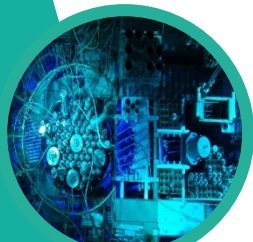
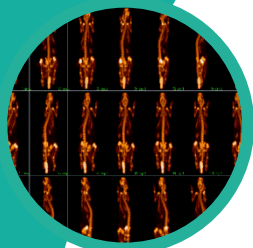




Belgian expertise and creativity in nuclear medicine

**Belgian Nuclear Society
April 26, 2018**



Rad4Med.be :



- The Belgian not for profit network of companies, research and training centres, university hospitals and associations, dedicated to radiation applications in healthcare.
- Today: more than 60 actors.

BioWin
THE HEALTH CLUSTER OF WALLONIA



Ora
Optimized
Radiochemical
Applications



MOLECUBES
MODULAR
BENCHTOP
IMAGING



EXCELLING in COLD CHAIN
PHARMA LOGISTICS

ANMI
Advanced Nuclear Medicine Ingredients

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THE BELGIAN NETWORK
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BNS, 2018-04-26

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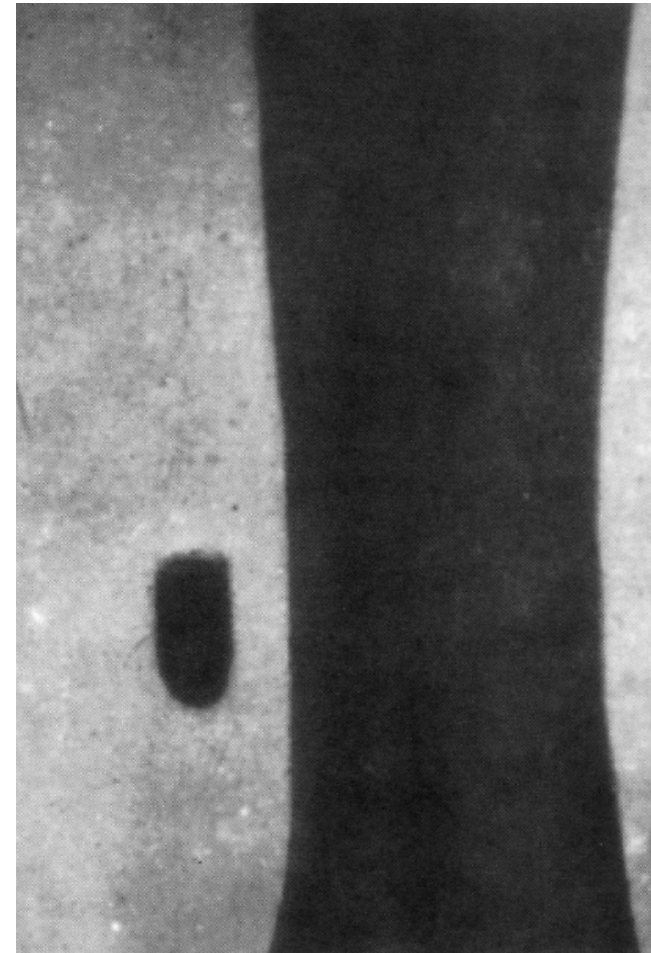
EORTC
The future of cancer therapy

**ONCIDIUM
FOUNDATION**

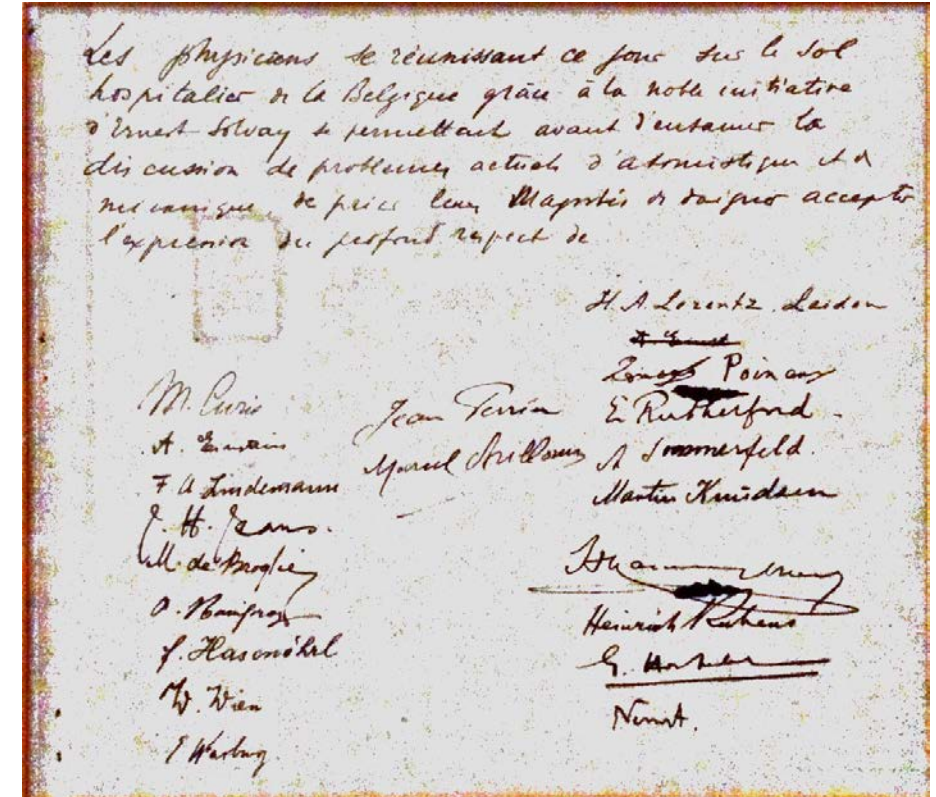
ClinicoBru
THE BRUSSELS CLINICAL TRIALS NETWORK

December 1895 – April 1896

Röntgen – Belgian army



Solvay Conference 1911



Marie and Irène Curie in Belgium, training medical staff, WW1



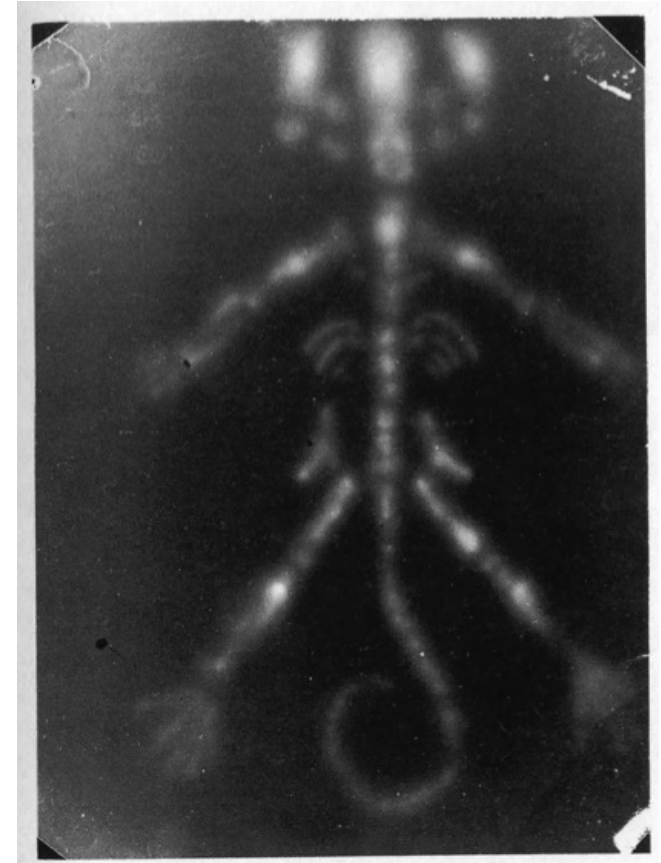
Belgian gift to China in 1931

1931, the Sino-Belgian Radium Institute, first oncological hospital in China, now the Fudan University Shanghai Cancer Center



Charles Pecher, 1940-41

- MD ULB 1939
- Discovery of Sr-89 and other isotopes at Berkeley (Lawrence Berkeley Lab)
- First bone scan
- First therapeutic use of Sr-89 for pain palliation in patients with bone metastasis



Nuclear medicine imaging vs. radiography

- Radiography depicts the absorption of X-rays, related to electron density x path length: mainly structural information. It requires an external X-ray source.
- Nuclear medicine imaging shows the distribution of a radioactive substance as influenced by metabolism or function. It requires the administration of a radiopharmaceutical labeled with an adequate isotope, such as Tc-99m, F-18 or Ga-68.

CT brain scan (mainly structure)

Living person

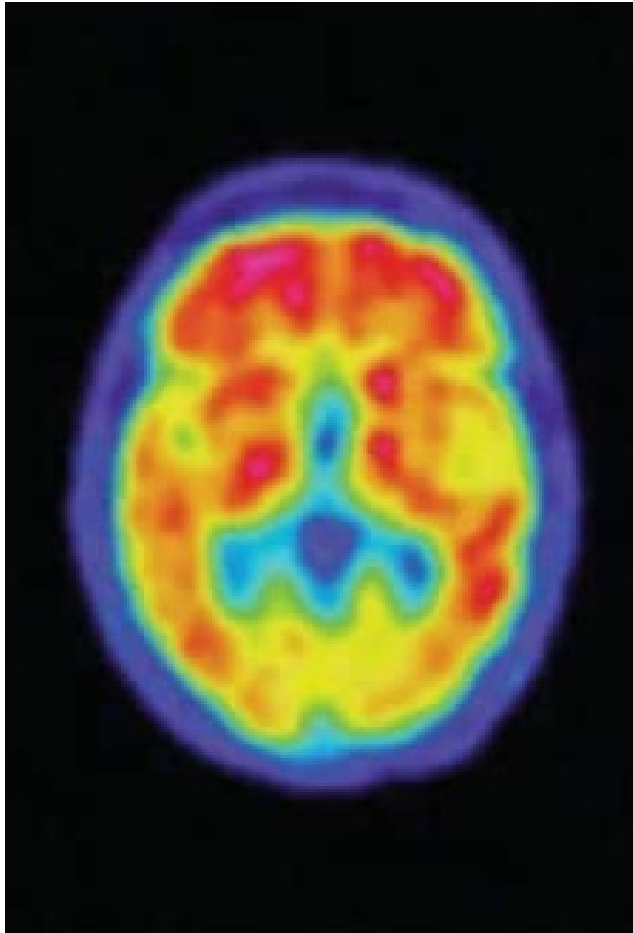


Death person



Nuclear medicine brain scan (mainly function)

Living person



Death person

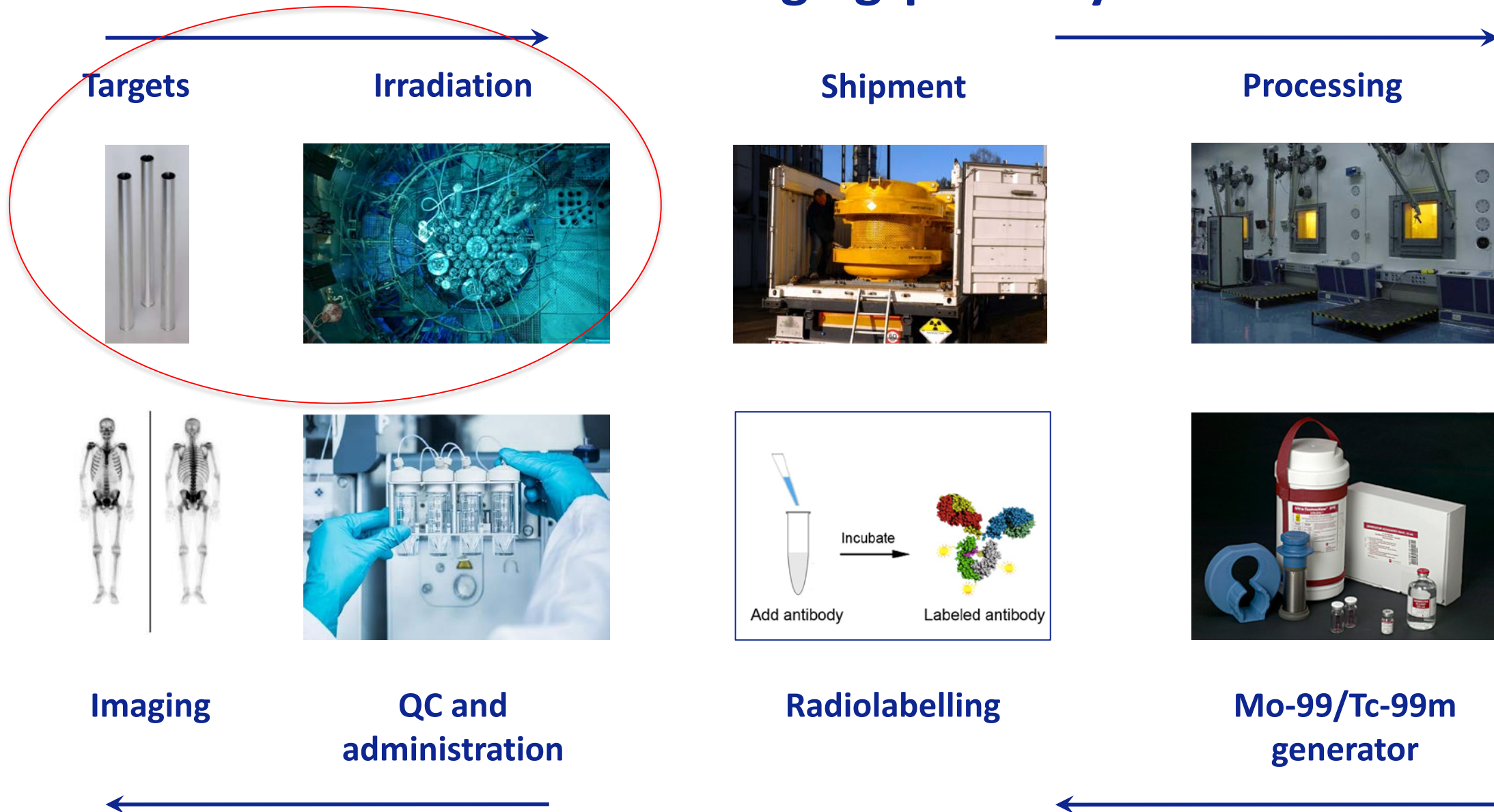


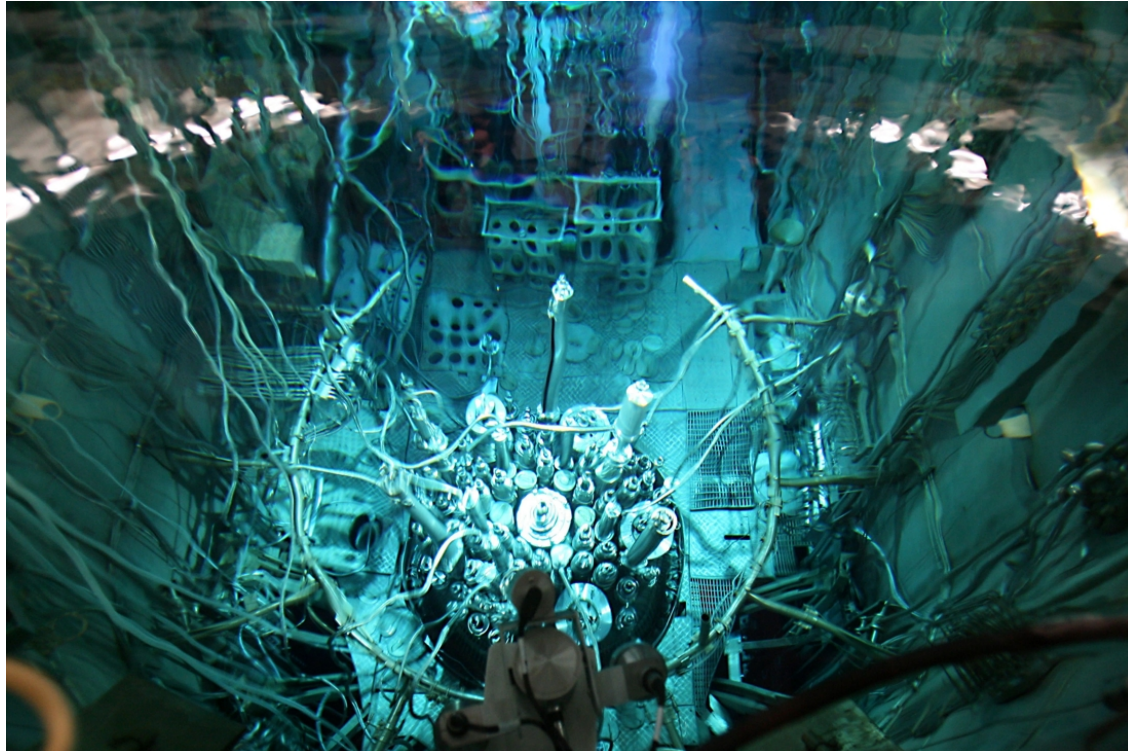


BNS, 2018-04-26



Nuclear Imaging pathway





**BR2 reactor at SCK•CEN:
2nd supplier of
 $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$ worldwide:
> 25% /y ; peak 100%**

Theranostics

- In addition to the current production of radioisotopes for **therapy** (I-131, Lu-177, Ir-192, Ho-166, Y-90, P-32, ...) and for **palliation of metastatic bone pain** (Sm-153, Re-186, Re-188, Sr-89, Sn-117m, Ra-223, ...), **matched pairs** are offering new perspectives for **theranostics**.

Matched Pairs	Half-life $T_{1/2}$	Decay mode	Average Energy β^-	β^+ or α / Average Energy γ
Ga-68 / Lu-177	0,05 d / 6,71 d	β^+ / β^-	134 keV	890 keV / 208 keV
Sc-44 / Sc-47	3,97 h / 3,35 d	β^+ / β^-	162 keV	632 keV / 159 keV
Cu-64 / Cu-67	0,53 d / 2,58 d	β^+ / β^-	141 keV	278 keV / 186 keV
Tb-152 / Tb-161	17,5 h / 6,90 d	β^+ / β^- , Auger e^-	154 keV	1,08 MeV / 75 keV
Tb-155 / Tb-161	5,32 d / 6,90 d	EC, γ/β^- , Auger e^-	154 keV	95 keV / 75 keV
Tb-149 / Tb-161	4,12 h / 6,90 d	α / β^- , Auger e^-	154 keV	3,97 MeV / 75 keV



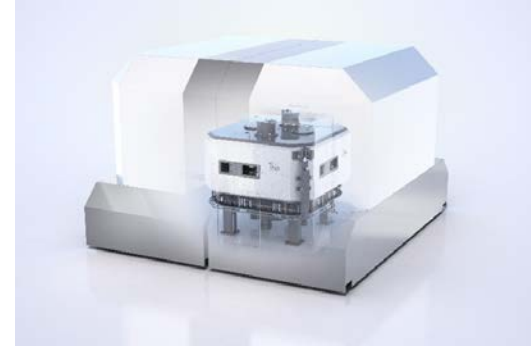
**Cyclone® KIUBE,
production capacity for
F-18, N-13, O-15, C-11,
Ga-68,...**



IBA is a high-technology medical company with 4 business units



PROTON
THERAPY



RADIOPHARMA
SOLUTIONS



INDUSTRIAL
SOLUTIONS



DOSIMETRY

Nuclear Imaging pathway

Targets



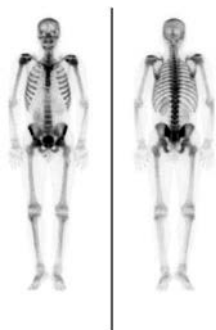
Irradiation



Shipment



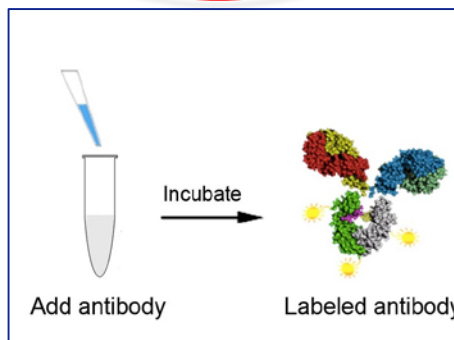
Processing



Imaging



QC and
administration



Radiolabelling



Mo-99/Tc-99m
generator



TRANSRAD
RESPONSIBLE LOGISTICS



Transporting radioactive material that is by nature decaying is like transporting a bucket of water with a hole in it and make sure you are quick enough to still deliver some water to your final customer.

Rob Dekkers , Chair AIPES Transport Working Group

Nuclear Imaging pathway

Targets



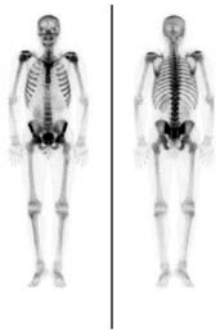
Irradiation



Shipment



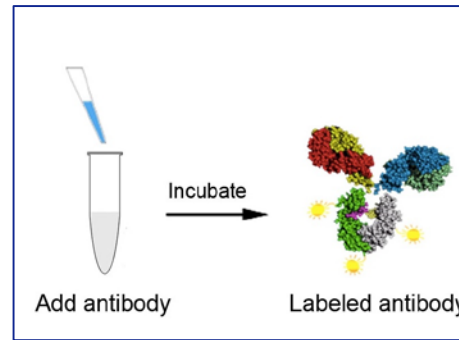
Processing



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Radiolabelling



Generator

COMMITTED TO LIFE

Excellence dedicated to nuclear medicine, healthcare and the environment.

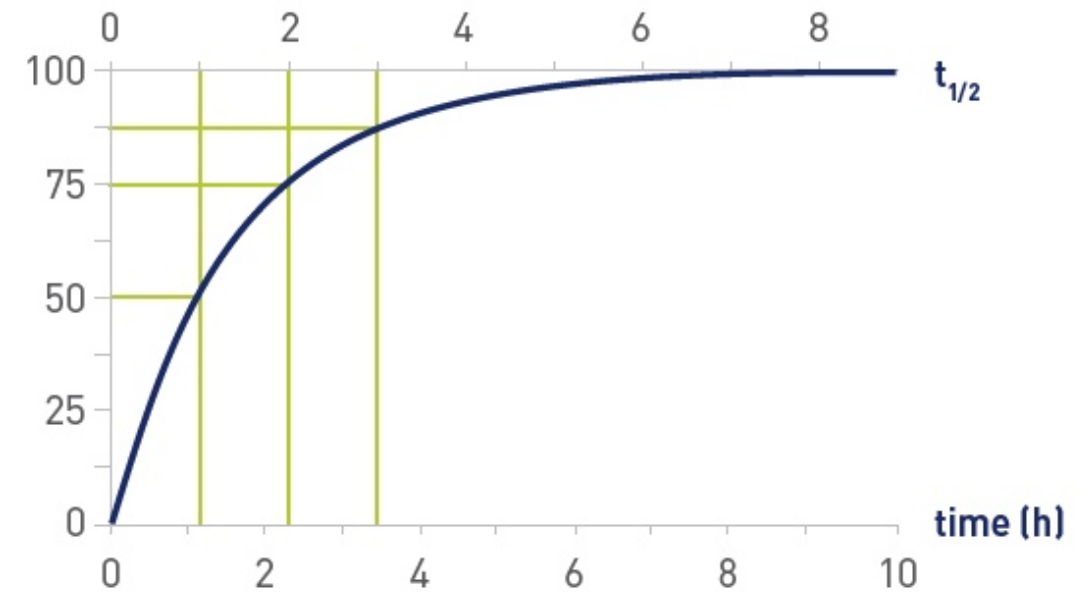
Galli Eo



$^{68}\text{Ge} / ^{68}\text{Ga}$ generator



^{68}Ga ACTIVITY AS A FRACTION OF ^{68}Ge



Nuclear Imaging pathway

Targets



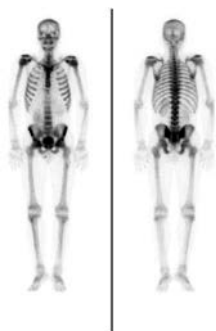
Irradiation



Shipment



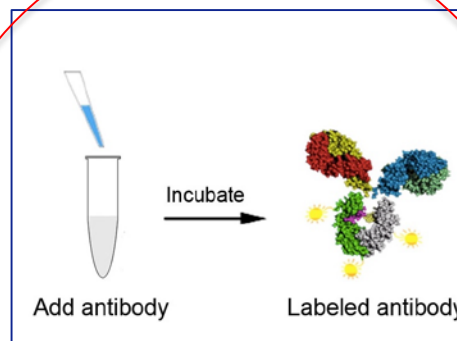
Processing



Imaging



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administration



Radiolabelling



Generator



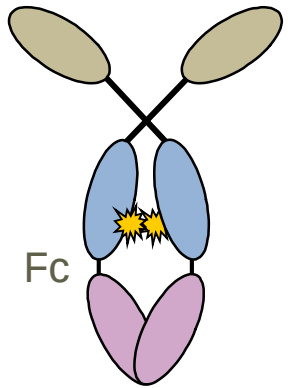
Toward cold kits for PET





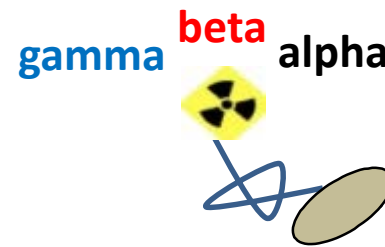
Camel-IDS

STRIKE THE CANCER, NOT THE PATIENT



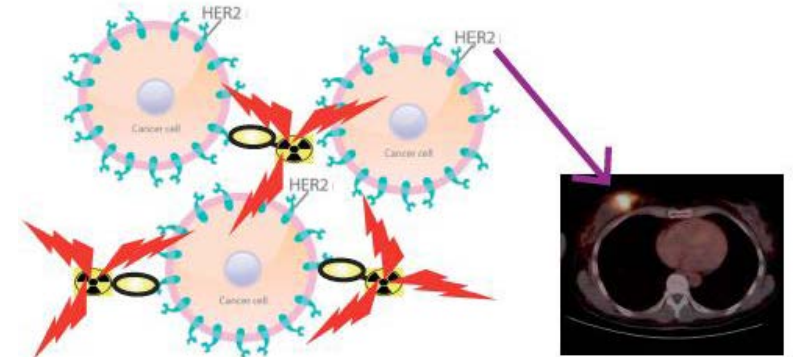
camelidae

single domain antibody
fragment
or
'camelid'



CAM-RIT:

CAMelid-Radio Immuno-Therapy



Clinical Trial Phase 1 in HER2-positive breast cancer

One drug product & two formulations:

Biomarker dose: Patient selection

Therapeutic dose: Treatment

BNS, 2018-04-26

Nuclear Imaging pathway

Targets



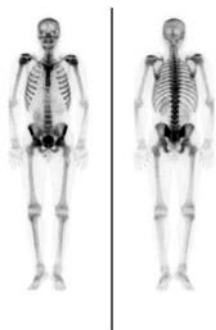
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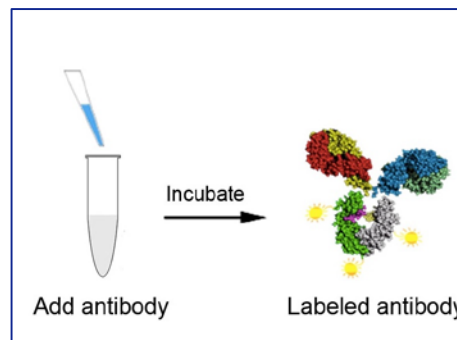
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Imaging



QC and
administration



Radiolabelling



Generator

QC-Cubicle



The QC-Cubicle is an all in one Quality Control lab for the production of radiopharmaceuticals.

The basic system contains all hardware and software needed for the Quality Control of FDG, enabling the customer to set up a entire QC lab in a very short time.

It can easily be extended to other tracers.

The complete QC needs less than 2 m² lab space.

Nuclear Imaging pathway

Targets



Irradiation



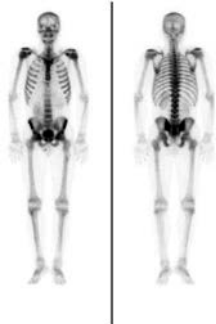
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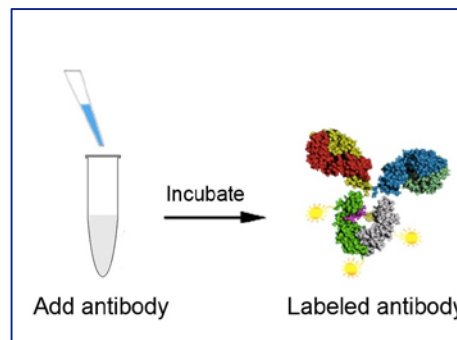
Imaging



QC and
administration



Radiolabelling



Generator





MOLECUBES

MODULAR
BENCHTOP
IMAGING

γ -CUBE

SPECT



The γ -CUBE is our high-resolution, high-sensitivity micro-SPECT scanner using patented collimator design.

[READ MORE](#)

X-CUBE

CT



The X-CUBE is our high-throughput micro-CT scanner allowing sub-minute acquisition at extremely low doses.

[READ MORE](#)

β -CUBE

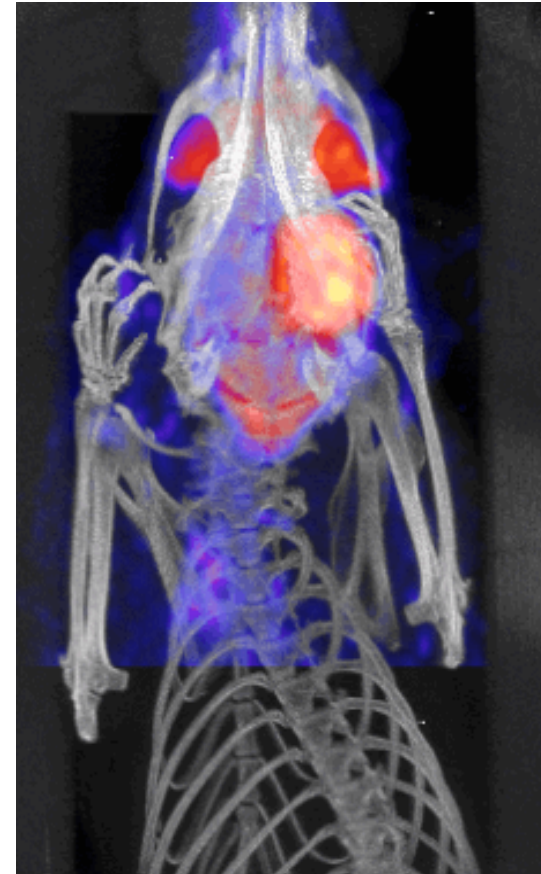
PET



The β -CUBE is our sub-millimeter, high-sensitivity whole body mouse and rat micro-PET scanner.

[READ MORE](#)

IMAGING EXAMPLES



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The future of cancer therapy

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FOUNDATION**

ClinicoBru
THE BRUSSELS CLINICAL TRIALS NETWORK

A few numbers (12-2017)

- 10 operating cyclotrons
- 26 PET cameras = 2,3 per million persons (NL: 3,0; UK: 1,0)
- Cameras: only 33% 1 - 5y; 67% 6 - 10y; opposite in France
- ~380 nuclear medicine physicians
- ~2600 direct and 2100 indirect jobs

Rad4Med.be :



- The Belgian network of companies, research and training centres, university hospitals and associations, dedicated to radiation applications in healthcare.
- Today: more than 60 actors.
- The single contact point to access the Belgian expertise in radiation applications in healthcare is :
contact@rad4med.be

The Global $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$ Supply Chain

