Nuclear Medicine
-How does it work

Gerald R. Aben, MD FACR
Department of Radiology
College of Osteopathic Medicine
Nuclear Medicine
Nuclear Medicine
Physiological Imaging

• Radioactive isotopes which emit gamma rays or other ionizing forms (half life for most is hours to days)
• Radionuclides are injected intravenously or inhaled where, depending on substance, they concentrate in organ of study
• The emitted gamma rays are then picked up by gamma camera and displayed
• **Special terms used on nuclear medicine reports**
  • Hot, Photon Rich, Cold, Photon Poor, Photopenic
Nuclear Medicine
Physiological Imaging

• Conventional Nuclear Medicine
  • Emitted gamma rays create image

• SPECT (Single Photon Emission Computed Tomography)
  • Tomographic images of emitted gamma rays
  • Rotating gamma camera creates 3-D data set
  • Data set is then manipulated to create volume images (sum of all images in stack), multiplanar thin section images and 3-D volume data sets
Gamma Camera
Bone Scan
HIDA Scan

Gallbladder

Common Duct
CT-PET
PET Scanning

- Oncology
- Function
- Metabolism
- Perfusion
Positron Emission Tomography

- **PET (Positron Emission Tomography)**
  - Tomographic images of emitted positrons
  - Can be used to study metabolic processes
  - 511 kEev gamma ray Photons emitted simultaneously at 180 degrees to each other
  - Evaluate location in space
  - Fusion imaging with CT scanning for precise localization
Nuclear Medicine
Physiological Imaging

• Positron Emission Tomography

• Radionuclide emits positrons which interact with electrons to eject gamma rays at 180°

• Use computer to localize in space
Positron Emission Tomography

- Lung Cancer
- Mediastinal Metastasis
Positron Emission Tomography

- Lung Cancer
- Metastases
- Obstructed right ureter
Normal Cardiac Perfusion
Anterior Wall Ischemia
13N-Ammonia and 18F-FDG PET-perfusion and viability