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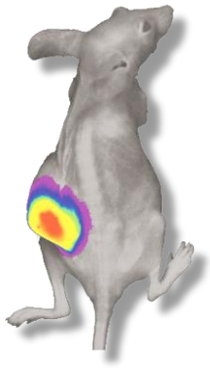
In Vivo Imaging System

FOBI



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FOBI

Fluorescence *In Vivo* Imaging System

High Quality Image Data

Personal Imaging System (Compact, Easy, Cost effective)

In Vivo, Ex Vivo and *In Vitro*

Small animal and Plant

Tumorization, Cell tracking, Drug tracking and Gene expression

FOBI is a device that can image and analyze fluorescent signals from tissues and organisms. Images of various fluorescent proteins and dyes are taken using 4 channels consisting of Blue, Green, Red, and NIR. Using an optimized light source, filter, and color camera for macro-imaging, FOBI can obtain intuitive and high quality images. This configuration clearly distinguishes between background and signal without further analysis and is also available through a live window.

NEOimage program providing with FOBI analyzes fluorescence images easily by removing a background image effectively which is the biggest obstacle for fluorescence imaging and caused by autofluorescence and reflected light. In addition, the uniform light intensity of LED light makes it possible to measure certain quantity values. FOBI has a simple design, is easy to use, fast and reliable.

Features

Intuitive color data

FOBI uses color sensor and optimized filters for the fluorescence signal through a live window without any special analysis. The live window allows you to identify the position and intensity of the fluorescence intuitively, and to get image data as it shown.

Fast

FOBI has a fast frame rate capable of recording videos. Due to the fast video speed, many samples can be processed quickly and observed instantly and responded.

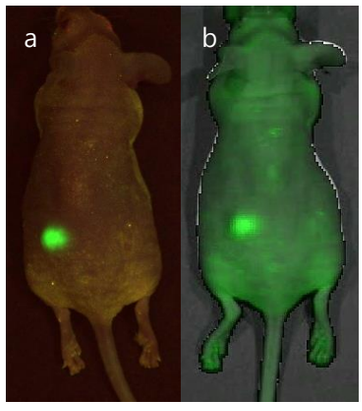

Fig. 1. Intuitive data by FOBI's color sensor
a. Image with color sensor.
b. Image with mono sensor (pseudo color).

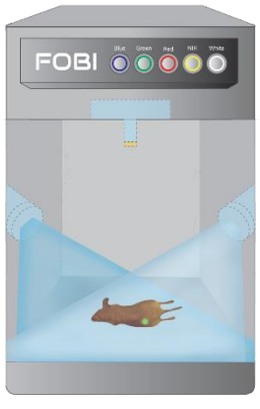

Fig. 2. Structure of FOBI

Simple

FOBI is structured as simple and optimal for quick and easy installation. It is also easy to move, manage, and maintain.

Compact size

The FOBI has a compact size (26 x 26 x 40 cm), so it is ideal for small spaces. Due to its convenient size and portability, it can be used for a wide variety of applications.

Easy to use

Hardware and software are user-friendly. Mounting filters, controlling exposures, and capturing images are all simple and easy to use.

Multi function

It is possible to apply most fluorescence proteins and fluorescence materials from GFP to ICG by using four channels as Blue, Green, Red and NIR. Since more than one fluorescent can be imaged, various functions can be observed in one sample. For example, tumor and drug imaging can be performed in the same animal so that targeting and tumorization can be observed simultaneously. You can also merge bright images in order to localize the fluorescence within the animal.

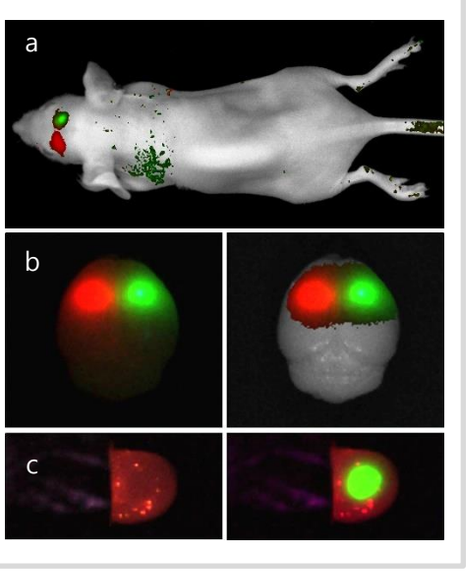

Fig. 3. Multi function imaging
a. In Vivo image of Tumor cell (green) and Stem cell (red) in the same brain.
b. Whole brain image after sacrificed. c. Sliced brain image.

Applications

Tumor imaging

GFP stable cell line can be used to confirm tumorization. The created GFP stable cell line can be imaged *In Vitro* by using FOBI. By means of injecting GFP cells into subcutaneous tissues, cell proliferation can be imaged as fluorescence. In this way, it can obtain the images of metastasis to other tissues, in addition to quantifying and comparing tumor size.
Over the time, the signal strength of the fluorescence changes and the camera exposure time may vary accordingly. Because NEOimage analysis program can quantify the changes depending on imaging conditions like exposure time and gain, it can also compare and analyze the result of samples under the different condition.

Cell tracking

Stem cells or immune cells with enhanced functions for various purposes can be imaged within the animal so as to ascertain their location and viability. Stem cells and immune cells are difficult to label with fluorescent genes. So, cells can be stained with fluorescent reagents in a variety of ways.
Stem cells and immune cells stained with a fluorescent reagent can be put into an animal using various methods such as intravenous injection, intraperitoneal injection, and subcutaneous injection. These cells can be located by using FOBI imaging. Cell survival can be determined by using quantitative analysis.

Plant imaging

By using a specific filter of FOBI, Chlorophyll's autofluorescence can be removed and analyzed with GFP although it is difficult to obtain images of plant leaves due to the strong autofluorescence of Chlorophyll.
The autofluorescence of chlorophyll itself can also be used as data. The degree of activity of chlorophyll can be confirmed by the intensity of the autofluorescence.
In addition, images can be obtained from plant seeds and callus. Fluorescence imaging is possible with plants throughout their entire life cycle.

DDS (Drug Delivery System)

Drugs confirmed *In Vitro* can be injected into animals for experimental purposes. By taking images at certain intervals, you can check the movement and accumulation pattern of the drug in the living tissues of the animal.
The image of the drug confirmed *In Vivo* can be checked again *Ex Vivo*. Because the fluorescence is still expressed even after the animal is sacrificed, it is possible to quantify each tissue separately.
The result of *Ex Vivo* data, together with the *In Vivo* data, can provide an excellent evidence for an experiment.

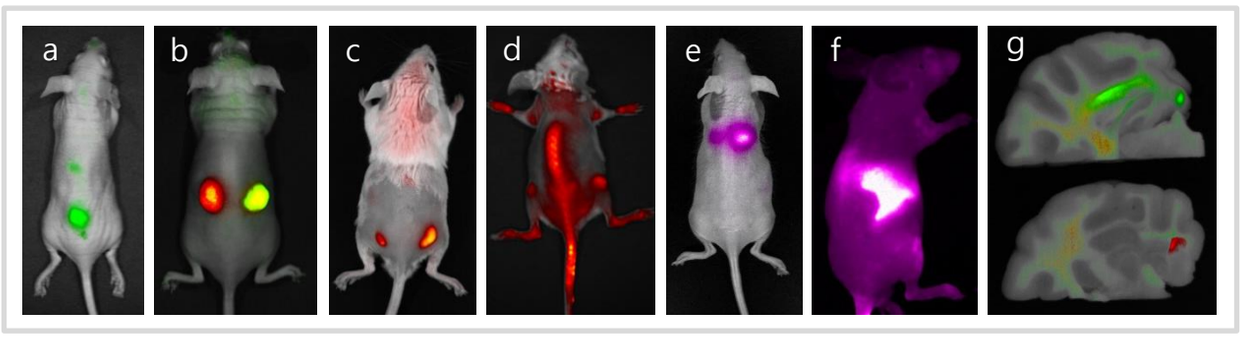

Fig. 4. Animal imaging by FOBI

a. Tumorization of GFP expressing stable cell line injected subcutaneous. b. FOBI can image variable fluorescence molecules from GFP to ICG. c. iRFP (near infrared fluorescence gene) tumor. d. DiD labeled immune cell injected via tail vein moved to inside the spine. e. ICG labeled drug targeted to the lung. f. Cy7 labeled drug moved to the liver. g. GFP expression and drug targeting in the sliced ape's brain.

Optimized Filters for *In Vivo* Imaging

FOBI uses optimized filters for In Vivo imaging. Fluorescent In Vivo imaging should be able to remove the reflected light of a remaining light source and the background light originated from self-fluorescence existing in biological tissues. FOBI uses differentiated filters with a fluorescence microscope since such a background light shows different patterns with cell imaging getting from a fluorescence microscope.

Fig. 5. Filters for *In Vivo* Imaging

Software - NEOimage

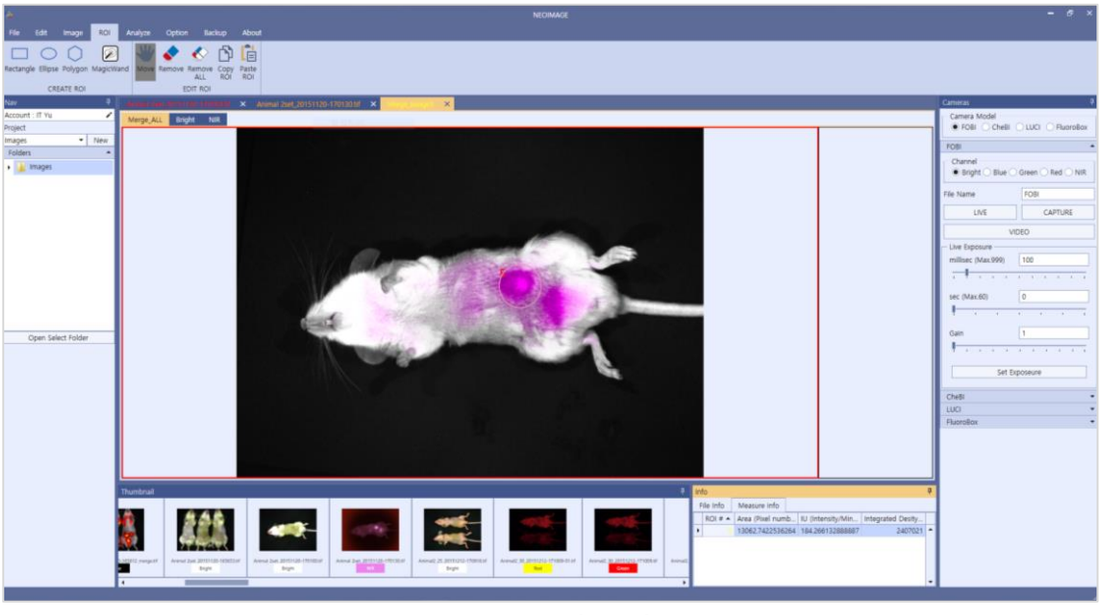

Fig. 6. NEOimage software for FOBI

The dedicated software, NEOimage, can capture and analyze fluorescent signals in a very intuitive and easy-to-use manner. The Live window displays the fluorescent image in real time. It helps determine the optimal exposure time and gain. The fluorescence live window helps you find the fluorescence signal and observe the operation scene in real time. Background images can be removed by using a simple method. When the analysis is complete, a scale bar appears to show the degree of fluorescence. The color can be displayed in monochromatic, two-color, or rainbow colors range. You can also compare and analyze samples with different exposure times by adjusting the highest and lowest values of the scale bar.

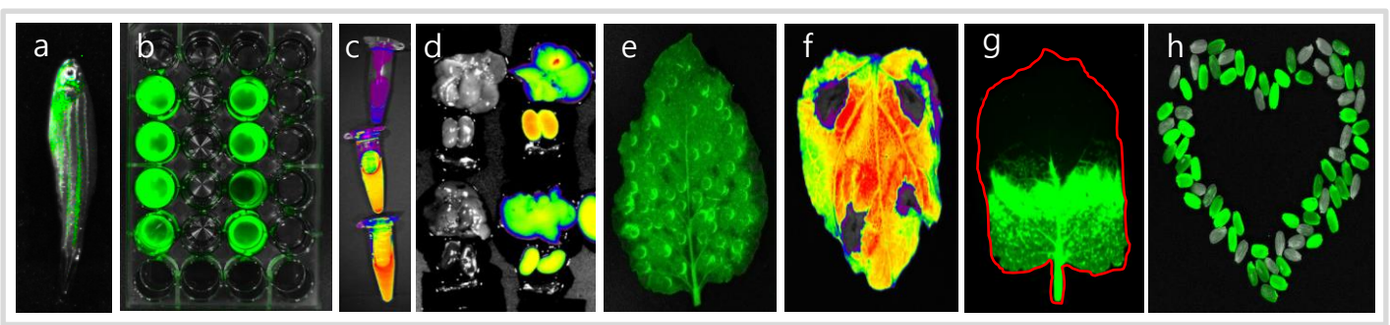

Fig. 7. Fluorescence imaging of various materials and methods

a. Fluorescence labeled chemicals in the Zebrafish. b. GFP cell in the 24 well plate. c. Fluorescence labeling test. d. *Ex Vivo* imaging for drug delivery system. e. GFP expression leaf infected gene by virus vehicle. f. Auto-fluorescence from the chlorophyll. g. Gene expression on the leaf with marker gene. h. Gene transfected seed separated by GFP imaging.

FOBI

Product Type

There are two types of FOBI. One is a standard type that takes a picture with the door closed and outside light blocked. The other is an open type with no doors and no walls on the right and left side. The open type FOBI can be used when the sample size is large, such as rabbits and apes, or when recording a video of a surgical scene.

Fig. 8. Types of FOBI

Mini *In Vivo* Imaging System

FluoroMini is available as a mini *In Vivo* Imaging system. Tumorization, Stem cell, Immune cell, DDS and Plant, Various applications can be applied. FluoroMini has no camera but the mini version of FOBI. However, if you need an image, you can use a normal camera to get the image and analyze.

Fig. 9. FluoroMini, Mini In Vivo Imaging System

FOBI 2, Enhanced fluorescence signal

FOBI's functionality has been improved. The camera's sensitivity is improved about 3 times, and the excitation light source is also about up to 10 times stronger than before. In addition, FOBI 2 minimizes the interference of fluorescent images by changing the location of the light source (Light angle: 67° to 45°). Also, a heating bed is added to protect the experimental organisms from hypothermia.

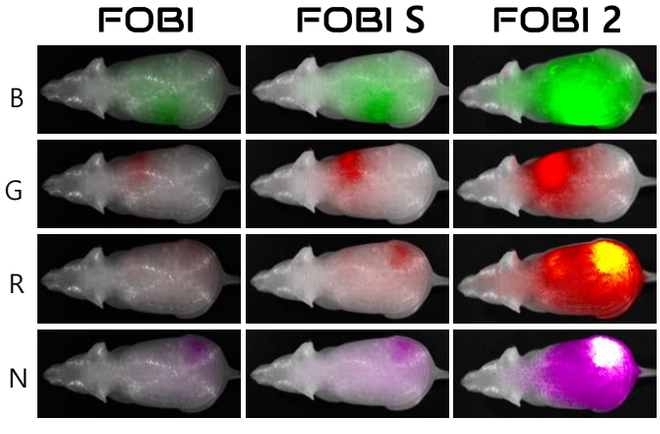

Fig. 10. Fluorescence signal comparison

Color for FOBI 2

Fig. 11. Color options for FOBI 2

Specifications

	FOBI	FOBI S	FOBI 2
Image Sensor	1/2" color CCD sensor	4/3" Color CMOS sensor	
Resolution	1392 x 1040	1400 x 1050	
Frame Rate	15 fps	30 fps	
Digital Output	24-bit	24-bit	
Interface Connector	USB 2.0	USB 3.0	
Power consumption (B G R N)	8.6 8.6 5.8 1.9		15 15 10 10
Ex light angle	67°		45°
Distance of ex light	275 mm		135 mm
Stage heating	no		yes
Chamber type	Standard or Open		Standard
Channel	**Blue** (GFP, FITC...) **Green** (RFP, Cy3...) **Red** (Cy5.5, DiD...) **NIR** (Cy7, ICG...)		
Channel number	1, 2, 3 or 4 (upgradable, maximum 4ch)		4 (one model)
Capacity (Mouse)	3		
Weight	9 Kg		12.5 Kg
Size (W x D x H)	260 x 260 x 400 mm		

Accessories

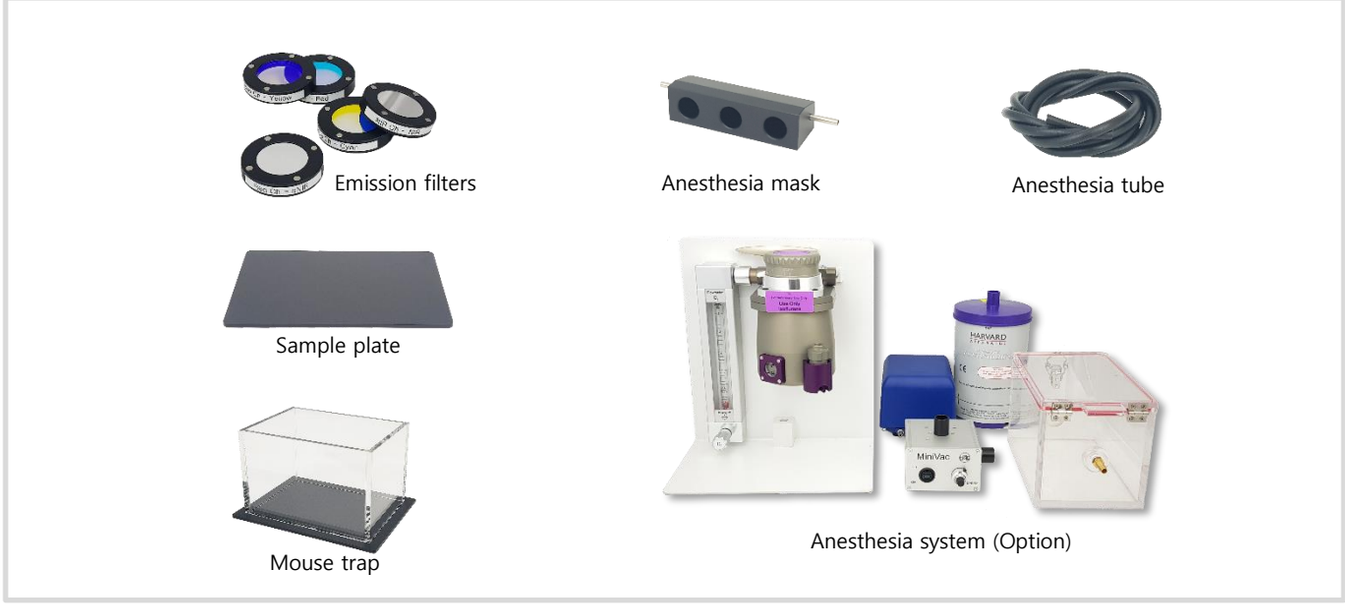

Fig. 11. Accessories for FOBI

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