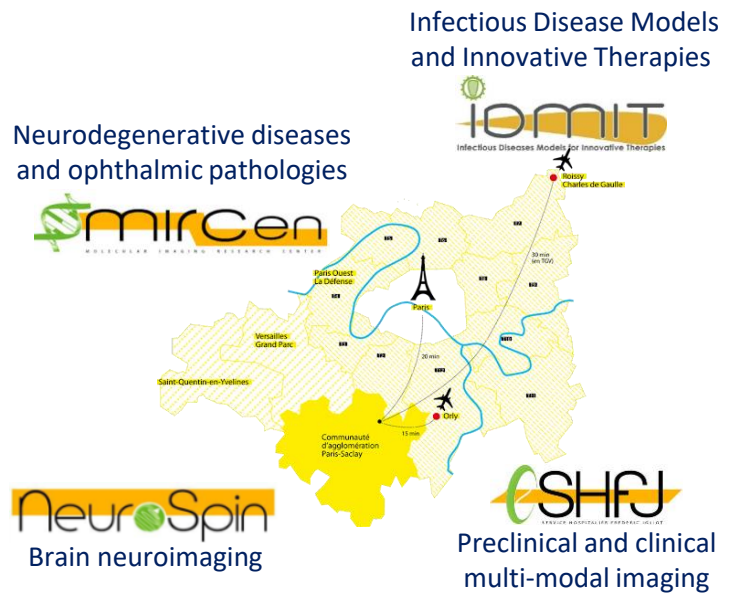


**State-of-the-art *in vivo* imaging**

**ULTRASOUND ASSETS**

# A SYNERGY OF IN VIVO IMAGING EXPERTISE & TECHNOLOGIES TO SUPPORT INNOVATIVE PROJECTS

**Four complementary and multidisciplinary centers (IDMIT, MIRCen, SHFJ and NeuroSpin) contributing to major advances in various research fields**



From preclinical POC to drug development in patients



PET, MRI, ultrasound, multimodal imaging and radiopharmaceutical production

**Expertise and state-of-the-art translational in vivo imaging platforms:**

- \* 4 medical research imaging centers
- \* 34 technological platforms for preclinical and clinical research
- \* 10 research laboratories

**An access to a full range of scientific and technological solutions through one-stop shop and a dedicated project manager to support partner innovative developments from preclinical to clinical stages**

# ULTRASOUND

## OUR ACTIVITY

- ✓ Imaging
- ✓ Therapy

## MEDICAL FIELDS

- ✓ Neurodegenerative diseases
- ✓ Oncology
- ✓ Clinical diagnosis in radiology (liver, kidney, muscle...)

## EXPERTISE

### IMAGING

- ✓ Shear wave elastography (a recent imaging technique (MRI or ultrasound) that allows the quantification of the biomechanical properties of soft tissues)
- ✓ Ultrasensitive Doppler
- ✓ Ultrafast Doppler
- ✓ Ultrafast imaging (>20 kHz)

### THERAPY

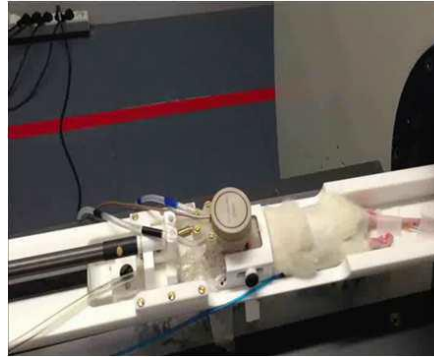
- ✓ Molecular contrast agent formulations and new technologies for theranostic applications
- ✓ Formulation of sono-sensitive agents (increasing BBB permeability using micro and nano-bubbles)
- ✓ Delivery of antibodies into brain
- ✓ Internal vectorized radiotherapy combined with ultrasound
- ✓ Cavitation control devices during ultrasound therapy (new sensors to detect the cavitation signal - improving the detection of bubbles and defining in real time the cavitation doses necessary for a safe permeabilization of biological barriers)

## OUR STRENGTH

- ✓ Long-standing experience in multimodal imaging processing
- ✓ Clinical investigations
- ✓ Complementary experts: biologists, physicists, pharmacologists, radiochemists, radiopharmacists, nuclear doctors, physicians
- ✓ Well-established partnerships with public and industrial players

# PRECLINICAL US

## BBB PERMEABILIZATION



## APPLICATIONS

### ❖ Therapeutic fields

- ✓ Neurodegenerative diseases
- ✓ Oncology

### ❖ Imaging fields

- ✓ Elastography
- ✓ Ultrasensitive Doppler
- ✓ Contrast imaging

### ❖ Expertise

- ✓ Localization of microbubbles
- ✓ Monitoring of microbubble activity
- ✓ In vivo sequences for Acoustic Droplet Vaporization
- ✓ Acoustical characterization of contrast agents
- ✓ Optimized protocols for BBB opening combined with PET and MRI (efficiency and safety)

## EQUIPMENT

Vevo F2  
Aixplorer Mach 30  
Aixplorer Ultimate  
Aixplorer  
CUBE

Fujifilm Visualsonics  
SuperSonic Imagine  
SuperSonic Imagine  
SuperSonic Imagine  
Image Guided Therapy

# PRECLINICAL CAPACITIES

## ULTRAFAST IMAGING

### Main advantages

- ✓ Localization of targeted microbubbles
- ✓ Monitoring of microbubble activity during therapy
- ✓ *In vivo* sequences for Acoustic Droplet Vaporization

### Platform

Vevo F2 (Fujifilm Visualsonics)

Ultrafast open scanner

Up to 20 000 Frames/s

### Modes

- ✓ Ultrafast Doppler,
- ✓ Super-resolved contrast agent imaging



## THERAPEUTIC ULTRASOUND

### Main advantages

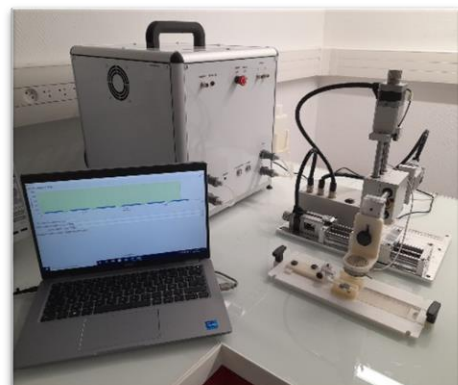
- ✓ Acoustical characterization of contrast agents
- ✓ Optimized protocols for BBB opening combined with PET and MRI (efficiency and safety)

### Platform

CUBE (Image Guided Therapy)

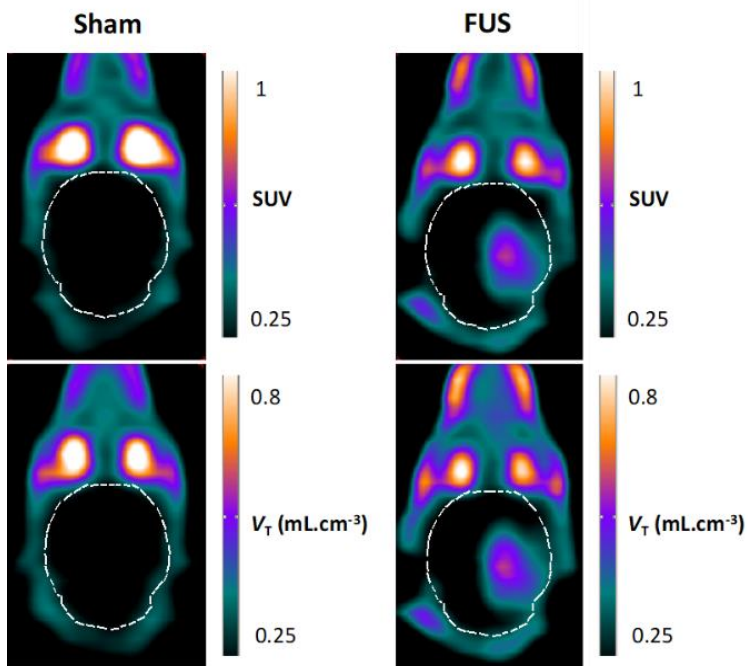
### Modes

- ✓ HIFU (thermal effect)
- ✓ Sono-permeabilization
- ✓ BBB opening on rodents

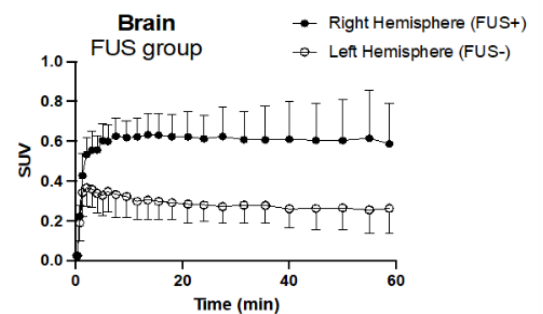
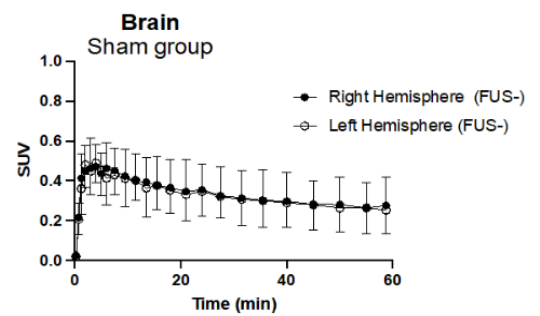
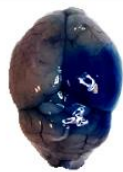


# PRECLINICAL CASE STUDIES

## Quantification of BBB opening using TEP imaging ( $^{18}\text{F}$ -FDSorbitol)



Evan's Blue

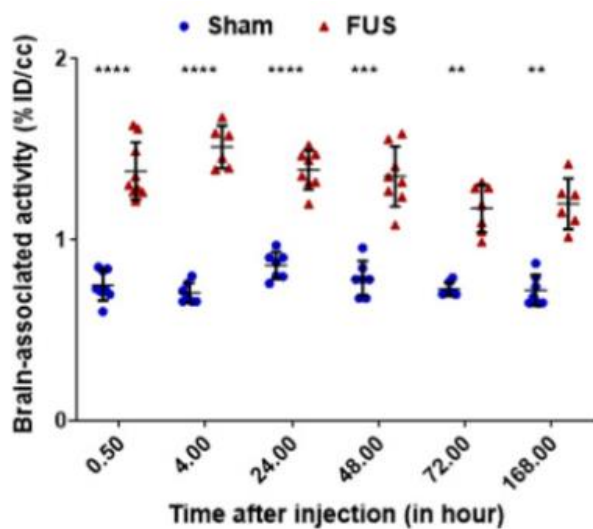
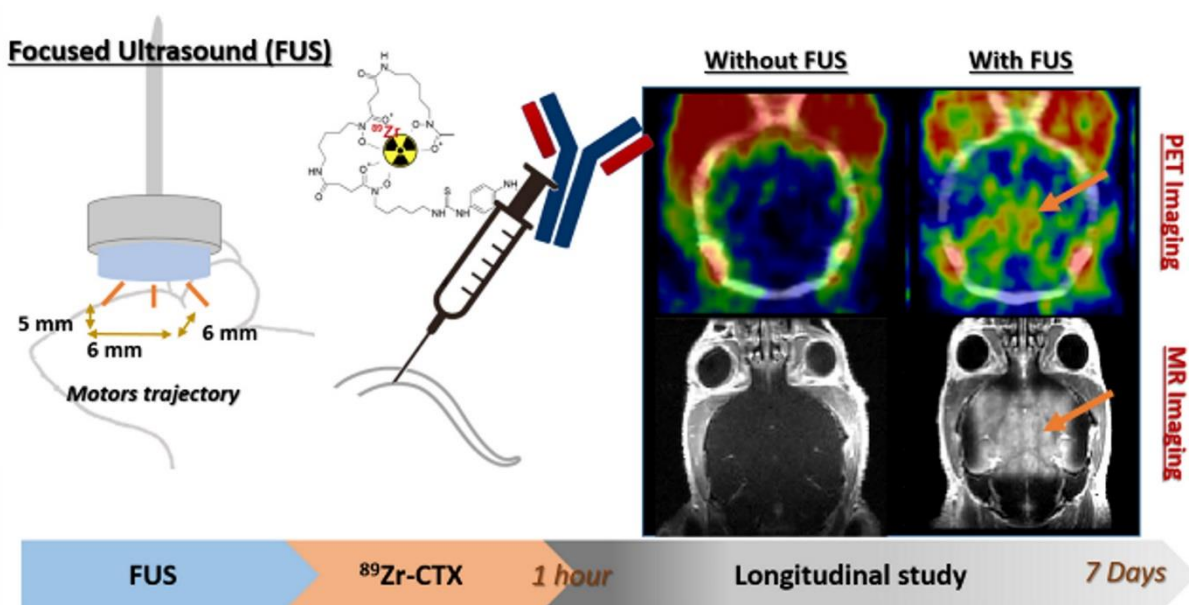


Hugon *et al.*, *Pharmaceutics* 2021



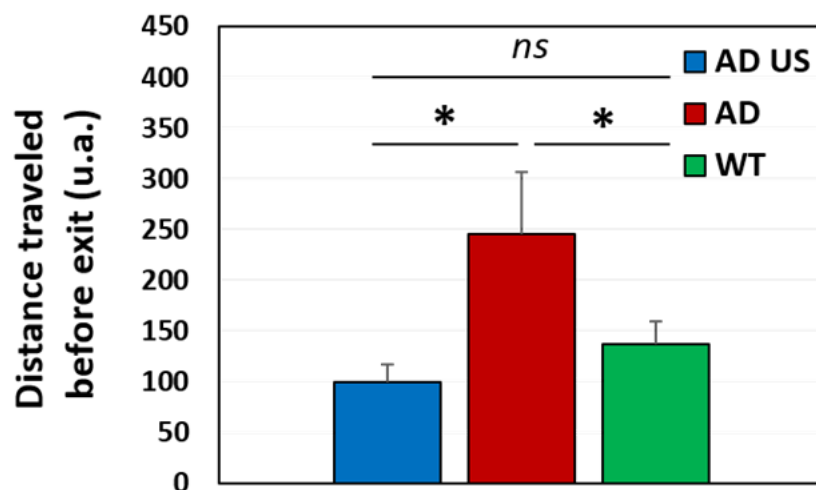
# PRECLINICAL CASE STUDIES

## Radiolabelled Antibody brain delivery for cancer therapy



# PRECLINICAL CASE STUDIES

**Focused ultrasound-induced BBB opening  
to restore certain cognitive deficits in animal model of AD**







# PASREL

## imagerie



[www.pasrel-imagerie.com](http://www.pasrel-imagerie.com)



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