Radioiodine is trapped by the thyroid and *organified* in the synthesis of thyroxine. $^{99m}$TcO$_4^-$ is also trapped by the thyroid but is not organified. Consequently, Tc99m activity does not always indicate the physiologic condition of the thyroid.¹

Radioiodine clearly demonstrates the “cold,” non-functioning nodules that may be associated with malignant thyroid tumors. Such nonfunctioning nodules have appeared “hot” or “cold” on images obtained with Tc99m, necessitating a confirmatory radioiodine scan.² ³

Radioiodine thyroid imaging is preferred to Tc99m in such instances as investigation of patients with possible retrosternal thyroid tissue or with unsatisfactory Tc99m images due to poor radionuclide concentration.³


²"Information for Physicians—Irradiation-Related Thyroid Cancer" prepared by the Division of Cancer Control and Rehabilitation, National Cancer Institute, DHEW Publication No. (NIH) 77-1120, p 13.

Organization is Imperative to Thyroid Studies

A palpable nodule in the left lower lobe present for at least six years considered to be "functioning" on the ¹²³I/TcO₄⁻ image.

Medi-Physics Sodium Iodide 123 is important for informative thyroid studies. The principle gamma emission of 123 is 159 keV which is well suited for gamma camera imaging. The 13.2 hours half-life and lack of non-penetrating radiations minimize the absorbed radiation dose. Thyroid uptake studies may be performed at 2, 4, 6, and 24 hours. If desired, a thyroid scan and a quantitative radiiodine uptake measurement may be performed simultaneously. Sodium iodide 123 is available in capsules or solution for next day delivery almost anywhere in the United States. Call Toll Free (in Calif.) (800) 772-2446; (outside Calif.) (800) 277-0483 for further information.

The ¹²³I image demonstrated that this nodule was "non-functioning."

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

**SODIUM IODIDE 123**

**CAPSULES AND SOLUTION FOR ORAL ADMINISTRATION**

**DESCRIPTION:** Sodium iodide 123 for diagnostic use is supplied as capsules and in vials as an aqueous solution for oral administration. At calibration time each capsule has an activity of 100 microcuries and each vial contains solution with a total specific concentration of two microcuries per ml.

**INDICATIONS:** Sodium iodide 123 is indicated for use in the diagnosis of thyroid function and imaging.

**CONTRAINDICATIONS:** None known.

**WARNINGS:** This radiopharmaceutical should not be administered to children or to patients who are pregnant or to nursing mothers unless the information to be gained outweighs the potential hazards. Ideally, examinations using radiopharmaceuticals, especially those effective in nature, in women of childbearing capacity should be performed during the first few (approximately 10) days following the onset of menses. However, when studies of thyroid function are clinically indicated for members of these special population groups, use of 123 would be preferable to the use of 131 in order to minimize radiation dosage.

**PRECAUTIONS:** Sodium iodide 123 as well as other radioactive drugs must be handled with care. Appropriate safety measures should be used to minimize radiation exposure to clinical personnel. Care should also be taken to minimize radiation exposure to the patient consistent with proper patient management. The prescribed Sodium iodide 123 dose should be administered as soon as practicable in order to minimize the fraction of radiation exposure due to relative increase of radionuclidic contaminants with time. The uptake of 123 may be decreased by recent administration of iodinated contrast materials, by intake of stable iodine in any form, or by thyroid, anti-thyroid and certain other drugs. Accordingly, the patient should be questioned carefully regarding diet, previous medication, and procedures involving radiographic contrast media.

**ADVERSE REACTIONS:** There were nine adverse reactions reported in a series of 1,393 administrations. None of these were attributed to 123. Five adverse reactions, consisting of gastric upset and vomiting, were attributed to a filler in the capsule. Two cases of headache and one case of nausea and weakness were attributed to the label state. One case of gastric color on the breath was presumed to be attributable to the presence of tellurium.

**DOSEAGE AND ADMINISTRATION:** The recommended oral dose range for diagnostic studies of thyroid function in the average adult patient (70 kg) is from 100 to 400 microcuries. The patient dose should be measured by a suitable radioactivity calibration system immediately prior to administration. Concentration of 123 in the thyroid gland should be measured in accordance with standardized procedures.

**SPECIAL CONSIDERATION:** 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.

**HOW SUPPLIED:** Sodium iodide 123 for oral administration is supplied in aqueous solution in glass vials and in capsules.
KODAK FILMS FOR NUCLEAR MEDICINE:
MORE INFORMATION
You can reduce the costs of recording nuclear images by specifying Kodak transparency films. And the images you obtain will be clear, informative, and durable.

Typically, the initial cost of Kodak transparency film is lower than paper prints. And in addition, you can record multiple images on a single sheet or strip of film, and this can make for considerable savings.

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For further details, ask your Kodak Technical Sales Representative or your x-ray products dealer. Or write: Eastman Kodak Company, Dept. 740-B, Rochester, New York 14650.
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Generator

Small in size and light in weight, but big in performance. That's Minitec. Designed for minimum amount of exposure to operator, its unique construction (no exposed tubing) and thick shielding (1/8" lead) provide high shielding-to-activity ratio. Small-volume, high-concentration eluates give maximum flexibility for varying applications. Wide range of potencies and calibration dates fit the Tc 99m needs of every lab.

Minitec (Technetium Tc 99m) Generator — the largest-selling generator in the U.S.

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When you buy Minitec and Squibb radiopharmaceuticals, you get the back-up service of a Squibb Technical Associate. He's had extensive training in nuclear medicine, radiopharmaceuticals, RIA and instrumentation. Call him when a new tech needs instruction, a problem develops, you're planning to expand, or there's need for special information. You'll get the prompt, personal attention of an experienced specialist.
What do you get when you marry the best Giant-Field Detector to the most versatile Command Module imaginable?

Why, you get STEP ONE Raytheon's newest gamma camera development

... A superb performer you'll find to be easy to use fast sharp dependable cost effective

... And it's supported by a team of knowledgeable, responsive people at ...

RAYTHEON MEDICAL ELECTRONICS
70 Ryan Street
Stamford Connecticut 06907
Tel: 800-243-9058
Indications and Usage: Technetium Tc 99m aggregated albumin is indicated as a lung imaging agent to be used as an adjunct in the evaluation of pulmonary perfusion.

Contraindications: Technetium Tc 99m aggregated albumin should not be administered to patients with severe pulmonary hypertension.

The use of Tc 99m aggregated albumin is contraindicated in persons with a history of hypersensitivity reactions to products containing human serum albumin.

Warnings: The possibility of allergic reactions should be considered in patients who receive multiple doses.

Theoretically, the intravenous administration of particulate material such as aggregated albumin imposes a temporary small mechanical impediment to blood flow. While this effect is probably physiologically insignificant in most patients the administration of aggregated albumin is possibly hazardous in acute cor pulmonale and other states of severely impaired pulmonary blood flow.

This radiopharmaceutical preparation should not be administered to children or to pregnant or lactating women unless the expected benefits to be gained outweigh the potential risks.

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 menestes.

Precautions: In cases of right-to-left cardiac shunt, additional risk may exist due to the rapid entry of aggregated albumin into the systemic circulation.

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.

The labeling reactions involved in preparing the agent depend on maintaining 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.

The contents of the vial are sterile and non-pyrogenic. It is essential that the user follow the directions carefully and adhere to strict aseptic procedures during preparation of the radiopharmaceutical.

Technetium Tc 99m aggregated albumin is physically unstable and as such the particles will settle with time. Failure to mix the vial contents adequately before use may result in non-uniform distribution of radioactivity.

It is also recommended that, because of the increasing probability of agglomeration with aging, a batch of Technetium Tc 99m aggregated albumin not be used after eight hours from the time of reconstitution. Refrigerate at 2° to 8°C after reconstitution. If blood is withdrawn into the syringe, unnecessary delay prior to injection may result in clot formation in situ.

The contents of the vial are under a nitrogen atmosphere and should be protected from air. Do not use if clumping or foaming of the contents is observed.

Adequate reproduction studies have not been performed in animals to determine whether this drug affects fertility in males or females, has teratogenic potential, or has other adverse effects on the fetus. Technetium Tc 99m aggregated albumin should be used in pregnant women only when clearly needed.

It is not known whether this drug is excreted in human milk. As a general rule, nursing should not be undertaken while a patient is on a drug since many drugs are excreted in human milk.

Safety and effectiveness in children have not been established.

As in the use of any radioactive material, care should be taken to minimize radiation exposure to the patient, consistent with proper management, and to insure minimum radiation exposure to the occupational worker.

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 governmental agency authorized to license the use of radionuclides.

Adverse Reactions: The literature contains reports of deaths occurring after the administration of aggregated albumin to patients with pre-existing severe pulmonary hypertension. Instances of hemodynamic or idiosyncratic reactions to preparations of Tc 99m-labeled aggregated albumin have been reported.

Hypersensitivity reactions are possible whenever protein-containing materials such as Tc 99m-labeled aggregated albumin is used in man. Epinephrine, antihistamines and corticosteroid agents should be available for use.

Dosage and Administration: The recommended intravenous dose range for the average patient (70kg) is 1 to 4 millicuries. The volume of the dose may vary from 0.2 to 13ml.

The recommended number of aggregated albumin particles to be administered per dose is 200,000-700,000 with the suggested number being approximately 350,000.

For ease and accuracy in dispensing the prepared agent, it is recommended that prior to reconstitution, concentrated sodium pertechnetate Tc 99m be further diluted to a volume of 8ml with fresh, preservative-free sodium chloride injection (U.S.P.).

New Supplies: PULMOLITE™ Technetium Tc 99m Aggregated Albumin Kit is supplied in kits of five (5) or thirty (30) vials, sterile and non-pyrogenic, each vial containing in lyophilized form:

- Aggregated albumin (human)-1.0mg
- Normal human serum albumin-10mg
- Sodium chloride-10mg
- Stannous chloride dithosphate, maximum-0.07mg

Each vial contains 3.6-6.5 x 10⁶ aggregated albumin particles.

PULMOLITE contains no preservative; after reconstitution the shielded vial should be stored at 2° to 8°C.

Included in each five (5) vial kit is one (1) package insert and six (6) radiation labels. Included in each thirty (30) vial kit is one (1) package insert and thirty-six (36) radiation labels.

Cat. No. NRP-415

New England Nuclear
Medical Diagnostics Division

Ohio-Nuclear’s Sigma 420/VIP-550 mobile camera and nuclear medicine computer. The software is designed for nuclear cardiology as well as general nuclear medicine. It images, analyzes, displays and moves almost anywhere. Correlation of the VIP-550’s cardiac software with cineangiography has been proven in the CCU, ICU, ER and in the Stress Lab.

**Independent acquisition & display memory:** Provides 256 × 256 real image resolution. Acquires and processes a 32 interval gated cardiac study with 64 × 64 resolution 1,024 counts deep.

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**BASIC Interpreter:** User programmable. Line oriented. Fast, easy editing and development. Specially enhanced by Ohio-Nuclear programmers for nuclear medicine.

**48K program memory:** Independent of acquisition and display memory. No processing interruptions.

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A single unit integrating the finest

**Video persistence scope:** More reliable. Improved contrast. Less service expense.

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**Four user interactive controls:**
1. Background subtraction.
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4. Region of interest size control.

**Standard 5" video monitor:** Displays command sequence or patient images and wall motion studies. Continuous gray scale for images.

**Joystick:** Makes setting regions of interest easy.

**ECG isolator:** Eliminates complex external gate.

**Flexible discs:** 2.4 megabytes of storage capacity. 30 frames/second maximum frame rate for first transit studies. Practical archival storage. Rapid random access to patient studies, BASIC program files and macro protocols. Easy method of upgrading software.

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The never ending struggle for product popularity often leads a manufacturer to add gadgets. It's called "one-upmanship." We sometimes lose sight of what YOU, the user, wants.

By customer demand, Radx has gone "Back to Basics" and developed the Assayer 1, a simple dosecalibrator, a reliable dose-calibrator, an economical dosecalibrator.

The return to basics does not require a return to the 1960's technology. The Assayer 1 is microprocessor controlled, totally solid state, with a method of isotope selection way ahead of its time (an optical scanner) which is so precise, reproducible, and reliable that it will soon be copied.

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A consistent agent for skeletal imaging, *TechneScan PYP* is now available for use as an adjunct in the diagnosis of acute myocardial infarction, and for gated cardiac blood-pool imaging. Investigators have found the technetium-99m pyrophosphate scintigraphic study to be a highly useful diagnostic technique for evaluating chest pain of uncertain origin.1

"The gated cardiac blood pool scan permits the calculation of both ejection and regional wall motion from a single examination."2

Mallinckrodt's *TechneScan PYP*...a preferred way to detect acute myocardial infarction...an advanced method to dynamically assess cardiac function.

References:

Mallinckrodt, Inc.
P.O. Box 5840, St. Louis, Missouri 63134
See reverse side for brief summary of complete prescribing information.
An advance from Mallinckrodt provides an excellent adjunct in the detection of myocardial infarction and the dynamic assessment of cardiac function.

TechneScan® PYP™ Kit (Stannous Pyrophosphate) for preparation of Technetium Tc-99m Stannous Pyrophosphate.

BRIEF SUMMARY

CLINICAL PHARMACOLOGY

When injected intravenously TechneScan PYP Tc 99m has a specific affinity for areas of altered osteogenesis. 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 of 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 osteogenesis, 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 8 percent. False negative images 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 constrictions.

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 elective in nature, of a woman of childbearing capability should be performed during the first few (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 vial are intended for use in the preparation of Technetium Tc 99m Stannous Pyrophosphate. 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 insure minimum radiation exposure to the patient, consistent with proper patient management, and to insure 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. Heparinized catheter systems should be avoided.

ADVERSE REACTIONS

None.

HOW SUPPLIED

Catalog Number—094 TechneScan PYP Kit

Kit Contains:

5—Stannous Pyrophosphate Reaction Vials (lyophilized) for the preparation of Technetium Tc-99m Stannous Pyrophosphate.

Reaction Vial Contains:

12.0 mg sodium pyrophosphate and 3.4 mg stannous chloride (lyophilized).

Hydrochloric acid is added for pH adjustment prior to lyophilization.

5—Radioassay Information String Tags.

Mallinckrodt, Inc.
P.O. Box 5840, St. Louis, Missouri 63134
Results obtained using the DYMAX-MB Mobile Camera with its powerful minicomputer data processor, clearly demonstrate the advantages of radiocardiology as a diagnostic technique. DYMAX-MB is compact, fully mobile and simple to operate. The camera produces studies with excellent resolution and uniformity at both low and high countrates, while the self-contained processor provides instant clinical analysis of the data. Among the heart functions which can be studied "live" are wall motion, ejection fraction, cardiac output, interventricular shunts and other parameters of major importance.

Analytical procedures are speeded by automatic repeat of previously established protocols. On-the-spot analysis enables the attending physician to immediately evaluate results, eliminating the delays of batch processing at a central installation, thus maximising the efficacy of the DYMAX-MB.

Check for yourself the significant advantages of this highly efficient clinical tool.

You can:

- Spare your patient the trauma of catheterization.
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Tech is a quality control testing system which provides a quick, convenient and inexpensive means for determining unbound and free Technetium 99m in the following products:

- PYROPHOSPHATE
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- GLUCOHEPTONATE
- SULFUR COLLOID
- MACROAGGREGATED ALBUMIN

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Low* Dissolved Oxygen
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  Use for diluting high specific concentrations of Technetium-99m.

SODIUM CHLORIDE INJECTION U.S.P.
with LOW DISSOLVED OXYGEN

**DESCRIPTION:**
SODIUM CHLORIDE INJECTION U.S.P. with LOW DISSOLVED OXYGEN is a sterile isotonic solution of sodium chloride in water for injection. It contains no antimicrobial agent. It contains 0.9% sodium chloride and is packaged in single dose vials. The osmolality is 300 mOsm/1, the dissolved oxygen content is less than 5 ppm.

**INDICATIONS:**
SODIUM CHLORIDE INJECTION U.S.P. with LOW DISSOLVED OXYGEN is indicated for eluting, preparing and/or diluting pharmaceuticals that specify oxidants may cause adverse effects on the final product. SODIUM CHLORIDE INJECTION U.S.P. with LOW DISSOLVED OXYGEN is also used as a fluid and electrolyte replenisher or as an irrigating solution.

**WARNING:**
Excessive amounts of sodium chloride by any route may cause hypopotassemia and acidosis. Excessive amounts by the parental route may precipitate congestive heart failure and acute pulmonary edema, especially in patients with cardiovascular disease, and in patients receiving corticosteroids or corticotropin drugs that may give rise to sodium retention. No antimicrobial agent has been added.

**PRECAUTIONS:**
Unused amounts should be discarded immediately following withdrawal of any portion of the contents.

**HOW SUPPLIED:**
Catalog No. 5-25 Product Packaging
SODIUM CHLORIDE INJECTION U.S.P. with LOW DISSOLVED OXYGEN
Each 10 ml single dose vial contains approximately 6 ml. Each ml contains 9 mg sodium chloride providing 0.154 mEq each of sodium and chloride ions. Total osmolality 300 mOsm/1; pH between 4.5 and 7.0. Dissolved oxygen content less than 5 ppm. Contains no preservatives.

ACKERMAN NUCLEAR, INC.
445 W. Garfield Ave.
Glendale, Calif. 91204

1/78

Decrease the amount of oxygen you add daily and reduce the effect of one more variable from your radiopharmacy. Use Low Dissolved Oxygen saline when preparing kits containing any stannous tin products.

*less than 5 ppm

For additional information call or write to:

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The UNION CARBIDE Hand-held Console . . .
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- The UNION CARBIDE Large Field Gamma Camera hand-held console eliminates the need for a separate operator console.
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- The hand control isn’t the only thing we’ve done just right: even the feet of the camera are specially designed to accommodate wheelchairs, hospital beds and stretchers.

Ask UNION CARBIDE for the facts.
Union Carbide Medical Products are designed to enhance diagnosis and research, produce a return on investment, and create better health care at lower patient costs. Send today for descriptive literature. Or call for fast action.

Look Into Life . . .

The hand-held console eliminates the need for a separate operator console.

Above — Diffuse metastatic disease throughout torso and limbs.

Top — Hepatoma in 31-year-old female with 3.5 mCi Tc99m Sulfur Colloid.

Bottom — Subdural hematoma on left, seen in 76-year-old male with 20 mCi D.T.P.A.
The UNION CARBIDE Whole Body Imager . . . Faster Patient Throughput.

- Capable of performing more than 18 whole body scans per 8 hour day; maximum scan speed is 20cm/minute.
- Dual detector heads provide simultaneous anterior/posterior focal tomographic views with no patient repositioning.
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- Built-in floppy diskette stores raw data.
- Image enhancement controls and 2x magnification are standard.
- Organ mode allows high-resolution static organ studies, two views at a time.
- Priced below comparable gamma camera systems.

Ask UNION CARBIDE for the facts.
Union Carbide Medical Products are designed to enhance diagnosis and research, produce a return on investment, and create better health care at lower patient costs. Send today for descriptive literature. Or call for fast action.

Look Into Life . . .

Below – Organ mode Gallium scans of a 30 year old male 72 hours post-injection (posterior and anterior views) and 96 hours post-injection with 5 mCi of Ga-67. Abnormal activity in the lower abdomen is seen clearly with two photo peaks.

Above – Actual 13.5 to 1 magnification of posterior and anterior whole body bone scan of a 45 year old male two hours post-injection with 20 mCi Technetium Tc99m MDP. Diagnosis: normal.
for professional products and supplies
PDR® is the acknowledged ethical reference source for professional product information... it organizes package insert information on radiopharmaceuticals and commonly used general pharmaceuticals. It also includes manufacturers’ information on test kits, radiographic film and dosimetry devices.

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Look into PDR for advanced diagnostic aids—ultrasound equipment, linear accelerators, computerized tomographic scanners—selections are organized by manufacturer to suit your needs and budget. A reply card information service is included for your convenience.

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OSTEOLITE bone imaging in metabolic disease

The superior technique: "the bone scan is a more sensitive indicator of abnormal metabolic activity than the X-ray."


The superior agent: OSTEOLITE™

Technetium Tc 99m Medronate Sodium Kit (MDP)

New England Nuclear®
In metabolic bone disease...

for evaluating extent and activity of skeletal involvement.

**Most rapid blood clearance**

- At 90 minutes postinjection, blood clearance of MDP pharmacologically identical to OSTEOLITE was approximately equal to that of tested pyrophosphate agents at 6 hours postinjection.
- At 3 hours, MDP blood levels were considerably less than those of tested EHDP and pyrophosphate.

**Result:** low-background studies, whether you must scan early to meet patient-flow demands, or at 3 hours for more optimal image detail.

**Lowest soft tissue activity**

The "difference in soft tissue activity (highest with polyphosphate and lowest with MDP) is discernible in clinical images."²

A University of Minnesota study found that only 4% of 175 MDP images showed moderate to marked soft tissue activity, compared to 17% of EHDP images.³

**Result:** highest assurance of visualizing all skeletal structures.

**Highest target-to-background differential**

OSTEOLITE’s rapid blood clearance and lower soft tissue uptake usually enable current gamma cameras to resolve peripheral skeletal structures and phalanges.

**Result:** confidence of detecting resolution-challenging alterations in osteogenesis…even roentgenographically "invisible" fractures and small metastases.

**Convenient storage and preparation**

Available in 5-vial or 30-vial "Convenience Packs," OSTEOLITE can be stored and used at room temperature (15–30°C).

**REFERENCES**

3. Forstrom L et al: Data on file at New England Nuclear, Medical Diagnostics Division, North Billerica, MA
4. Davis MA, Jones AG: Comparison of Tc-99m-labeled phosphate and phosphonate agents for skeletal imaging. **Sem Nucl Med** 6:19, 1976
Case report:
68-year-old female, hypercalcemic on routine examination, referred to "rule out metastatic disease." No known primary. OSTEOLITE images show increased calvarial uptake, poorly visualized kidneys, generally diffuse skeletal uptake. Findings interpreted as more consistent with hyperparathyroidism than metastatic disease. Nuclear medicine interpretation was confirmed by further laboratory study.

Discussion:
The differential diagnosis of hypercalcemia is often difficult and only occasionally resolved by a clear history of vitamin D intoxication, sarcoidosis, or multiple myeloma. The incidental discovery of elevated serum calcium requires differentiation: is it malignant disease with osseous metastases; ectopic pseudohyperparathyroidism; benign, true hyperparathyroidism?

Osseous metastases can usually be detected or ruled out by routine skeletal imaging. Primary sites of osteitis associated with increased parathyroid hormone production include the skull, ends of the clavicles, and hands. Sy and Mittal have reported that bone scans in renal patients with secondary hyperparathyroidism typically show increased activity in the calvaria, mandible, acromioclavicular area, sternum, vertebrae, distal thirds of long bones, and the phalanges and metacarpals.5

Images produced with 15 mCi technetium-99m-labeled OSTEOLITE; recorded at 500 K counts, Searle LFOV™ camera with Micro Dot™ Imager.

Please see following page for full prescribing information.


**OSTEOLITE™**

Technetium Tc 99m Medronate Sodium Kit (Formerly Known as MDP)

**DESCRIPTION:** New England Nuclear’s OSTEOLITE™ Technetium Tc 99m Medronate Sodium Kit (formerly known as MDP) is supplied sterile and non-pyrogenic in lyophilized kit form suitable for reconstitution with sodium perhydroxyte Tc 99m to form a diagnostic skeletal imaging agent for intravenous administration. Each vial contains 10mg medronate disodium and 0.85mg stannous chloride dihydride; pH is adjusted to between 7.0–7.5 with hydrochloric acid and/or sodium hydroxide solution. The contents of the vial are lyophilized and stored under nitrogen.

**PHYSICAL CHARACTERISTICS:** Technetium Tc 99m decays by isomeric transition with a physical half-life of 6.20 hours. SOURCE: Martin, M. J. Nuclear Data Project, Oak Ridge National Laboratory, March, 1976.) Photons that are useful for imaging studies are listed in Table 1.

<table>
<thead>
<tr>
<th>Table 1. Principal Radiation Emission Data—Technetium Tc 99m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiation Form</td>
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<tr>
<td>---------------</td>
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<tr>
<td>Gamma-2</td>
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<tr>
<td><em>Calibration Time</em></td>
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</table>

To facilitate correction for physical decay of Technetium Tc 99m, the fractions of initial activity that remain at selected intervals after the time of calibration are shown in Table 2.

<table>
<thead>
<tr>
<th>Table 2. Physical Decay Chart: Technetium Tc 99m Half-Life 6.02 Hours</th>
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<tbody>
<tr>
<td>Fraction Remaining</td>
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<td>0.9</td>
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<td>0.2</td>
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</table>

To facilitate correction for physical decay of Technetium Tc 99m, the fractions of initial activity that remain at selected intervals after the time of calibration are shown in Table 2.

**EXTERNAL RADIATION:** The specific gamma ray constant for Technetium Tc 99m is 0.89Bq/MCi at 1cm. The half value layer is 0.2mm of Pb. To facilitate control of radiation exposure from milliCuries amounts of Technetium Tc 99m, the use of a 0.33mm thick standard radiation ejection lead shield will attenuate the radiation emitted by a factor greater than 10-3.

**CLINICAL PHARMACOLOGY:** Upon intravenous injection, Technetium Tc 99m OSTEOLITE exhibits a specific affinity for areas of altered osteogenesis. In humans, blood levels fall to 40-10% of the injected dose by two hours post-injection and to 3-5% by three hours. During the first 24 hours following its administration in patients with normal renal function, 50-75% of the radioactivity is excreted into the urine and less than 2% of the injected dose remains in the vascular system.

Uptake of the Technetium Tc 99m in bone appears to be related to osteogenic activity and to skeletal blood perfusion. The deposition in the skeleton is bilaterally symmetrical, with increased accumulation in the axial structure as compared to the diaphysis. In pediatric patients, in whom the epiphysial centers are still open, there is more marked accumulation of the radiopharmaceutical in the distal aspects of long bones than is seen in adults in whom the epiphyseal centers are closed. Localized areas of abnormal accumulation of the radiopharmaceutical may be seen in primary skeletal malignancies, metastatic malignancies to bone, acute or chronic osteomyelitis, arthritides, recent fractures, areas of ectopic calcification, Paget’s disease, regional migratory osteoporosis, areas of asceptic necrosis and, in general, any pathological situation involving bone in which there is increased osteogenic activity or localized increased osteous blood perfusion. Since increased osteogenic activity and localized increased osteous blood perfusion are not usually present in chronic bone diseases, bone imaging agents, in general, are not effective in detecting such diseases. Localized areas of decreased accumulation of the radiopharmaceutical may be noted in areas of bone which have received localized fields of external radiation or to which blood flow has been interrupted. OSTEOLITE has also been noted to accumulate in areas of acute myocadial infarction from one to fourteen days after the pathological event.

**INDICATIONS AND USAGE:** Technetium Tc 99m OSTEOLITE may be used as a bone imaging agent to delineate areas of altered osteogenesis.

**CONTRAINDICATIONS:** None known.

**WARNINGS:** The contents of the OSTEOLITE vial are intended only for use in the preparation of Technetium Tc 99m medronate sodium and are NOT to be directly administered to patients.

Ideally, examinations using radiopharmaceuticals—especially those elective in nature—of women of childbearing capability should be performed during the first ten days following the onset of menes.

**PRECAUTIONS:** A thorough knowledge of the normal distribution of intravenously administered Technetium Tc 99m medronate sodium is essential in order to accurately interpret pathologic studies. Technetium Tc 99m medronate sodium, as well as any radiopharmaceutical containing it, should be handled with care. Once sodium perhydroxyte Tc 99m is added to the kit, appropriate safety measures should be used 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.

The Technetium Tc 99m labeling reaction involved in preparing Technetium Tc 99m medronate sodium depends on the maintenance of Div in the dialyzed state. Any oxidant present in the sodium perhydroxyte Tc 99m employed may adversely affect the quality of the prepared agent. Thus, sodium perhydroxyte Tc 99m containing oxidants should not be used without first demonstrating that it is without adverse effect on the properties of the resulting agent.

The use of bacteriostatic sodium chloride as a diluent for sodium perhydroxyte Tc 99m may adversely affect the biologic distribution of the prepared agent, and its use is not recommended.

Adapted from various animal studies have not been performed in animals to determine whether this drug affects fertility in males or females, has teratogenic potential, or has other adverse effects on the fetus. Technetium Tc 99m medronate sodium should be used in pregnant women only when clearly needed.

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.

Safety and effectiveness in children have not been established.

**ADVERSE REACTIONS:** None reported.

**DOSE AND ADMINISTRATION:** The recommended dose for the average 70kg adult patient is 15mCi (a range of 10–20mCi). The patient dose should be measured by a suitable radiometric ratio calibration system immediately prior to administration. Optimal imaging results are obtained within one to four hours after administration.

OSTEOLITE should be used within six hours after aseptic reconstruction with sodium perhydroxyte Tc 99m. For optimum results this time should be minimized.

The vial contains no bacteriostat.

Radiopharmaceuticals should be used by persons 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 governmental agencies authorized to license the use of radionuclides.

**RADIATION DOSIMETRY:** The estimated absorbed radiation dose to an average patient (70kg) from an intravenous injection of a maximum dose of 20 millicuries of Technetium Tc 99m OSTEOLITE is shown in Table 4.

**METHOD OF CALCULATION:** A schema for Absorbed-Dose Calculations For Biologically Distributed Radionuclides, Supplement No. 1, NCRP, Pamphlet No. 1, p. 7, 1968.

**HOW SUPPLIED:** NEN's OSTEOLITE™ Technetium Tc 99m Medronate Sodium Kit is supplied as a set of five or thirty vials, sterile and non-pyrogenic. Each nitrogen-flushed vial contains in lyophilized form:

- Medronate Disodium-10mg
- Stannous Chloride Dihydrate-0.85mg

The pH is adjusted to between 7.0–7.5 with hydrochloric acid and/or sodium hydroxide solution. The contents of the vial were lyophilized under nitrogen. Store at room temperature (15–30°C). Included in each five (5) vial kit is one (1) package insert and six (6) radiation labels. Included in each thirty (30) vial kit is one (1) package insert and thirty-six (36) radiation labels.

**INSTRUCTIONS FOR PREPARATION OF TECHNETIUM Tc 99m OSTEOLITE:** Aspreically inject 2 to 8mL of sodium perhydroxyte Tc 99m perhydroxyte in isotonic saline without a bacteriostat into the supplied vial of OSTEOLITE enclosed by a radiation shield. Swirl for at least ten seconds to dissolve completely. Label appropriately. Suitable labels have been supplied with each OSTEOLITE Kit. Use within six hours after reconstitution. For optimum results, this time should be minimized.

Using proper shielding, the vial containing the reconstituted solution should be visually inspected to insure that it is clear and free of particulate matter.

The contents of the kit vials are not radioactive; however, after reconstitution with sodium perhydroxyte Tc 99m the contents may be radioactive and adequate shielding and handling precautions must be maintained.

Do not use if there is a vacuum in the immediate drug container or if air is injected into the container when the dose is withdrawn.

Catalog Number NRP-420 (5 vial kit)
Catalog Number NRP-420C (30 vial kit)
**Gamma Camera Upgrade**

**1/10 Inch or Better Resolution at a fraction of new system cost.**

**BEFORE**
NEN Thallium 201 phantom at 2” distance from collimator.
500K

**AFTER**
NEN Thallium 201 phantom at 2” distance from collimator.
500K

The picture on your left does not provide adequate resolution for cardiac work. The picture on the right is more than adequate!

Picker 2C with ultrafine collimator.

Picker 2C with ultrafine collimator and SX-11 detector head.

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Learn more about this efficient and economical method available from one of the country’s largest independent nuclear medicine service organizations. Call or write NSI for complete information on gamma camera upgrade.

Up to 75% Better Resolution.

<table>
<thead>
<tr>
<th>Picker</th>
<th>Improved Resolution</th>
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<tbody>
<tr>
<td>2</td>
<td>75%</td>
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<tr>
<td>2C</td>
<td>50%</td>
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<td>3C, 4-12</td>
<td>40%</td>
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<tr>
<td>1/8”</td>
<td>20%</td>
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</table>

*Leasing plans and reconditioned upgraded systems also available.*

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Hamden, CT 06518
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ADAC Nuclear Medicine Computer. For more than three years, doctors have called it the finest system of its kind.

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As nuclear medicine has matured and progressed so has the development of the Ultra-TechneKow® FM Tc99m Generator. In keeping pace with the changing needs of the nuclear medicine community, we have redesigned the Ultra-TechneKow system and further refined those features that have, through the years, made the Ultra-TechneKow Generators among the safest, easiest-to-operate, and most reliable performing technetium delivery systems in the world.

An important part of the total system is our commitment to provide the best overall, on-time-delivery record in the industry. The Customer Service people have established a reputation for solving some of the most difficult routing problems imaginable.

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Here are a few of the changes that make the latest Ultra-TechneKow easier to use and more reliable than ever:

- **Redesigned canister:**
  For easier lifting and maneuverability, the canister has a large firm top handle. Change in design simplifies engaging and removing the Luer-lock needle on a daily basis; an important feature in maintaining sterile elution technique.

- **New valve system:**
  Provides positive protection against accidental elution or leakage.

- **Better shielding:**
  To reduce radiation levels during elution, an additional lead plate has been inserted inside between the tubing and the canister.

  A redesigned auxiliary shield is available that provides added reduction in surface radiation levels on all sides and the top.

- **Reduced weight (smaller units):**
  A change in the configuration of the internal column shield allows weight reduction of our smaller generators.

See following page for brief summary.
INTRODUCING...

Our latest Evolutionary Technetium delivery system.

Ultra-TechneKow® FM
(Technetium Tc-99m Generator)
For the Production of Sodium Pertechnetate Tc 99m

DESCRIPTION

The Ultra-TechneKow FM Generator is prepared with fission-produced molybdenum-99. This generator provides a closed system for the production of sterile metastable technetium-99m, which is produced by the decay of molybdenum-99. Sterile, pyrogen-free isotonic solutions of Sodium Pertechnetate Tc 99m can be obtained conveniently by periodic aseptic elution of the generators. These solutions should be crystal clear.

The generator consists of a sealed glass chamber containing specially processed alumina. This treated alumina has a high absorption capacity for molybdenum-99 and a low affinity for technetium-99m. As a result, elution of the generator yields a solution of technetium-99m containing negligible amounts of molybdenum-99.

ACTIONS

The pertechnetate ion distributes in the body similarly to the iodide ion but is not organified when trapped in the thyroid gland. Pertechnetate tends to accumulate in intracranial lesions with excessive neovascularity or an altered blood-brain barrier. It also concentrates in thyroid gland, salivary glands, stomach and choroid plexus. After intravascular administration it remains in the circulatory system for sufficient time to permit blood pool, organ perfusions, and major vessel studies. It gradually equilibrates with the extracellular space. A fraction is promptly excreted via the kidneys.

INDICATIONS

Sodium pertechnetate Tc-99m is used for brain imaging, thyroid imaging, salivary gland imaging, placenta localization and blood pool imaging.

CONTRAINDICATIONS

None.

WARNINGS

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

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.

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.

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.

At the time of administration the solution should be crystal clear.

ADVERSE REACTIONS

None.

DOSAGE AND ADMINISTRATION

Sodium pertechnetate Tc-99m is usually administered by intravascular injection but can be given orally. The dosage employed varies with each diagnostic procedure.

The suggested dose range employed for various diagnostic indications in the average patient (70 kg) is:

- Brain imaging: 10 to 20 mCi
- Thyroid gland imaging: 1 to 10 mCi
- Salivary gland imaging: 1 to 5 mCi
- Placenta localization: 1 to 3 mCi
- Blood pool imaging: 10 to 20 mCi

NOTE: Up to 1 gram of reagent grade potassium perchlorate in a suitable base or capsule may be given orally prior to administration of sodium pertechnetate Tc-99m injection for brain imaging, placenta localization and blood pool imaging.

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

HOW SUPPLIED

The Ultra-TechneKow FM (Technetium Tc 99m) Generators contain the following amount of molybdenum-99 at the time of calibration stated on the label:

<table>
<thead>
<tr>
<th>Catalog Number</th>
<th>0.25 curies</th>
<th>0.50 curies</th>
<th>0.75 curies</th>
<th>1.0 curies</th>
<th>1.5 curies</th>
<th>2.0 curies</th>
<th>2.5 curies</th>
<th>3.0 curies</th>
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Each generator is supplied with the following components for the elution of the generator:

6—Sterile, graduated, evacuated collecting vials
6—Sterile Luer-Lock needles with plastic covers
6—Pressure-sensitive "Caution---Radioactive Material" collecting vial labels
6—Pressure-sensitive radioassay data labels for lead dispensing shield

EVACUATED COLLECTING VIALS. Collecting vials are available on request in 5, 10 and 30 milliliter sizes.

Mallinckrodt, Inc.
P.O. Box 5840
St. Louis, MO 63134

RADIOPHARMACEUTICALS

32A

THE JOURNAL OF NUCLEAR MEDICINE
Q. Dr. Johnston, what observations have come from N.I.H. work with multiple gated blood pool studies?
A. The equilibrium method is a much more reliable test than the traditional ECG method. Patients with forms of aortic stenosis, whose resting ejection fractions are higher than normal, experience a drop in ejection fraction during exercise. Following correction of the stenotic lesion, the ejection fraction rises. With exercise there is an improvement in the ejection fraction of patients who have had coronary bypass surgery, indicating that patients can benefit from this operation. Studying patients with aortic insufficiency has provided some hope that the nuclear method may be helpful in selecting the optimal time for valvular replacement.

Q. Comparing multiple gated studies with thallium studies, which in your opinion are easiest to interpret?
A. They are both relatively easy to interpret once the observer has had some experience with them. Because the thallium studies are stationary studies, the subtleties of a very minor lesion might escape you. Because the wall is moving in an equilibrium study, you should be able to pick up very subtle lesions. Therefore, either would be relatively easy to interpret, but probably the equilibrium study would be the easiest.

Q. Which of the two studies yields the most diagnostic information?
A. The equilibrium study gives you more information. The thallium study will show a wall defect if there is an infarct or marked ischemia. However, deficiencies in coronary flow are a bit harder to pick up where myocardial function is still intact. When comparing a rest and exercise equilibrium study, slight abnormalities can be readily observed.

Q. What particular advantages do nuclear cardiology studies have over other methods in the evaluation of heart disease?
A. These procedures are less invasive and provide global and regional functional information. Contrast studies are more invasive. In addition, a significant amount of radiation is required for contrast studies so that repeating them is not taken lightly. Once the initial baseline nuclear cardiology information is obtained from a patient, one would then be in a position to follow the patient’s status and see if he was improving as a result of treatment. This is one of the big advantages of these methods, particularly the equilibrium approach.

Q. In your research, how do these tests correlate with cineangiography?
A. We find that the nuclear cardiology data correlates very well with coronary catheterization and contrast angiography data. The three dimensional nuclear data gives us an edge over contrast angiography’s two-dimensional view. In all probability, nuclear cardiology studies will become the standard with which to judge contrast angiography.

Q. As you look to the future, is nuclear cardiology going to become the primary diagnostic method in cardiac disorders?
A. When you are involved with nuclear cardiology, it seems like that may well be the case. A considerable amount of effort is going into simplifying the computerized aspects of nuclear cardiology as well as improving the detector devices. However, considering the large amount of information gained in exchange for the small dose of radiation that is involved in this method, I think that nuclear cardiology has the potential of being one of the primary methods used in cardiology.

For the complete transcript of this interview with Dr. Johnston, write Inner-View, General Electric Company, Medical Systems Division, P.O. Box 414 (Mail Code W-504), Milwaukee, WI 53201.

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Journal of Nuclear Medicine
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If you ordered only a perfusion lung scan on this patient...
...you could have missed the diagnosis.
The new definition of "lung scan"

**Ventilation + Perfusion**

*SPECIFICITY*

Xenon-133 ventilation lung imaging reliably increases the specificity of the perfusion study by demonstrating regions of abnormal perfusion—normal ventilation (strongly suggesting PE) or of abnormal perfusion—abnormal ventilation (COPD, effusion or infiltrate).

*SENSITIVITY*

Perfusion lung imaging is recognized as the most sensitive noninvasive means of detecting pulmonary embolism (PE). Almost every patient with PE will have an abnormal study—while a normal study virtually rules out PE. But perfusion defects are nonspecific, since both vascular disorders, such as PE, and parenchymal disease or effusion alter pulmonary perfusion.

---

**For convenient, safe ventilation imaging**

**Xenon Xe 133 Gas (CALIDOSE) Dispensing System**

**For high-quality perfusion lung imaging**

**PULMOLITE™**

Technetium Tc 99m Aggregated Albumin Kit

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Please see following page for full prescribing information.
PULMOLITE™

Technetium 99m Aggregated Albumin Kit

August 1976

DIAGNOSTIC—FOR INTRAVENOUS USE

DESCRIPTION: Each vial of PULMOLITE™ Technetium 99m Aggregated Albumin Kit contains 0.6 ml of a solution of technetium-99m aggregated albumin in saline, 2 ml of a solution of sodium chloride, and 0.3 ml of a solution of sodium carbonate. The sodium carbonate is added to adjust the pH of the mixture to 5.5. Each vial contains 3.7 MBq (100 mCi) of technetium-99m aggregated albumin and 200 mCi of sodium chloride, 0.5 mCi of sodium carbonate, and 750 mCi of water.

PHYSICAL CHARACTERISTICS:

Technetium-99m Tc99m has a beta emission with a half-life of 6.0 hours.

Table 1. Principle Radiation Emission Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Decay Mode</th>
<th>Energy (MeV)</th>
<th>Half-life (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gamma-1</td>
<td>Internal</td>
<td>0.004</td>
<td>6.00</td>
</tr>
<tr>
<td>Gamma-2</td>
<td>Internal</td>
<td>0.069</td>
<td>6.00</td>
</tr>
<tr>
<td>Internal</td>
<td>0.004</td>
<td>6.00</td>
<td></td>
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Table 2. Radiation Attenuation by Lead Shielding

<table>
<thead>
<tr>
<th>Shielding</th>
<th>Attenuation Coefficient (cm²/mg/cm)</th>
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<tbody>
<tr>
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Table 3. Physical Decay Chart—Beta 9.65 Hours

<table>
<thead>
<tr>
<th>Decay Stage</th>
<th>Remaining Radioactivity (MBq)</th>
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</thead>
<tbody>
<tr>
<td>9.65 Hours</td>
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<tr>
<td>2.0 Hours</td>
<td>0.004</td>
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</tbody>
</table>

Table 4. Particle Dosages* (F'T) = 3 x 10¹⁶ particles/vidal

<table>
<thead>
<tr>
<th>Activity</th>
<th>Cumulative Dose (rem)</th>
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</thead>
<tbody>
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<td>1 mCi</td>
<td>0.25</td>
</tr>
<tr>
<td>2 mCi</td>
<td>0.50</td>
</tr>
<tr>
<td>5 mCi</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Table 5. Radiation Dosages

<table>
<thead>
<tr>
<th>Tissue</th>
<th>Radiation Dose (rem)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 mm lead</td>
<td>-0.1</td>
</tr>
<tr>
<td>1.0 mm lead</td>
<td>-0.2</td>
</tr>
<tr>
<td>2.0 mm lead</td>
<td>-0.3</td>
</tr>
<tr>
<td>3.0 mm lead</td>
<td>-0.4</td>
</tr>
<tr>
<td>4.0 mm lead</td>
<td>-0.5</td>
</tr>
</tbody>
</table>

RADIATION DOSE

The lowest dose of radiation to which the body is subjected as a result of the administered dose of Technetium Tc99m aggregated albumin is approximately 0.20 mCi. This dose is equivalent to the use of 200 mCi of Technetium Tc99m aggregated albumin.
NOW AVAILABLE FOR USE WITH UP TO 90 mCi PER VIAL.

**Technetium Tc 99m Aggregated Albumin**

**BRIEF SUMMARY OF PRESCRIBING INFORMATION**

**indications and usage**
Technetium Tc 99m Aggregated Albumin is indicated as a lung imaging agent to be used as an adjunct in the evaluation of pulmonary perfusion.

**contraindications**
Technetium Tc 99m Aggregated Albumin should not be administered to patients with severe pulmonary hypertension.

The use of Technetium Tc 99m Aggregated Albumin is contraindicated in persons with a history of hypersensitivity reactions to products containing human serum albumin.

**Warnings**
The possibility of allergic reactions should be considered in patients who receive multiple doses.

Theoretically, the intravenous administration of any particulate material such as aggregated albumin imposes a temporary small mechanical impediment to blood flow. While this effect is probably physiologically insignificant in most patients, the administration of aggregated albumin is possibly hazardous in acute cor pulmonale and other states of severely impaired pulmonary blood flow.

This radiopharmaceutical preparation should not be administered to children, to pregnant women or lactating women unless the expected benefits to be gained outweigh the potential risks.

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.

**Precautions**
In cases of right-to-left cardiac shunt, additional risk may exist due to the rapid entry of aggregated albumin into the systemic circulation.

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.

The labeling reactions involved in preparing the agent depend on maintaining the Tn 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.

The contents of the vial are sterile and pyrogen-free. It is essential that the user follows the directions carefully and adheres to aseptic procedures during preparation of the radiodiagnostics.

Technetium Tc 99m Aggregated Albumin is physically unstable and as such the particles will settle with time. Failure to agitate the vial adequately before use may result in non-uniform distribution of radioactivity.

It is also recommended that, because of the increasing probability of agglomeration with aging, a bath of Technetium Tc 99m Aggregated Albumin not be used after eight hours from the time of preparation. Refrigerate at 2° to 8° C after preparation. If blood is withdrawn into the syringe, unnecessary delay prior to injection may result in clot formation in situ.

The contents of the vial are under a nitrogen atmosphere and should be protected from air. On preparation with Sodium Pertechnetate Tc 99m, the contents of the vial should be mixed by gentle swirling to avoid changes in particle size. Do not use if clumping or foaming of the contents is observed.

**Easy to prepare.**
**Stable formulation** prepared with stannous tartrate, which is more resistant to oxidation than stannous chloride.

**Lowest dose rate** to the lungs of any commercially available kit.

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**Technetium**

**Tc**

**Kit**

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**MAA**

**VC**

**TECHNETIUM**

**99m**

**INR**

**FOR INTRAVENOUS USE.**

Adequate reproduction studies have not been performed in animals to determine whether this drug affects fertility in males or females, has teratogenic potential, or has other adverse effects on the fetus. Technetium Tc 99m Aggregated Albumin should be used in pregnant women only when clearly needed.

It is not known whether this drug is excreted in human milk. As a general rule, nursing should not be undertaken while a patient is on a drug since many drugs are excreted in human milk.

Safety and effectiveness in children have not been established.

As in the use of any radioactive material, care should be taken to minimize radiation exposure to the patient, consistent with proper patient management, and to insure minimum radiation exposure to the occupational worker.

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 governmental agency to license the use of radionuclides.

**Adverse reactions**
The literature contains reports of deaths occurring after the administration of aggregated albumin to patients with pre-existing severe pulmonary hypertension. Instances of hemodynamic or idiosyncratic reactions to preparations of Technetium Tc 99m labeled aggregated albumin have been reported.

**Hypersensitivity reactions** are possible whenever protein-containing materials such as Technetium Tc 99m labeled aggregated albumin are used in man. Epinephrine, antihistamines and corticosteroid agents should be available for use.

**How supplied**

Kit contents

5 STERILE MULTIDOSE REACTION VIALS (10 cc. silver aluminum overseal), each containing 0.34 mg MAA Aggregated Normal Serum Albumin (Human) 2.0 × 10⁶± 25% particles, 0.27 mg stannous tartrate, 0.6 ml of isotonic saline. Hydrochloric acid and/or sodium hydroxide may have been added for pH adjustment.

10 PRESSURE-SENSITIVE LABELS for final Technetium Tc 99m Aggregated Albumin preparation.

1 PACKAGE INSERT.

FOR FULL PREPARATION AND PRESCRIBING INFORMATION, SEE PACKAGE INSERT.


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- Model 320 (3cc) 125.00 ea.
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**Collimator, n.**
1. an array of holes with lead septa that pass gamma radiation to a gamma camera’s crystal in parallel rays.

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The following abstract is taken from a paper written by James Thrall, M.D., Thomas J. Brady, M.D., and Bertram Pitt, M.D., with the technical assistance of Jean M. Clare, ARRT, of the Divisions of Nuclear Medicine, Cardiology, Department of Internal Medicine, University of Michigan Medical Center, Ann Arbor, Michigan.

The complete paper was published in the February, 1979 issue of Radiology/Nuclear Medicine Magazine. Copies of the protocol are available upon request from Medical Data Systems as a continuing service to the medical community to provide current information on new technologies and practices in Nuclear Medicine.

Also ask us to send you information about our new A² Image Processing System introduced in March at the American College of Cardiology Meeting. Demonstrations will also be given during the Society of Nuclear Medicine Meeting in Atlanta in June.

Introduction

OVER the past decade radionuclide ventriculography has been shown to be an accurate technique for evaluating left ventricular function, and its clinical utility is well established for diagnosing, managing and assessing therapeutic responses in many types of heart disease. Within the past two years, the value of radionuclide ventriculography for detection of hemodynamically significant coronary artery disease has been enhanced by the development of techniques for performing the studies during exercise. The rationale underlying this application is that the imbalance between myocardial oxygen supply and demand with resulting ventricular dysfunction becomes manifest in many patients with stable coronary artery disease only after the heart has been subjected to stress.

The purpose of this paper is to illustrate an approach to graded exercise gated blood pool radionuclide ventriculography based on experience at the University of Michigan Medical Center.
Graded Coronary Ventricle Ejection Fraction

Exercise .80

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6. (Bicycle) ergometer.
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9. Cardiac shield (optional).
10. Defibrillator, emergency kit.

The MUGX program is a special program component of the MUGA™ cardiac program package. MUGX was developed specifically for exercise testing. Data is collected in frame mode (histogram mode) format, thereby essentially eliminating count rate limitations through the computer interface which in turn facilitates rapid collection of statistically adequate studies during exercise.

Exercise Response Patterns

Functional response of the left ventricle to exercise is extremely complex and the complete significance of observed patterns during graded radionuclide exercise ventriculography is by no means completely established. In normal subjects the ejection fraction increases progressively with distinct plateauing of the rate of increase during the higher exercise levels(1). Patients developing significant myocardial ischemia often demonstrate a monotonically decreasing ejection fraction pattern during graded exercise with a diminished ejection fraction compared to the baseline value observed at even the lowest exercise level(2). In such cases the diagnosis is quite clearcut and in fact virtually any two points on the curve could be used to establish the presence of a hemodynamically significant coronary artery lesion. However in some patients with coronary artery disease, the ejection fraction actually rises at the lower exercise levels with an abnormal downturn in the ejection fraction response curve only noted at higher levels. If a single exercise level were obtained in such cases, the functional response of the ventricle might appear equivocal, or perhaps even normal if maximal exercise had not been achieved (3).

Conclusion

Graded exercise radionuclide ventriculography is a valuable new diagnostic procedure for detecting hemodynamically significant coronary artery disease. Although further refinements will undoubtedly be forthcoming, the reported diagnostic accuracy of exercise radionuclide ventriculography is impressively high. The procedure is technically demanding and requires a melding of knowledge and skills from two disciplines: nuclear medicine and cardiology.

For a copy of the complete paper, write to:

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Technetium Tc 99m Normal Serum Albumin (Human) Reagent Kit
DIAGNOSTIC-FOR INTRAVENOUS USE

BRIEF SUMMARY OF PRESCRIBING INFORMATION

Indications and usage
Technetium Tc 99m Human Serum Albumin is used as an agent for imaging the heart blood pool and to assist in the detection of pericardial effusion and ventricular aneurysm.

Contraindications
The use of Technetium Tc 99m Human Serum Albumin is contraindicated in persons with a history of hypersensitivity reactions to products containing human serum albumin.

Warnings
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. This radiopharmaceutical preparation should not be administered to children or to patients who are pregnant or to nursing mothers unless the expected benefits to be gained outweigh the potential hazards. Ideally, examinations using radiopharmaceuticals, especially those elective in nature, of women of childbearing capability should be performed during the first few (approximately 10) days following the onset of menses.

Precautions
The components of the kit are sterile and pyrogen-free. It is essential that the user follows the directions carefully and adheres to strict aseptic procedures during preparation of the radiodiagnostic.

Technetium Tc 99m Human Serum Albumin must not be used after three hours from the time of formulation.

Adequate reproduction studies have not been performed in animals to determine whether this drug affects fertility in males or females, has teratogenic potential, or has other adverse effects on the fetus. Technetium Tc 99m Human Serum Albumin should be used in pregnant women only when clearly needed.

It is not known whether this drug is excreted in human milk. As a general rule, nursing should not be undertaken while a patient is on a drug since many drugs are excreted in human milk.

Safety and effectiveness in children have not been established.

Technetium Tc 99m Human Serum Albumin, as well as other radiopharmaceuticals, must be handled with care and appropriate safety measures should be used to minimize external radiation exposure to clinical personnel. Also, care should be taken to minimize radiation exposure to patients, consistent with proper patient management.

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.

Adverse reactions
Hypersensitivity reactions are possible whenever protein-containing materials such as Technetium Tc 99m labeled human serum albumin are used in man. Epinephrine, antihistamines and corticosteroid agents should be available for use.

How supplied
Unit dose kit
The kit consists of 10 unit dose reaction vials each containing a lyophilized mixture of 7 mg human serum albumin and 0.08 mg stannous tartrate. Hydrochloric acid was added prior to lyophilization for pH adjustment.

Multidose kit
The kit consists of 5 multidose reaction vials each containing a lyophilized mixture of 21 mg human serum albumin and 0.23 mg stannous tartrate. Hydrochloric acid was added prior to lyophilization for pH adjustment.

For full preparation and prescribing information, see package inserts.
Notes: *Refer to package insert for full preparation and prescribing information. *Data on file at Union Carbide Corporation, Tuxedo, New York

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Sealed flood sources

Supplied as $^{57}$Co (2 and 3mCi) and $^{133}$Ba (0.5 and 1.0mCi) in two sizes, to check the uniformity and resolution of conventional and wide field-of-view gamma cameras, and for transmission imaging. The maximum acceptable variation in activity over the entire active area is $\pm 1\%$ of the mean value. Each uniformly active plastic component is surrounded by inactive plastic and enclosed in an anodized aluminium casing. A shielded storage case is supplied with each source.

Anatomical marker sources

**Spot sources** are available as a 1 mm bead of $^{57}$Co or $^{133}$Ba (10 and 100µCi). Features include a welded plastic capsule, point source geometry with a visible active bead, and colour coding for quick identification of nuclide and activity. They are packed in sets of three in shielded boxes; replacements are available separately.

**Pen point tracers** have a 1 mm diameter bead of $^{57}$Co (100µCi) sealed in the tip of a ball-point pen shaped holder with a brass shield for the active end.

**Flexible sources** are 50cm x 4mm diameter; $^{57}$Co (100µCi) is dispersed in an inner core of active plastic, sealed in an inactive PVC tube, and closed by aluminium caps.

**$^{129}$I rod sources for $\gamma$ counters**

$^{129}$I (0.1µCi) gamma/X-ray spectrum is virtually identical to $^{125}$I, and has a half-life of $1.57 \times 10^7$ years. Calibration in terms of $^{125}$I is available. The length is 100mm, maximum diameter 15mm—suitable for most manual and automatic counters. Active material is sealed in a plastic capsule attached to a handling rod. Other nuclides $^{241}$Am, $^{133}$Ba, $^{57}$Co, $^{60}$Co, $^{137}$Cs, $^{54}$Mn, $^{22}$Na, $^{75}$Se, $^{123}$mTe, $^{88}$Y and mock $^{131}$I.

The Radiochemical Centre
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In many instances, our demand to see things more clearly could only be satisfied with technology that finally enabled cameras to go where one has never been before. In diagnostic imaging, Searle Radiographics’ Pho/Gamma L.E.M. (low energy mobile) Scintillation Camera satisfies a similar demand in that it can be taken wherever the patient’s environment may be, and incorporates state-of-the-art electronics that result in excellent inherent resolution and uniformity, as well as overall system reliability, accuracy, and image stability.

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With the introduction of lighter photographic cameras that enabled man to seek new perspectives from which to take pictures, new horizons in realism were made possible. Searle Radiographics similarly influences technology in the field of nuclear medicine with its extensive line of systems that extend the clinical utility of nuclear cardiology throughout the hospital.

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PLACEMENT

POSITIONS OPEN


NUCLEAR MEDICINE RESIDENCY: Two year program in Nuclear Medicine with two positions open immediately. Requirements for application are completion of preceptorship as outlined by the American Board of Nuclear Medicine. Positions offered are in a four bed general hospital, with over 7,000 scans and 11,000 in-vitro studies yearly. This program is didactic year (hospital) and the Nuclear Medicine, with research projects of a clinical nature. Two full-time Nuclear Medicine physicians direct the training, with the assistance of associate physicians, a radiation physicist and a radiopharmacist. Equipment includes modern gamma cameras and large modern computer facility. Contact: D. R. Spiegelhoff, M.D., Director of Nuclear Medicine, St. Luke's Hospital, 2900 W. Oklahoma Avenue, Milwaukee, WI 53215.

ASSISTANT CHIEF, NUCLEAR MEDICINE Service: The Minneapolis Veterans Administration Hospital is currently accepting applications for the position of Assistant Chief, Nuclear Medicine Service effective July 1, 1979. Requirements include certification by the ABNM, a strong patient orientation and expertise in all phases of clinical nuclear imaging, including imaging, radionuclide and internal radionuclide therapy. In addition, the Assistant Chief, Nuclear Medicine Service will have specific responsibilities in research and education. Applications from all qualified candidates are welcome. Inquiries, including a curriculum vitae and an autobiographical letter, should be sent to: Rex B. Shafer, M.D., Chief, Nuclear Medicine Service (115), Veterans Administration Hospital, 54th Street and 48th Avenue South, Minneapolis, MN 55417. An Equal Opportunity Employer.

NUCLEAR MEDICINE RESIDENCY — Extensive clinical base of imaging, in-vitro testing, and in-vivo testing, and therapy in combined University Hospital/VA Hospital program. Opportunities for clinical and laboratory research. Contact: Write: W. N. Tauxe, M.D., Professor of Radiology and Pathology (Nuclear Medicine), University of Alabama Hospitals, Birmingham, AL 35233. An Equal Opportunity/Affirmative Action Employer.

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POSTDOCTORAL FELLOWSHIP IN area of 3-dimensional nuclear medicine imaging and instrumentation with special emphasis on cardiac applications. Must be citizen, non-citizen with permanent U.S. residence. Position open immediately. Send resume and phone number of 3 references to: Dr. L. J. Brown, Division of Nuclear Medicine, University of Michigan Medical Center, Ann Arbor, Michigan 48109. A nondiscriminatory/affirmative action employer.

RADIOLOGISTS — 400 BED MAJOR medical center in South Florida seeking Board certified Radiologist with sub-specialty. Also, seeking a second Radiologist with specialization in ultrasound. Must have Florida license. Position opening September, 1979. Send C.V., photograph, current salary and minimum starting salary desired. Write Chairman, Board of Directors, Florida Medical Center, 5000 West Oakland Park Boulevard, Ft. Lauderdale, Florida 33313.

NUCLEAR MEDICINE TECHNOLOGIST: Staff Technologist needed at a 363 bed teaching hospital located in a community of 35,000, unlimited recreation, educational and cultural opportunities, in Southeastern NC. Salary and fringe benefits. Salary open, call collect William B. Montgomery, Vice President for Personnel (614) 454-4601, Bethesda Hospital, 2951 N. Maple Ave., Zanesville, Ohio 43701.

NUCLEAR PHYSICIAN: The University of Missouri-Columbia is seeking a board certified or board eligible physician for July 1, 1979. The successful candidate will staff position with imaging and in vitro responsibilities. Background in internal medicine, radiology or pathology is acceptable. Candidates must be prepared to accept full clinical duties and teaching responsibilities. There is ample opportunity for research. Contact H. Haibach, M.D., Chief of Nuclear Medicine, Department of Radiology, University of Missouri Medical Center, 807 Stadium Road, Columbia, Mo. 65212, Tel (314) 882-2541. An Equal Opportunity Employer.

CERTIFIED NUCLEAR MEDICINE Technician needed for busy Cardiology Department to work with Multi-Crystal Gamma Camera to help in the diagnosis and organization of a Department of Nuclear Cardiology. Possible opportunities in Clinical Research and Teaching. Address all inquiries, including imaging, with complete curricula vitae and bibliography, to: Dr. E. Leguizamon, M.D., 1717 Shaffer Street, Suite 106, Kalamazoo, Michigan, 49001.

NUCLEAR MEDICINE TECHNICIAN: Registered with Board of 401 bed teaching hospital is seeking qualified applicants for immediate openings in its Nuclear Medicine Lab. This position includes both imaging and radionuclide work. Competitive salary and excellent fringe benefits. Please direct reply to: Personnel Department, Flint Osteopathic Hospital, 1 Beecher Road, Flint, Mich. 48502. Telephone (313) 762-4740.

NUCLEAR MEDICINE PHYSICIAN: Board eligible/certified, with cardiovascular nuclear medicine experience preferred; to join two full-time nuclear medicine staff physicians at 650 bed teaching hospital in Pittsburgh, Pennsylvania. Reply: Box 400, Society of Nuclear Medicine, 475 Park Avenue South, New York, N.Y. 10016.

FACTORY REPRESENTATIVES AND DEALERS wanted who can sell large line of nuclear, ultrasound and X-ray equipment. Call Bill Cashman at 800-645-9110 for details.

HADASSAH MEDICAL ORGANIZATION, Department of Medical Biophysics and Nuclear Medicine, There are vacancies for physicians in Nuclear Medicine in senior (Board certified) and junior (Board eligible) positions. The department has the latest equipment for all its in vivo procedures including advanced computerized cardiac studies. Inquiries and applications accompanied by curriculum vitae and list of publications may be addressed to: Prof. H. Allan, M.D., Ph.D., Director, Department of Medical Biophysics and Nuclear Medicine, Hadassah University Hospital, Kiryat Hadassah, Jerusalem, Israel.

NUCLEAR MEDICINE TECHNOLOGIST: Full time position at progressive 200 bed freeway design hospital in western New York State suburb. Must be Board eligible/certified with BS and experience. Competitive salary and excellent benefits. Send resume to Personnel Department, Park Ridge Hospital, 1555 Long Pond Road, Rochester, New York 14626. Area Code 716-225-1949.

POSITION AVAILABLE FOR INDIVIDUAL with board certification in nuclear medicine. Preference given to those with Masters Degree or more and two years experience. Duties include laboratory, professional and administrative responsibilities, coordination of technologic staff, computer operations, and instrument quality control. Contact: Stanley M. Levenson, M.D., Assistant Director, Division of Nuclear Medicine, Georgetown University Hospital, 3000 Reservoir Rd. NW, Washington, D.C. 20007. Phone: (202) 625-2056.

NUCLEAR MEDICINE TECHNOLOGIST: Isolated opening for full time Nuclear Medicine Technologist in the Nuclear Medicine Department of a 650 bed teaching hospital in Pittsburgh, Pennsylvania. Registered or Certified Nuclear Medicine Technologist in a progressive Nuclear Medicine practice is preferred. Reply: Box 401, Society of Nuclear Medicine, 475 Park Avenue South, New York, N.Y. 10016.

A TWO YEAR TRAINING PROGRAM in nuclear medicine leading to certification in Nuclear Radiology by the American Board of Nuclear Medicine or one year training program leading to certification in Nuclear Imaging by the American Board of Radiology is offered in an AMA approved integrated program offered by Vanderbilt University School of Medicine in Nashville, Tennessee. Five full-time board certified nuclear medicine physicians and eight full-time nuclear medicine Ph.D.'s participate in the didactic as well as clinical experience in this program. Equipment includes three large field scintillation cameras, three small field scintillation cameras, the PhoCon tomographic scanner, a solid state scanning tomographic camera, a proportional wire chamber, a fluorescent scanner, a portable camera and five computer systems. The computer includes the complete spectrum of all imaging procedures for adults as well as the pediatric population. Particular emphasis is given to nuclear cardiology, renal evaluation, pulmonary function studies and tumor evaluation. The program includes rotations through the various units and has heavy emphasis on correlation between these two modalities and nuclear medicine procedures. There will be opportunities for all interested radiopharmacists to be involved in clinical research in basic areas of radiopharmacy. The clinical program is open to all radiographers and has heavy emphasis on correlation between these two modalities and nuclear medicine procedures. For further information, interested persons should direct their inquiries to: Dr. David Rollo, M.D., Ph.D., Director, Division of Nuclear Medicine, Department of Radiology and Radiological Science, Vanderbilt University Hospital, Nashville, Tennessee 37223.

NUCLEAR PHARMACIST: Applicants should have some radiopharmaceutical education and pharmacy degree. We will provide clinical training if necessary. Salary commensurate with experience. Submit resume to: Phocos, Inc., 25721 Coolidge Hwy., Wood Park, Mich. 48077. Attention: Personnel.

REGISTERED NUCLEAR MEDICINE Technologist/Registered X-Ray Technician. Private Office in NW Washi D.C. Beginning July 1, 1979. Salary $18,000. Send resume to: Dr. V. Mascellato, Georgetown University Hospital, Dept. of Radiology, 3800 Reservoir Rd. NW, Washington, D.C. 20007 Ph: (202) 625-2214.

CONFIDENTIAL SERVICE NATION-WIDE. We are a search firm dealing nationally in this field. We are an equal opportunity employer. Forward resume with salary requirements and location preferences to BMI, Health Care Division, Box 6457, Columbia, S.C. 29260, (803) 787-8710.

NUCLEAR MEDICINE PHYSICIAN. A nuclear medicine physician is being sought to join two full-time physicians in this active department in a 540 bed community hospital. Experience in nuclear cardiology is desired. Inquiries and applications should be addressed to: John B. Richards, M.D., Department of Nuclear Medicine, Saint John's Hospital and Health Service, 1328 22nd Street, Santa Monica, CA 90404.

ASSISTANT CHIEF, NUCLEAR MEDICINE Service. ABNM certified or eligible physician July 1, 1979 or sooner. Expertise in radiopharmaceuticals and all imaging processes. Salary, benefits, and other conditions commensurate with nuclear medicine desirable. Early advancement possibilities. Salary near top of Board certified candidate. Affiliation with Wright State University School of Medicine will be considered. Send curriculum vitae with salary and hour appointment. Excellent salary and fringe benefits. Equal Opportunity Employer. Send inquiries to: Dr. Ronald Schievwe, M.D., Chief, Nuclear Medicine Service (115), Veterans Administration Medical Center, 4100 West Third Street, Dayton Ohio 45428.

THE JOURNAL OF NUCLEAR MEDICINE
NUCLEAR PHARMACIST—DYNAMIC young corporation has immediate position available for qualified registered pharmacist with training in nuclear pharmacy. Excellent location in San Diego, California offers room for personal and professional growth. The individual must be licensed in California or must be able to take next available board examination. Salary commensurate with experience. Submit resume to: Nuclear Pharmacy of California, Inc., P.O. Box 25141, Albuquerque, New Mexico 87125.

NUCLEAR MEDICINE PHYSICIAN—North Shore University Hospital, a teaching hospital of Cornell University Medical College, is looking for a nuclear medicine physician, who is board-certified or eligible, and has several years of experience. The individual will fill a staff position in the Nuclear Medicine Division of the hospital, and receive an academic appointment at Cornell University Medical College. Prior training in Radiology or Internal Medicine is acceptable. Applicants are required to assume clinical teaching and research responsibilities. Position is available July 1, 1979 or sooner. Address inquiries to Donald Margounoi, M.D., Chief, Nuclear Medicine Division, Department of Medicine, North Shore University Hospital, 300 Community Drive, Manhasset, N.Y. 11030. (516) 562-4400. An equal opportunity employer.

NUCLEAR MEDICINE TECHNOLOGIST. Position open in progressive 350 bed Medical Center. Must be registered or certified with training in all phases of imaging. This is a fully equipped department including five cameras and a DEC Gamma Eleven Computer. Excellent fringe benefits. Contact: Mr. Charles E. Duxbury, Upstate Medical Center, Division of Nuclear Medicine, 750 East Adams Street, Syracuse, New York 13210. An Equal Opportunity/ Affirmative Action Employer.

POSITIONS WANTED

NUCLEAR MEDICINE TECHNOLOGIST, CNMT, RT(ARRT), 5 years experience in all phases seeking position in southeastern states. Reply Box 407, Society of Nuclear Medicine, 475 Park Avenue South, New York, N.Y. 10016.


ABNM, ABR CERTIFIED. COMPLETED two year nuclear medicine fellowship. Presently staff, university hospital for three years. Has expertise in all aspects of nuclear cardiology, computers, and also abdominal ultrasound. Wishes to relocate. Date available - negotiable. Reply: Box 404, Society of Nuclear Medicine, 475 Park Ave., S., New York, New York, 10016.

NUCLEAR MEDICINE PHYSICIAN. ABNM certified, Ph.D., M.D., internal medicine background. Academic, clinical and administrative experience. Will consider university or community hospital. Reply Box 403, Society of Nuclear Medicine, 475 Park Ave. So., New York, N.Y. 10016.

TECHNOLOGISTS AVAILABLE. Graduates of the SUNY/Buffalo B.S. in N.M.T. Program will be available for placement in June 1979. The program prepares generalists through comprehensive basic science and clinical training in both imaging and RIA. Contact Ann Stevens, N.M.T. Program Coordinator, 3495 Bailey Avenue, Buffalo, NY 14215 (716-838-5889) or Jehuda Steinbach, M.D., Chief, Nuclear Medicine Service, Veterans Administration Medical Center, 3495 Bailey Ave., Buffalo, NY 14215 (716-838-6000 EXT. 380).

ABNM CERTIFIED SEeks PART TIME or full time position in New York City or surrounding areas. Reply: Box 402, Society of Nuclear Medicine, 475 Park Avenue South, New York, N.Y. 10016.

CERTIFIED ABNM WISHES TO JOIN OR buy private practice any location. Reply: Box 403, Society of Nuclear Medicine, 475 Park Avenue South, New York, N.Y. 10016.

CHIEF TECHNOLOGIST

C.S.R.T. (N.M.) required for a modern newly expanded Nuclear Medicine Department. Full time Director and a staff of nine.

Engaged in both in-vitro and in-vivo procedures. Latest imaging equipment and computer facilities. Please apply in writing, stating past experience and salary expected to:

Director of Personnel
Bellevue General Hospital
P.O. Box 428,
Bellevue, Ontario K8N 5A9

RESIDENCY

Two-year approved program offering broad clinical experience including tertiary care and community hospitals, oncology and pediatrics. Ultrasound and CT. Strong basic science teaching, radiation safety, central radiopharmacy and RIA. Opportunity for research. An integrated program at State University of New York at Buffalo School of Medicine. Available July 1, 1979. Contact: M.A. Bender, M.D., Program Director, Dept. of Nuclear Medicine, 666 Elm Street, Buffalo, NY 14263 or M. Blau, Ph.D., Chairman, Dept. of Nuclear, 3495 Bailey Avenue, Buffalo, NY 14215.

JNM CLASSIFIED PLACEMENT SERVICE SECTION

This section in the Journal of Nuclear Medicine contains "Positions Open", "Positions Wanted", and "For Sale" listings. Nondisplay "Positions Wanted" ads by members of the Society are billed at 50¢ per word for each insertion with no minimum rate. Nondisplay "Positions Wanted" ads by nonmembers and all nondisplay "Positions Open" and "For Sale" ads by members and nonmembers are charged at 75¢ per word. Display advertisements are accepted at $110 for ½ page, $155 for ¼ page, $260 for 1/8 page, and $450 for a full page. Closing date for each issue is the 1st of the month preceding publication. Agency commissions and cash discounts are allowed on display ads only. Box numbers are available for those who wish them. All classified ads must be prepaid or accompanied by a purchase order. Send orders to:

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Registered Nuclear Medical Technician
Preferably with computer experience
To operate new clinical laboratory for measuring regional cerebral blood flow, using the 133Xe non-invasive method

- Most current data processing system available, including Medtronic Inhalation Cerebrograph and Hewlett-Packard 9845 Data Processing Sys.
- Rapidly growing University Medical Center
- Competitive salary and benefits
- Pleasant working conditions, newly equipped facilities

Please contact Dr. G. Howard Reichman, Professor and Chief, Division of Neurological Surgery, Loyola University Medical Center, 2160 S. First Avenue, Maywood, Illinois 60153. To interview, please phone: (312) 531-3207.

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MAYWOOD, ILLINOIS

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Chest, Abdomen and Pelvis

This impressive atlas promises to become one of the most valuable clinical tools in your field. Designed as a reference for normals, it features a complete set of sections (sagittal, transverse, and coronal) 1 cm. thick — all in full color plates — of the neck, chest, abdomen and pelvis. It also offers oblique views of the heart. To aid you in interpretation, each plate is accompanied by a labelled line diagram. Throughout, the photography is far superior to that in any other atlas currently available on this subject. And further, every organ is shown in its normal color since the body was seen without embalming! In addition, 60 unmounted slides (ten 35 mm strips, each with six plates) are included at the back of the book. Order your copy today!


Also of interest...


A New Book. ATLAS OF PEDIATRIC NUCLEAR MEDICINE. By Philip O. Alderson, M.D.; David L. Gilday, M.D., B.Eng., F.R.C.P., and Henry N. Wagner, M.D., with 2 assistants. This graphic atlas provides a broad overview of tracer procedures you can use to evaluate your pediatric clients. Organized according to systems, it uses case studies to examine congenital diseases, oncologic diagnosis, trauma, metabolic disorders and other acquired conditions. December, 1978. 310 pp., 788 illus. Price, $44.50.


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Volume 20, Number 4
67A
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Large teaching medical facility needs experienced person to assume leadership role in active nuclear medicine laboratory. Clinical expertise in all aspects of nuclear medicine required. Ability to effectively interact with other departments. **REQUIREMENTS:** B.S. plus ASCP or eligible and special training in radioisotopes. We offer attractive salary and comprehensive benefits and a convenient Central New Jersey location.

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**DEPARTMENT OF NUCLEAR MEDICINE**

The University of Massachusetts Medical School is seeking a faculty member to join the Department of Nuclear Medicine to begin on July 1, 1979, or soon thereafter.

It is essential that the candidate have proven excellence and achievement in research and teaching. Clinical expertise in all aspects of Nuclear Medicine is also required. Rank and salary depend on experience and qualifications.

Send curriculum vitae and three letters of reference to: Dr. L.E. Braverman, Department of Nuclear Medicine, 55 Lake Avenue North, Worcester, MA 01605, (617) 856-3176.

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**NUCLEAR MEDICINE MANAGER**

Challenging opportunity available for an experienced Nuclear Medicine Technologist to assume management duties in the areas of nuclear medicine, radioassay, and echo cardiography. Individual will be responsible for technical and administrative functions including developing and monitoring budgets, overall performance of nuclear medicine and ultrasound training programs, quality assurance, and supervision of personnel. Applicant should have proven technical expertise with at least 2 years experience at a chief technologist level. Must be ARRT registered. Salary commensurate with experience. Please send complete resume in confidence to Vivian Lopez.

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If you’ve waited until now to get started in cardiovascular nuclear medicine...

**Thallous Chloride TI 201**

New England Nuclear
Coronary artery disease

**Positive stress ECG without angina**

*History*
A.C., 50-year-old accountant, asymptomatic, required to undergo exercise ECG as part of "executive physical."

*ECG findings*
Normal at rest, 2.5-3 mm ST-segment depression on exercise; denied accompanying angina.

*Thallium-201 imaging*
Large apical defect on immediate post-exercise anterior view; defect filled in on delayed images.

*Working diagnosis*
Coronary artery disease, confirmed on preoperative angiography.

Acute myocardial infarction

**Early diagnosis**

*History*
J.B., 54-year-old construction worker, admitted to CCU following episode of severe chest pain, diaphoresis, dizziness. Patient fell to ground upon onset of symptoms, severely bruising left thigh, chest wall. No history of angina pectoris or prior MI; ECG documented left bundle branch block.

*Serum enzymes, ECG* Elevated shortly following admission; isoenzyme analysis unavailable to differentiate elevation secondary to trauma from possible elevation secondary to acute MI; ECG nondiagnostic because of LBBB.

*Thallium-201 imaging*
Images made upon admission displayed anterior wall defect (anterior view), large septal defect (LAO view).

*Working diagnosis*
Extensive antero-septal MI.
A recent model 37 photomultiplier tube camera
with all-purpose collimator, capable of resolving 1 cm line separations on an Au 195 line phantom

Treadmill or bicycle ergometer and ECG recorder,
to perform maximal stress testing in accordance with good clinical practice

Ability to begin imaging promptly
(within 3–5 minutes) following thallous chloride Tl 201 injection and termination of stress

Clinical training in scan interpretation
at an institution experienced in thallium-201 imaging*

Electronic image acquisition and processing,
to help resolve ambiguous studies

Mobile imaging/acquisition instrumentation,
to facilitate acute MI thallium-201 studies when patients cannot be transported to the nuclear medicine department

Continuing medical education on thallium-201,
for your staff and for your referring physicians*

*Your NEN representative may help recommend an institution in your area. For continuing medical education programming, ask your NEN representative or write: Teaching Program Administrator, New England Nuclear, 549 Albany Street, Boston, Mass. 02118.

Thallous Chloride Tl 201

New England Nuclear
Thallous Chloride TI 201
November 1977

FOR DIAGNOSTIC USE

DESCRIPTION: Thallous Chloride TI 201 is supplied in isotonic solution as a sterile, non-pyrogenic diagnostic radiopharmaceutical for intravenous administration. The aqueous solution at calibration time contains 1mCi/ml Thallous Chloride TI 201, adjusted to pH 4.5-6.5 by the addition of hydrochloric acid and/or sodium hydroxide solution. It is made isotonic with 0.9% sodium chloride and is preserved with 0.9% benzyl alcohol. Thallium TI 201 has a half-life of 73.1 hours and is cyclo- 
tron-produced. It is essentially carrier-free, and contains less than 0.25% lead Pb 203 and less than 1.9% Thallium TI 202.

PHYSICAL CHARACTERISTICS

Thallium TI 201 decays by electron capture to Mercury Hg 201 with a physical half-life of 73.1 hours. 1 Photons that are useful for detection and imaging are listed in Table 1. The lower energy X-rays obtained from the Mercury Hg 201 daughter of TI 201 are recommended for myocardial imaging, because the mean ½ disintegration at 68-80.3 keV is much greater than the combination of gamma-4 and gamma-6 mean ½ disintegration.

Table 1. Principal Radiation Emission Data

<table>
<thead>
<tr>
<th>Radiation</th>
<th>Mean Disintegration Energy (keV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gamma-4</td>
<td>2.65 135.3</td>
</tr>
<tr>
<td>Gamma-6</td>
<td>10.0 167.4</td>
</tr>
<tr>
<td>Mercury X-rays</td>
<td>94.5 68-80.3</td>
</tr>
</tbody>
</table>

Martin, M.J. Nuclear Data Project. ORNL, January 1977

EXTERNAL RADIATION

The specific gamma ray constant for Thallium TI 201 is 0.47R/mCi-hr. at 1 cm. The first half-value layer is 0.23mm of lead. A range of values for the relative attenuation of the radiation emitted by this radionuclide that results from the interposition of various thicknesses of lead (Pb) is shown in Table 2. For example, the use of 4.4mm of lead will decrease the external radiation exposure by a factor of about 10,000.

Table 2. Radiation Attenuation by Lead Shielding

<table>
<thead>
<tr>
<th>mm of Lead (Pb)</th>
<th>Coefficient of Attenuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.23</td>
<td>0.5</td>
</tr>
<tr>
<td>0.83</td>
<td>10°</td>
</tr>
<tr>
<td>1.9</td>
<td>10°</td>
</tr>
<tr>
<td>3.1</td>
<td>10°</td>
</tr>
<tr>
<td>4.4</td>
<td>10°</td>
</tr>
<tr>
<td>5.7</td>
<td>10°</td>
</tr>
</tbody>
</table>

To correct for physical decay of this radionuclide, the fractions that remain at selected intervals before and after calibration are shown in Table 3.

Table 3. Thallium TI 201 Decay Chart: Half-Life 73.1 Hours

<table>
<thead>
<tr>
<th>Fraction</th>
<th>Hours Remaining</th>
<th>Fraction</th>
<th>Hours Remaining</th>
<th>Fraction</th>
<th>Hours Remaining</th>
</tr>
</thead>
<tbody>
<tr>
<td>-72</td>
<td>1.06</td>
<td>0.64</td>
<td>0.84</td>
<td>72</td>
<td>0.51</td>
</tr>
<tr>
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<td>0.84</td>
<td>94</td>
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<td>0.71</td>
<td>0.90</td>
<td>100</td>
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<tr>
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<td>0.67</td>
<td>0.96</td>
<td>194</td>
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<td>0.63</td>
<td>1.06</td>
<td>106</td>
<td>0.38</td>
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<tr>
<td>0°</td>
<td>1.00</td>
<td>0.50</td>
<td>1.20</td>
<td>120</td>
<td>0.32</td>
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<tr>
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<td>1.32</td>
<td>126</td>
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<tr>
<td>12</td>
<td>0.89</td>
<td>0.64</td>
<td>1.44</td>
<td>144</td>
<td>0.26</td>
</tr>
</tbody>
</table>

Calibration Time

CLINICAL PHARMACOLOGY: Carrier-free Thallous Chloride TI 201 has been found to accumulate in viable myocardium in a manner analogous to potassium. Experiments employing labeled microspheres in human volunteers have shown that the myocardial distribution of Thallous Chloride TI 201 correlates well with regional perfusion.

In clinical studies, thallium images have been found to reveal areas of infarction confirmed by electrocardiographic and enzyme changes. Regions of transient myocardial ischemia corresponding to areas perfused by coronary arteries with partial stenoses have been visualized when thallium was adminis- 
terated in conjunction with an exercise stress test. It is usually not possible to differentiate recent from old myocardial infarction, and no exact differentiation can be made between recent myocardial infarction and ischemia.

After intravenous administration, Thallous Chloride TI 201 clears rapidly from the blood with maximal concentration by normal myo- 
cardium occurring at about ten minutes.

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 (athero- 
sclerotic 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 con- 
tinuous clinical monitoring and treatment in accordance with safe, accepted procedure. Exercise stress testing should be performed only under the supervision of a qualified phys- 
ician and in a laboratory equipped with appropriate resuscitation and support apparatus.

Ideally, examinations using radiopharmaceuti- 
cal drug products—especially those selective in 
 infancy—of women of childbearing capability 
should be performed during the first ten 
days following the onset of menses.

PRECAUTIONS: Data are not available concerning the effect of marked alterations in blood glucose, insulin, or pheochromocytoma (such as is found in dia- 
etes 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.

No long-term animal studies have been performed to evaluate carcinogenic potential. Adequate reproduction studies have not been performed in animals to determine whether this drug affects fertility in males or females, has teratogenic potential, or has other adverse effects on the fetus. Thallous Chloride TI 201 should not be used in pregnant women only when clearly needed.

It is not known whether this drug is excreted in human milk. As a general rule nursing mothers should not be undertaken when a patient is administered radioactive material.

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.

DOSAGE AND ADMINISTRATION: The recommended adult (70kg) dose of Thallous Chloride TI 201 is 15.5mCi. Thallous Chloride TI 201 is intended for intravenous administration only.

For patients undergoing resting thallium studies, imaging is optimally begun within 10-20 min of injection. Several investiga- 
tors have reported improved myocardial- 
to-background ratios when patients are injected in the fasting state, in an upright posture, or after briefly ambulating.

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 approximately 8 minutes post-injection since target-to-background ratio is optimum by that time. Several investiga- 
tors have reported significant decreases in the target-to-background ratios of lesions attributable to treatment at two hours after the completion of stress testing.

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

Radiopharmaceuticals should be used by persons with specific training in the safe use and handling of radionuclides by nuclear reactor or particle accelerator and whose experience and training have been approved by the appropriate government agencies authorized to license the use of radionuclides.

RADIATION DOSIMETRY

The estimated absorbed radiation dose to an average patient (70kg) from an intravenous injection of a maximum dose of 1.5 milli- 
curies of TI 201 is shown in Table 4.

Table 4. Radiation Dose Estimates of Thallous Chloride TI 201: Absorbed Dose 15.5mCi Thallium TI 201 Administered

<table>
<thead>
<tr>
<th>RadiomegaloCi</th>
<th>Heart</th>
<th>Small Intestines</th>
<th>Kidneys</th>
<th>Liver</th>
<th>Red Marrow</th>
<th>Ovaries</th>
<th>Testes</th>
<th>Thyroid</th>
<th>Total Body</th>
</tr>
</thead>
<tbody>
<tr>
<td>94.5</td>
<td>0.97</td>
<td>0.65</td>
<td>2.2</td>
<td>0.93</td>
<td>0.51</td>
<td>0.85</td>
<td>0.12</td>
<td>0.36</td>
<td>0.94</td>
</tr>
</tbody>
</table>

Values listed include a maximum correction of 10% to the radiation doses from TI 201 due to the radioactive Pb 203 and TI 202.

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 Chloride TI 201, 9mg/ml sodium chloride, and 9mg/ml of benzyl alcohol. The pH is adjusted to between 4.5-5.5 by addition of hydrochloric acid and/or sodium hydroxide solution. Vials are available in the following quantities of radioactivity: 1.5, 3.0, 4.5, 6.0, and 9.0 milllicuries of Thallous TI 201.

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

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