4 In Vivo Functional Onco-Imaging

UCI Chao Family Comprehensive Cancer Center

LEADERSHIP & MISSION

Gultekin Gulsen, PhD
Co-Director

Zhuoli Zhang, MD, PhD
Co-Director

Farouk Nouizi, PhD
Facility Manager

IVFOI supports cancer researchers by providing them with the necessary expertise, imaging instrumentation, and image analysis techniques

- Provide high-quality image acquisition and data analysis services for translational clinical studies
- Establish several multi-modality imaging systems to support innovative imagine studies
- Develop several cutting-edge technologies for quantitatively accurate high-resolution small animal imaging and translate them to clinical settings

SERVICES, TECHNOLOGIES & EQUIPMENT

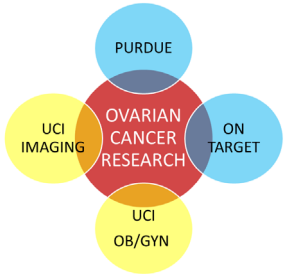
Existing systems (on Irvine campus)
- MR: 3.0 T (human & animal) | MR: 9.4 T (animal)
- Combined MRI & Optical Tomography (animal)
- Combined X-ray micro CT & Fluorescence Tomography (animal)
- Hybrid MRI & SPECT (animal)

Existing Systems (located at UCI Medical Center)
- PET/CT & PECT/CT (clinical scanners available at UCIMC)
- MR (1.5 & 3 T - clinical scanner available at UCIMC)

Systems currently under development or under acquisition
- Micro SPECT/CT (Hitachi, animal)
- Micro PET/CT (Siemens, animal)
- MRI Sodium Imaging (brain cancer)
- Hybrid MRI/Scintimammography (breast cancer)
- Hybrid MRI/Positron Emission Mammography (PEM)
- Temperature-modulated Fluorescence Tomography (animal)
- Photo-magnetic Imaging (animal)

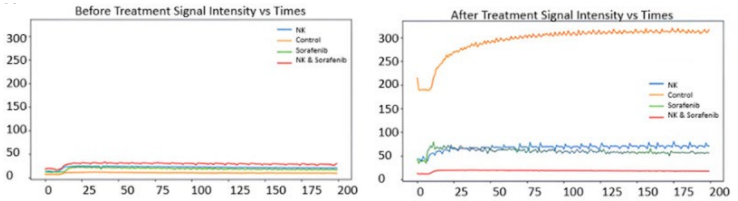
RESEARCH HIGHLIGHTS

Intra-operative Fluorescence Imaging



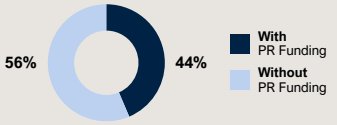
An MRI Compatible Stereotactic System

MRI Monitoring of NK Cell and Sorafenib Therapy for HCC



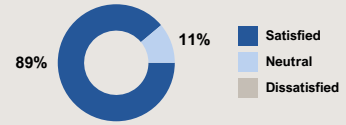
IMPACT & KEY METRICS CY2024

CFCCC MEMBER UTILIZATION



Used by **6** Unique CFCCC Member Labs
2% Overall Usage by CFCCC Members

CFCCC USER SATISFACTION

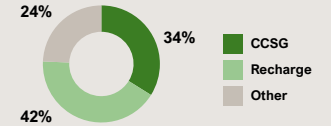


86% Response Rate

$855K Supported CFCCC Members Receive 1 New Cancer-relevant Grants (Total Direct Costs)

10 Support Led to New Cancer-Relevant Publications **(10%)** in IF ≥ 10 Journals)

BASE SR FUNDING



$310,114 Annual Budget

TRAINING

- Training: 3T MRI (10 days), Abi-Jaoudeh lab (BIDD)
- Training: 3T MRI (10 days), Zhang lab
- Training: FLECT 3T Optical Imaging (15 days), Acharya lab (BIDD)
- Training: Imaging rotation, 45 biomed engineering undergraduates

FUTURE PLANS

- Partnership with Endocyclic Therapeutics to test their novel agent ENDO-210
- Contract with ClearPoint Inc, to test their MR guided therapy platform
- Expand service area through partnership with CAIDM and encourage CFCCC members to utilize AI in their research
- Advance 3-year STTR grant ($1.5M) with TriFoil Inc, funded by NIH

Internal Advisory Committee

Ali Gholipour, PhD
Professor
Radiological Sciences

Jered Haun, PhD
Professor
Biomedical Engineering

Young Jik Kwon, PhD
Professor
Pharmaceutical Sciences

Lydia Su, PhD
Professor
Pharmaceutical Sciences

Xiaolin Zi, PhD
Professor
Pharmaceutical Sciences

MEMBERS

- The internal advisory committee includes experts in clinical and preclinical imaging, cancer biology, and molecular disease targeting probes
- **Member Responsibilities:** Set long-term vision and ensure alignment with institutional goals, monitor metrics and suggest improvements, provide feedback about operational details and regulatory standards
- **Selection Process:** The committee members are selected from diverse, cancer-related research areas and include both users and non-users of the imaging resource
- **Appointment Terms:** 3 years, renewable appointments

FREQUENCY
Once a year

FUNCTION
Strategic Guidance, Advising on Policies and Procedures, Monitoring Performance

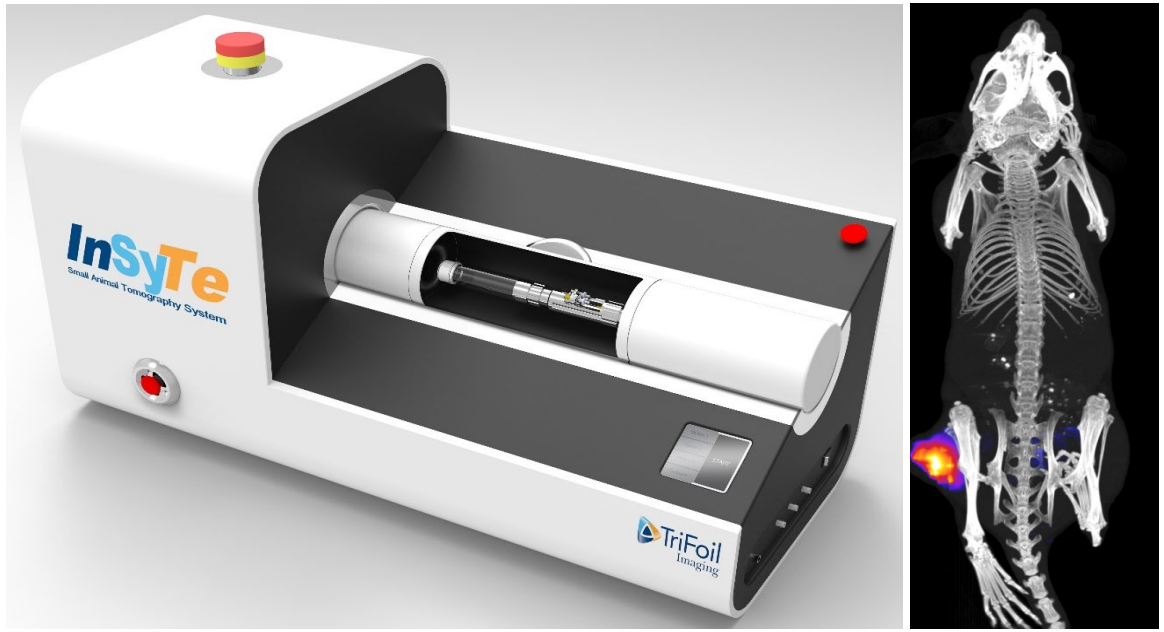
AUTHORITY
Develop, review, and enforce policies to ensure ethical, efficient, and best-practice imaging use

MAIN

Services, Technologies & Equipment

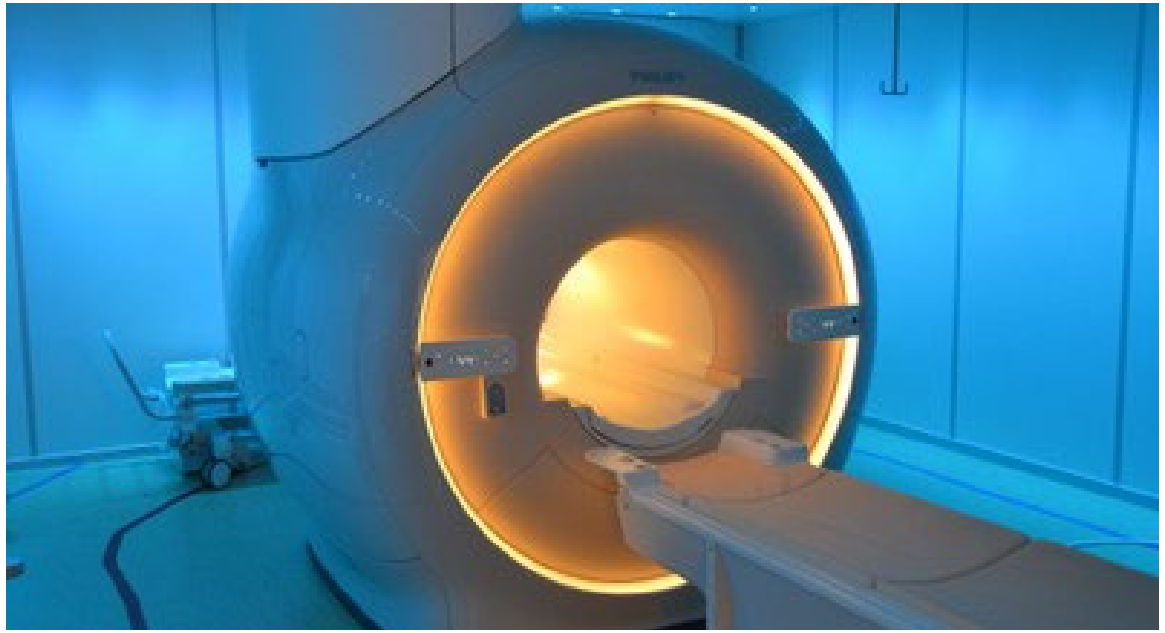
Overview

TriFoil FLECT Imaging Platform



- LA based industrial collaborator TriFoil, Inc, installed a commercial X-ray CT/Fluorescence Tomography machine instrument (FLECT)
- Open to CFCCC members **for free**

3T and 9.4T MRIs



- 3T and 9.4T MRIs provide unprecedented anatomic and functional MR images for preclinical and clinical research studies
- **Free pilot study** imaging opportunities available to CFCCC members

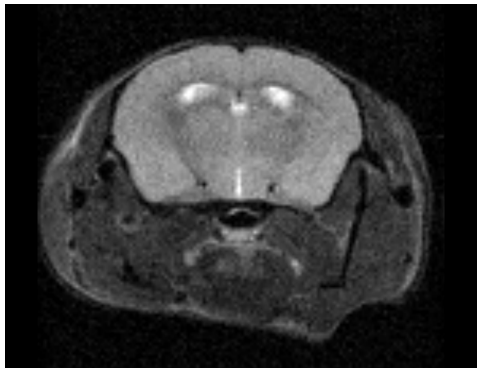
NEXT

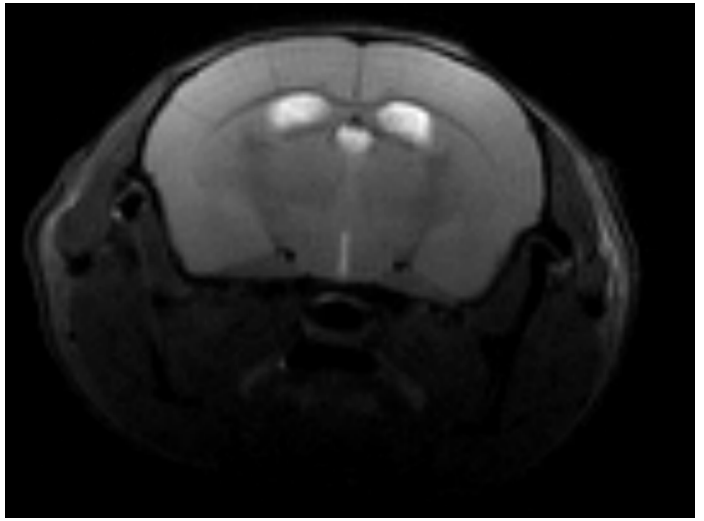
Services, Technologies & Equipment

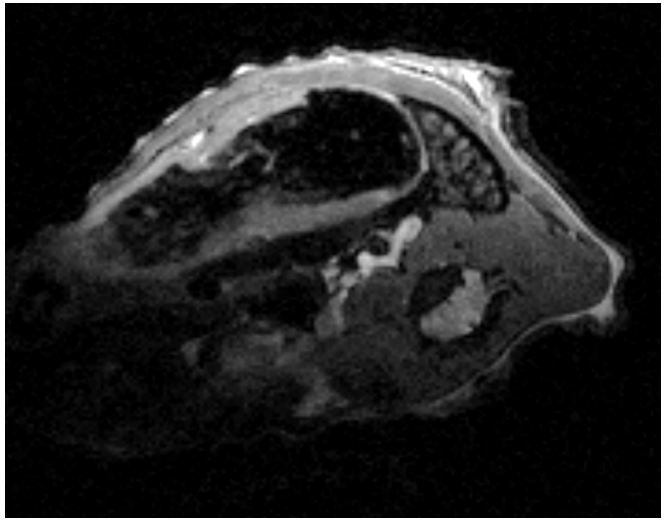
Bruker 9.4T MRI

Feb 2024

Jun 2024



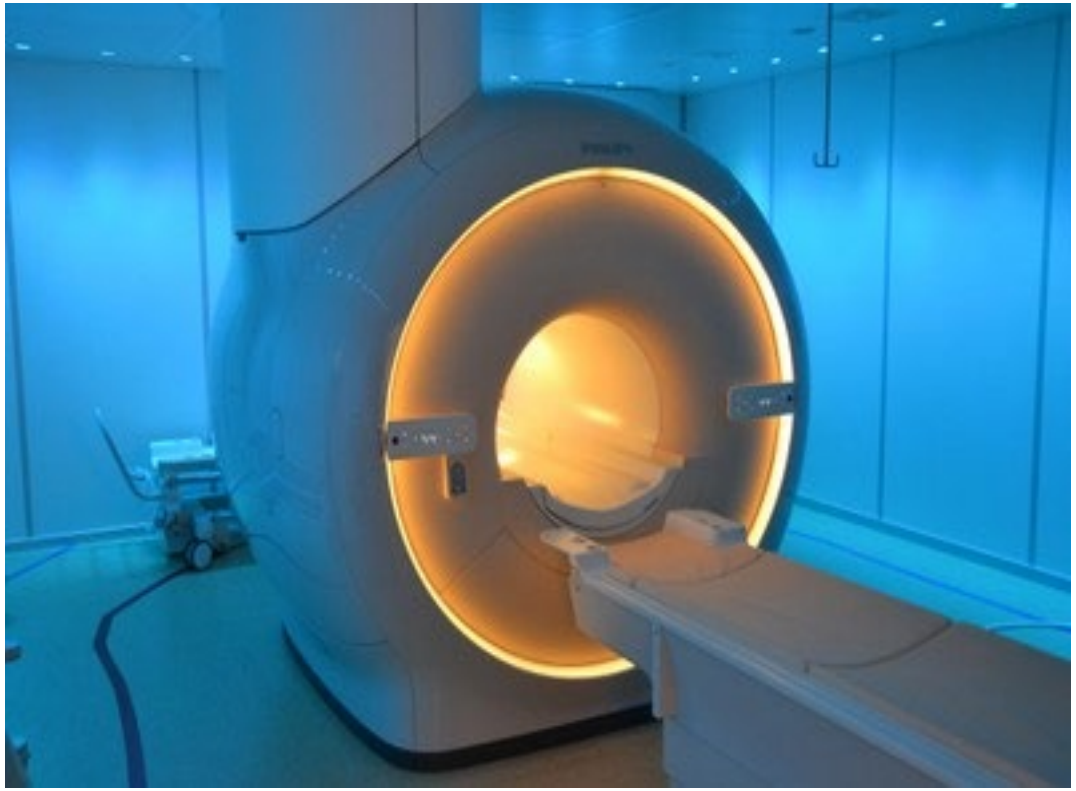




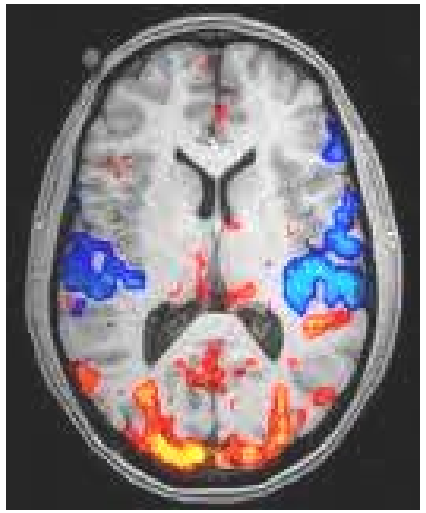
NEXT

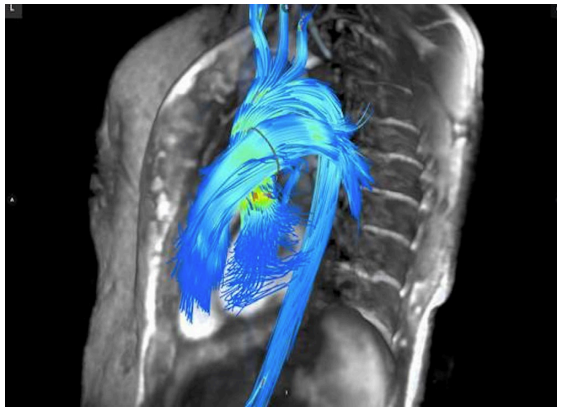
Services, Technologies & Equipment

Phillips Achieva 3T MRI



Brain fMRI





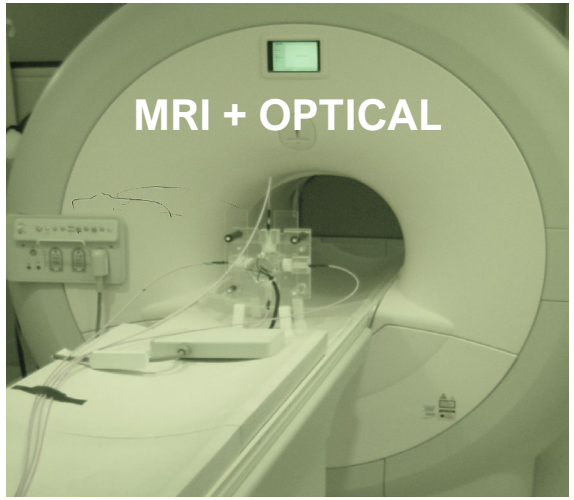
Cardiac 4D Flow

Preclinical Imaging

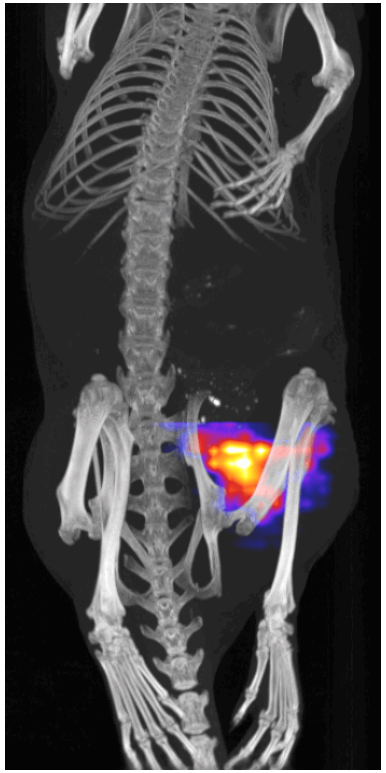
NEXT

Services, Technologies & Equipment

Cutting-edge Multi-modality Imaging Technologies



Xray + PET+OPTICAL



- Infrared Fluorescent Protein
- Smart Targeting Probes such as MMP, VGEF targeting

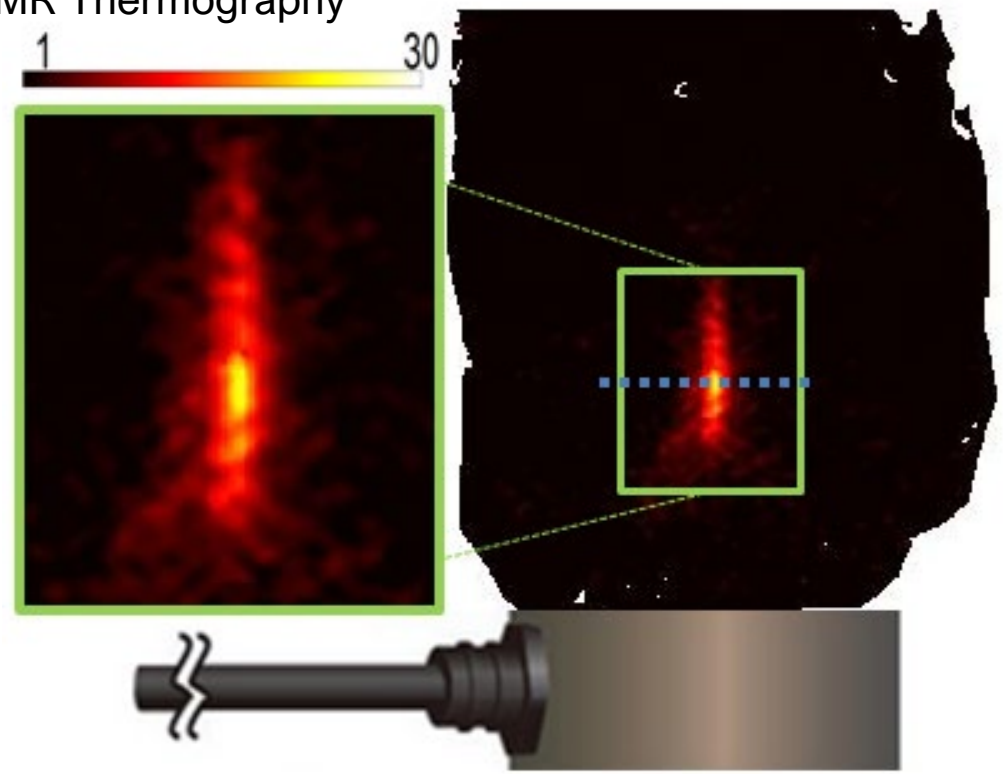
NEXT

Services, Technologies & Equipment

Expanding Imaging Resource Portfolio

MRI Compatible High Intensity Focused Ultrasound

MR Thermography



Commercial MR Compatible Ultrasound Imaging System for Small Animals

Vantage NTX US Imaging Instrument

FUS Instruments HIFU

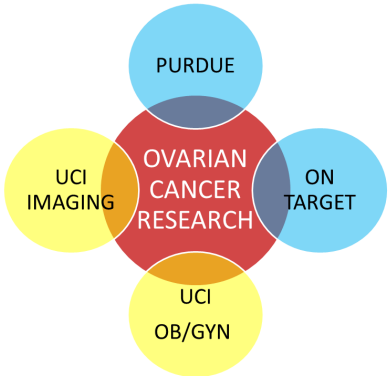
MRI Compatible HIFU Holder

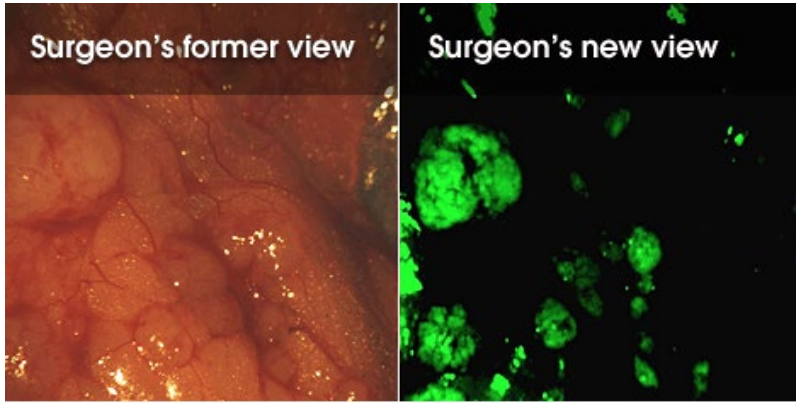
MAIN

Intra-operative Fluorescence Imaging

Folate targeting optical probes for colon & gastric cancers

- Established UCI as a site for Phase II and III clinical trials of a novel folate-targeting fluorescence probe for ovarian cancer surgery
- OnTarget Laboratories announced FDA approval last year for this groundbreaking optical molecular probe, the first of its kind
- Advancing second candidate, OTL410, to Phase I clinical trial at UCI. OTL410 is a fluorescent intra-operative contrast agent designed for colon and gastric cancers, in collaboration with Senthil, MD Dayyani, MD, PhD





CATCHMENT AREA RELEVANCE

Investigators

Senthil, MD

Dayyani, MD, PhD

CFCCC Investments

SHARED RESOURCE

DOT

FUNDING
2017, 2018
2020, 2022

PROGRAMS

Outcomes

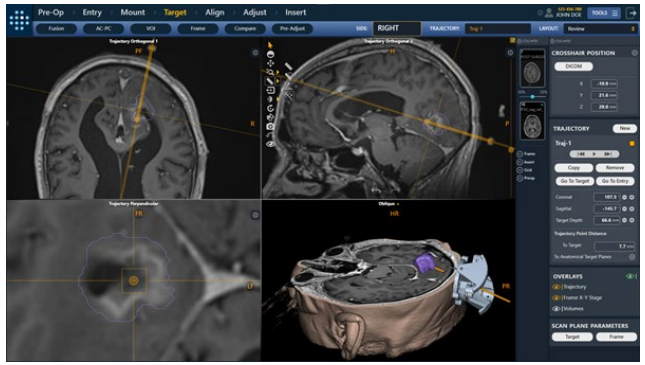
PUBLICATION
Yu, Cancers, 2023, PMC9954462

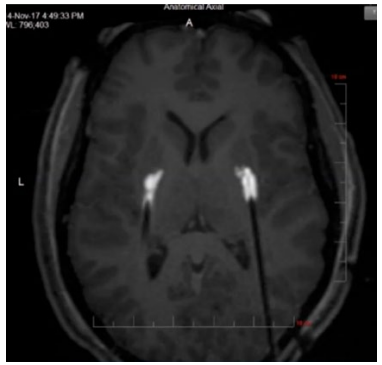
GRANTS NCT06511037

ClearPoint Stereotactic System

MRI compatible

- Collaboration with ClearPoint to integrate its stereotactic system into the Philips Achieva 3T MRI and obtaining FDA approval for use with this specific scanner
- The ClearPoint stereotactic system can be used for deep-brain stimulation, laser ablation, biopsy, neuro-aspiration, and delivery of drugs, biologics, and gene therapy to the brain. The ClearPoint Neuro Navigation System has FDA clearance, is CE-marked, and is installed in over 60 active clinical sites in the United States and the EU
- Laser interstitial thermal, drug delivery, and biopsy techniques all have a great potential to play a crucial role in the management of brain cancer





CATCHMENT AREA RELEVANCE

Investigators

Gulsen, PhD

Su, PhD

CFCCC Investments

SHARED RESOURCE

DOT

FUNDING
2020
2021

PROGRAMS

Outcomes

PUBLICATION
Nouizi, Photodiagnosis and photodynamic therapy, 2024, PMC11396545

GRANTS ClearPoint Research Grant

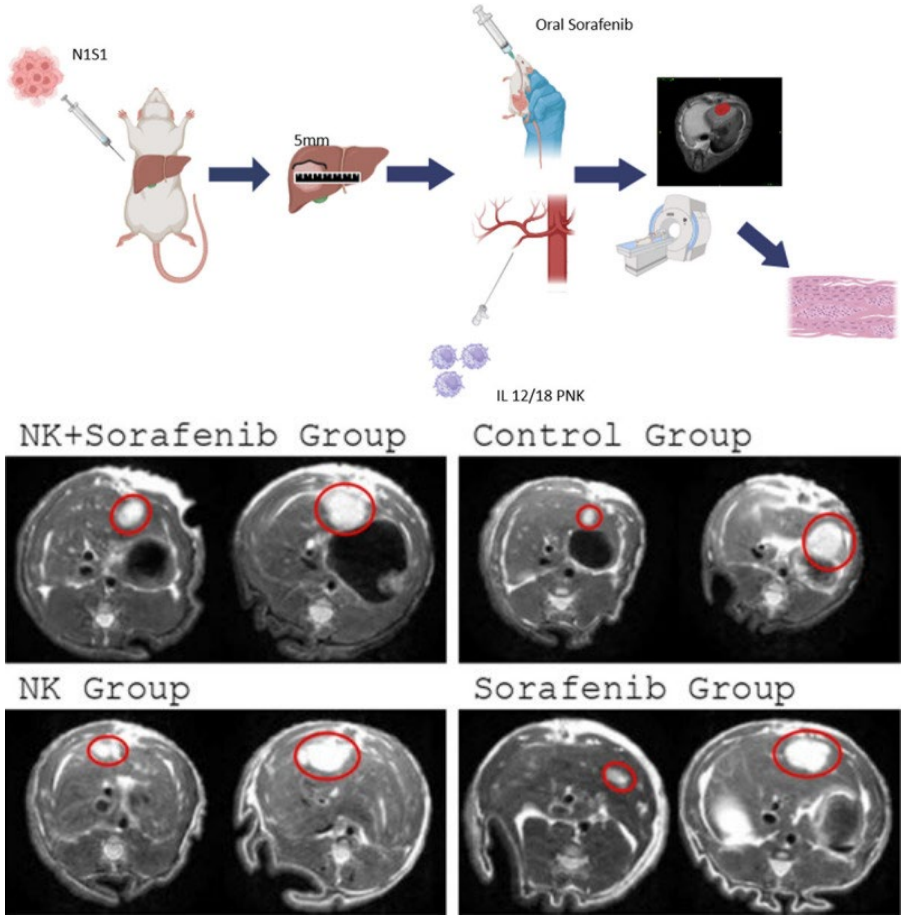
IMPACT | Development of an MR compatible stereotactic system for drug delivery, biopsy, and laser ablation

MAIN

MRI Monitoring of NK Cell and Sorafenib Combined Therapy for HCC

Treatment of HCC with transcatheter arterial delivery of NK cells and sorafenib

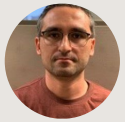
- Preclinical study explored sorafenib and NK cell chemoimmunotherapy for HCC in rats
- Goal: Enhance NK cell cytotoxicity with IL-12/18 cytokines and reveal molecular mechanisms
- 24 rats were treated with sorafenib and NK cells via hepatic artery catheterization
- Tumor growth and response monitored weekly with MRI (T1w, T2w, DCE, DWI)
- Combination therapy significantly inhibited tumor growth, angiogenesis, and induced antitumor immunity
- DCE-MRI and DWI revealed changes in tumor microvasculature, showing therapy effectiveness



CATCHMENT AREA RELEVANCE

Investigators


Zhang, MD, PD


Eresen, PhD


Yaghmai, MD

CFCCC Investments

SHARED RESOURCE

FUNDING
2021
2024

PROGRAMS

Outcomes

PUBLICATION
Zhang, American Journal of Cancer Research 2024, PMC11162671

GRANTS R01CA241532*

*Supported research

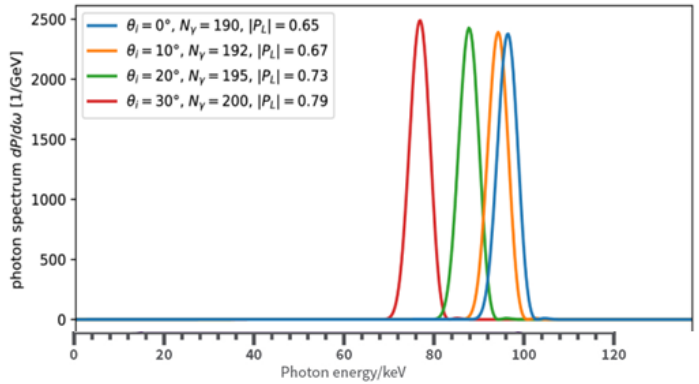
IMPACT | Combined Sorafenib and NK cell chemoimmunotherapy may be an effective Rx for HCC

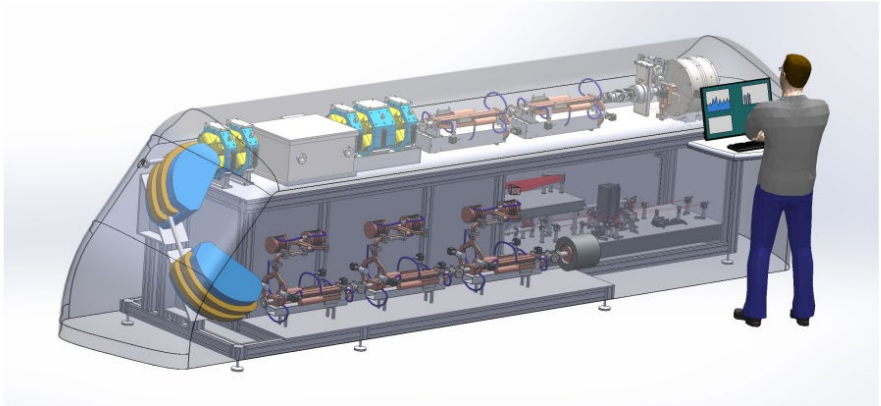
MAIN

Lumitron Tunable Monoenergetic X-ray Source (TMXS)

Compact tunable x-ray source for pre-clinical and clinical imaging

- Collaboration with Barty, PhD to develop a fully-automated imaging setup for LUMITRON's Tunable Monoenergetic X-ray Source (TMXS)
- First step: Use monoenergetic X-ray for k-edge imaging with the 4T1 breast cancer mouse model.
- Images will be acquired below and above the K-edge of Gadolinium, before and after Gd-DTPA injection, and compared to MR images
- Developing imaging interface and dedicated reconstruction algorithm for 3D tomographic imaging
- Phase-contrast imaging and image-guided therapy





CATCHMENT AREA RELEVANCE

Investigators


Barty, PhD


Gulsen, PhD


Limoli, PhD


Nouizi, PhD

CFCCC Investments

SHARED RESOURCE

DOT

FUNDING
2021, 2022

PROGRAMS

Outcomes

PUBLICATION

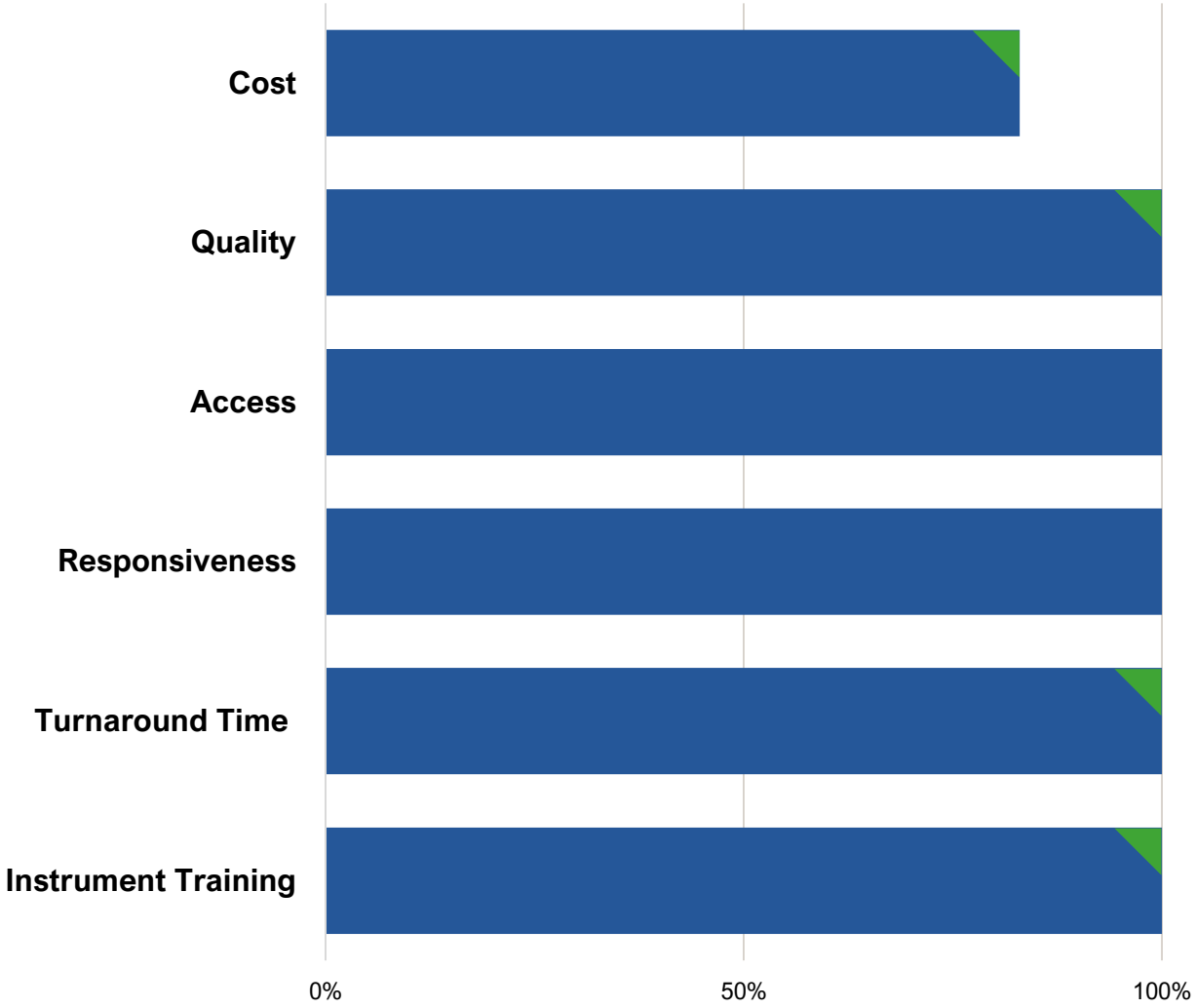
Barty, Frontiers in Physics, 2024
PMC11326425

IMPACT | World's first compact tunable x-ray source for medical imaging & theranostics

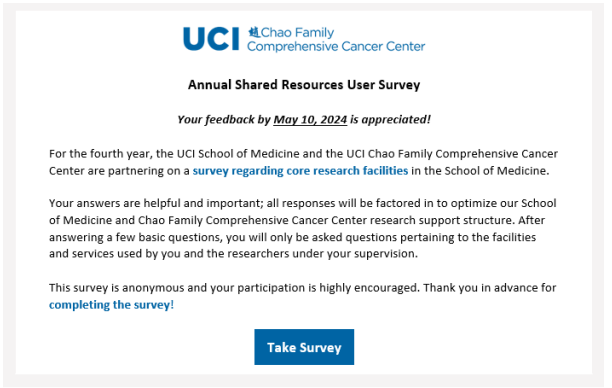
MAIN

2024 Annual Core Research Facilities Survey *

Excellent + Good (No scores below average received) Improved since 2021



SURVEY PROMOTION



UCI Chao Family Comprehensive Cancer Center

Annual Shared Resources User Survey

Your feedback by May 10, 2024 is appreciated!

For the fourth year, the UCI School of Medicine and the UCI Chao Family Comprehensive Cancer Center are partnering on a **survey regarding core research facilities** in the School of Medicine.

Your answers are helpful and important; all responses will be factored in to optimize our School of Medicine and Chao Family Comprehensive Cancer Center research support structure. After answering a few basic questions, you will only be asked questions pertaining to the facilities and services used by you and the researchers under your supervision.

This survey is anonymous and your participation is highly encouraged. Thank you in advance for **completing the survey!**

Take Survey

2024 Core Facilities Survey

UCI School of Medicine and the UCI Chao Family Comprehensive Cancer Center are partnering on a survey regarding core research facilities in the School of Medicine. Your answers are helpful and important; all responses will be factored in to optimize our research support structure. After answering a few basic questions, you will only be asked questions pertaining to the facilities and services used by you and the researchers under your supervision. This survey is anonymous. For questions, contact **Claire Brainard Draper**. Please complete the survey by **May 10, 2024**.

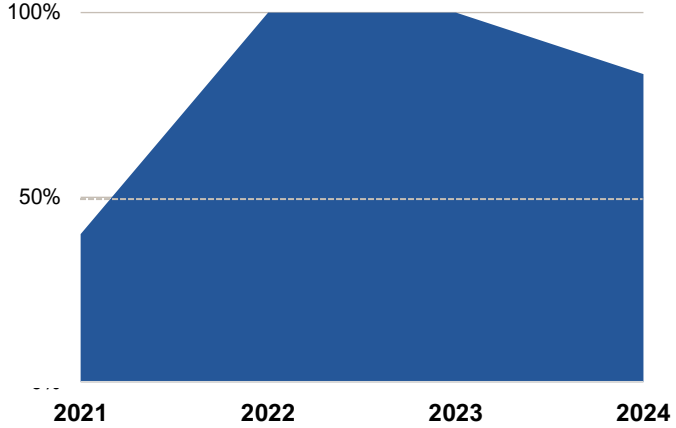
Complete Survey

NEXT

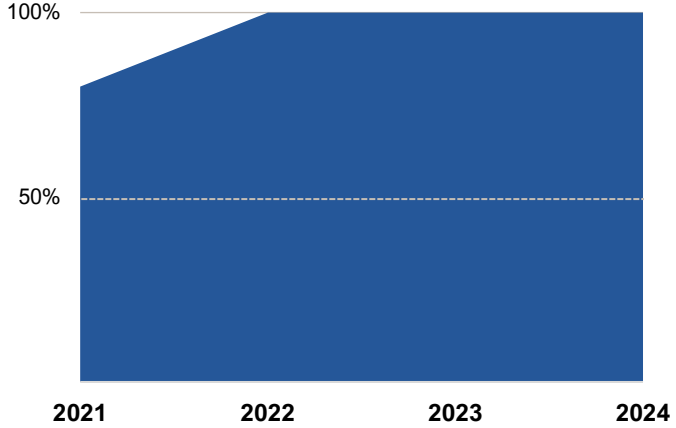
Annual Core Research Facilities Survey

Excellent + Good

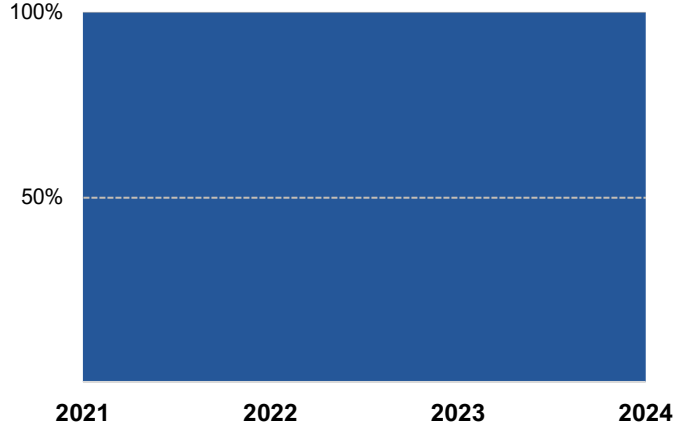
COST



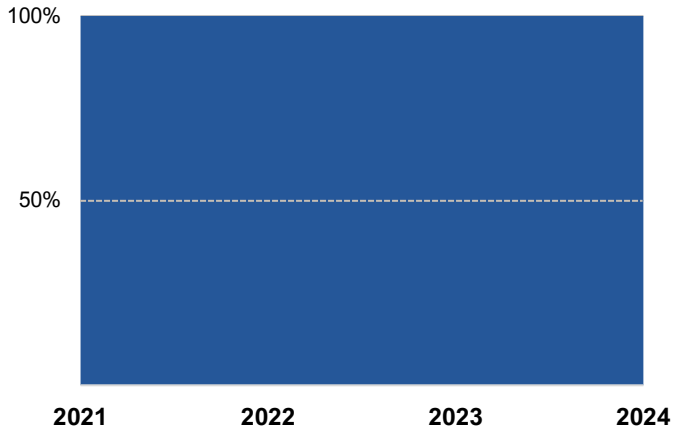
QUALITY



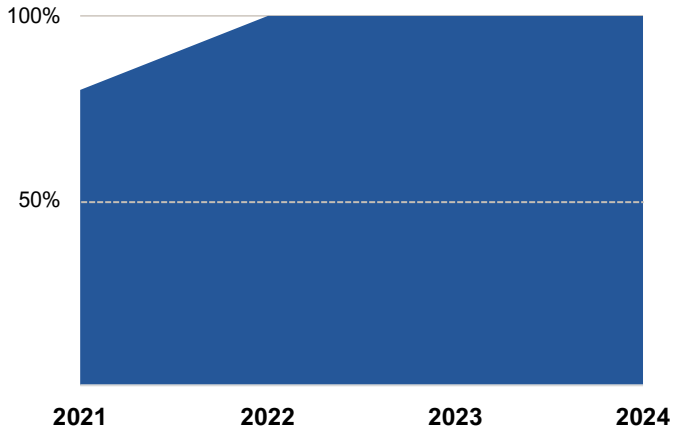
ACCESS



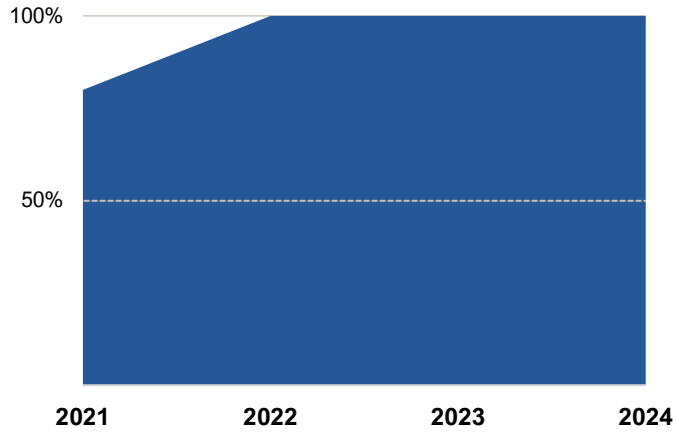
RESPONSIVENESS



TURNAROUND TIME



INSTRUMENT TRAINING



MAIN

Selected 2024 Publications

CFCCC INVESTIGATOR(S)	PROGRAM	JOURNAL	YEAR
Vahid Yaghmai, MD Zhuoli Zhang, MD, PhD	BIDD	American Journal of Cancer Research	2024
Min-Ying Su, PhD	BIDD	Journal of magnetic resonance imaging (JMRI)	2024
Farouk Nouizi, PhD Gultekin Gulsen, PhD	BIDD	Photodiagnosis and photodynamic therapy	2024
Min-Ying Su, PhD	BIDD	Life	2024

MAIN