^{67}Cu Studies at UAB

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UAB Cyclotron Facility
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Knowledge that will change your world

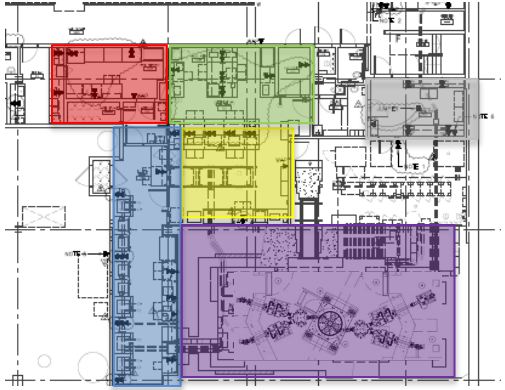
UAB Cyclotron Facility

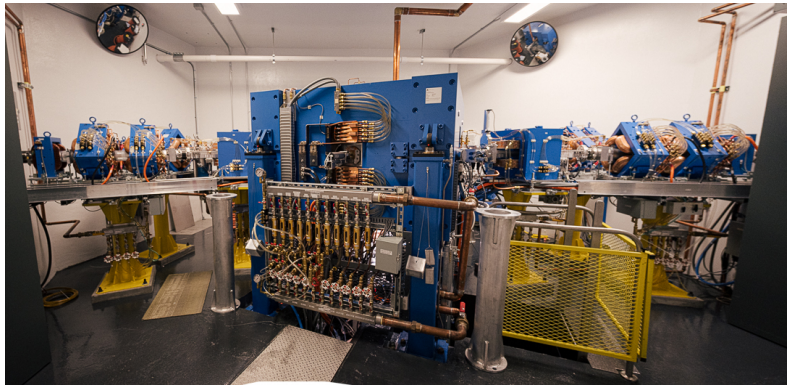
Facility stats

- Part of the UAB Advanced Imaging Facility and located in the O'Neal Comprehensive Cancer Center
- Composed of a radiopharmaceutical production suite, standalone radiopharmacy, quality control room and additional research space for preclinical and radiometal purification
- Currently have more than 15 approved IND's!

Cyclotron stats

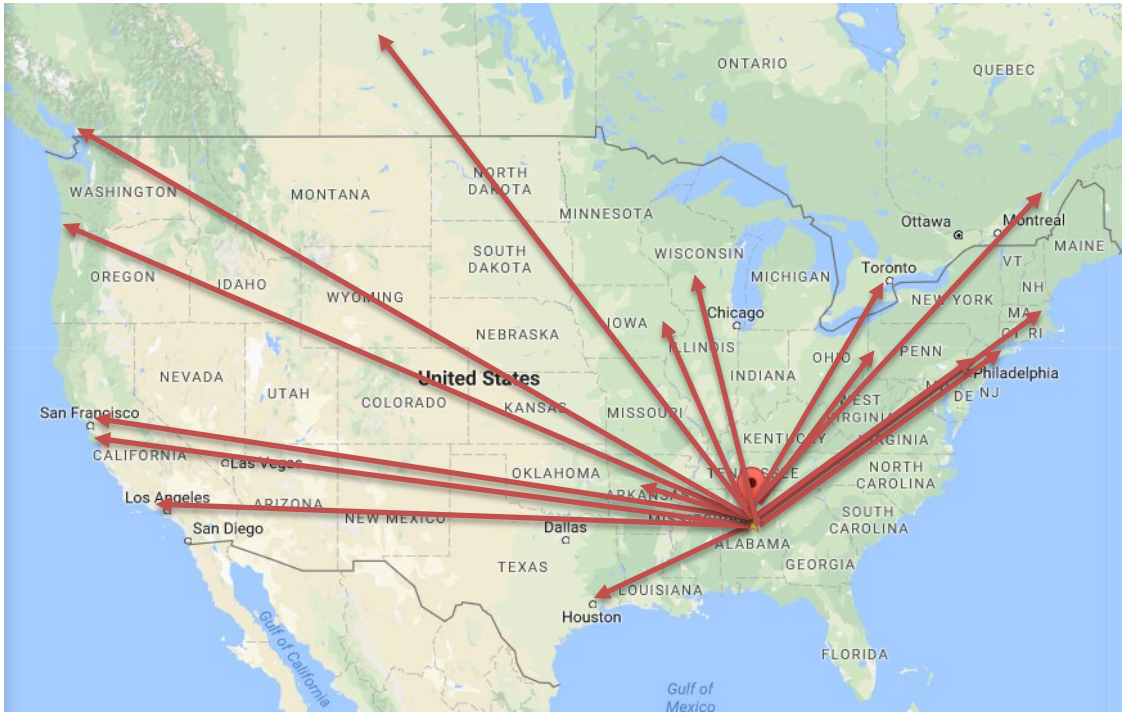
- TR-24 (Advanced Cyclotron Systems, Inc)
- Variable energy, 15-24 MeV
- Total current up to 300 μA
- Dual extraction ports, 4 beamlines
- Solid liquid and gas targets
- On top of the traditional isotopes (^{11}C, ^{13}N, ^{18}F), we can produce: $^{43/44/47}$Sc, ^{45}Ti, ^{48}V, ^{52}Mn, ^{55}Co, ^{64}Cu, and ^{89}Zr



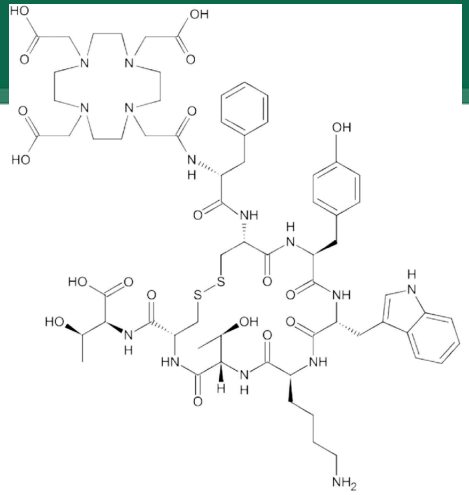


UAB Cyclotron Facility : A Nationwide Resource

- Multi-state pharmacist, pharmacy and manufacturing licenses to allow dispensing and distribution of radiopharmaceuticals into adjoining states.
- DOT certified shipping containers and internal training to distribute ^{89}Zr, ^{64}Cu and other isotopes to other research facilities throughout the country and internationally.
- We have many collaborative efforts across the country using ^{64}Cu and hope to expand that work using ^{67}Cu!
- Recently, UAB became a member of the DOE University Isotope Network.



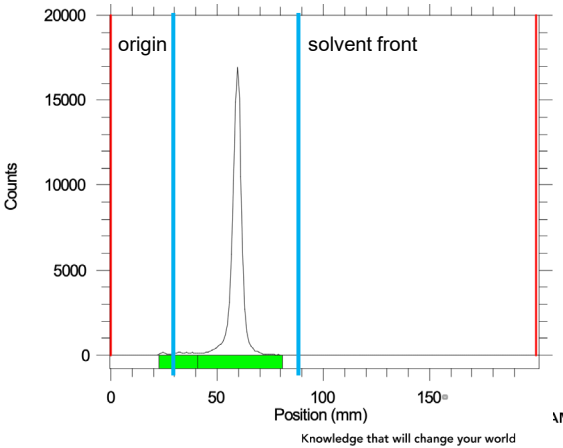
^{67}Cu-DOTATATE



- Stock ^{67}Cu diluted into 0.5 M NH_4OAc at pH 5
- Combined with DOTATATE (in 0.5 M NH_4OAc, pH 5 buffer) to determine optimum radiolabeling conditions
- For all test labeling, reactions were in the same volume (50 µL) and incubated for the same amount of time 15 min

Temperature	Target SA (µCi/µg)	DOTATATE (µg)	^{67}Cu (µCi)	Labeling efficiency (%)
37°C	100	5	544	19
65°C	100	5	545	72
90°C	100	5	550	94
90°C	10	5	54	97.3
90°C	50	5	260	97.5
90°C	100	5	549	98.4

iTLC conditions - 1:1 MeOH/0.25 M NH_4OAc pH 5
Rf Free ^{67}Cu = 0, Rf ^{67}Cu-DOTATATE = 0.7



Proof-of-Concept Animal Study

- Goal of the study = compare clearance and localization of free ^{67}Cu in naïve mouse to ^{67}Cu-DOTATATE injected in tumor bearing mouse
- BALB/c mouse with 4T1 breast tumor (MFP and Sub-Q flank)
  - ✓ 4T1 tumor cells happen to overexpress somatostatin receptors

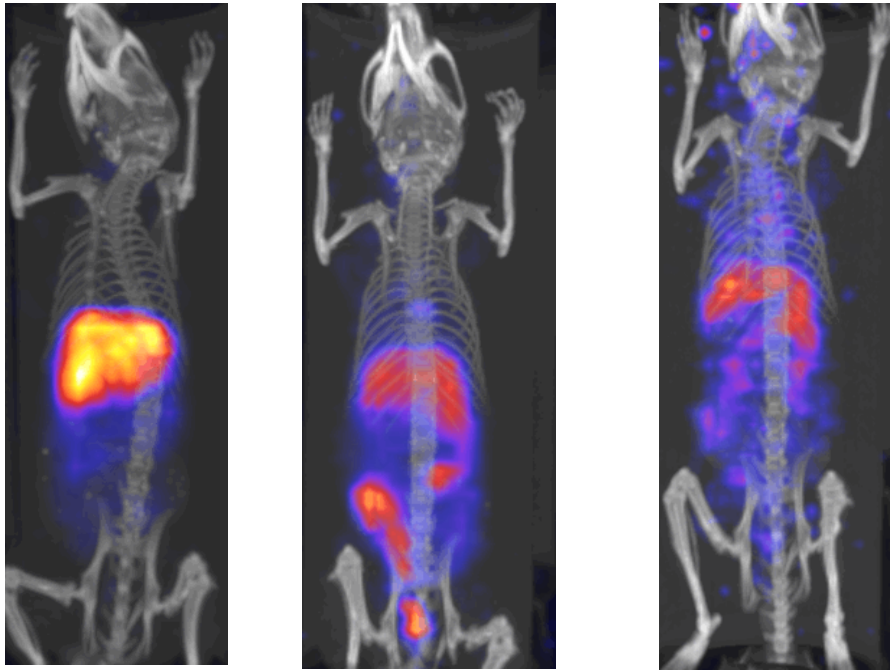
- Naïve mouse, BALB/c
  - ✓ Tail vein injection of 500 µCi
  - ✓ Imaging time points: D_0, day 1 and 4 post injection

- 4T1 tumor bearing mouse
  - ✓ Tail vein injection of 500 µCi
  - ✓ Imaging time points: D_0, day 1, 4, 5 and 6 days post injection

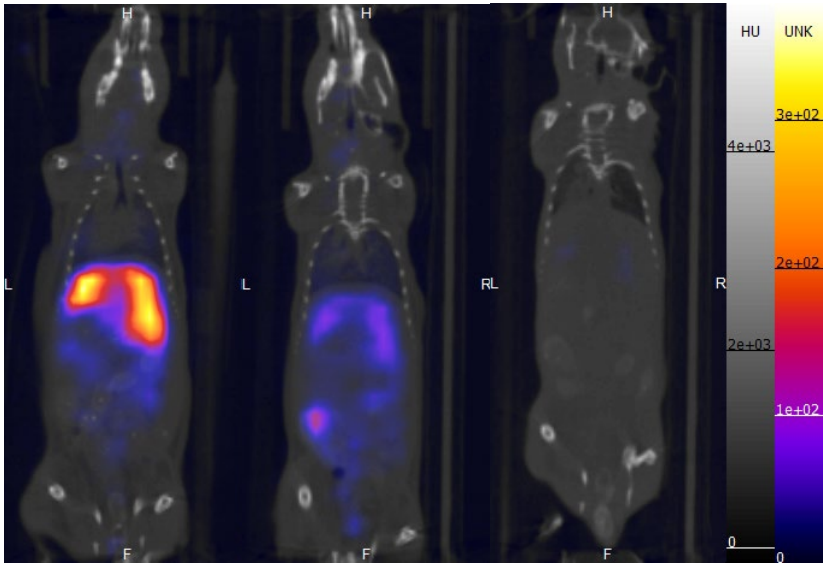
SPECT/CT
X-SPECT (Gamma Medica)

Free ^{67}Cu in naïve mouse

Day 0 Day 1 Day 4



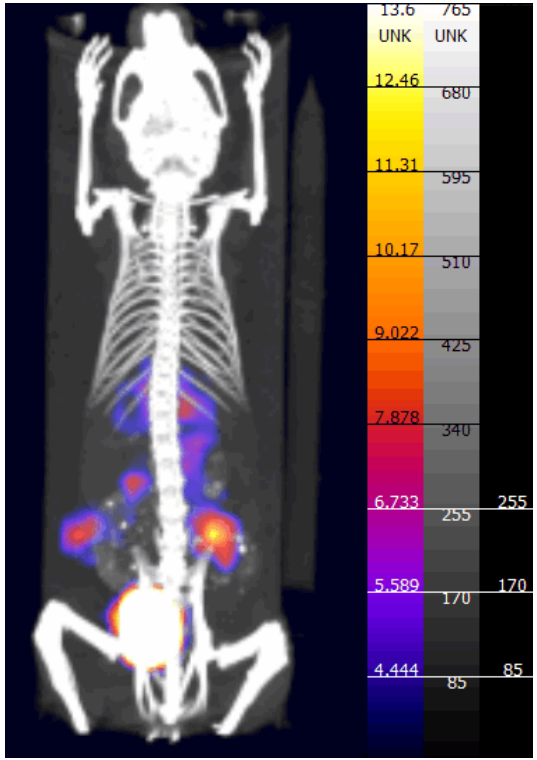
Tomographic, 30 min



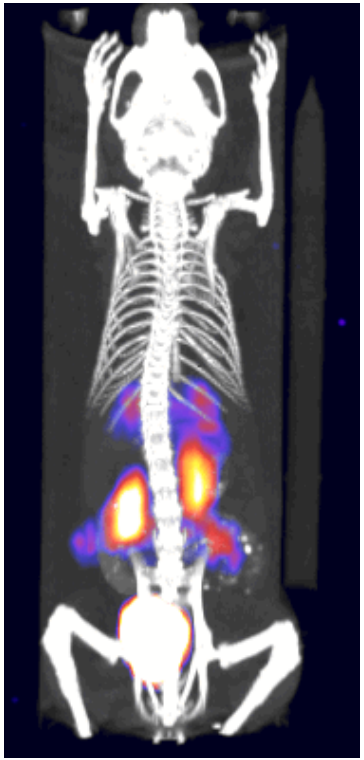
Coronal slices, Days 0, 1, 4

Day 0- ^{67}Cu-DOTATATE in tumor bearing mouse

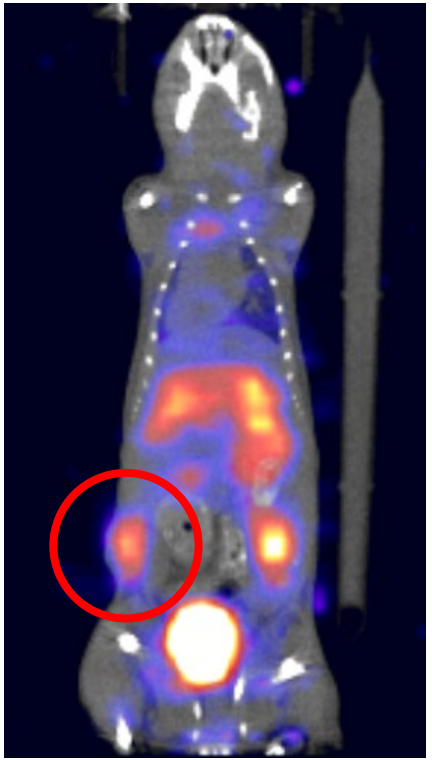
Dynamic, 30 min



Tomographic, 30 min

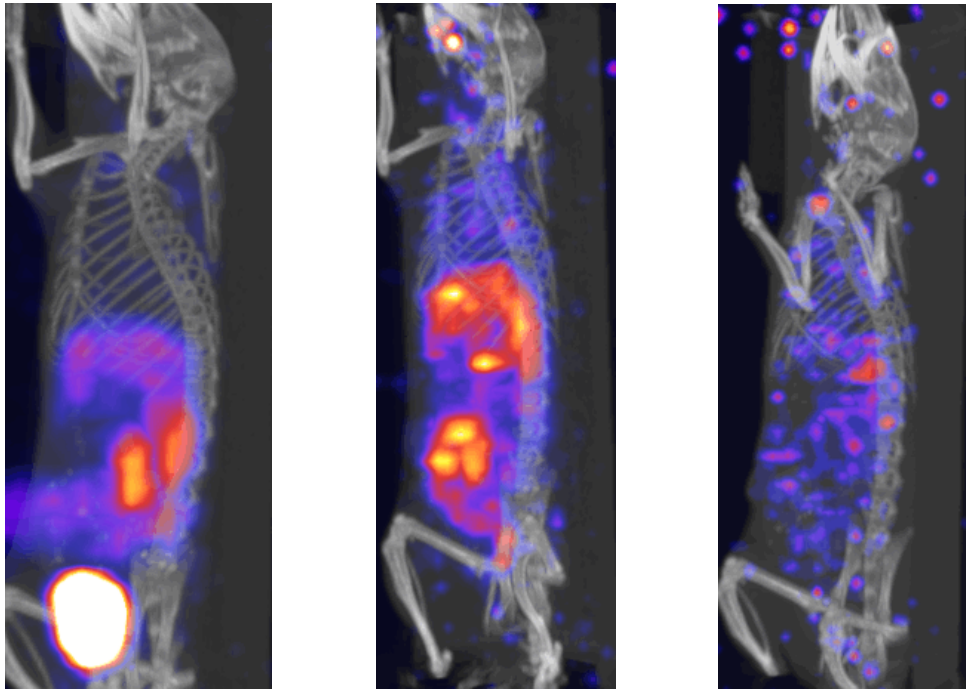


Coronal slice

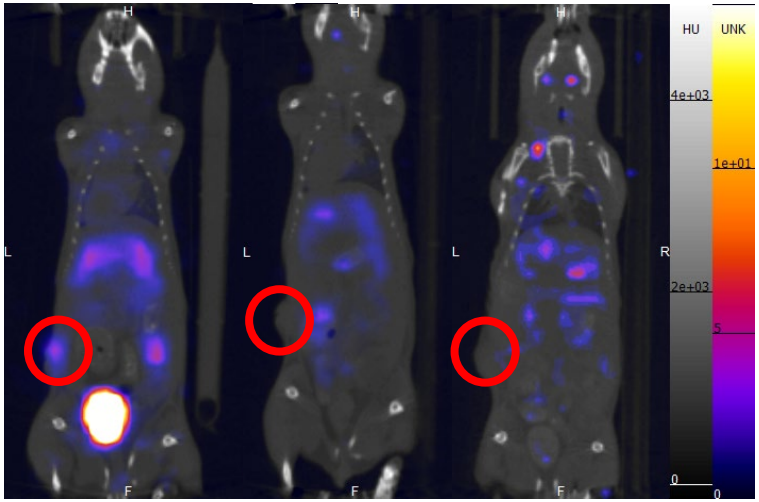


^{67}Cu-DOTATATE in tumor bearing mouse- D0 vs D1 vs D4

Day 0 | Day 1 | Day 4



Tomographic comparison, 30 min



Coronal slices, Days 0, 1, 4

In the future we are interested in exploring ^{67}Cu therapy studies in various preclinical models.

Acknowledgements

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