ANNOUNCING

MPI Indium DTPA In 111
(Pentetate Indium Disodium In 111)
In Cisternography

Cisternography presents the dynamics of CSF flow

When you need to know function—
cisternography is useful in the evaluation of:

- Patients who may need ventricular shunts
- Shunt patency and/or site of blockage
- Patients with symptoms of "normal pressure" hydrocephalus
- Patients with symptoms of "communicating" hydrocephalus
- CSF rhinorrhea patients
CLINICAL CRITERIA

"An ideal radiopharmaceutical for cisternography would satisfy the following criteria: (I) physiologically governed by CSF flow, (II) adequate half-life for desirable period of study, (III) photons suitable for scanning, (IV) low radiation dose, (V) least probable chemical toxicity, and (VI) controlled pharmaceutical quality. Chelated $^{111}$In satisfies all these conditions."

COMPARISON OF TWO RADIOPHARMACEUTICALS USED IN EVALUATION OF CEREBROSPINAL FLUID PATHWAYS

<table>
<thead>
<tr>
<th></th>
<th>$^{188}$Yb DTPA</th>
<th>$^{111}$In DTPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Half-Life</td>
<td>32 days</td>
<td>2.8 days</td>
</tr>
<tr>
<td>Biological Half-Life</td>
<td>12 hours</td>
<td>10 hours</td>
</tr>
<tr>
<td>Useful Photons (energy MeV)</td>
<td>0.177, 0.198</td>
<td>0.173, 0.247</td>
</tr>
<tr>
<td>Useful Photons (% disintegration)</td>
<td>0.57</td>
<td>1.85</td>
</tr>
<tr>
<td>Whole Body Dose</td>
<td>0.069/500 µCi</td>
<td>0.039/500 µCi</td>
</tr>
<tr>
<td>Spinal Cord Surface Dose (rads)</td>
<td>8.0/500 µCi*</td>
<td>1.9/500 µCi*</td>
</tr>
</tbody>
</table>

*Dose to spinal cord and brain surface


FOR COMPLETE PRESCRIBING INFORMATION PLEASE CONSULT PACKAGE INSERT, A SUMMARY OF WHICH FOLLOWS:

MPI Indium DTPA In 111
(Pentetate Indium Disodium In 111)

DESCRIPTION: MPI Indium DTPA In 111 is a diagnostic drug for intrathecal use. It is available as a sterile, pyrogenic, isotonic, aqueous solution, buffered to pH 7 to 8. At calibration time each milliliter contains 1 millicurie of Pentetate Indium Disodium In 111 (no-carrier-added), 20 to 50 micrograms of pentetic acid, and sodium bicarbonate for pH adjustment. The drug is to be discarded after single use. Radionuclidic purity at calibration time is at least 99.0% with less than 0.1% Indium 114m and 0.1% Zinc Zn 65. The concentration of each radionuclidic contaminant changes with time. Graph 1 shows maximum concentration of each radionuclidic impurity as a function of time.

INDICATIONS AND USAGE: Pentetate Indium Disodium In 111 is recommended for use in radionuclide cisternography.

CONTRAINDICATIONS: None known.

WARNINGS: The contents of the vial are radioactive. Adequate shielding of the preparation must be maintained at all times.

Since the drug is excreted by the kidneys, caution should be exercised in patients with severely impaired renal function.

PRECAUTIONS: Pentetate Indium Disodium In 111, as well as other radioactive drugs, must be handled with care and appropriate safety measures should be used to minimize external radiation exposure to clinical personnel, and to minimize radiation exposure to the patients consistent with proper patient management.

Do not use after the expiration time and date (7 days after calibration time) stated on the label.

Discard vial after a single use. Do not use if contents are turbid.

Carcinogenesis, Mutagenesis, Impairment of Fertility

No long-term animal studies have been performed to evaluate carcinogenic potential, or whether Pentetate Indium Disodium In 111 affects fertility in males or females.

Pregnancy Category C

Animal reproductive studies have not been conducted with MPI Indium DTPA In 111. It is also not known whether Pentetate Indium Disodium In 111 can cause fetal harm when administered to a pregnant woman or can affect reproductive capacity. Pentetate Indium Disodium In 111 should be given to a pregnant woman only if clearly needed.

PRECAUTIONS: Ideally, examinations using radiopharmaceuticals, especially those elective in nature of a woman of childbearing capability should be performed during the first few (approximately 10) days following the onset of menses.

Nursing Mothers

It is not known whether this drug is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when Pentetate Indium Disodium In 111 is administered to a nursing mother.

Pediatric Use

Safety and effectiveness in children have not been established.

Radiopharmaceuticals should be used only by physicians who are qualified by training and experience in the safe use and handling of radionuclides, and whose experience and training have been approved by the appropriate government agency authorized to license the use of radionuclides.

ADVERSE REACTIONS: Aseptic meningitis and pyrogenic reactions have been rarely (less than 0.4%) observed following cisternography with Pentetate Indium Disodium In 111.

HOW SUPPLIED: Pentetate Indium Disodium In 111 (no-carrier-added) is supplied in single dose glass vials, each containing 1.5 ml of solution with a concentration of 1 millicurie per ml and a total activity of 1.5 millicurie per vial at calibration time.
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Thallous Chloride TI 201

For complete prescribing information consult package insert, a brief summary of which follows:

DESCRIPTION: Thallous Chloride TI 201 is supplied as a sterile, nonpyrogenic diagnostic radiopharmaceutical for intravenous administration. Each unit dose contains 1 milliliter and each milliliter contains 2 milligrams of Thallous Chloride TI 201 at calibration time, with 0.2 mg of sodium chloride or sodium hydroxide. It contains no bacteriostatic preservative. Thallous Chloride TI 201 is a cationic product and is essentially carrier-free. Radiocardiographic purity of calibration time is at least 98.0% with less than 1.0% Thallous Chloride 200.0% Thallous 202 and 0.2% lead 203. The concentration of each tracer radiocardiographic contaminant changes with time.

INDICATION AND USAGE: Thallous Chloride TI 201 may be used in cardiac imaging to define the extent of myocardial infarction. It may also be useful in conjunction with exercise stress testing as an adjunct in the diagnosis of ischemic heart disease (atherosclerotic coronary artery disease).

CONTRAINDICATIONS: None known

WARNINGs: When studying patients suspected or known to have myocardial infarction or ischemia, care should be taken to assure continuous clinical monitoring and treatment in accordance with safe, accepted procedure. Exercise stress testing should be performed only under the supervision of a qualified physician and in a laboratory equipped with appropriate radiological and support apparatus.

PRECAUTIONS:

General:
Do not use after the expiration time and date (4 days after calibration time) stated on the label.
Discard vial after single use. Do not use if contents are turbid.
The patient dose should be measured by a suitable radioactivity calibration system immediately prior to administration.

Ideally, examinations using radiopharmaceuticals, especially those electively in nature, on a woman of childbearing capability should be performed during the first 10 days following the onset of menses.

Thallous Chloride TI 201 is as well as other radioactive drugs must be handled with care. And appropriate safety measures should be used to minimize radiation exposure to clinical personnel. Also, care should be taken to minimize radiation exposure to the patient consistent with proper patient management.

Radiopharmaceuticals should be used only by physicians who are qualified by training and experience in the safe use and handling of radiopharmaceuticals, and whose experience and training have been approved by the appropriate government agency authorized to license the use of radiopharmaceuticals.

Carcinogenesis, Mutagenesis, Impairment of Fertility
No long-term animal studies have been performed to evaluate carcinogenic potential, mutagenic potential, or whether Thallous Chloride TI 201 affects fertility or males or females.

Pregnancy Category C
Animal reproduction studies have not been conducted with Thallous Chloride TI 201. It is also not known whether Thallous Chloride TI 201 can cause fetal harm when administered to a pregnant woman or can affect reproduction capacity. Thallous Chloride TI 201 should be given to a pregnant woman only if clearly needed.

Nursing Mothers
It is not known whether this drug is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when Thallous Chloride TI 201 is administered to a nursing woman.

Pediatric Use
Safety and effectiveness in children have not been established.

ADVERSE REACTIONS: Adverse reactions related to use of this agent have not been reported to date.

HOW SUPPLIED: Thallous Chloride TI 201 is supplied as a sterile, nonpyrogenic, isotonic solution in unit dose vials containing 1 milliliter. Each milliliter contains 2 milligrams of Thallous Chloride TI 201 at calibration time. Contains no bacteriostatic preservative.
Broad Clinical Applications
The Novo Cerebrograph quantifies data on various functional and hemodynamic changes within the brain through measurement of regional Cerebral Blood Flow (rCBF). This multidetector system yields results frequently unobtainable by other methods. The rCBF technique is used to study a broad range of pathological conditions, including cerebrovascular disease, head trauma, and dementia states. It is also used in neuropsychology to quantify changes in cortical activation during higher mental functions.

Inhalation Method. Especially accurate for fast (gray matter) flow. Allows simultaneous bilateral measurement. Noninvasive, it can be performed repeatedly with virtually no risk and provides a high degree of correlation with overall IA results.

Intra-arterial Injection Method. Offers higher spatial resolution and accurate measurement of slow (white matter) perfusion.

Intravenous Method. An alternative when the inhalation method is not appropriate.

State of the Art
The Novo Cerebrograph is the finest system available for measurement of rCBF by $^{133}$Xenon clearance. It includes a pushbutton microprocessor-controlled automated Xenon administration system with a Xenon trap, a data collection system with air detector and up to 32 brain detectors with exchangeable collimators. It offers a choice of on-line and off-line data calculation and presentation format. In addition to the Obrist calculation model, only Novo offers the Fourier and 6-Unknown alternative models, both developed by Novo research. Modular design facilitates easy system expansion.

Novo is proud of its pioneering role in the development of this clinical milestone, and proud to define today's state of the art while developing systems for tomorrow.
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NEW ANALYTIC METHOD OF ABSORPTION CORRECTION
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ARRAY PROCESSOR

S.T.E.P.S.*
TOMOGRAPHY

GATED ACQUISITION
PHASE HISTOGRAMME

PHASE IMAGE
AMPLITUDE IMAGE

IMAC

0 \int E(x,y) e^{-L(x,y)} dL...

L=+\infty

E(x,y) dl
FROM PHOTON DETECTION TO IMAGE PROCESSING

OFFERS A COMPLETE RANGE OF PRODUCTS

• GAMMATOME T 9000
A complete system for E.C.T. and planar scintigraphy including:
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- a data acquisition and processing system:
  IMAC 7600 series.

• FIP 3 : FAST IMAGE PROCESSOR
CGR introduces the break through in image processing: the array processor. The processing speed for complex tomographic algorithm is illustrated by the table below.

<table>
<thead>
<tr>
<th>Processor</th>
<th>ECAT</th>
<th>GECAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose computer IMAC type(*)</td>
<td>18 sec./slice</td>
<td>3 hours for 16 slices</td>
</tr>
<tr>
<td>Array processor FIP 3(*)</td>
<td>3 sec./slice</td>
<td>6 minutes for 16 slices</td>
</tr>
</tbody>
</table>

(*) with CGR-APU

• STEPS : SOFTWARE - TOMOGRAPHY - EMISSION - PLANAR-SCINTIGRAPHY
An integrated software package allowing an easy selection between planar scintigraphy and tomography.
- Simultaneous acquisition and image reconstruction or processing.
- Full capabilities of ECAT image reconstruction transverse, coronal, sagittal, oblique.
- Post reconstruction image processing.
- Gated cardiac emission computed axial tomography - G.E.C.A.T.
- Powerful absorption correction.
- Others...

• QUANTIFICATION
- STEPS offers possibilities of quantification of images.
- Volume regions of interets.
- Organes volumes.

• REAL TIME
STEPS offers real time processing of planar gated cardiac studies.

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Space/time quantitative thallium imaging

Daniel S. Berman, MD
Director, Nuclear Cardiology
Cedars-Sinai Medical Center
Associate Clinical Professor of Radiology
University of California, Los Angeles
School of Medicine

Ernest V. Garcia, PhD
Director, Nuclear Medicine Computer Sciences
Cedars-Sinai Medical Center
Adjunct Assistant Instructor of Radiology
University of California, Los Angeles
School of Medicine

Jamshid Maddahi, MD
Director, Nuclear Cardiac Stress Testing
Cedars-Sinai Medical Center
Assistant Professor of Medicine
University of California, Los Angeles
School of Medicine

At Cedars-Sinai Medical Center, we have developed a computerized technique for analyzing both the regional myocardial distribution and the washout of thallium-201. The technique combines some of the most useful aspects of previously described quantitative approaches to thallium imaging with certain unique display features. Our studies so far have convinced us that the method yields objective, highly accurate results and, more important, provides valuable information that often cannot be obtained by visual inspection alone of thallium-201 scintigrams.

Space/time quantitation

The method we have developed for simultaneous spatial and temporal quantitation of myocardial thallium distribution uses a computer to:

- perform interpolative background subtraction of the images. This approach to myocardial background subtraction—first described by Goris and colleagues, and modified by Watson et al—appears to provide the most satisfactory approximation of the true background contribution.
- generate and display maximal circumferential profiles representing the myocardial distribution of thallium in the immediate-postexercise and 4-hour delayed images. Following the approach suggested by Burow et al and Vogel and associates, the profiles are constructed by the computer for the postexercise images from the maximal-count-per-pixel values along 60 radii spaced at 5° intervals.
- generate and display washout circumferential profiles. These profiles are computer-constructed by subtracting, point by point, the 4-hour distribution profile from the initial postexercise profile, and then dividing by the initial profile. This yields a percent washout rate for each region around the myocardium.
- compare both the initial distribution profile and the percent washout profile with previously established normal profiles. Our normal profiles are drawn from a population of patients with less than a 1% likelihood of coronary disease on the basis of Bayesian analysis. This approach avoids the pitfalls inherent in defining as normals either patients with normal coronary arteriography (who, in fact, may have nonatherosclerotic ischemic disease) or "normal volunteers" (who may have occult coronary disease).

Operator interaction is confined to selecting the ventricular region of interest for background subtraction; visual determination of the center of the ventricle (and thus the maximum radius to which the computer will search); and locating the apex. Of these three operator-dependent steps, location of the apex is most critical. The computer automatically assigns the selected apex to the 90° position for comparison of the curves for washout calculation and for comparison of patient results with our normal values.

Displaying the data

Finally, the computer displays the quantitative data in a way that is very easy to comprehend and interpret. In addition to curves of initial distribution, 4-hour distribution and percent washout for the anterior, 45° LAO and 70° LAO views, the display shows a series of three concentric ellipses that permits immediate identification of segments with abnormal perfusion and/or washout.

The innermost of these three ellipses is a reference indicating the position of the myocardium. The middle ellipse corresponds to initial postexercise thallium distribution, and the outer ellipse to the percent washout for each region. Consecutive unbroken ellipses in each view suggest a normal study—with no regions of perfusion deficit or abnormal washout. Gaps in the middle ellipse represent abnormal regional perfusion; gaps in the outer ellipse represent abnormal regional washout. Regional abnormalities are determined by the computer by comparison with the lower limits of normal established for both perfusion and washout from our normal population.

Improved thallium imaging

We believe that our program overcomes some of the limitations associated with reliance on visual interpretation of thallium-201 images. The first of these, as most experienced observers would admit, is the subjectivity of visual analysis and the consequent variability of reported sensitivity and specificity values. In our recently reported study, the sensitivity
and specificity for detection of coronary artery disease were 93% and 90%, respectively—compared to 91% and 86% for visual interpretation. More important, interobserver agreement was 93% with the quantitative technique—higher than reported for visual interpretation, and suggesting that high sensitivity and specificity values could be routinely obtained in every nuclear cardiology laboratory.

Another reported problem is the relative insensitivity of visual analysis for identifying individual-vessel coronary lesions. Visual reading relies on the fact that the initial myocardial distribution of thallium reflects relative, not absolute, differences in uptake between ischemic and nonischemic regions. Thus, in a patient with multivessel disease, some areas with diminished perfusion may appear relatively normal compared with a more severely hypoperfused region. In the worst case, significant three-vessel disease with balanced reduction in blood flow may not be seen as abnormal by visual inspection of the images.

Our technique overcomes this limitation by quantifying regional thallium washout, thus permitting us to compare each region with itself over time rather than with other regions. Because ischemic regions demonstrate altered washout, we can thus identify areas supplied by stenosed vessels which might be undetected by visual region-to-region comparison alone.

How successful have we been in identifying individual diseased vessels? In our recent study, we detected left anterior descending disease with a sensitivity of 80% (compared to 56% for visual inspection), left circumflex disease with a sensitivity of 63% (compared to 34%) and right coronary disease with a sensitivity of 94% (compared to 65%). In addition, our sensitivity for distinguishing coronary arteries with moderate disease was 70%, compared to 35% by visual inspection.

**Clinical implications**

The increased sensitivity and specificity of our program, and the enhanced interobserver agreement, have important implications not only for detection of coronary disease, but also for patient prognosis. We know from angiographic studies that the likelihood of major cardiac events may be related to the location and extent of a patient's coronary disease. The ability to identify individual-vessel disease—especially in patients with multiple-vessel involvement—that we have demonstrated with our quantitative approach to thallium imaging suggests that such potentially prognostic information can now be obtained noninvasively, with the attendant advantages of reduced patient inconvenience and lower cost.

**References**


Please see following page for brief summary of prescribing information.
**INDICATIONS AND USAGE:** Thallous Chloride Ti 201 may be useful in myocardial perfusion imaging for the diagnosis and localization of myocardial infarction. It may also be useful in conjunction with exercise stress testing as an adjunct in the diagnosis of ischemic heart disease (atherosclerotic coronary artery disease).

**CONTRAINDICATIONS:** None known.

**WARNINGS:** In studying patients in whom myocardial infarction or ischemia is known or suspected, care should be taken to assure continuous clinical monitoring and treatment in accordance with safe, accepted procedures. Exercise stress testing should be performed only under the supervision of a qualified physician and in a laboratory equipped with appropriate resuscitation and support apparatus.

**PRECAUTIONS:** Data are not available concerning the effect of marked alterations in blood glucose, insulin, or pH (such as is found in diabetes mellitus) on the quality of thallium Ti 201 scans. Attention is directed to the fact that thallium is a potassium analog, and since the transport of potassium is affected by these factors, the possibility exists that the thallium may likewise be affected.

Thallous Chloride Ti 201, as all radioactive materials, must be handled with care and used with appropriate safety measures to minimize external radiation exposure to clinical personnel. Care should also be taken to minimize radiation exposure to patients in a manner consistent with proper patient management.

**Pregnancy Category C.** Animal reproductive studies have not been conducted with Thallous Chloride Ti 201. It is also not known whether Thallous Chloride Ti 201 can cause fetal harm when administered to a pregnant woman or can affect reproductive capacity. Thallous Chloride Ti 201 should be given to a pregnant woman only if clearly needed.

**Nursing Mothers.** It is not known whether this drug is excreted in human milk.

As a general rule, nursing should not be undertaken when a patient is administered radioactive material.

**Pediatric Use.** Safety and effectiveness in children below the age of 18 have not been established.

**Radiopharmaceuticals should be used only by physicians who are qualified by training and experience in the safe use and handling of radionuclides, and whose experience and training have been approved by the appropriate government agency authorized to license the use of radionuclides.**

**The expiration date for Thallous Chloride Ti 201 is a maximum of five days post-calibration.**

**ADVERSE REACTIONS:** A single adverse reaction to the administration of Thallous Chloride Ti 201 has been reported consisting of hypotension accompanied by pruritus and a diffuse rash which responded to antihistamines and steroids within one hour.

**DOSAGE AND ADMINISTRATION:** The recommended adult (70kg) dose of Thallous Chloride Ti 201 is 1–2mCi. Thallous Chloride Ti 201 is intended for intravenous administration only.

**For patients undergoing resting thallium studies, imaging is optimally begun within 10–20 minutes after injection. Several investigators have reported improved myocardial-to-background ratios when patients are injected in the fasting state, in an upright posture, or after brief ambulation.**

**Best results with thallium imaging performed in conjunction with exercise stress testing appear to be obtained if the thallium is administered when the patient reaches maximum stress and when the stress is continued for 30 seconds to one minute after injection. Imaging should begin within ten minutes post-injection since target-to-background ratio is optimum by that time. Several investigators have reported significant decreases in the target-to-background ratio of lesions attributable to transient ischemia by two hours after the completion of stress testing.**

**The patient dose should be measured by a suitable radioactivity calibration system immediately prior to administration.**

**HOW SUPPLIED:** Thallous Chloride Ti 201 for intravenous administration is supplied as a sterile, non-pyrogenic solution containing at calibration time, 1mCi/ml of Thallous Ti 201, 3mg/ml sodium chloride, and 9mg/ml of benzyl alcohol. The pH is adjusted to between 5–7 with hydrochloric acid and/or sodium hydroxide solution. Vials are available in the following quantities of radioactivity: 2, 2.4, and 6.6 millicuries of Thallous Ti 201.

**The contents of the vial are radioactive. Adequate shielding and handling precautions must be maintained.**

**Catalog Number MRP-427 January 1982**
NUCLEAR CARDIOLOGY: Provide your cardiologist with the best.

With the multicrystal camera and Baird support, you can obtain, in your own hospital:

**Clear, easy-to-diagnose, first pass images.** One ventricle at a time with high signal-to-background for simple data reduction algorithms.

**Easy, upright exercise testing.** Fast, convenient and complete measurements, ideal for patient and physician (only 20 minutes of patient time required for complete rest exercise test).

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Before valve replacement surgery
- EF = 22%
- EDV = 253 ml

Immediately after surgery
- EF = 28%
- EDV = 202 ml

6 months after surgery
- EF = 45%
- EDV = 135 ml

14 months after surgery
- EF = 65%
- EDV = 160 ml

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Examples of data from the Baird multicrystal gamma camera, System Seventy Seven. Aortic valve replacement. Exercise images of end systolic blood pool, with end diastolic perimeter superimposed. Provided by R. H. Jones, M.D., Associate Professor of Surgery, Duke University Medical Center.

Baird
Certainty in cardiac diagnostics.
You've heard a lot of talk about improvements in linearity... or uniformity... or resolution.

But the gain in one parameter is usually at the expense of others. In short—a compromise.

With Raytheon nuclear systems, there is no such compromise. All factors are optimized in a superbly balanced, thoroughly proven system. One that gives you a closer, more detailed view of every patient.

A good head for numbers.

Performance is, ultimately, a function of the detector head. And in our Step One gamma camera, Raytheon's technological expertise comes to the fore.

In the largest useful field of view, Raytheon uses a "honeycomb" array of 91 two-inch tubes. And couples it to a specially-designed V/2-inch receptor crystal and 8-stage dynode PMT. Thus, your Raytheon nuclear system can record the full spectrum of static and dynamic studies... with optimized efficiency.

What's more, the system is ultra sensitive, extremely fast. A 1-million count image takes about one minute. That's up to 50% faster than other systems. And represents a considerable time savings for you.

Triple-pulse analysis adds still more detail.

The exclusive Raytheon detector head is interfaced with a specialized triple-pulse height detector. This advanced electronic system accepts peak pulses only and analyzes each one separately. So you can study up to three Ga" photo peaks at one time... and know you've captured the most significant detail.

A protected investment, too.

The basic Raytheon nuclear system includes the Step One gamma camera and Step Two digital image format-
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tional information density.

Raytheon also offers the unique Micro-Blend TBI. With
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All Raytheon nuclear systems are designed to stand
up to the heaviest case loads. Their technology and con-
struction is based on more than 12 years of continuous,
in-depth participation in nuclear medicine.

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give you a closer look. Raytheon.

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In myocardial imaging with technetium Tc 99m pyrophosphate

Once is not enough...

"...SERIAL MYOCARDIAL IMAGES MUST BE OBTAINED in order to derive maximal information from the test."¹

After performing technetium Tc 99m pyrophosphate myocardial scintigraphy on more than 3,000 patients, a group of clinicians has reported that "our rewarding experience utilizing this particular imaging technique has been almost certainly the result of our utilization of serial myocardial imaging."

The accuracy of serial myocardial imaging as an adjunct in the diagnosis of acute myocardial infarction is well-established. In another recent study, researchers "...have found less than 4% false negative scintigrams when imaging is performed during optimal timing postinfarction and serial Tc-PYP myocardial imaging is performed. Other groups have reported 5%--10% false negative results, but this is often without the benefit of serial myocardial imaging."²

For a reprint of the papers cited here plus more information about Technescan PYP, just call your Mallinckrodt sales representative or call 800-325-3181 toll free. (In Missouri, 314-935-2405 collect)

For brief summary see opposite page.

¹ Technescan PYP
Technetium Tc 99m Pyrophosphate Kit

THE MALLINCKRODT COMMITMENT to Nuclear Cardiology
**TechneScan** PYP
Technetium Tc 99m Pyrophosphate Kit

**BRIEF SUMMARY**

**CLINICAL PHARMACOLOGY**
When injected intravenously TechneScan PYP Tc 99m has a specific affinity for areas of altered osteosclerosis. It is also concentrated in the injured myocardium, primarily in areas of irreversibly damaged myocardial cells.

One to two hours after intravenous injection of TechneScan PYP Tc 99m, an estimated 40 to 50 percent of the injected dose has been taken up by the skeleton and approximately 0.01 to 0.02 percent per gram by acutely infarcted myocardium. Within a period of one hour, 10 to 11 percent remains in the vascular system, declining to approximately 2 to 3 percent twenty-four hours post-injection. The average urinary excretion was observed to be about 40 percent of the administered dose after 24 hours.

TechneScan PYP also has an affinity for red blood cells. When administered 30 minutes prior to the intravenous administration of sodium pertechnetate Tc 99m approximately 76 percent of the injected activity remains in the blood pool providing excellent images of the cardiac chambers.

**INDICATIONS AND USAGE**
TechneScan PYP Tc 99m is a skeletal imaging agent used to demonstrate areas of altered osteosclerosis, and a cardiac imaging agent used as an adjunct in the diagnosis of acute myocardial infarction.

As an adjunct in the diagnosis of confirmed myocardial infarction (ECG and serum enzymes positive), the incidence of false negative images has been found to be 6 percent. False negative images can also occur if made too early in the evolutionary phase of the infarct or too late in the resolution phase. In a limited study involving 22 patients in whom the ECG was positive and serum enzymes questionable or negative, but in whom the final diagnosis of acute myocardial infarction was made, the incidence of false negative images was 23 percent. The incidence of false positive images has been found to be 7 to 9 percent. False positive images have also been reported following coronary by-pass graft surgery, in unstable angina pectoris, old myocardial infarcts and in cardiac contusions.

TechneScan PYP is a blood pool imaging agent which may be used for gated cardiac blood pool imaging. When administered intravenously 30 minutes prior to the intravenous administration of sodium pertechnetate Tc 99m approximately 76 percent of the injected activity remains in the blood pool.

**CONTRAINDICATIONS**
None.

**WARNINGS**
This radiopharmaceutical should not be administered to patients who are pregnant or lactating unless the information to be gained outweighs the potential hazards.

Ideally, examinations using radiopharmaceuticals, especially those electively in nature, of a woman of childbearing capability should be performed during the first two (approximately 10) days following the onset of menses.

Warning: Preliminary reports indicate impairment of brain scans using pertechnetate Tc 99m which have been preceded by bone scan. The impairment may result in false positives or false negatives. It is recommended, where feasible, that brain scans precede bone imaging procedures.

Radiopharmaceuticals should be used only by physicians who are qualified by specific training in the safe use and handling of radionuclides produced by nuclear reactor or particle accelerator and whose experience and training have been approved by the appropriate government agency authorized to license the use of radionuclides.

The TechneScan PYP Kit must be maintained at refrigerator temperature until use.

The contents of the TechneScan PYP reaction vials are intended for use in the preparation of Technetium Tc 99m Pyrophosphate Injection. TechneScan PYP may also be reconstituted with sterile pyrogen-free normal saline containing no preservatives and injected intravenously prior to the administration of sodium pertechnetate Tc 99m.

Sodium pertechnetate Tc 99m solutions containing an oxidizing agent are not suitable for use with the TechneScan PYP Kit.

The contents of the kit are not radioactive. However, after the sodium pertechnetate Tc 99m is added, adequate shielding of the final preparation must be maintained.

TechneScan PYP Tc 99m should not be used more than six hours after preparation.

**PRECAUTIONS**
As in the use of any other radioactive material, care should be taken to ensure minimum radiation exposure to the patient, consistent with proper patient management, and to ensure minimum radiation exposure to occupational workers.

**Bone Imaging**
Both prior to and following TechneScan PYP Tc 99m administration, patients should be encouraged to drink fluids. Patients should void as often as possible after the TechneScan PYP Tc 99m injection to minimize background interference from accumulation in the bladder and unnecessary exposure to radiation.

**Cardiac Imaging**
Patient's cardiac condition should be stable before beginning the cardiac imaging procedure.

If not contraindicated by the cardiac status, patients should be encouraged to ingest fluids and to void frequently in order to reduce unnecessary radiation exposure.

Interference from chest wall lesions such as breast tumors and healing rib fractures can be minimized by employing the three recommended projections.

**Blood Pool Imaging**
TechneScan PYP should be injected by direct venipuncture. Heparinated catheter systems should be avoided.

**ADVERSE REACTIONS**
None.

**HOW SUPPLIED**
Catalog Number—904
TechneScan PYP Tc 99m Pyrophosphate Kit.

**Kit Contains:**
- 5—Stannous Pyrophosphate Reaction Vials for the preparation of Technetium Tc 99m Pyrophosphate Injection.
- Reaction Vials contain a hypoallergenic 12 mg sodium pyrophosphate and 3.4 mg stannous chloride (anhydrous).
- Hydrochloric acid is added for pH adjustment prior to hypophosphatization.
- Radioassay Information String Tags.

**FOOTNOTES:**

**CURRICULUM GUIDE**

Educators, students, and career counselors in nuclear medicine will benefit from this new publication featuring topics recommended for a one-year nuclear medicine technology program. Arranged in 25 sequential units, containing an overview, outline, and objectives, this book serves as a model for educators to develop or expand their curricula. Two additional sections describing associate and baccalaureate degree programs are included.

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Technetium Tc99m Oxidronate Kit

The superior bone scanning agent

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Please see the following page for a brief summary of prescribing information.
INDICATIONS AND USAGE
OSTEOSCAN-HDP (Technetium Tc99m Oxidronate Kit) is a diagnostic skeletal imaging agent used to demonstrate areas of altered osteogenesis.

CLINICAL PHARMACOLOGY
During the 24 hours following injection, Technetium Tc99m-labeled OSTEOSCAN-HDP is rapidly cleared from blood and other non-osseous tissues and accumulates in the skeleton and urine. In humans, blood levels are about 10% of the injected dose at one hour post-injection and continue to fall to about 6%, 4% and 3% at 2, 3 and 4 hours respectively. When measured at 24 hours following its administration, skeletal retention is approximately 50% of the injected dose. OSTEOSCAN-HDP exhibits its greatest affinity for areas of altered osteogenesis and actively metabolizing bone.

CONTRAINDICATIONS
None known.

WARNINGS
This class of compounds is known to complex cations such as calcium. Particular caution should be used with patients who have, or who may be predisposed to hypocalcemia (i.e., alkalosis).

PRECAUTIONS
General
Contents of the vial are intended only for use in the preparation of Technetium Tc99m Oxidronate and are NOT to be administered directly to the patient. Technetium Tc99m Oxidronate should be formulated within eight (8) hours prior to clinical use. Optimal imaging results are obtained one to four hours after administration. Technetium Tc99m Oxidronate as well as other radioactive drugs, must be handled with care, and appropriate safety measures should be used to minimize radiation exposure to the patients consistent with proper patient management. Radiopharmaceuticals should be used only by physicians who are qualified by specific training in the safe use and handling of radionuclides and whose experience and training have been approved by the appropriate government agency authorized to license the use of radionuclides.

To minimize radiation dose to the bladder, the patients should be encouraged to drink fluids and to void immediately before the examination and as often thereafter as possible for the next four to six hours.

Carcinogenesis, Mutagenesis, Impairment of Fertility
No long-term animal studies have been performed to evaluate carcinogenic potential or whether Technetium Tc99m Oxidronate affects fertility in males and females.

Pregnancy — Category C
Animal reproduction studies have not been conducted with Technetium Tc99m Oxidronate. It is also not known whether Technetium Tc99m Oxidronate can cause fetal harm when administered to a pregnant woman or can affect reproduction capacity. Technetium Tc99m Oxidronate should be given to a pregnant woman only if clearly needed. Ideally, examinations using radiopharmaceuticals, especially those elective in nature, of a woman of childbearing capability should be performed during the first few (approximately 10) days following the onset of menses.

Nursing Mothers
Technetium Tc99m is excreted in human milk during lactation, therefore formula feedings should be substituted for breast feeding.

Pediatric Use
Safety and effectiveness in children have not been established.

ADVERSE REACTIONS
Although adverse reactions have not been reported that are specifically attributable to the use of Technetium Tc99m Oxidronate, allergic dermatological manifestations (erythema) have been infrequently reported with similar agents.

DOSEAGE AND ADMINISTRATION
General Instructions
The recommended adult dose of Technetium Tc99m-labeled OSTEOSCAN-HDP is 15 mCi with a range of 10 to 20 mCi. The activity of each dose should be measured by a suitable radiation calibration system just prior to administration. The dose should be given intravenously by slow injection. For optimal results imaging should be done 1-4 hours post-injection.

HOW SUPPLIED
OSTEOSCAN-HDP is supplied as a lyophilized powder packaged in vials. Each vial contains 2.0 mg oxonate sodium and 0.16 mg stannous chloride as active ingredients, and 0.56 mg gentisic acid as a stabilizer. Kits containing 5 or 30 vials are available. The NDC number for this product is NDC 37000-403-01. The drug can be stored at room temperature both prior to and following reconstitution with ADDITIVE-FREE sodium pertechnetate Tc99m.

July, 1982

24A

THE JOURNAL OF NUCLEAR MEDICINE

The Technologist Section of the Society of Nuclear Medicine announces...

CLINICAL EVALUATION METHODS GUIDE

This publication is designed to aid allied health and nuclear medicine technology educators in developing appropriate assessment instruments for evaluating student performance.

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While indispensable to professionals in nuclear medicine and related technology programs, the information contained herein will also be useful to those involved in personnel evaluation.

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From enhanced Quantum Detection Efficiency (QDE) tubes to refined Z-CORR PLUS™ circuitry, Technicare's 438HR (High Resolution) gamma camera is the result of new design concepts leading to significantly improved performance.

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RADX Ventil-Con II
The $^{133}$Xe system that pays for itself

With Ventil-Con II you can re-use stored $^{133}$Xe gas.

The RADX Ventil-Con II is the only completely functional self-contained mobile xenon gas ventilation unit available anywhere. Ventil-Con retains over 90% of the xenon gas within its internal dry spirometer system, ready for continued use in examination after examination. A bacteriological filter and a CO$_2$ absorber within the spirometer breathing system constantly filter the xenon enriched atmosphere the patient breathes. The patient experiences only 0.2" of water resistance. No disconnects or aborted exams because of breathing resistance.

The xenon gas exhausted from the patient at washout is trapped by a charcoal cartridge pack. If more than 2 uCi/liter attempts to escape, (well below NRC maximum permissible concentration), a built-in alarm alerts the operator. An interface system within the breathing apparatus completely controls the xenon gas flow into the charcoal cartridge. Result: many more examinations can be safely conducted with Ventil-Con II than with any other system.

Ventil-Con II automatically admits oxygen as CO$_2$ is removed. Spirometer volume is held constant, patient comfort is assured. And Ventil-Con's movable arm allows exceptional flexibility in patient positioning while minimizing "dead air space". Radiation shielding of $\frac{1}{8}$" to $\frac{3}{4}$" thickness of lead provides positive containment of radioactivity. A volume meter and a xenon concentration meter inform the operator that the system is operating normally. Provisions for use in cerebral blood flow studies are optionally available.

The RADX Ventil-Con II is the unchallenged leader in value and excellence. For more details and pricing information, call or write RADX.
The 14.5" x 20" detector is the largest of any gamma camera available. The Omega 500's rectangular field of view is designed for maximum clinical versatility. Its far-reaching C-arm permits the curvilinear travel and full head rotation required in ECAT scanning. The arm is easily positioned and fully secured through fingertip control of magnetic disc brakes.

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Technicare's Omega 500 is unique. Its field of view and design concepts are meant to give the user maximum clinical versatility. The beneficiaries are you, the diagnostician, and your patient.
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Now with the newly developed Calicheck™ dose calibrator activity linearity test kit, you can meet N.R.C. Regulatory Guide 10.8, appendix D., Section 2E or your state’s equivalent requirement in just 4 minutes — not days. You can complete the test in one short sitting and check for linearity virtually at a glance. Plus you eliminate the frustration of having to start the test all over simply because you forgot to take a reading on time.

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The new Calicheck kit is designed to attenuate 99mTc by known values — accurate using a high yield generator eluant or a unit dose.

A Calicheck kit provides for seven successive measurements simulating the decay of 99mTc at approximately 0, 6, 12, 20, 30, 40 and 50 hours from the initial assay.

Complete Yet Reusable
Your Calicheck kit comes to you complete with its own storage container, a unique arrangement of seven color-coded lead-wrapped tubes, work/record keeping sheets, instructions for use and a license amendment form (if needed.)

Just four minutes
As simple as 1, 2, 3, 4, 5, 6, 7. Place central tube in the dose calibrator. Place the source in this tube and take a reading. Then sequentially place color-coded tubes over the central tube. Additional readings are taken immediately, converted with a predetermined factor and you can see the degree of linearity virtually at a glance.

May require approval of the Agency issuing your radioactive materials license.

Low Price
A Calicheck dose calibrator activity linearity test kit is just $375.00 shipping included.

Just call (216) 663-1773 or write: Calcor, Inc., P.O. Box 25589, Cleveland, Ohio 44125-0589.

A Calicheck kit provides for seven successive measurements simulating the decay of 99mTc at approximately 0, 6, 12, 20, 30, 40 and 50 hours from the initial assay.

Complete Yet Reusable
Your Calicheck kit comes to you complete with its own storage container, a unique arrangement of seven color-coded lead-wrapped tubes, work/record keeping sheets, instructions for use and a license amendment form (if needed.)

Just four minutes
As simple as 1, 2, 3, 4, 5, 6, 7. Place central tube in the dose calibrator. Place the source in this tube and take a reading. Then sequentially place color-coded tubes over the central tube. Additional readings are taken immediately, converted with a predetermined factor and you can see the degree of linearity virtually at a glance.

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- Active ingredient: 20 mg medronic acid in each 10 ml capacity reaction vial.
- Kit of 10 reaction vials.
- Easy two-step procedure

* An example of new vial shield available late 1982.

See next page for brief summary.
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MDP-SQUIBB™
Technetium Tc 99m Medronate Kit
For Diagnostic Use

DESCRIPTION: Each 10 ml capacity reaction vial contains a sterile, nonpyrogenic lyophilized powder prepared from 20 mg medronic acid, 11 mg sodium hydroxide, and 0.25 mg tin as fluoride; the product does not contain a preservative. When sterile, nonpyrogenic sodium pertechnetate Tc 99m is added to the vial, technetium Tc 99m medronate is formed.

CONTRAINdications: None known.

WARNINGS: This class of compounds is known to complex cations such as calcium. Particular caution should be used with patients who have or who may be predisposed to hypocalcemia (i.e., alkalosis). Preliminary reports indicate impairment of brain scans using sodium pertechnetate Tc 99m injection which have been preceded by a bone scan using an agent containing stannous ions. The impairment may result in false-positive or false-negative brain scans. It is recommended, where feasible, that brain scans precede bone imaging procedures. Alternatively, a brain-imaging agent such as technetium Tc 99m pentetate may be employed.

PRECAUTIONS: General — Contents of the reaction vial are not radioactive and are intended only for use in the preparation of technetium Tc 99m medronate and are NOT to be administered directly to the patient.

Technetium Tc 99m medronate as well as other radioactive drugs must be handled with care, and appropriate safety measures should be used to minimize radiation exposure to the patient and occupational workers consistent with proper patient management.

To minimize radiation exposure to the bladder, the patient should be encouraged to drink fluids and to void immediately before the examination and as often thereafter as possible for the next four to six hours.

Technetium Tc 99m medronate should be formulated within 6 hours prior to clinical use. Optimal imaging results are obtained one to four hours after administration.

Radio pharmaceuticals should be used only by physicians who are qualified by training and experience in the safe use and handling of radionuclides and whose experience and training have been approved by the appropriate government agency authorized to license the use of radionuclides.

Carcinogenesis, Mutagenesis, Impairment of Fertility — No long-term animal studies have been performed to evaluate carcinogenic potential or whether technetium Tc 99m medronate affects fertility in males or females.

Pregnancy Category C — Animal reproduction studies have not been conducted with technetium Tc 99m medronate. It is also not known whether technetium Tc 99m medronate can cause fetal harm when administered to a pregnant woman or can affect reproduction capacity. Technetium Tc 99m medronate should not be given to a pregnant woman only if clearly needed.

Ideally, examinations using radiopharmaceuticals, especially those elective in nature, of a woman of childbearing capability should be performed during the first few (approximately 10) days following the onset of menses.

Nursing Mothers — Technetium Tc 99m is excreted in human milk during lactation; therefore, formula-feedings should be substituted for breast-feedings.

Pediatric Use — Safety and effectiveness in children have not been established.

ADVERSE REACTIONS: Although adverse reactions specifically attributable to the use of technetium Tc 99m medronate have not been reported, allergic dermatological manifestations (erythema) have been infrequently reported with similar agents.

For full prescribing information, consult package insert.

HOW SUPPLIED: In packages of 10 reaction vials.
**Techneplex**

(Technetium Tc 99m Pentetate Kit)

from Squibb

For kidney imaging, brain imaging, to assess renal perfusion, and to estimate glomerular filtration rate

Does not accumulate in choroid plexus
Rapid clearance rate of DTPA allows:
• brain imaging in less time than with sodium pertechnetate Tc 99m
• delayed brain imaging in 30-40 minutes, as compared with 3-4 hours with technetium Tc 99m pertechnetate
Easy two-step procedure

Kit contains 10 multidose reaction vials.

For further information, call Technical Customer Service, 609-921-4100.

See next page for brief summary.
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Our competition gives up image quality for high frame rates: a fruitless trade-off. Apex doesn’t: it provides both.

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For kidney imaging, brain imaging, to assess renal perfusion, and to estimate glomerular filtration rate

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Easy two-step procedure

Kit contains 10 multidose reaction vials.

For further information, call Technical Customer Service, 609-921-4100.

See next page for brief summary.
TECHNEPLEX®
Technetium Tc 99m Pentetate Kit

DIAGNOSTIC—FOR INTRAVENOUS USE

DESCRIPTION: The kit consists of 10 multidose reaction vials, each containing a sterile, pyrogen-free lyophilized mixture of 10 mg pentetate calcium disodium. 0.50 mg stannous chloride under a nitrogen atmosphere. When sterile, pyrogen-free sodium pertechnetate Tc 99m in isotonic saline is added to the vial, a chelated technetium Tc 99m pentetate is formed. The product as supplied is sterile and pyrogen-free.

INDICATIONS AND USAGE: Technetium Tc 99m pentetate may be used to perform kidney imaging, brain imaging, to assess renal perfusion, and to estimate glomerular filtration rate.

CONTRAINDICATIONS: None known.

WARNINGS: None known.

PRECAUTIONS: Contents of the vial are intended only for use in the preparation of technetium Tc 99m pentetate and are not to be administered directly to the patient except after the addition of sodium pertechnetate Tc 99m. The contents of the kit are not radioactive. However, after the sodium pertechnetate Tc 99m is added, adequate shielding of the final preparation must be maintained. Technetium Tc 99m pentetate as well as other radioactive drugs, must be handled with care, and appropriate safety measures should be used to minimize radiation exposure to the patients consistent with proper patient management and to insure minimum radiation exposure to occupational workers.

To minimize radiation dose to the bladder, the patients should be encouraged to drink fluids and to void immediately before the examination, and for the next 4 to 6 hours thereafter, as often as possible.

Technetium Tc 99m pentetate should be formulated within 6 hours prior to clinical use for brain and kidney imaging, and for assessing renal perfusion. For estimating glomerular filtration rates Tc 99m pentetate should be used within 1 hour after formulation.

The components of the Technetium Tc 99m Pentetate Kit (Chelate) are supplied sterile and non-pyrogenic. Aseptic procedures normally employed in making additions and withdrawals from sterile, non-pyrogenic containers should be used during addition of pertechnetate solution and the withdrawal of doses for patient administration.

The labeling reactions involved in preparing the agent depend on maintaining the tin in the reduced state. Any oxidant present in the sodium pertechnetate Tc 99m supply may thus adversely affect the quality of the prepared agent. Hence, sodium pertechnetate Tc 99m containing oxidants, or other additives, should not be employed without first demonstrating that it is without adverse effect on the properties of the resulting agent.

Carcinogenesis, Mutagenesis, Impairment of Fertility: No long-term animal studies have been performed to evaluate carcinogenic potential or whether technetium Tc 99m pentetate affects fertility in males or females.

Pregnancy Category: C: Animal reproductive studies have not been conducted with technetium Tc 99m pentetate. It is also not known whether technetium Tc 99m pentetate can cause fetal harm or affect reproduction capacity when administered to a pregnant woman. Technetium Tc 99m pentetate should be given to a pregnant woman only if clearly needed.

Ideally, examinations using radiopharmaceuticals, especially those effective in nature, of a woman of childbearing capability should be performed during the first few (approx. 10) days following the onset of menstruation.

Nursing Mothers: Since Tc 99m is excreted in human milk during lactation, formula feedings should be substituted for breast feedings.

Pediatric Use: Safety and effectiveness in children below the age of 18 have not been established.

Radiopharmaceuticals should be used only by physicians who are qualified by training and experience in the safe use and handling of radionuclides and whose experience and training have been approved by the appropriate government agency authorized to license the use of radionuclides.

ADVERSE REACTIONS: None specifically attributable to the use of technetium Tc 99m pentetate have been reported.

Drug Abuse and Dependence: There is no report of any drug abuse or dependence with this diagnostic agent.

Overdosage: Increased radiation exposure would be expected if an overdosage of the diagnostic agent occurred.

For complete prescribing information, consult package insert.

HOW SUPPLIED: Technexep (Technetium Tc 99m Pentetate Kit) is supplied as a sterile, pyrogen-free kit containing 10 sterile multidose reaction vials and 20 pressure sensitive labels.

Cancer isn’t just a grown-up disease.

Cancer is the number one killer disease of thousands of children each year. Time is running out for many of these children, but with your support the research can continue and the cure will be found.

For information on how you can help please write St. Jude Children’s Research Hospital, 505 N. Parkway, Box 3704, Memphis, Tennessee 38103, or call 1-800-238-9100.
There are 32 reasons why Apex Processors are better.

There are 32 reasons why Apex Processors are better than any other Nuclear Medicine Data Systems. This is reason Number 6.

Our competition gives up image quality for high frame rates: a fruitless trade-off. Apex doesn’t: it provides both.

Elscint’s apex line

Elscint has prepared a full-color booklet detailing all 32 reasons. Contact us today for your personal copy.
Some of our competitors achieve high frame rates— but with poor resolution. If they opt for image quality, the frame rates are too low for meaningful cardiac studies. Apex makes no trade-offs. Apex systems accommodate high count rate studies— up to 500,000 cps— acquiring frames sized 64×64, at 64 frames per second.

Consequently, Apex First Pass Studies display superior wall motion images with fine time definition— essential for accurate diagnoses in coronary artery disease.

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The low-temperature (−20°C) "Cryo/Safe" offers high-volume xenon users an excellent means of decreasing trap effluent concentrations. At −20°C, the xenon adsorption capacity of activated charcoal is about five times greater than at 20°C because xenon atoms remain adsorbed on the charcoal surface for a longer period at lower temperatures. This greatly slows the xenon bolus migration through a charcoal cartridge when carried by a steady air flow. These factors give the xenon more time to decay and thus greatly reduce the xenon concentration in the effluent. In fact, the long-term, steady-state, effluent xenon concentration of this freezer trap is less than 1% of that for a room-temperature trap (assuming a typical use for about 10 patients per week). For detailed information, see Technical Notes: "Refrigerated Charcoal Trap For Xe-133", in the Nov./Dec. 1981 issue of Medical Physics.

Or, contact us and ask for Bulletin 300-B.

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NUCLEAR MEDICINE PHYSICIAN. Full-time junior staff position available at Children's Hospital Medical Center, Harvard Medical School. Clinical, research, and teaching responsibilities. Board certification or eligibility in Nuclear Medicine or Nuclear Radiology required. Requires B.S. with curriculum vitae to S. Treves, MD, Department of Radiology, Children's Hospital Medical Center, 300 Longwood Avenue, Boston, MA 02115. An Affirmative Action/Equal Opportunity Employer.

NUCLEAR RADIOLOGIST AT THE Asst. or Assoc. Professor level is sought for position of Assoc. Director, Division of Nuclear Medicine, Dept. of Radiology, Georgetown University Hosp. Please contact John Harbert, M.D., 3800 Reservoir Rd. N.W., Washington, DC 20007.

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PHARMACEUTICAL SCIENTIST—NUCLEAR PHARMACY, University of Oklahoma Health Sciences Center, College of Pharmacy. Applications are invited for a faculty tenure track position as Assistant/Associate Professor in Nuclear Pharmacy. Appointment to begin September 1, 1982 or soon thereafter. Applicants should possess a Ph.D. degree in pharmacaceutical or related sciences with expertise in Nuclear Pharmacy/Radiosotope Methodology/Radiochemistry. A strong background in animal handling and Nuclear Medicine instrumentation is required. The successful applicant is expected to participate in undergraduate and graduate education programs and establish an independent research program. Eligibility for licensure in Oklahoma is desirable. Salary will be commensurate with qualifications and experience. Interested applicants should send a letter of application accompanied by a Curriculum Vitae prior to August 15, 1982 to: Garo P. Basnadjian, Ph.D., Chairman, Search Committee, College of Pharmacy, University of Oklahoma Health Sciences Center, P.O. Box 26901, Oklahoma City, OK 73190. The University of Oklahoma Health Sciences Center is an Equal Opportunity/Affirmative Action Employer.


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Contact: Martin F. Sturman, MD, Director of Nuclear Medicine, (201)622-5348; Home: (215)635-6820.

KUWAIT
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Faculty of Medicine

CHIEF TECHNICIAN IN NUCLEAR MEDICINE

Applications are invited for the appointment of Chief Technician in Nuclear Medicine in the newly established Department of Radiology and Nuclear Medicine. The Department’s services cover most aspects of diagnostic imaging including conventional radiography, C.T., ultrasonography and digital radiography. It is actively involved in undergraduate and postgraduate teaching, and basic and clinical research.

Candidates should be graduates of a recognized program in nuclear medicine and have fifteen years’ experience including training. They should also be familiar with operating computers and data processors.

Salary will be in the range KD 450-512 per month, (KD 1=£1.8, US $3.5, approx.). There is no income tax in Kuwait and currency is transferable without restriction. Free, furnished, air-conditioned accommodation is provided, and electricity and water supplied free of charge. Sixty days paid annual leave for each completed year of employment, and annual economy class return air tickets to the country of citizenship or permanent residence are provided for the appointee, spouse and three dependent children. Free medical treatment is available under the State Health Service.

Applications should be submitted to: The Dean, Faculty of Medicine, University of Kuwait Health Science Centre, PO Box 24923 Safat, Kuwait, with detailed curriculum vitae in duplicate, recent passport photograph, and the names of three referees, to arrive not later than October 30th, 1982.
Applications are invited for the following appointments in the Division of Nuclear Medicine in the newly established Department of Radiology and Nuclear Medicine. The Department's services cover all aspects of diagnostic imaging, including conventional radiography, C.T., ultrasonography and digital radiography. It is also actively involved in undergraduate and postgraduate teaching, and basic and clinical research.

- Assistant and Associate Professors in Clinical Nuclear Medicine (3 posts). Candidates should have experience in radionuclide imaging.
- Assistant Professor in Radiopharmacy.
- Assistant Professor in Radiation Physics. Candidates should have a special interest in nuclear medicine.

Requirements for Appointment
Applicants should possess a Ph.D., or equivalent higher professional qualification, in their respective speciality, and have conducted and published research in their field. Associate professors should have 9 years' experience, 4 as an assistant professor or its equivalent, i.e. lecturer.

Conditions of Appointment
Salaries: Total monthly salaries will be within the following scales according to qualifications and experience (1 KD=$1.8, US $3.5 approx.).
- Associate Professors with clinical appointments: KD 969–1129 (8 increments).
- Associate Professors non-medically qualified: KD 855–1015 (8 increments).
- Assistant Professors with clinical appointments: KD 748–908 (8 increments).
- Assistant Professors non-medically qualified: KD 660–820 (8 increments).

Clinical supplements: In addition to the above University salaries there will be a monthly supplement paid by the Ministry of Public Health for ten months' a year to medical school staff with clinical service commitments. These are:
- Associate Professor: KD 150
- Assistant Professor: KD 100

Gratuity: There is a gratuity of one month's basic salary for each year employed payable on termination of contract.

Housing: Suitably furnished, air-conditioned accommodation, electricity and water are provided free of charge.

Medical care: Free, comprehensive treatment is available in Kuwait under the State Health Service.

Travel: Air tickets are provided from the country of recruitment for the appointee, spouse and up to three dependent children under 20 years. Thereafter, return air tickets are issued annually to the country of citizenship or permanent residence. On termination of contract, air tickets are provided to the country of recruitment. A baggage and freight allowance is also provided. In addition, travel expenses for attending one scientific meeting a year are paid by the University.

Vacation: Sixty days paid annual leave and various national holidays.

Education: This is provided free in state schools where the instruction is in Arabic. Staff who have to send their children to non-Arabic schools in Kuwait will have the tuition fees of up to a maximum of three met by the University.

Taxation: There is no income tax in Kuwait. Currency is transferable without restriction.

Method of Application
Curriculum vitae in duplicate, which should include the names of three referees, personal particulars, qualifications with dates, career history, teaching experience, research accomplishments and, where appropriate, clinical experience should be sent to the Dean, Faculty of Medicine, University of Kuwait Health Science Centre, PO Box 24923 Safat, Kuwait to arrive no later than October 30th, 1982.
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