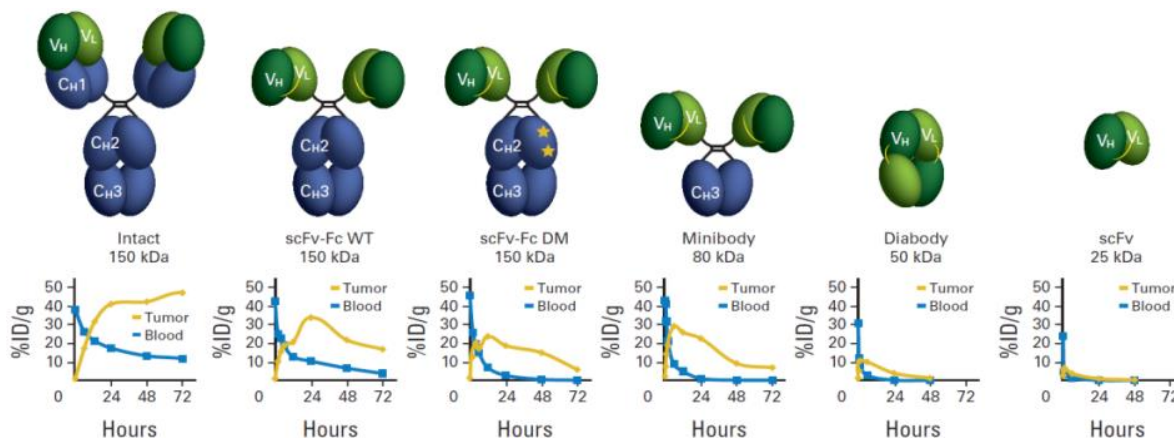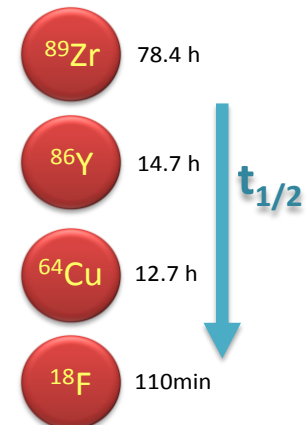# ImmunoPET

ImmunoPET – Positron Emission Tomography with radiolabeled immunoproteins or fragments as radiotracers. By noninvasive tracking of the immuno-probes in live subjects with the quantification capability of in vivo distribution, immunoPET is now playing a more and more important role in diagnostic imaging and mAb-based therapies.
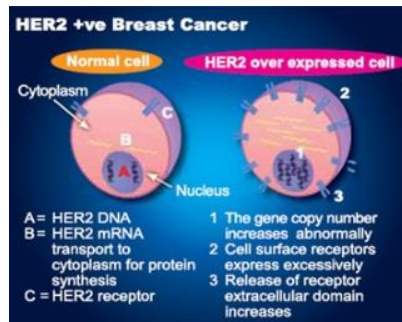
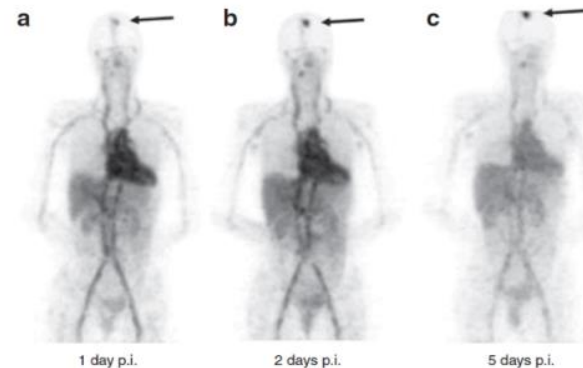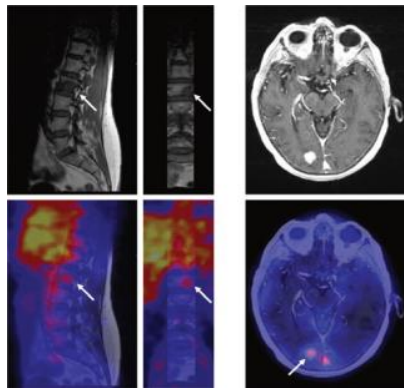## Extended choices of immunoprotein molecules

Radioisotopes of choice

Isotope	$t_{1/2}$
^{89}Zr	78.4 h
^{86}Y	14.7 h
^{64}Cu	12.7 h
^{18}F	110 min

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Clinical Examples of ImmunoPET
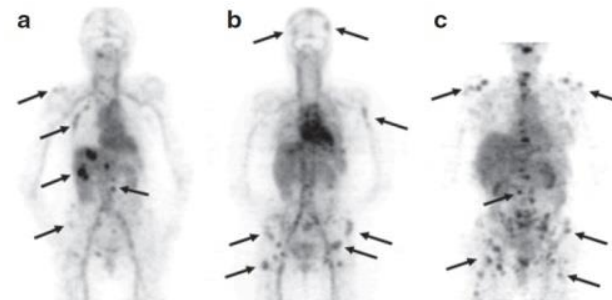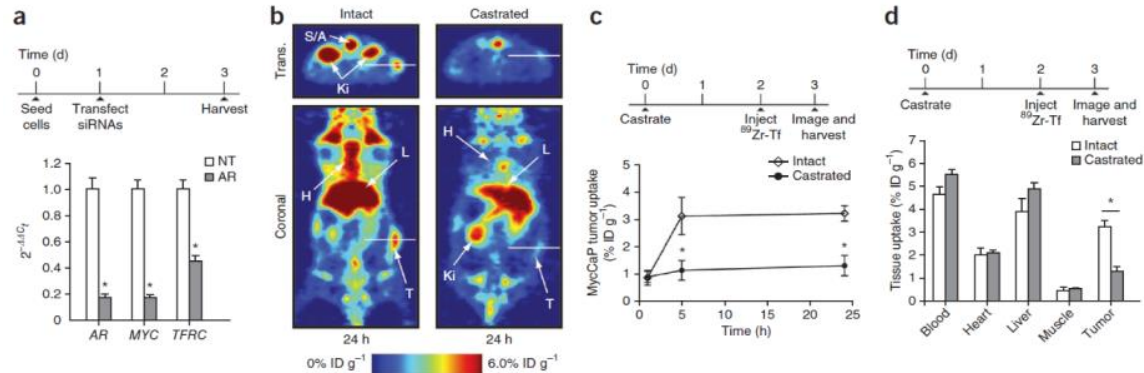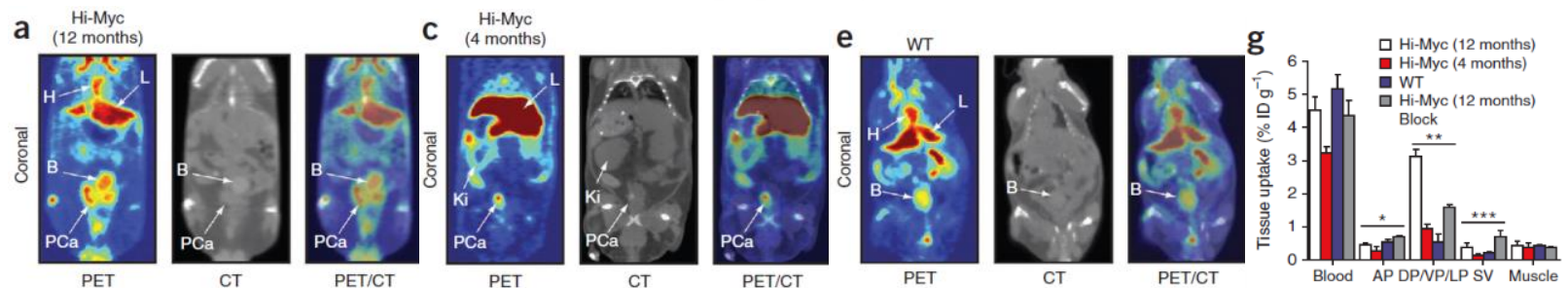

ImmunoPET imaging of HER2-positive metastatic lesions (breast cancer) with [89]Zr-trastuzumab

Preclinical Examples of ImmunoPET

**ImmunoPET imaging (Intact vs. Treated)**



ImmunoPET-CT imaging (Hi-Myc vs. WT)

Quantitatively tracking MYC oncogene-driven transferrin receptor 1 (TFRC) expression with ^{89}Zr-transferrin

Nanoparticle-based PET Imaging

Capable of carrying high payloads of imaging moieties or therapeutic drugs or both, varieties of nanoconstructs have been explored or designed for more efficacious detection and treatment of diseases. Tagged with positron-emitting radioisotopes, nanoparticles can be noninvasively monitored by PET in live subjects for imaging or theranostic purposes.
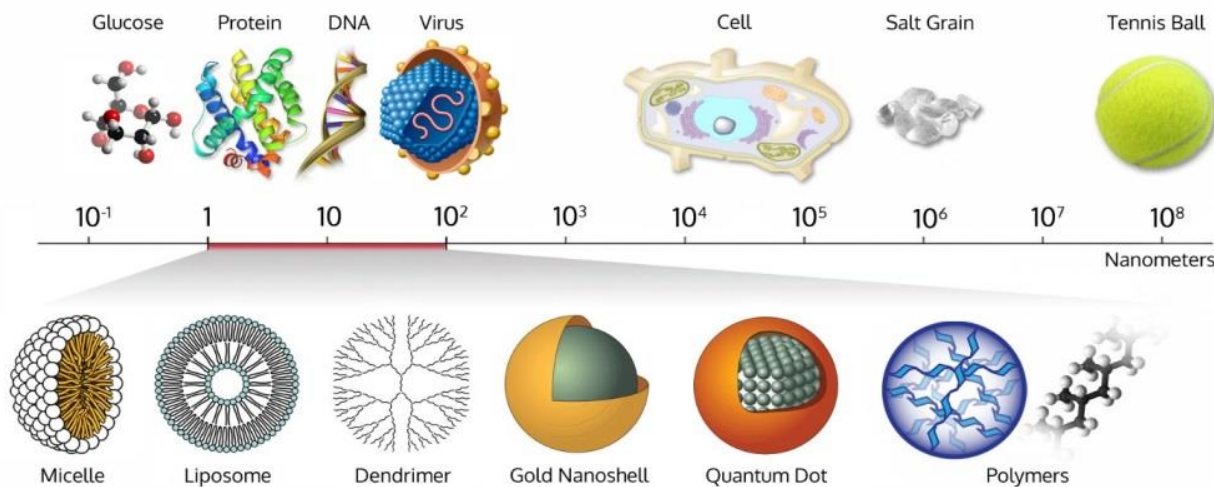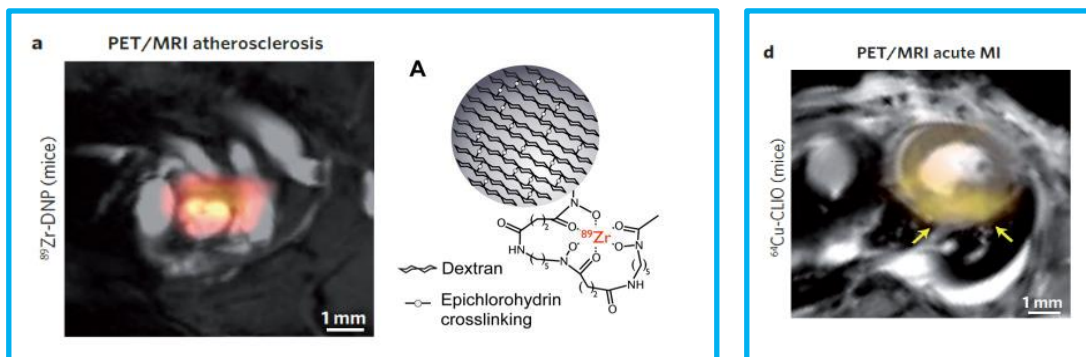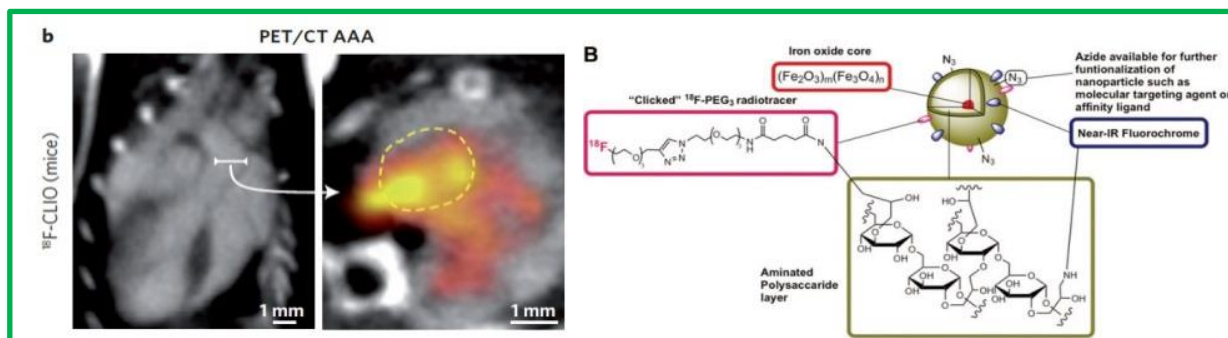

Nanoparticles of interest

Radioisotopes of choice

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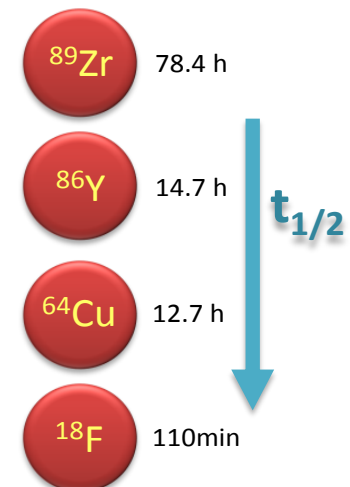
Examples with Radioisotope-labeled Nanoconstructs (^{18}F, ^{64}Cu, or ^{89}Zr)

Cardiovascular inflammation assessed by PET/MRI or PET/CT with radiolabeled nanoconstructs

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PET Imaging of Stem Cells

Directly or indirectly, molecular imaging techniques can be used for in vivo tracking of stem cells, which assists the understanding of the fundamental behavior of stem cells, including their survival, biodistribution, immunogenicity, and tumorigenicity in the targeted tissues of interest.
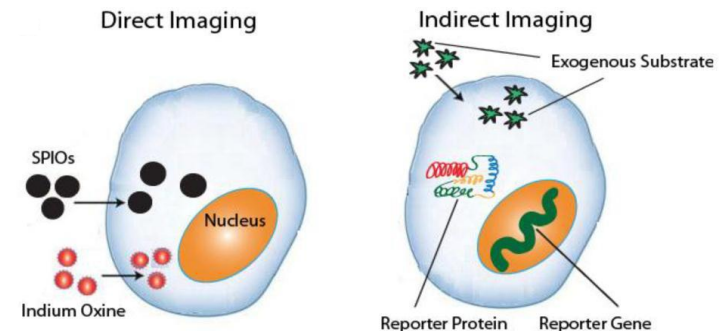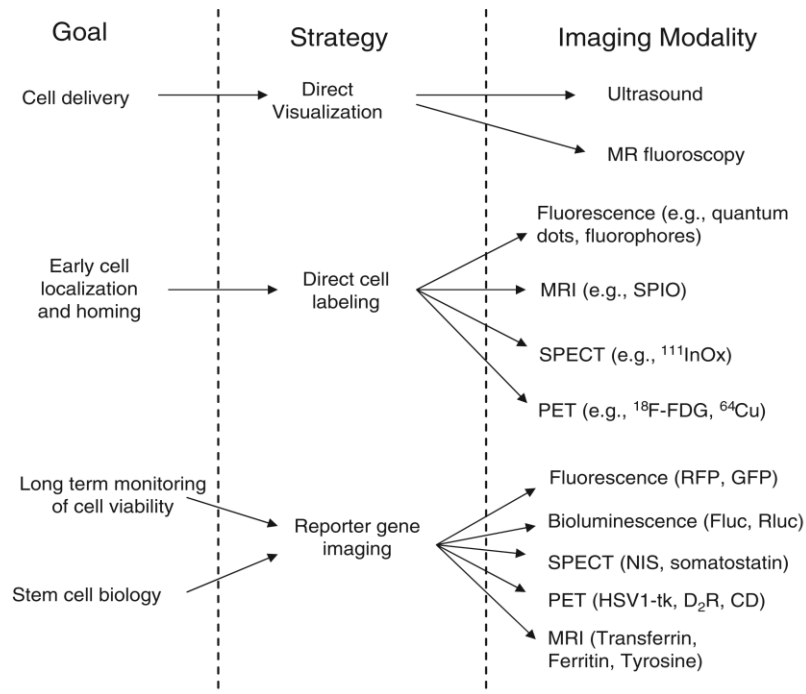
Two main classes of molecular imaging techniques: direct stem cell labeling and indirect reporter-gene imaging.

Imaging Examples after Direct Stem Cell Labeling
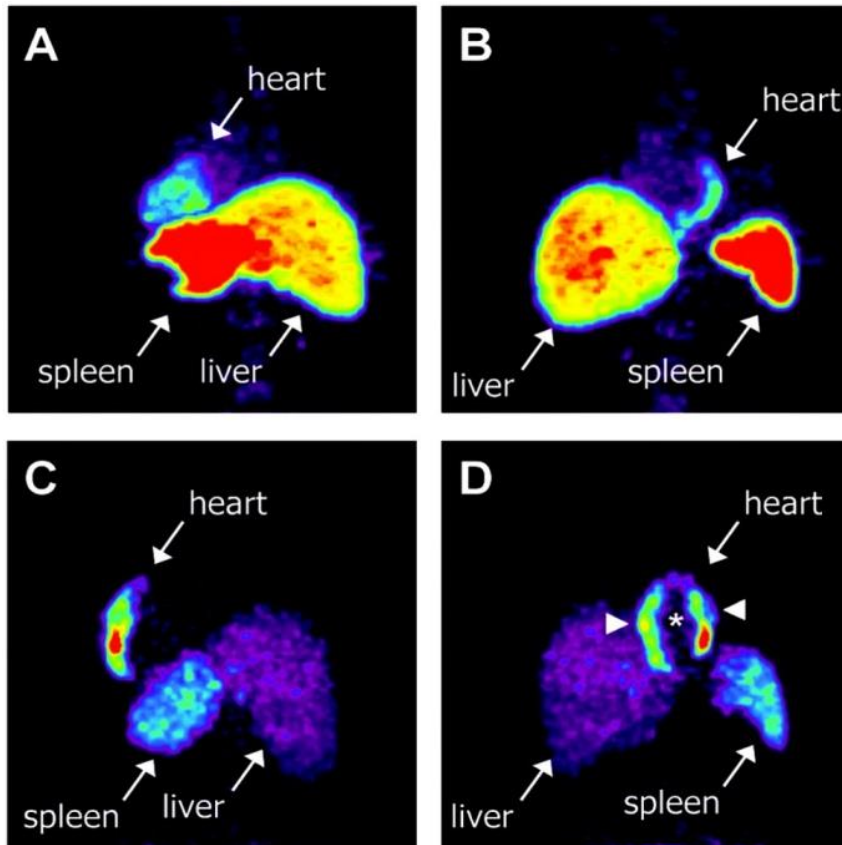
Myocardial homing and biodistribution of ^{18}F-FDG–labeled bone marrow cells. Left posterior oblique (A) and left anterior oblique (B) views of chest and upper abdomen of patient. Left posterior oblique (C) and left anterior oblique (D) views of chest and upper abdomen of patient.

Imaging Tumor Hypoxia with ^{64}Cu-ATSM

- **Chemical name:** Copper(II) diacetyl-di(N4-methylthiosemicarbazone)

- **Abbreviated name(s):** Cu-ATSM

- **Application:** Delineate hypoxic areas within tumors

- **Target Category:** Redox trapping mechanism, reduction of Cu(II) to Cu(I)

- **Studies:** In vitro; Rodents; Other non-primate mammals; Humans
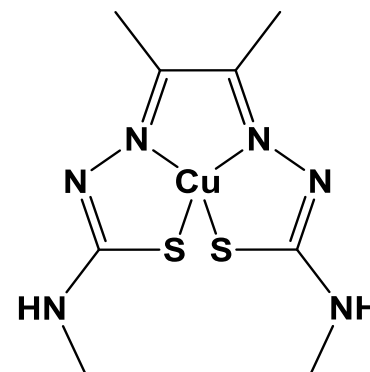
Imaging examples of ^{64}Cu-ATSM
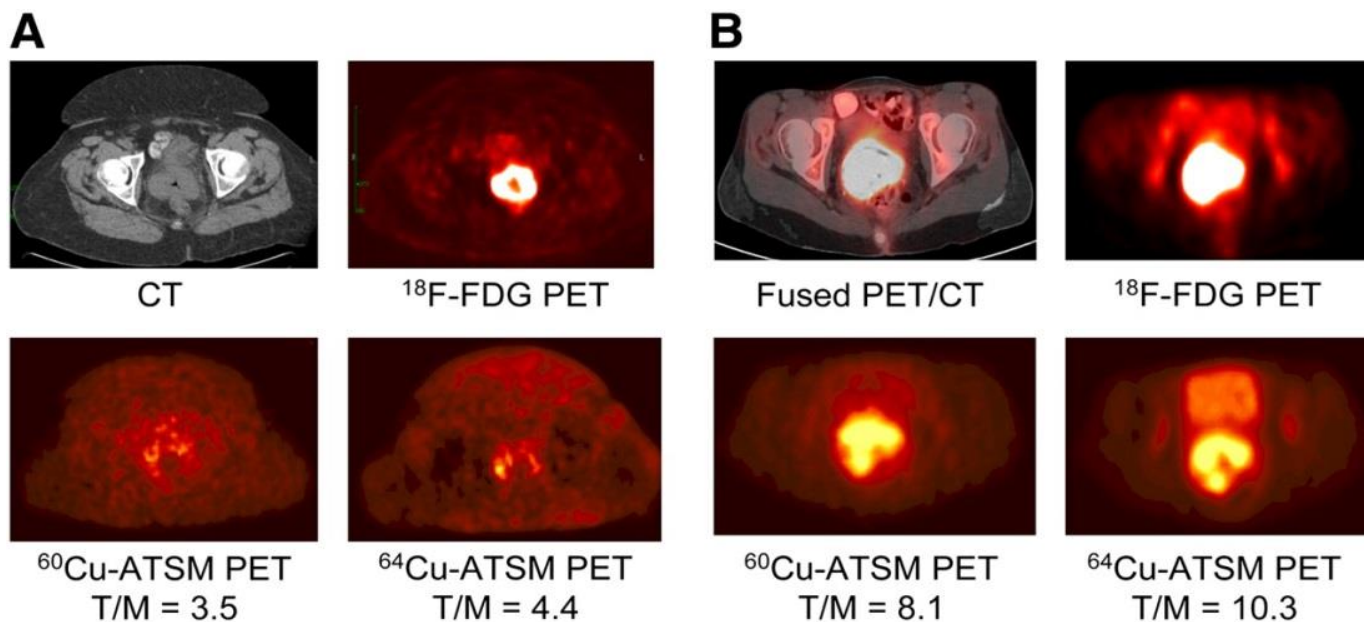
An Imaging Comparison of $^{60/64}$Cu-ATSM and ^{18}F-FDG in Cancer of the Uterine Cervix