GERMAN CANCER RESEARCH CENTER IN THE HELMHOLTZ ASSOCIATION

Research for a Life without Cancer

TECHNOLOGY OFFERS

Optical Tomographic (OT) Device for Combination with MR in Preclinical Imaging (P-734)

An optical imaging detector for fluorescence and bioluminescence in small animal imaging that is compatible with magnetic resonance imaging.

EXECUTIVE SUMMARY

Optical techniques, such as bioluminescence and fluorescence, are emerging as powerful new modalities for molecular imaging in disease and therapy. Combining innovative molecular biology and chemistry, researchers have developed optical methods for imaging a variety of cellular and molecular processes *in vivo*, including protein interactions, protein degradation, and protease activity. DKFZ has developed an optical imaging detector for fluorescence and bioluminescence in small animal imaging that is compatible with magnetic resonance imaging (MRI). This technology provides the possibility to study simultaneously tracer/marker kinetics of both optical (OT) and NMR induced signals.

Armin Kübelbeck, CC-BY-SA, Wikimedia Commons
https://commons.wikimedia.org/wiki/File:Nacktratte_PET_01.jpg

Category	Indication	Development stage	Seeking
Devices	Brain cancer	Prototype	Licensing, Development partner

BENEFITS

- micro-lens array with a plurality of micro-lenses
- detector: CMOS sensor with high sensitivity
- combination MR-OT
- multimodal imaging generating images simultaneously in DICOM standard
- no necessity for contact between detector and object
- thin CMOS detector (option for small device)
- high resolution/sensitivity- combination MR-OT possible
- identical imaging geometries and animal positioning
- shorter acquisition time and better study management

TECHNOLOGY BACKGROUND

The device characterizes and quantifies functional and/or molecular biological processes at the cellular and sub-cellular levels, and anatomical structures (primarily through the MR signal) in animal studies. The invention describes an imaging system that is highly sensitive in identifying location, magnitude and time variation of specific molecular events (e.g. gene expression and enzyme activity) by simultaneously detecting optical markers in vivo. During the same acquisition procedure this spatially low-resolution (generally 500 nm) optical information is superimposed over the spatially high-resolution (generally 50 nm) anatomical details of the imaged object, improving the diagnostic accuracy of optical imaging by magnetic resonance imaging.

DEVELOPMENT STAGE

An OT prototype has been developed, established and tested successfully in animal studies in combination with an MR system.

APPLICATIONS

Optimizing drug and gene therapy, imaging drug effects at a molecular and cellular Level, monitoring multiple molecular events near simultaneously, monitoring time-dependent therapeutic influences on gene products in the same animal, studying the interaction between tumor cells and the immune system

INTELLECTUAL PROPERTY

- P-734, [MR-OT], “Dual-modality Imaging”, WO2008028904A1 .
- P-734, [MR-OT], “Dual-modality Imaging”, granted as CA2662548C, EP2062032B1 (DE, NL, GB, FR, CH), US8041414B2, JP5060559B2.

PUBLICATIONS & REFERENCES

- “Iterative reconstruction of projection images from a microlens-based optical detector.” By Cao L, Peter J. published in Opt Express. 2011 Jun 20;19(13):11932-43. doi: 10.1364/OE.19.011932. PMID: 21716427
- “Image formation with a microlens-based optical detector: a three-dimensional mapping approach.” By Unholtz D, Semmler W, Dössel O, Peter J. published in Appl Opt. 2009 Apr 1;48(10):D273-9. PMID: 19340119
- “A novel optical tomographic instrument for multimodal imaging application in mice” in J. Nucl. Med. 2011; 52 (Supplement 1):1958; by Joerg Peter and Liji Cao; Medical Physics in Radiology, German Cancer Research Center, Heidelberg, Germany; Abstract No. 1958

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ABOUT THE DKFZ Innovation Management

Working at the interface of research and industry, the Innovation Management of the German Cancer Research Center (DKFZ) helps to get new cancer drug candidates, diagnostic tests, and research instruments onto the market as quickly as possible.

The DKFZ with its more than 3,000 employees is the largest biomedical research institution in Germany. At the Center more than 1,300 scientists investigate how cancer develops, identify cancer risk factors and endeavor to find new strategies to prevent people from getting cancer. They develop novel approaches to make tumor diagnosis more precise and treatment of cancer patients more successful. DKFZ is a member of the Helmholtz Association of National Research Centers, with ninety percent of its funding coming from the German Federal Ministry of Education and Research and the remaining ten percent from the State of Baden-Württemberg.