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DHU-Imaging: Molecular Imaging & Imaging-Guided Therapy

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Abstract: *Départments Hospito-Universitaires* (DHU) are Projects of excellence whose objective is to be the support of joint projects between the hospital, universities and research organizations. **DHU-Imaging** is one of the 5 DHUs chosen by the A*MIDEX Foundation, with the support of AMU, AP-HM, CNRS, Ecole Centrale Marseille and CEA. **DHU-Imaging** associates 13 hospital departments, 28 academic laboratories, 10 technology platforms including CERIMED (European Center for Research in MEDical Imaging), 12 industrial partners, and is supported by 2 clusters (Eurobiomed and OPTITEC) and by patients' associations.

The issue of **DHU-Imaging** consists in selective deposit of a physical agent on a biological target (*vector-based*), using :

- molecular tracers, mainly detected by isotopic labeling (preclinical and clinical imaging) and/or optical (subcellular, preclinical and tissue imaging) for multiscale imaging biomarkers and theranostics
- interventional percutaneous or endovascular procedures for imaging-guided therapy

These applications are mainly conducted in:

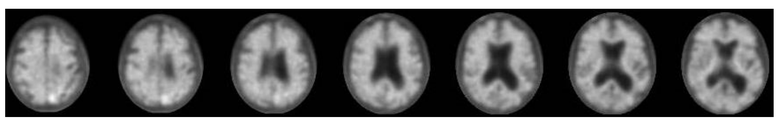
- Oncology, with the two Comprehensive Cancer Centers of APHM (Brain Tumor Program and Pancreatic Tumor Program), and an emerging topic (endocrine tumors)
- Clinical Neuroscience (psychiatry, neurology, ophthalmology, chronic pain diseases)

DHU Imaging
Molecular imaging & imaging-guided therapy

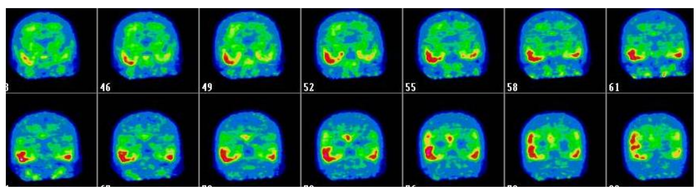
Aim 1

Precise and early characterization of disease (diagnostic, molecular signature, biomarkers) because :

- molecular changes precede morphological ones: ***more sensitive for early diagnosis & evaluation***

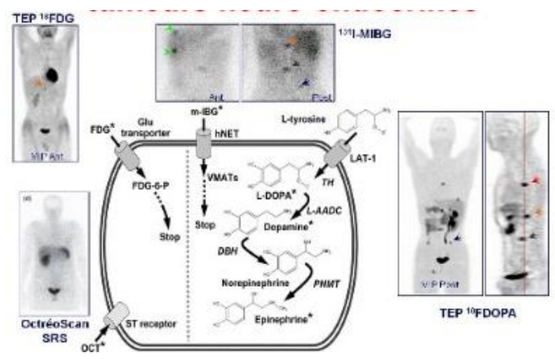


Evaluation of Alzheimer's Disease by PET amyloid imaging



Evaluation of Alzheimer's Disease by PET TAU imaging

- molecular ***biomarkers*** better evaluate complexity of each disease at patient- and lesion- levels: ***more specific for precise diagnosis & evaluation***



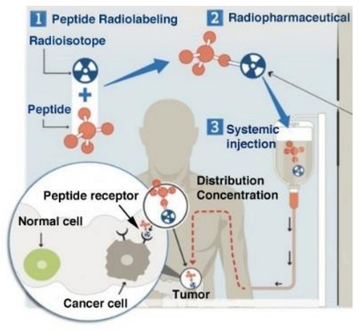
Molecular signature of neuro-endocrine tumors

Aim 2

Personalized treatment : selective deposit of a physical agent on a biological target (vector-based), using

- interventional percutaneous or endovascular procedures

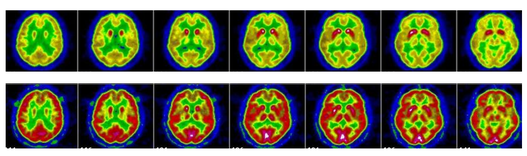
- molecular theranostics



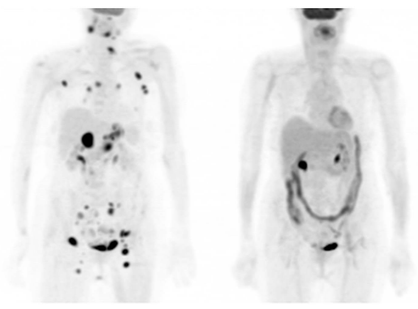
Aim 3

Evaluation of efficiency of treatment

- to not delay more effective treatment, and not cause unnecessary side effects



Therapeutic evaluation of encephalitis by 18FDG-PET



18FDG-PET predicts prognostic after 1 cycle of chemotherapy in lymphoma

A quantitative imaging to characterize molecular signatures

Understand, Diagnose, Select, Predict, Evaluate, Treat

Biomarker

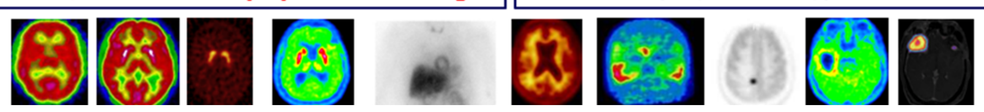
Neuroscience

- ✓ *GLUT1*
- ✓ *Cerebral blood flow*
- ✓ *Dopamine transporter*
- ✓ *DOPA-decarboxylyase*
- ✓ *D2/3*
- ✓ *Noradrenergic reuptake*
- ✓ *5HT1-A*
- ✓ *Acetylcholinesterase*
- ✓ *NMDA receptor*
- ✓ *TSPO: microglia activation*
- ✓ *Amyloïd burden*
- ✓ *TAU phosphorylation*

Oncology

- ✓ *GLUT1*
- ✓ *LAT1*
- ✓ *Choline-kinase*
- ✓ *PSMA*
- ✓ *Tyrosine*
- ✓ *Somatostatin receptor*
- ✓ *Fluor*
- ✓ *VCAM-1*
- ✓ *Thymidine-kinase*
- ✓ *Hypoxia*

Gallium, for tailored peptide labeling



Companion Drug

Oncology/Neuroscience

- ✓ *Targeted therapy*
- ✓ *Anti-amyloïd*
- ✓ *Anti-TAU*
- ✓ *Anti-inflammatory*
- ✓ *DOPA*

Extended to :

- ✓ *NOTES*
- ✓ *TMS/DBS*
- ✓ *Radiosurgery*
- ✓ *CBT*
- ✓ *Virtual Reality Exposure Therapy*

Theranostic

Oncology

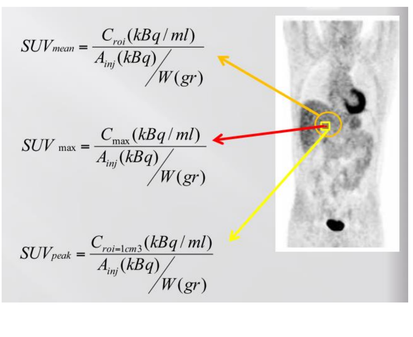
- ✓ *131 Iodine*
- ✓ *68Ga/177Lu-SSA*
- ✓ *90Y/177Lu-TheraSphere*

Aim 4

Technology Development mainly in :

- Instrumentation

- Image processing



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