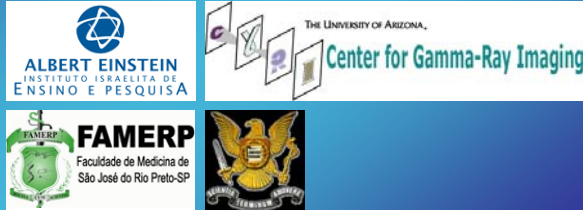


SPECT Imaging of Mouse Organs with protoBrazuka

Mejia J, Galvis-Alonso OY, Miller B.



SPECT Imaging of Mouse Organs with protoBrazuka

Mejia J, Galvis-Alonso OY, Miller B.

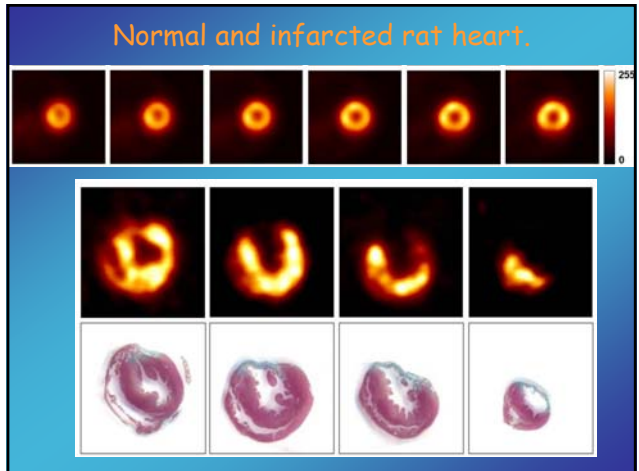
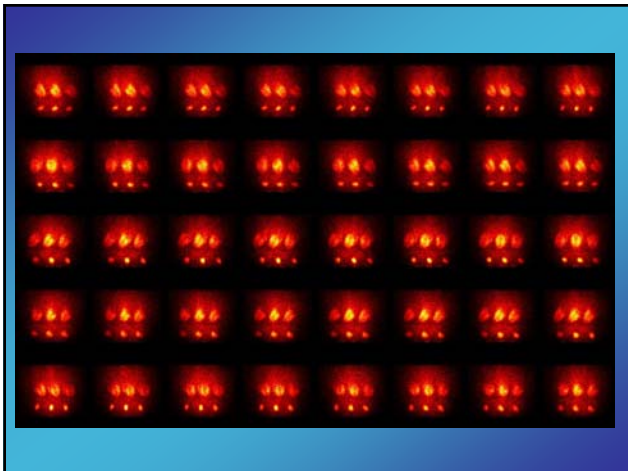
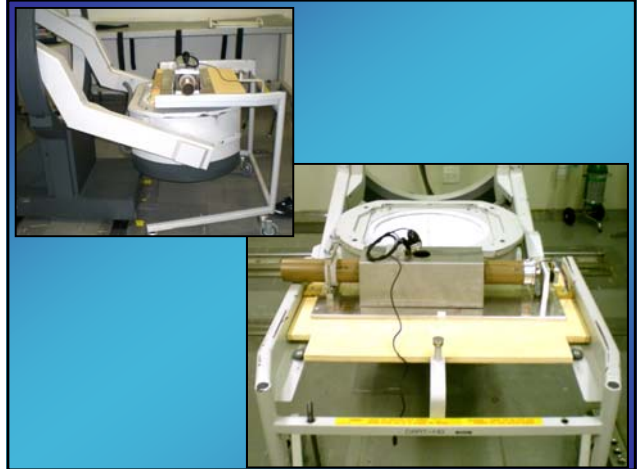
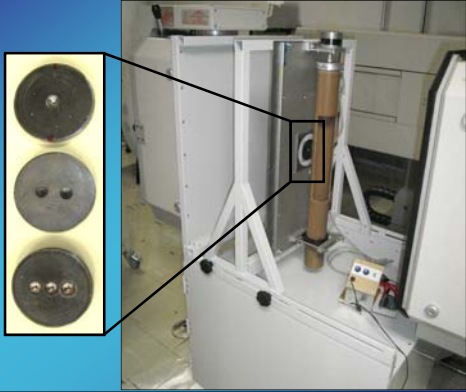


Animal models of cardiac diseases in Wistar rats and Syrian Hamsters.

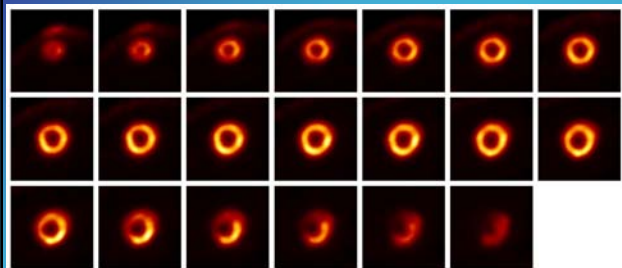


Size: Weight = 250/600 g and 80/180 g.
 Sensitivity: Anesthetics = 30 min.
 Resolution: small - medium infarct defects. = 1 mm
 ECG-gated SPECT?
 Available technology.

miniSPECT: a low-cost, multi-purpose, multi-pinhole, multi-platform SPECT upgrading device



Normal hamster heart



Imaging parameters:

- 10 to 15 mCi of ^{99m}Tc -Sestamibi.
- 25 to 40 projections, 30 sec/projection.
- Pinhole diameter = 1.5 mm.
- Spatial resolution = 1.25 mm.
- Anesthetics: injected, Ket/Xil.
- Animal rotates in the vertical position.
- Imaging at night or on weekends.

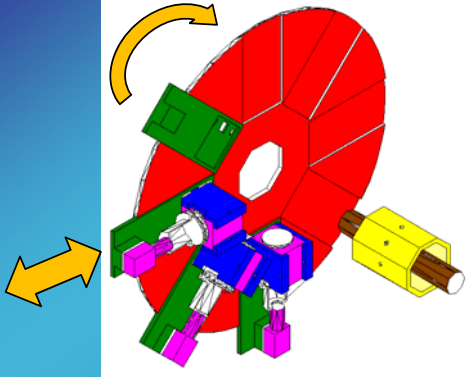
Animal Models:

- Chagas disease.
- Infarct remodeling in stem cell therapy.
- Characterization of a Parkinson's disease model with ^{99m}Tc -TRODAT-1.

SPECT Imaging of the heart of Wistar rats and Syrian Hamsters.

"Low-cost, animal-dedicated instrument"

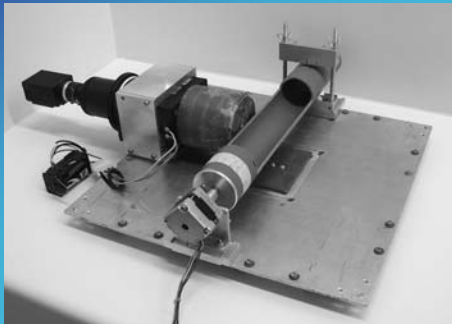
Brazuka-SPECT: the BRazilian cousin of Bazooka-SPECT



Brazuca: the brazilian ball for the 2014 Soccer World Championship



protoBrazuka



protoBrazuka



proteBrazuka: image acquisition and processing (C-Language)

RAW CCD FRAME	PREPROCESSED FRAME	PROJECTION
Frame registration at 15 fps	Subtraction of hot pixels, thresholding and centroiding of 11x11-element windows	Piling up of events (energy range, number of neighbors) with subpixel resolution

Projections are MLEM-combined to produce a 3D model of the gamma emission

Planar image, 10K frames, 1.0-mm and 0.5-mm diameter pinhole	
20 projs, 2500 frames/proj, 50 iter, 1.0-mm diameter pinhole	

20 projections, 2500 frames, 1-mm diameter pinhole, 25 mCi sodium pertechnetate.	Transversal slice through the 3D model, after 6 iterations.	Axial slice through the 3D model, after 6 iterations .

20 projections, 2500 frames, 1-mm diameter pinhole, 5 mCi 99mTc-MAA.	Transversal slice through the 3D model, after 6 iterations.	Axial slice through the 3D model, after 6 iterations .

20 projections, 2500 frames, 1-mm diameter pinhole, 5 mCi 99mTc-DMSA.	Frontal projection, 10K frames, 1-mm diameter pinhole, 5 mCi 99mTc-DMSA.	Dorsal projection, 10K frames, 1-mm diameter pinhole, 5 mCi 99mTc-DMSA.

With the initial experimental conditions ...

The proposed instrument configuration is feasible.

To improve sensitivity ...

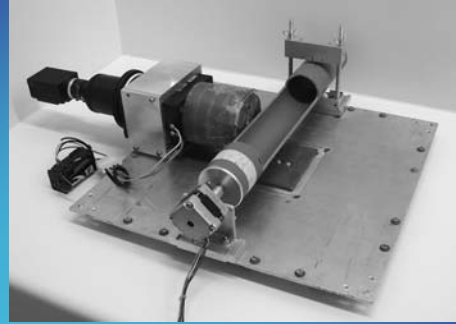
- Multiple-head detector.
- More efficient detector.
- Pinhole diameter (1.5-mm diameter).
- Multi-pinhole collimator.

Truncated icosahedron = Espherical surface



20 hexagons + 12 pentagons

miniSPECT + Brazuka



Special thanks to ...

- Brian.
- Dr. Barrett.
- Technical staff in the IIEPAE (Albert Einstein Hospital).
- Technical staff in FAMERP (Medicine School of Sao Jose do Rio Preto).
- All of you.

Our team in Brazil...

- Jorge Mejia – Astrophysics.
- Orfa Galvis-Alonso – Physiology.
- Marcus Simões – Cardiology.
- Ana Camargo Miranda – Biomedicine.
- Marilia dos Reis – Biomedicine.
- Luciano Oliveira – Physiotherapy.
- Eduardo Carvalho – Physiotherapy.

