

and stores data. The system is capable of revealing information previously unavailable to researchers. The IVIS® Imaging System is currently being used for genomics, biotechnology and pharmaceutical research and development.

Imaging Technologies Product Lines

- IVIS® Imaging System Hardware and Accessories
- Living Image® Software
- Bioware™ Cells & Microorganisms
- LPTA™ Animal Models

Xenogen has designed Living Image® data acquisition and analysis software to operate on both Windows® and Macintosh® operating systems.



Xenogen believes that real-time *in vivo* imaging has application in the pharmaceutical industry for drug discovery and development as well as for toxicology screening R&D applications. Imaging applications can include various therapeutic areas of interest.

IVIS[®] Imaging System

Imaging System Components

CCD Camera & Imaging Chamber

- Ultra low-noise, CCD camera
- Low background imaging chamber
- Six-position optical filter wheel
- High-efficiency optics
- NIST traceable absolute calibrations
- Sample illumination system
- Auto zoom and focus
- Heated sample shelf
- Gas anesthesia inlet and outlet ports
- Software controlled field of view, f-stop, focus and filter wheel
- Multi-port anesthesia manifold for mice or rats

Cryogenic Refrigeration Unit

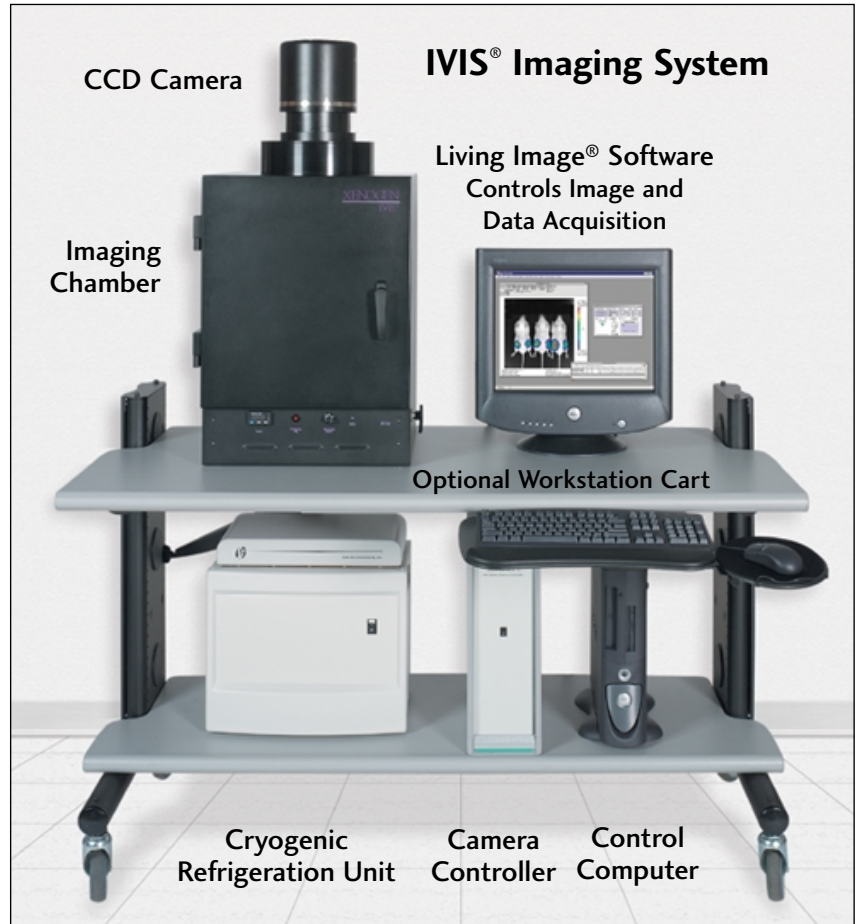
- Cools CCD to temperatures as low as -120°C without liquid nitrogen, a self-contained system requiring no user maintenance

Camera Controller

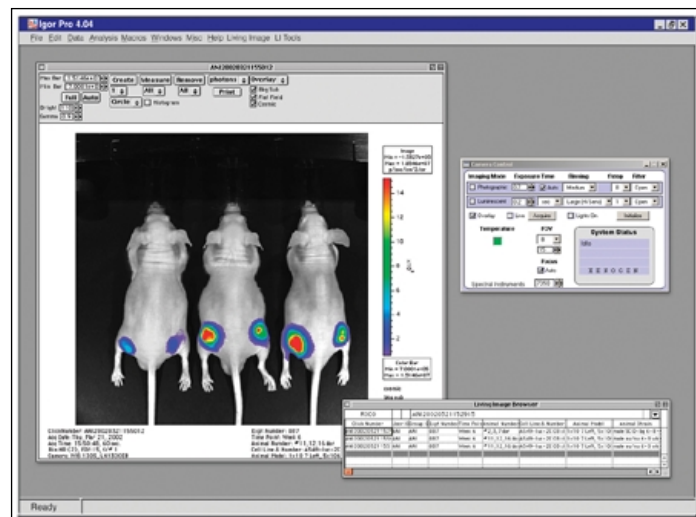
- Low noise electronic readout, for extremely low background images

Controlling Computer and Software

- Windows[®]-based control and acquisition computer, and monitor, Living Image[®] software installed
- Living Image[®] software from Xenogen is custom-designed to control the IVIS[®] Imaging System, as well as display and analyze image data
- Desktop copies of Living Image[®] software are available for both Windows[®] and Macintosh[®] platforms



IVIS[™] Imaging System Workstation Components, shown with optional workstation



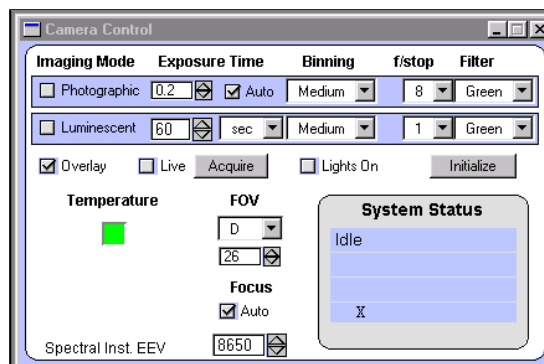
Living Image[®] software from Xenogen controls the imaging process as well as image acquisition and analysis

Living Image® Software

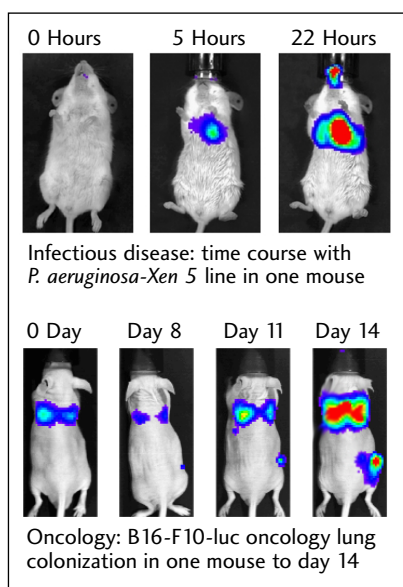


Living Image® software provides an interface for imaging and analysis. It

also acts as a guide to lead technicians through the imaging procedure. The camera control panel sets and displays all imaging parameters—all designed to limit set-up time and enhance throughput. The system takes



pictures per user settings and displays the data as an overlaid color image, recording emitted photon data. The colors in the images represent the number of photons emitted per unit area, with the high signal value represented by red and the low signal value represented by purple. This color scale is adjustable to bring out detail in any set of data.



Infectious disease: time course with *P. aeruginosa-Xen 5* line in one mouse

Oncology: B16-F10-luc oncology lung colonization in one mouse to day 14

Bioware™ reporters in anesthetized test subjects imaged over several time points.

Focus areas for the initial set of Xenogen LPTA™ animal models in development are:

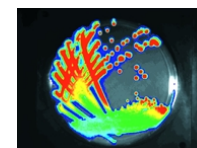
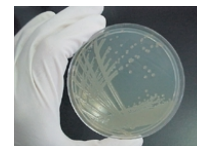
- Drug metabolism/toxicology
- Inflammation
- Angiogenesis/oncology
- Endocrine signaling
- Transcription factor signaling
- Metabolic disease
- Organ transplant

Bioware™ Cells and Microorganisms



Bioware™ lines currently include bacteria, fungi, and cancer strains tagged with luciferase. Xenogen supplies bioluminescent reporters designed to allow real-time *in vivo* assessment of the spread and growth of specific infectious diseases and cancers. These tagged organisms and cells provide new insight into the mechanisms of action and overall efficacy of drug candidates.

Bioware™ infectious disease lines include gram-positive and gram-negative bacteria and fungi. Bioware™ oncology models are both primary and metastatic and include breast and prostate cancer, melanoma, and other lines currently in development.

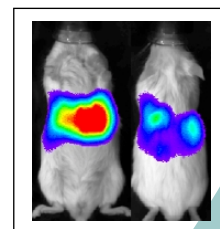


LPTA™ Animal Models



LPTA™ animal models are engineered to emit light when a tagged gene is active. They are used to provide real-time *in vivo* validation of targets or drug candidates, and to assess the toxicity of drug candidates or other chemicals. It is anticipated that LPTA™ animal models will be valuable tools for performing *in vivo* validation of targets identified through genomics and gene targeting, as well as modeling disease pathways to determine mechanism or action of a drug.

LPTA™ animal models are being developed for toxicology testing by both the pharmaceutical and chemical manufacturing industries, as well as PK/ADME (pharmacokinetics/absorption, distribution, metabolism, and excretion) studies.



LPTA™ HO-1-luc model imaged 7 hours after CdCl₂ induction

Product Lines Availability and Contact Information

Please use the contact numbers shown below for more information on imaging technology products from Xenogen.

Current listings of available Bioware™ cells and microorganisms as well as LPTA™ animal models are available via e-mail inquiry at: imaging@xenogen.com, or businessdev@xenogen.com

Xenogen Corporation holds the exclusive license under U.S. patent numbers 5,650,135 and 6,217,847 and grants sublicenses to practice the technology

covered by these patents. Xenogen also holds the exclusive licence under European patent number 0861093. This proprietary *in vivo* biophotonic imaging technology and associated biological products are available only by a commercial-use license which will define the license field(s) of Xenogen technology use.

Xenogen also grants academic licenses for the purposes of further research and development of the imaging technology.

IVIS® Imaging System 100 Series Specifications

Imaging System Component	Specifications
Sensor	Back-thinned, back-illuminated Grade 1 CCD
Imaging Pixels	≥1024 x 1024
Resolution	Better than 0.2 mm at object
Pixel Size	20µm square
CCD Size	2.5 x 2.5 cm
Quantum Efficiency	>85% 500–700 nm; >30% 350-950nm
Read Noise	<5 electrons RMS
Dark Current	<100 electrons/s/cm ²
Minimum Detectable Luminance	<100 photons/s/sr/cm ²
Lens	f/.95 – f/16, 50 mm
CCD Operating Temperature	As low as -120°C
Field of View	10x10 cm to 25x25 cm
IVIS™ System Imaging Chamber	46 cm x 46 cm x 51 cm (L x W x H)
Power Requirements	15A at 120V

IVIS® Imaging Chamber

System Features: Heated Stage: up to 40°C; Gas anesthesia inlet and outlet ports are provided; High performance acquisition computer; 20-inch, high resolution flat screen monitor; Software-controlled focus, f-stop, field of view; 6-position filter wheel; Living Image® software provides image acquisition controls and image analysis.

Contact information

Please call 1.877.936.6436 or e-mail: imaging@xenogen.com

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www.xenogen.com