Focal Points
Application Note FP-182

Imaging of Fluorescent Metastatic Mouse Models of Pancreatic Cancer Using the iBox Explorer^2 Imaging Microscope

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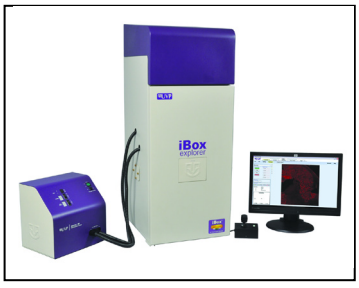
Introduction

Cancer metastases are responsible for the majority of cancer-related deaths. Approximately 50% of cancer patients die within 5 years as a result of cancer-related problems, mostly attributable to metastatic lesions caused by the spread of cancers to near and distant sites [1]. A widely held hypothesis is that cancer metastasis arises from rare cells in the primary tumor that acquire the ability to progress through sequential steps necessary to grow at a distant site [2, 3]. Metastasis is presently under intense study, and various mouse model systems are in use to experimentally recapitulate and dissect the various steps of the metastatic process.

To better visualize and track the metastatic process, an imaging system with sensitive signal detection is important to the study. Here, the UVP iBox® Explorer^2 Imaging Microscope was used to reveal patterns of metastasis formation by human pancreatic carcinoma cells in mice. The iBox Explorer^2 system can quickly detect low fluorescent signals with its high resolution, high sensitivity camera. The system supplies a wide range of excitation and emission filter combinations designed to detect various fluorescent proteins. These filters provide the opportunity to maximize the level of emission intensity while simultaneously reducing the number of unwanted photons from auto fluorescence or bleed-through by other fluorophores.

Fig.1. iBox Explorer^2 Imaging Microscope



Materials and Methods

Vector, Cell Line and Animal

The human pancreatic cancer cell line MIA-PaCa-2 was transduced with RFP-tagged plasmid. Cell culture and selection of MIA-PaCa-2 cells stably expressing RFP were conducted. A six-week-old male nude mice (BALB/c-nu/nu) was purchased (Beijing HFK Bio-Technology Co. Ltd., China) and then acclimated for one week. MIA-PaCa-2 cells stably expressing RFP were harvested and kept on ice. Cells (1×10^7 cells in 0.1 mL PBS) were subcutaneously injected into the nude mice.

Fluorescent Microscopy

Ten weeks after MIA-PaCa-2-RFP inoculation, mice were sacrificed consecutively by neck dislocation and the organs were dissected out immediately. Images of different organs of the mice, including spleen, kidney, intestine, heart and liver were captured with the iBox Explorer which was configured with an RFP excitation filter (525BP45) and emission filter (650BP50). The iBox Explorer incorporates a Xenon multispectral light source for sample illumination, capable of emitting high intensity excitation in the visible to NIR wavelengths.

Results

The dissected organs, including spleen, kidney, intestine, heart and liver from the mouse inoculated with MIA-PaCa-2-RFP cells and control mouse were imaged one by one using the iBox Explorer to detect the RFP signal. Figure 2 shows 0.5x magnification of an illuminated specimen. Liver and heart from the inoculated mouse were dissected. Strong RFP signal was detected from liver, but not from heart or any other tissues. There was no RFP signal observed in any organ tissues in the control mouse.

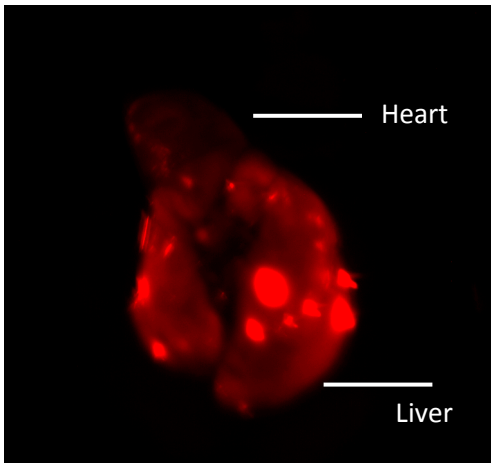


Fig.2. Ex vivo imaging of the excised organs, including liver and heart from MIA-PaCa-2-RFP inoculated mouse. Strong RFP signal was detected from the liver, but not from the heart.

Discussion

The preliminary results showed metastasis formation in the distant site (liver) 10 weeks after the human pancreatic cancer cell were inoculated in the mouse.

This application illustrates the functionality of the iBox Explorer in imaging fluorescently-labeled tumor tissue. Using the iBox Explorer's high-sensitivity, cooled CCD camera and wide spectra filters, images with clear fluorescent signals and tissue structure were obtained.

The iBox Explorer can be used for evaluating and monitoring metastatic process in various preclinical animal models. It can make both in vivo and ex vivo imaging in mouse models easier, faster, and more accurate. The system's large selection of excitation and emission filters enables researchers to visualize multiple fluorescent signals in the same model.

References

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