Announces
An Ideal Radioisotope
For The Study of
Pulmonary Ventilation

- A half-life of 13 seconds and decay by Isomeric Transition means low radiation exposure to patients and staff.
- The monoenergetic gamma emission of 191 keV is well suited for the gamma camera.
- No special radioactive gas collection or disposal system required.
- Completely portable system allows studies in ICU, CCU, and Post-Surgical departments with portable camera.
- Studies can be conducted on comatose, uncooperative, or mechanically ventilated patients.
- Distribution of radioactive gas is mainly to the lungs.
- Elaborate delivery system is not required.
- The only radioisotope that can be administered ON and OFF as needed.
- Easy to license when compared to Xenon Xe 133 gas.

MPI Krypton Kr 81m Gas Generator
Krypton Kr 81m
THE PULMONARY PROFILE

THE CONCEPT
The pulmonary profile is a series of matched perfusion and ventilation studies done consecutively on a patient using the MPI Krypton Kr 81m Gas Generator and Technetium Tc 99m Albumin Aggregated. Following administration of the two products you are able to switch the energy window on the gamma camera and scan the patient in the same position for each of the isotopes before you move the patient to the next view. Thus, a complete series of matching views may be accumulated for any number of patient positions.

THE PURPOSE
To increase the diagnostic sensitivity and specificity of lung imaging procedures by providing an easy means of obtaining matched perfusion-ventilation images in one patient visit.

THE RESULT
A new patient study which combines ventilation and perfusion imaging procedures into one study called the Pulmonary Profile Study.

For information regarding the MPI Krypton Kr 81m Gas Generator Krypton Kr 81m please call Medi-Physics at (415) 658-2184, Outside California (800) 227-0492 or Inside California at (800) 772-2477.

DESCRIPTION: The Krypton Kr 81m Gas Generator consists of Rubidium Rb 81 fixed to a solid support from which the Krypton Kr 81m is eluted by passage of humidified oxygen or air through the generator. Other rubidium radio-isotopes which do not decay to radioactive Krypton Kr 81m in their decay are present in the generator (Rubidium Rb 82m, for example, is present at a concentration of 30-40%).

INDICATIONS AND USAGE: The Krypton Kr 81m Gas Generator is indicated for use in the study of pulmonary ventilation.

CONTRAINdications: None known.

WARNINGS: None known.

PRECAUTIONS:

General
The Krypton Kr 81m Gas Generator as well as other radioactive drugs, must be handled with care to minimize radiation exposure to clinical personnel. Also care should be taken to minimize radiation exposure to the patient consistent with proper patient management.

Carcinogenesis, Mutagenesis, Impairment of Fertility
No long-term animal studies have been performed to evaluate carcinogenic potential, mutagenicity potential, or whether Krypton Kr 81m gas affects fertility in males or females.

Pregnancy-Category C
Animal reproduction studies have not been conducted with Krypton Kr 81m gas. It is also not known whether Krypton Kr 81m gas can cause fetal harm when administered to a pregnant woman, or can affect reproduction capacity. Krypton Kr 81m gas should be given to a pregnant woman only if clearly needed.

Nursing Mothers
It is not known whether this drug is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when Krypton Kr 81m gas is administered to a nursing woman.

Ideally, examinations using radiopharmaceuticals, especially those elective in nature, in women of child-bearing capability, should be performed during the first few (approximately ten) days following the onset of menstural.

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

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

ADVERSE REACTIONS: None known.

DOSAGE AND ADMINISTRATION: The recommended dose range for Krypton Kr 81m is 1-10 millicuries and should be administered by continuous inhalation for a sufficient time to provide desired diagnostic information. The multiplication product of the radioactivity and the time of continuous inhalation of Krypton Kr 81m generally should not exceed 100 millicuries-minutes.

HOW SUPPLIED: The Krypton 81m Gas Generator is supplied in the form of Rubidium Rb 81, bound to a solid support, with an activity of 2-10 millicuries at calibration time. The generator is enclosed in a lead shielded filter assembly surrounded by a capped plastic canister to which a handle is affixed. The generator should be stored at room temperature. The generator expires 12 hours after date and time of calibration.
Any of these four ADAC nuclear medicine systems will deliver useful clinical information faster and more accurately than ever before possible.

And one has exactly the capacity your clinic or hospital needs today.

That's the one to buy.

Later, as you expand, your ADAC expands with you.

**ADAC System I**

*It processes and acquires.*

It has a Diagnostic Acquisition/Processing Console, a Computer Section, and a Winchester disc drive.

It can easily be expanded to a System II.

**ADAC System II**

*It processes one study while acquiring or processing another.*

It's a System I — plus a Remote Acquisition/Processing Terminal, a second Computer Section, and a second Winchester.

It can easily be expanded to a System III.
It processes and acquires in two places at once. It looks just like a System II.
But there's more capability inside the Computer Section. It can easily be expanded to a System IV.

It has a three-location option. With two Consoles and an expanded Computer Section, you can process and acquire in two places at once.
Add an optional Remote Terminal and you can process and acquire studies at three locations.

For more information on ADAC Systems I, II, III, & IV, write or call collect. ADAC Laboratories, 255 San Geronimo Way, Sunnyvale, California 94086. (408) 736-1101.
For the past decade, nuclear medicine has enjoyed a continuing stream of new radiopharmaceuticals, new isotopes, new diagnostic procedures — and new patients. Many of these new diagnostic procedures resulted directly or indirectly from the investments in product research and development, testing, production, and promotion by a single company: New England Nuclear.

We supported investigators with grants to develop their ideas into agents suitable for animal and human testing …we invested in the production facilities to manufacture sufficient quantities of radiopharmaceuticals and isotopes to perform the studies necessary to bring new products to you.

And then, we underwrote an effort unique in nuclear medicine — we began spending hundreds of thousands of dollars each year to inform primary-care physicians and specialists why they should send their patients to nuclear departments for these new studies.

Such investments in new product development and physician education are common among traditional pharmaceutical companies producing proprietary products that can be patented. However, all NEN’s investments were made on products for which no exclusivity of patent protection was available. Some of NEN’s investments were not successful. A few were, however — and they profoundly changed nuclear medicine.

Of course, NEN could have waited for other companies to develop new procedures and products …to carry the risk and investment of pioneering trial and error. We could have waited until someone else created a demand for new isotopes, and then capitalized on their efforts.

Instead, we built four of our own cyclotrons, and are currently building a multimillion-dollar linear accelerator — further evidence of NEN’s unique commitment to research and development innovation in isotope and radiopharmaceutical production.

If NEN had not been so committed to advancing nuclear diagnostics, perhaps bone scans might still be done with strontium…and techniques such as tumor, abscess, and myocardial perfusion imaging might still be subjects for academic — not clinical — consideration.

NEN has maintained a high level of customer acceptance of its isotopes and radiopharmaceuticals, thanks to physicians and technologists who understand that when they trust their business to NEN they are sharing our investment in future nuclear diagnostics …in the profession’s future ability to diagnose diseases for which medicine has no agents today …and in the effort to communicate the benefits of nuclear diagnostics to the medical community.
CintiChem®
Technetium 99m Generators
(Technetium Tc 99m Generators for the Production of Sodium Pertechnetate Tc 99m)

- Shielded Elution Transfer Point
- Rapid Elution Vial-Needle Engagement Reduces the Radiation Exposure Time Factor

"Automatic" Elution Vial-Needle Alignment Eliminates the Need for Direct Eye Exposure

Elution Transfer Point Shielded Hood Maximizes Radiation Protection During the Elution Process Itself

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Up to now, if you wanted good CRT image recording from computed tomography, ultrasound and nuclear medicine equipment, you may have used several different "special purpose" imaging films.

We started with a conviction that a more convenient universal emulsion film was desirable and possible. The result is Agfa-Gevaert’s new SCOPIX CR3 Universal CRT Imaging Film... the one film that does it all!

It is a film matched to the spectral emission of white, blue and green phosphors used for CRT displays and video monitors.

**Matched Response To All CRT Displays.**

The broad spectral sensitivity of SCOPIX CR3 Film ensures accurate and detailed recording from greyscale CRT and video monitors which use white, blue or green phosphors in their display tubes. It is the “blindness” to green phosphors which causes other films to exhibit higher grain and less definition.

SCOPIX CR3 Film is a single-coated, orthochromatic, medium speed film of relatively high contrast, which gives outstanding recording of CT scan, ultrasound and nuclear video images.

**Sharper Image**

Its higher speed allows CRT monitor intensity to be decreased, thus reducing the “halo” effect on the video screen and improving image definition.

SCOPIX CR3 Film is single-coated on GEVAR polyester base, with anti-halation layer. This combination enhances image detail and definition by preventing image parallax. It is suitable for all RP and manual film processing.

With SCOPIX CR3 film... you purchase fewer film types and simplify film inventory; get improved and consistent quality and economy because one film does it all!

For additional information, contact your nearest Agfa-Gevaert Rex Representative or call 914-682-5650.

**Image Quality and Support Second to None.**

Agfa-Gevaert Rex offers a complete line of superior, sensitometrically dependable X-ray films. All have the finest definition and image quality to help make precise diagnoses. And all offer appropriate speed for the desired technique. Whether it’s general purpose radiology, or special procedures such as cinefluorography, angiography or mammography, Agfa-Gevaert has the film to meet your diagnostic needs.
This small desk top microprocessor computer provides complete inventory control and NRC record keeping functions for the nuclear medicine department. It is user programmable — you program it to fit your requirements even down to the half-life of the radionuclide so the Isotron never becomes obsolete in the rapidly changing field of nuclear medicine.

The Isotron can keep track of up to 20 different radiopharmaceuticals simultaneously by both radionuclide and chemical form! Updates the quantity of radioactivity every minute to reflect radioactivity decay.

The Isotron performs patient dose/volume calculations.

The Isotron subtracts the administered dose from the decayed activity and provides a running total of remaining activity.

The Isotron performs future time calculations. If it is 8:00 A.M. and you want to draw up a dose for 1:00 P.M. the calculation is simply and rapidly performed.

An optional hard copy data printer is available with the Isotron, known as the Isocord, which provides three copies of all pertinent data for your record keeping. The Isotron may be used with any manufacturers dosecalibrator.

The Cost? Very reasonable. When combined with the Isocord and our Assayer 1 Dosecalibrator the total price is less than competitive systems with 50% of the capabilities.

RADX gave you the first calculating dosecalibrator, the first printing dosecalibrator, and now the first desk top inventory control computer, the ISOTRON.

For more information or to arrange a demonstration call our toll free number 800-231-1747 (Texas customers call 713-468-9628.)

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Toshiba's patented delay line system and modern IC-technology provide long term stability, trouble free performance, and ease of operation.

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This combination of human engineering, fail-proof auto exposure and easy collimator changeover provides the highest efficiency while minimizing patient discomfort.

When you're ready to fill your nuclear medicine department's need for a large field gamma camera, remember Toshiba. We're the first.

Patented Delay Line, U.S. Patent Number 3,717,763
New Micro Cal, from Picker, does everything your present isotope calibrator does — and everything you wish it did.

Micro Cal automates dose calibration. A keyboard operated microprocessor memory stores calibration factors for up to 96 radioisotopes. And an exclusive prompting panel lights up to provide the technologist with easy step-by-step instructions for each setup. Micro Cal calculates dosage, correcting for isotope decay and the time the dose is to be administered, while its printout accessory gives you a hard copy record. Micro Cal figures dosage fast and makes error virtually impossible.

Since every phase of a nuclear medicine diagnostic process begins with correct dosage, Micro Cal is the beginning of a better diagnosis. For more information, call your Picker representative or write: Picker Corporation, 12 Clintonville Rd., Northford, CT 06472, or Picker International, 595 Miner Rd., Highland Hts., OH 44143.
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Mallinckrodt's generator delivery system is ranked number one* in the industry. Here's why:

Our mid-continental location means we can make most deliveries by truck. So for 90% of our customers in 45 states, the number one delivery problem—airline delays—is no problem at all. If there is a hitch, one quick call to our toll-free service number will straighten it out.

Mallinckrodt weekend generators are delivered no later than 8 AM every Monday. If you need midweek delivery, your generator will arrive by 8 AM Wednesday.

For dependable, on-time generator delivery, week after week, call your Mallinckrodt representative or this toll-free number:
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For technical assistance it's 800-325-8181

*In a recent independent survey of 400 nuclear medicine departments, data on file at Mallinckrodt.
Digital's Gamma-11 is found in more large teaching hospitals and research centers worldwide than any other nuclear medicine imaging system. And the reasons these hospitals prefer the Gamma-11 are no different from the reasons you should choose it.

**Your first reason for choosing the Gamma-11 is beautifully simple.**

The Gamma-11 is designed for ease of use. The computer prompts you in English. So it's simple to learn, even if you don't know anything about computers. Nothing is mysterious, but you'll find the results remarkable.

To help you with your job it does two jobs at once.

On the screen you'll see dynamic or static images of single or multiple studies in color, monochrome or black and white. Or you can focus your attention on two different studies side by side for comparison. For instance, an image acquired at rest and stress, or pre- and post-operative. On every frame, positive patient identification automatically appears. But best of all, the Gamma-11 can both acquire and analyze data simultaneously, even in gated cardiac mode. Something no other imaging system can do without expensive additions.

Digital's Gamma-11 will acquire, process, store, and display information so expertly and thoroughly that you can diagnose your patient's problem faster. With a greater degree of accuracy.

The information acquired from the Gamma-11 is gathered on a disk pack which has a much greater capacity for permanent information storage than, for example, the smaller alternative floppy disk. Also the disk, unlike the floppy, allows you to acquire data in both matrix and list mode.
Digital can help you learn from the experienced.
In addition to clinical applications available from medical software firms, you can also get application packages from Digital and other Gamma-II users. Such as the large teaching hospitals. So in effect, you'll be benefiting from their experience.
And many teaching hospitals have been using Gamma-II systems since 1971. Which means that, in demanding circumstances, and over a lengthy period of time, Digital's system has proven itself in both reliability and performance.
The Gamma-II comes with the acquisition software you'll need. Digital will provide on-site training plus information concerning university-based clinical training courses on the Gamma-II.
Find out more. Fill out and mail this coupon today. You'll soon see that with the flexibility and reliability of the Gamma-II, the nuclear medicine imaging system found in more of our large hospitals is more than ideal for your hospital.
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(technetium Tc 99m)
Generator
Easy to operate
—After a few simple preparations, Minitec elutes automatically and quickly. Subsequent elutions are even simpler.
—Small-volume, high-concentration eluates give maximum flexibility for varying applications.

On-time delivery
—Express ground transportation and special air system assure on-time deliveries.

Dependable service
—Specially trained Technical Associates and Squibb Technical Customer Service provide prompt personal attention when needed.

See next page for brief summary.

Minitec®
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Designed for minimum exposure
—Unique construction (no exposed tubing) and thick shielding (11/8" lead) provide high shielding-to-activity ratio.
—Another 11/2" of lead shielding provided by Maxi-Shield™.
—Built-in handle reduces hand exposure during carrying.
—A comparison study of radiation exposure from the three leading generator systems is available from your Squibb Representative.

Convenient
—Available in potencies of 220, 440, 880, 1330, 1770 and 2220 mCi.
—Tuesday-calibrated generators delivered Wednesday a.m.
—Saturday-calibrated generators delivered Monday a.m.
MINITEC®
Technetium Tc 99m
GENERATOR

DESCRIPTION: Minitec (Technetium Tc 99m) Generator consists of a specially
designed lead-shielded alumina column containing adsorbed fission-produced Mo 99. Tc 99m, the short-lived daughter of Mo 99, is obtained as sterile sodium pertechnetate Tc 99m by periodic elutions of the generator with an isotonic saline solution.

INDICATIONS AND USAGE: Sodium pertechnetate Tc 99m is indicated in
ADULTS as an agent for brain imaging including cerebral radionuclide
angiography, thyroid imaging, salivary gland imaging, placenta localization,
and blood pool imaging including radionuclide angiography. (For use of sodium pertechnetate Tc 99m as a diagnostic radiopharmaceutical in
CHILDREN, consult package insert.)

CONTRAINDICATIONS: None known.

WARNINGS: Radiopharmaceuticals should not be administered to patients
who are pregnant or to nursing mothers unless the expected benefit to be
gained outweighs the potential hazards.

Since sodium pertechnetate Tc 99m is excreted in human milk during lacta-
tion, formula-feedings should be substituted for breast-feedings.

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

Radiation risks associated with the use of sodium pertechnetate Tc 99m are
greater in children than in adults and, in general, the younger the child the
greater the risk owing to greater absorbed radiation doses and longer life expect-
cy. These greater risks should be taken firmly into account in all
benefit-risk assessments involving children.

IMPORTANT: Since material obtained from the generator may be intended
for intravenous administration, aseptic technique must be strictly observed
in all handling. Only the eluent provided should be used to elute the
generator. Do not administer material eluted from the generator if there is
any evidence of foreign matter.

PRECAUTIONS: In the use of any radioactive material, care should be taken to
insure minimum radiation exposure to the patient and occupational workers
consistent with proper patient management. At the time of administration the
solution should be crystal clear.

ADVERSE REACTIONS: No adverse reactions specifically attributable to the
use of sodium pertechnetate Tc 99m have been reported.

For full prescribing information, consult package insert.

HOW SUPPLIED: Minitec (Technetium Tc 99m) Generator is available in poten-
cies of 220, 440, 880, 1330, 1770, or 2220 millicuries Mo 99 at calibration time.
The generator is supplied with vials of sterile, nonpyrogenic eluent; a sterile
needle adapter assembly and evacuated sterile collecting vials. Other
accessories including lead shields, reference standard solutions, and a whole
vial assay kit are available on request for use with the Minitec (Technetium
Tc 99m) Generator.

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in a durable, custom-designed Library Case or Binder. These storage units will hold an
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Through the years, Mallinckrodt's customer service system has been refined until it's second to none for prompt, dependable deliveries.

For example, our schedule is designed for your convenience... and your time zone. Just call by 2:30 PM your time, specify early delivery, and you'll have the radiopharmaceuticals you need no later than 8:00 your time the next morning.

Find out how our schedule can help keep your department on schedule. Call your Mallinckrodt representative or this toll-free number:
800-325-3688 (In Missouri, 314-895-0880 collect)

For technical assistance, it's 800-325-8181

THE
MALLINCKRODT
COMMITMENT

to Nuclear Medicine

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Take it anywhere—and interface it with any gamma camera.

Newest of our Spectrum One nuclear medicine computers and cameras, the MCS-560 makes analysis of cardiology and nuclear medicine procedures easy.

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NUCLEAR IMAGES ON KODAK FILM: SHARP.
Informative. Durable.

Obtaining high-quality images in nuclear medicine requires both skilled personnel and valuable time. Reason enough to record the information you require on Kodak NMB or NMC film.

**Sharp.** Kodak NMB (blue base) and NMC (clear base) films feature single-coated emulsions to eliminate parallax. Since they are orthochromatic and, therefore, sensitive to both blue and green CRT phosphors, they record all the information on blue or green cathode-ray tubes. The built-in halation control provides for the imaging of crisp sharp dots, resulting in images with clearly defined edges.

**Informative.** Whether you use a multi- or single-image format, Kodak NMB and NMC films have the “view-box” quality that no other medium can match. The inherent contrast level and excellent resolution of these films enable dot concentration patterns to image both flow and uptake studies effectively.

**Durable.** Both films are coated on a tough 7-mil Estar base. These films resist curling or cracking and can form a convenient and reliable part of a patient’s record for years to come.

Kodak NMB and NMC films can be processed in 90 seconds and are available in a variety of sheet film sizes. If you would like to know more about these and other Kodak films for nuclear medicine, ask your Kodak Technical Sales Representative, or write: Eastman Kodak Company, Health Sciences Markets Division, Dept. 740-B, Rochester, New York 14650.

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In the practice of modern Nuclear Medicine, physicians have learned that a camera’s major diagnostic advantage is often negated by a parallel disadvantage. High count rate is one such case. Until Apex, high count rates were achievable only with multicrystal cameras—at the expense of image quality. Only Elscint’s Apex Line provides count rates as high as 500,000 CPS and resolutions as fine as 1.8mm bars (Apex 215M).

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**High Count Rates—The Clinical Need**

As Nuclear Medicine techniques become more sophisticated, they require higher count rates. Cardiac first-pass studies, for example, can only be effectively accomplished with count rates exceeding the limitations of most present day gamma cameras. Apex systems, however, do perform these studies—with remarkable image clarity.

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The remarkable *Count Rate* performance of the Apex Line is supported by a high *Dynamic Frame Rate* of 64 FPS for 64*64* pixels, and a *Multigated Frame Rate* of 64 frames per heart cycle for 64* matrix.
Cardiac Stress Table & Ergometer System

Permits all patient positions, from supine through upright, plus standard imaging procedures

VERSATILE • PRACTICAL • COST EFFECTIVE

Here is the most versatile stress imaging table available. It permits routine stress tests of patients in any position, from supine to upright. Whatever your nuclear cardiology requirements are, this exceptional system provides them quickly and easily...full gamma camera clearance, complete mobility, vibration-free rigidity, positive (but comfortable) patient restraint, easy-to-make positioning adjustments, unobstructed access to the patient and controls, choice of Collins or Quinton ergometers, and much more. The unit also doubles as a standard imaging table.

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One order assures dependable delivery of your nuclear imaging needs...shipped together for freight savings. You also get the convenience of one-source responsibility for shipping, billing and follow-through support from the most responsive service organization in the business.

Mallinckrodt offers a full range of generator sizes and the organ-imaging kits you use most often. Find out how Mallinckrodt's efficient shipping can save time and money in your department. Call your Mallinckrodt representative or this toll-free number:

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to Nuclear Medicine

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A syringe shield with all the visibility of glass—all the protection of solid lead.

360 degree visibility because it's made of Nuclear Pacific's optically clear lead glass.
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Quick, smooth insertion and removal with an "O" ring seal.
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No shielding leakage.
Available for immediate shipment.
Developed by a company with 30 years experience in radiation shielding.
Currently in use in hospitals worldwide.

Price schedule
With Luer Lock
- Model 110 (1cc Tuberculin) $125.00 ea.
- Model 310 (3cc) 94.00 ea.
- Model 510 (5cc and 6cc) 97.00 ea.
Without Luer Lock
- Model 120 (1cc Tuberculin) $125.00 ea.
- Model 220 (2cc) 125.00 ea.
- Model 320 (3cc) 125.00 ea.
- Model 520 (5cc and 6cc) 125.00 ea.
- Model 1012 (10 and 12cc) 125.00 ea.

1. All models without Luer Lock will accept Luer Lock and non-Luer Lock syringes.
Prices effective in U.S.A. and Canada.

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"Booth #2313"

*Hi-D lead glass (6.2gm/cm²). Registered U.S. Patent Office. Platinum melted ultra high density optical glass.

For information contact: Nuclear Pacific, Inc., 6701 Sixth Avenue So., Seattle, WA. 98108 (206) 763-2170.
Diagnosis: hypertrophic pulmonary osteoarthropathy

Imaging information: Instrument: GE MaxiCamera™ 535
Scan time: 2.5-3.0 hours postinjection
Acquisition time: 6 minutes/view

Dose: 20 mCi OSTEOLITE

OSTEOLITE™
Technetium Tc 99m Medronate Sodium Kit (MDP)

Please see following page for brief prescribing information.
INDICATIONS AND USAGE: Technetium Tc 99m OSTEOLITE may be used as a bone imaging agent to delineate areas of altered osteogenosis.

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 the patient.

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 menses.

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 radioactive agent, must be handled with care. Once sodium pertechnetate 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.

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.

DOSEAGE AND ADMINISTRATION: The recommended dose for the average 70kg adult patient is 15mCi with a range of 10-20mCi. The patient dose should be measured by a suitable radioactivity 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 reconstitution with sodium pertechnetate 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 who have been approved by the appropriate governmental agencies authorized to license the use of radionuclides.

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:

- Sodium Medronate—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.

The contents of the kit vials are not radioactive; however, after reconstitution with sodium pertechnetate Tc 99m the contents are radioactive and adequate electromagnetic 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)  
April 1978

Catalog Number NRP-429C (30 vial kit)  

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GLUCOSCAN

Technetium Tc 99m Glucosate Sodium Kit

INDICATIONS AND USAGE: Technetium Tc 99m Glucosate Sodium is used for brain imaging.

Technetium Tc 99m Glucosate Sodium is indicated for renal perfusion imaging as an adjunct in the diagnosis, localization, and evaluation of kidney disease. It may provide useful information about renal size, shape, and position and may delineate lesions affecting renal blood flow.

CONTRAINDICATIONS: None known.

WARNINGS: The contents of the GLUCOSCAN vial are intended only for use in the preparation of Technetium Tc 99m Glucosate Sodium and are NOT to be directly administered to the patient.

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

Dehydration of the patient prior to imaging may result in failure to visualize urinary excretory structures in the presence of normal function. Adequate patient fluid intake and repositioning may reduce the incidence of such false positive studies.

PRECAUTIONS: Technetium Tc 99m Glucosate Sodium, as well as any radioactive agent, must be handled with care. Once sodium pertechnetate 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 Glucosate Sodium depends on the maintenance of tin in the divalent state. Any oxidant present in the sodium pertechnetate Tc 99m employed may adversely affect the quality of the prepared agent. Thus, sodium pertechnetate 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 pertechnetate Tc 99m may adversely affect the biologic distribution of the prepared agent, and its use is not recommended.

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 Glucosate 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: Although infrequent, erythema has been reported in association with the use of Technetium Tc 99m Glucosate Sodium.

DOSEAGE AND ADMINISTRATION: The recommended dose for the average (70kg) adult patient is 10-20 millicuries for both renal and brain imaging. Technetium Tc 99m Glucosate Sodium is intended for intravenous administration only.

Technetium Tc 99m Glucosate Sodium should be used within six hours after aseptic reconstitution with sodium pertechnetate Tc 99m. For optimal results, this time should be minimized. The reaction vial contains no bacteriostat.

Optimal results for both renal and brain imaging are obtained one hour after administration. Studies have shown that although optimal target-to-background ratios for brain lesions are obtained at two hours post-injection, there is no improvement in diagnostic efficacy after one hour.

Radiopharmaceuticals should be used by persons with 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.

The components of the New England Nuclear GLUCOSCAN Kit are supplied sterile and non-pyrogenic. Aseptic procedures normally employed in making additions and withdrawals from sterile, non-pyrogenic containers should be used during addition of pertechnetate solution and the withdrawal of doses for patient administration.

HOW SUPPLIED: NEN'S GLUCOSCAN Technetium Tc 99m Glucosate Sodium Kit is supplied as a set of five or thirty vials, sterile and non-pyrogenic. Each vial contains in lyophilized form:

- Glucosate Sodium—200mg
- Maximum Tin—0.07mg
- Stannous Chloride (min.)—0.06mg
- Prior to lyophilization the pH is adjusted with hydrochloric acid and/or sodium hydroxide solution. 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.

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

This reagent kit is approved for use by persons licensed by the U.S. Nuclear Regulatory Commission pursuant to Section 35.14 and 35.100 Group III of 10 CFR or under equivalent licenses of Agreement States.

Catalog Number NRP-180 (5 vial kit)  
August 1978

Catalog Number NRP-180C (30 vial kit)  

Brain

Diagnosis: arteriovenous malformation

Imaging information:
- Instrument: Ohio Nuclear Series 100 Gamma Camera
- Scan time: 90 minutes postinjection
- Counts: 400 K

Dose: 15 mCi GLUCOSCAN

GLUCOSCAN
Technetium Tc 99m Gluceptate Sodium Kit

Please see preceding page for brief prescribing information.
Xenon Xe 133 Gas (CALIDOSE) Dispensing System

INDICATIONS: Inhalation of xenon Xe 133 gas has proved valuable for the evaluation of pulmonary function and for imaging the lungs. It may also be applied to assessment of cerebral flow.

CONTRAINDICATIONS: To date, no known contraindications to the use of xenon Xe 133 gas have been reported.

WARNINGS: This radiopharmaceutical should not be administered to pregnant or lactating women unless the benefits to be gained outweigh 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 the menses.

Radiotherapeutics 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 governmental agency authorized to license the use of radionuclides.

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. Expired xenon Xe 133 gas should be controlled in a manner that is in compliance with appropriate governmental regulations.

Xenon Xe 133 adheres to some plastics and rubber and should not be allowed to stand in tubing or respirator containers. Such unrecognized losses of radioactivity from the dose for administration may render the study nondiagnostic. Xenon Xe 133 gas delivery systems, i.e. respirators or spirometers, and associated tubing assemblies must be shown to be air tight to avoid loss of radioactivity into the laboratory environments not specifically protected by exhaust systems.

ADVERSE REACTIONS: To date, no adverse reactions based on the use of xenon Xe 133 gas have been reported.

DOSAGE AND ADMINISTRATION: Xenon Xe 133 gas is administered by inhalation from closed respirator systems or spirometers.

The suggested activity range employed for inhalation by the average adult patient (70kg) is: Pulmonary function including imaging; 2-30 mCi in 3 liters of air.

The cerebral blood flow; 10-30 mCi in 3 liters of air.

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

HOW SUPPLIED: The xenon Xe 133 gas is supplied as part of the Calidose® system, consisting of 2 ml unit dose vials and the Calidose dispenser* for shielded dispensing.

Normally vials containing either 10 or 20 mCi/vial, packed up to 5 vials per shield tube, are supplied. Vial sets containing up to 100 mCi/vial are available.

Catalog Number NPR-127 *Patent Pending TJO July 1975, Rev 1

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PULMOLITE™

Technetium Tc 99m Aggregated Albumin Kit

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 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 the 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 oxidant 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 radiodiagnostic.

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. Refrigrate 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. In humans, has teratogenic potential, or has other adverse effects on the fetus. Therefore, 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 by the patient if this drug is 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 patients, consistent with proper management, and to insure minimum radiation exposure to the occupational worker.

Radiotherapeutics 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 are 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 1.3 ml.

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

HOW SUPPLIED: 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 dihydrate- 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.

This reagent kit is approved for use by persons licensed by the U.S. Nuclear Regulatory Commission pursuant to Section 35.14 and 35.100 Group III of 10 CFR 35 or under licenses of Agreement States.

Catalog Number NRP-415 August 1976
Diagnosis: normal ventilation, abnormal perfusion — pulmonary embolism

Imaging information: Instrument: Picker Model 4/15 Gamma Camera
Dose: 15 mCi Xenon 133; 3 mCi PULMOLITE
Information density: 1,000 counts/cm²; 2,000 counts/cm²

Xenon Xe 133 Gas (CALIDOSE™) Dispensing System
PULMOLITE™
Technetium Tc 99m Aggregated Albumin Kit

Please see preceding page for brief prescribing information.
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- ONE YEAR WARRANTY

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All AccuSync-I features with the exception of the Strip Chart Recorder.

AccuSync-IV
All AccuSync-III features with the exception of the Heart Rate R-R int. display.

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See brief summary on following page.

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

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 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 ensure minimum radiation exposure to the patient, consistent with proper patient management and to ensure minimum radiation exposure to occupational workers.

**Bone Imaging**

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

**Cardiac Imaging**

Patient’s cardiac condition should be stable before beginning the cardiac imaging procedure.

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

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

**Blood Pool Imaging**

Technescan PYP should be injected by direct venipuncture. Heparinized catheter systems should be avoided.

**Adverse Reactions**

None.

**How Supplied**

Catalog Number—094 Technescan PYP Technetium Tc-99m Pyrophosphate 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.

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Volume 21, Number 9
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Tomographic thallium imaging

Robert A. Vogel, MD
Associate Professor of Medicine
University of Colorado Health Sciences Center
Director, Coronary Care Unit and Medical Intensive Care Unit
Denver VA Medical Center

Dennis L. Kirch, MSEE
Assistant Professor of Radiology
University of Colorado Health Sciences Center
Research Engineer
Denver VA Medical Center

The initiative for tomographic thallium imaging arises from the segmental nature of coronary artery disease—which typically affects one portion of the myocardium more severely than others. An ischemic area of the heart that takes up less thallium may overlap or underlie another, normally perfused region. Planar imaging may resolve small deficits juxtaposed to normally perfused myocardium only with difficulty. Tomographic imaging may enable spatial separation of high- and low-uptake regions at different depths, thereby providing a better image of regional ischemia.

Thallium myocardial tomography provides advantages in addition to a series of depth-separated Z-axis images of relative isotope uptake. It ensures that the entire study is acquired as early as possible after injection, before any significant redistribution takes place, because only a single left oblique view is required to provide the data on regional thallium uptake provided in planar imaging by multiple views. And possibly of greatest importance, the technique permits objective computerized quantification of regional isotope uptake and redistribution—circular differential profile analysis—simplifying detection and interpretation of regional differences in thallium redistribution.

These three attributes together—Z-axis resolution, single-view image acquisition, and objective regional quantification—have increased the sensitivity and specificity of thallium myocardial perfusion imaging in our department to 90% or better.

Optimum utilization of this imaging/image-processing technique requires a thorough technical appreciation of several features of the tomographic collimator and software.

The seven-pinhole collimator

The seven-pinhole collimator is not a completely revolutionary or untried concept; rather it represents the combination of two well-accepted concepts in order to better image the thallium-perfused myocardium: single-pinhole collimation and rotating slant-hole collimation. A single-pinhole collimator can produce superior magnified myocardial images with only a minimal contribution from noncardiac background, but its low sensitivity lengthens acquisition time so much that significant redistribution may occur before a view is complete. The rotating slant-hole collimator was pioneered early in the development of the Anger camera as a technique to produce tomographic images. But it is a cumbersome device that is difficult to utilize rapidly and repeatedly, and uses a simple back-projection tomographic reconstruction technique unsatisfactory for myocardial imaging.

The seven-pinhole collimator represents a combination of these two techniques. By projecting seven pinhole images on the crystal, several advantages are gained:

- Instead of projecting a single image onto perhaps 10% of the camera crystal, and imaging background counts with the remaining 90%, the seven-pinhole collimator can project seven 1:1 myocardial images with very little noncardiac background contribution. This full utilization of the crystal for organ imaging makes the seven-pinhole collimator comparable in sensitivity to a high-sensitivity standard collimator... capable of collecting up to 750,000 myocardial counts within 10 minutes.
- Instead of developing angular perspective by taking several sequential planar views, or by rotating a slant-hole collimator, the seven-pinhole collimator uses the seven pinholes to simultaneously view the heart from slightly different angular perspectives, from which computer processing can provide tomographic reconstruction.

To these collimator-derived benefits, one must add two benefits from the quantitative analysis of seven-pinhole imaging: enhanced subjective confidence in the presence or absence of perfusion deficits on the displayed images and objective quantification of relative thallium distribution and redistribution kinetics in each of the important tomographic planes through the myocardium.
The impedance-estimation algorithm

Traditionally, tomographic nuclear images have been reconstructed by back projection, as in the original rotating slant-hole system, and in the Searle PhoCon. More complete, faster processing—with iterative capability for error correction—results from the use of the impedance-estimation technique of the seven-pinhole program.

The basic principle of this program is that a voxel, a volume element in space, has been viewed from seven points projected through pinholes onto the crystal. The program applies an impedance-estimation algorithm to the summing of the seven perspectives of each voxel, so that the lowest number of counts detected from any one perspective will dominate the greater counts detected from the other six—much as a single low-resistance resistor will conduct more current than numerous high-resistance elements in a parallel electrical circuit.

We believe this impedance-estimation program provides an initial estimate of real voxel value that is closer to actual isotope distribution than is possible with simple back projection. With a single 1- to 2-minute iterative pass to refine this estimate, the algorithm provides an accurate derivation of isotope distribution in a specific tomographic plane. Thus, the clinician can be confident that any perfusion defect which can be resolved by the camera/collimator is certain to be detected and displayed on the resultant "hard" image...without substantial degradation by overlying or surrounding normally perfused tissue, or by redistribution during image acquisition.

Circumferential quantification

Circumferential profile analysis of thallium-201 tomographic images may significantly increase the accuracy of evaluating regional thallium uptake and comparing uptake/redistribution kinetics. This quantification technique defines the center of the left ventricle, divides the myocardium into a predetermined number of segments, then quantitatively plots the relative thallium uptake in each segment against its angular location on the left ventricular wall. The procedure, as performed at the Denver VA Medical Center, permits objective comparison of stress/redistribution uptake curves—even in regions where ischemia cannot confidently be diagnosed solely by visual examination of the images.

In summary, the tomographic process reduces patient imaging time and, in our experience, has enabled improved visualization of segmental abnormalities in thallium-201 distribution, and has offered a means of data presentation well suited to quantitative interpretation and correlation.

Please see following page for brief summary of prescribing information.
Thallous Chloride

Thallous Chloride Ti 201

INDICATIONS AND USAGE: Thallous Chloride Ti 201 may be useful in myocardial perfusion imaging for the diagnosis and localization of myocardial infarction.

It may also be useful in conjunction with exercise stress testing as an adjunct in the diagnosis of ischemic heart disease (atherosclerotic coronary artery disease).

CONTRAINdications: None known.

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

With thallium 201 the patient is exposed to a minimum of radiation. Typical amounts used in radiopharmaceutical drug products – especially those efficacious in nature – of women of childbearing capacity may 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 pH (such as is found in diabetes mellitus) on the quality of thallium Ti 201 scans. Attention is directed to the fact that thallium is a potassium analog and since the transport of potassium is affected by these factors, the possibility exists that the thallium may likewise be affected.

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

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 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 radiopharmaceutical 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.

DOSEAGE AND ADMINISTRATION: The recommended adult (70kg) dose of Thallous Chloride Ti 201 is 1-1.5mCi. Thallous Chloride Ti 201 is intended for intravenous administration only.

For patients undergoing resting thallium studies, imaging is optimally begun within 10-20 minutes after injection. Several investigators have reported improved myocardial-to-background ratios when patients are injected in the fasting state in an upright posture, or after 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 maximal stress and when the stress is continued for 30 seconds to one minute after injection. Imaging should begin within ten minutes post-injection since target-to-background ratio is optimum by that time. Several investigators have reported significant decreases in the target-to-background ratios of lesions attributable to transient ischemia by two hours after the completion of stress testing.

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

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

HOW SUPPLIED: Thallous Chloride Ti 201 for intravenous administration is supplied as a sterile, non-pyrogenic solution containing at calibration time, 1mCi/ml of Thallous Ti 201, 3mg/ml sodium chloride, and 5mg/ml of benzyl alcohol. The pH is adjusted to between 4.5-6.5 with hydrochloric acid and/or sodium hydroxide solution. Vials are available in the following quantities of radioactivity: 1, 2, 3, 4.5, 6.0, and 9.0 millicuries of Thallous Ti 201. The contents of the vials are radioactive. Adequate shielding and handling precautions must be maintained.

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10 CFR, Part 20, Sec. 20.103 and Appendix B, Table 1.
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Technetium Tc 99m Medronate Kit

BRIEF SUMMARY OF PRESCRIBING INFORMATION

Indications and usage
Technetium Tc 99m Medronate may be used as a bone imaging agent to delineate areas of altered osteogenesis.

contraindications
None known.

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

This radiopharmaceutical drug product should not be administered to children, to pregnant women, or to nursing mothers, unless the expected benefit to be gained outweighs the potential risk.

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

general
Technetium Tc 99m Medronate as well as other radioactive drugs, must be handled with care and appropriate safety measures should be used to minimize radiation exposure to clinical personnel. Also, care should be taken to minimize radiation exposure to the patients consistent with proper patient management.

To minimize radiation dose to the bladder, the patient should be encouraged to void when the examination is completed and as often thereafter as possible for the next 4-6 hours.

This preparation contains no bacteriostatic preservative. Technetium Tc 99m Medronate should be formulated within six (6) hours prior to clinical use.

pregnancy category C
Adequate reproductive 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 should be used in pregnant women only when clearly needed.

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

pediatric use
Safety and effectiveness in children have not been established.

adverse reactions
No adverse reactions specifically attributable to the use of Technetium Tc 99m Medronate have been reported.

how supplied
Union Carbide's Technetium Tc 99m Medronate Kit is supplied as a sterile, pyrogen-free kit containing 5 vials.

Each 10 ml vial contains 10 mg medronic acid, 0.17 mg (minimum) stannous chloride (maximum stannous and stannic chloride 0.29 mg), and 2 mg ascorbic acid. The pH has been adjusted to 4-8 with either HCl or NaOH prior to lyophilization. Following lyophilization, the vials are sealed under a nitrogen atmosphere.

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ACADEMIC POSITION AT THE ASSOCIATE or Assistant Professor level available in the Nuclear Radiology Division of the Department of Radiology at the University of Texas Medical School at Houston. Certification in Radiology and Nuclear Medicine, or in Radiology with experience in Nuclear Radiology is required. Applicant should have a sincere interest and a performance record in relevant clinical or basic nuclear research. Please send curriculum vitae to Robert W. McConnell, M.D., Director, Division of Nuclear Radiology, Department of Radiology, The University of Texas Medical School at Houston, 6431 Fannin Street, Houston, Texas 77030.

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INDICATIONS AND USAGE: Neoscan may be useful to demonstrate the presence and extent of Hodgkin's disease, lymphomas, and bronchogenic carcinoma. Positive gallium Ga 67 uptake in the absence of prior symptoms warrants follow-up as an indication of a potential disease state.

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 selective in nature, in women of childbearing capability should be performed during the first few (approximately 10) days following the onset of menses.

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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. Gallium citrate Ga 67 should be used in pregnant women only when clearly needed.

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Safety and effectiveness in children have not been established.

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DESCRIPTION

Each kit contains 10 vials, with each vial containing medronic acid, stannous chloride, and ascorbic acid. The 10 ml vial contains 10 mg of medronic acid, 0.17 mg (minimum) stannous chloride (maximum stannous and stannic chloride 0.29 mg), and 2 mg ascorbic acid. The contents of the vial are sterile, pyrogen-free, and lyophilized and sealed under nitrogen. The pH has been adjusted to 4-8 with hydrochloric acid and/or sodium hydroxide.

Administration is by intravenous injection for diagnostic use, after reconstitution with sodium pertechnetate Tc 99m Injection. The product as supplied is sterile and pyrogen-free.

The precise structure of stannous technetium-medronic complex is unknown at this time.

RADIATION DOSIMETRY

The effective half-life was assumed to be the physical half-life for all calculated values. About 50% of each dose of Technetium Tc 99m Medronate is retained in skeleton, and about 50% is excreted into the bladder. The estimated absorbed dose to an average patient (70 kg) from an intravenous injection of a maximum dose of 20 millicuries of Technetium Tc 99m Medronate are shown in Table IV.

Table IV

<table>
<thead>
<tr>
<th>Organ</th>
<th>Absorbed Radiation Dose (rads/20 mCi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Body</td>
<td>0.13</td>
</tr>
<tr>
<td>Bone Total</td>
<td>0.70</td>
</tr>
<tr>
<td>Red Marrow</td>
<td>0.56</td>
</tr>
<tr>
<td>Kidneys</td>
<td>0.80</td>
</tr>
<tr>
<td>Liver</td>
<td>0.06</td>
</tr>
<tr>
<td>Bladder Wall</td>
<td>2 hr void  2.60</td>
</tr>
<tr>
<td>Ovaries</td>
<td>4.8 hr void  6.20</td>
</tr>
<tr>
<td>Tests</td>
<td>4.8 hr void  0.16</td>
</tr>
</tbody>
</table>


CLINICAL PHARMACOLOGY

Following intravenous administration of Technetium Tc 99m Medronate, skeletal uptake occurs as a function of blood flow to bone and bone efficiency in extracting the complex. Bone mineral crystals are generally considered to be hydroxyapatite, and the complex appears to have an affinity for the hydroxyapatite crystals in bone.

Clearance of the complex from blood is rapid following intravenous administration. Up to 50% of the injected dose is usually cleared by urinary excretion within the first 3-6 hours. Bone uptake is usually 40-50% within 3 hours following intravenous administration.

INDICATIONS AND USAGE

Technetium Tc 99m Medronate may be used as a bone imaging agent to delineate areas of altered osteogenesis.

CONTRAINDICATIONS

None known.

WARNINGs

This class of compound is known to complex cations such as calcium. Particular caution should be used with patients who have, or who may be predisposed to, hypocalcemia (i.e., alkalosis). This radiopharmaceutical drug product should not be administered to children, to pregnant women, or to nursing mothers, unless the expected benefit to be gained outweighs the potential risk.

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

General

Technetium Tc 99m Medronate as well as other radioactive drugs, must be handled with care and appropriate safety measures should be used to minimize radiation exposure to clinical personnel. Also, care should be taken to minimize radiation exposure to the patient consistent with proper patient management.

To minimize radiation dose to the bladder, the patient should be encouraged to void when the examination is completed and as often thereafter as possible for the next 4-6 hours.

This preparation contains no bacteriostatic preservative. Technetium Tc 99m Medronate should be formulated within six (6) hours prior to clinical use.

Pregnancy Category C

Adequate reproductive 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 should be used in pregnant women only when clearly needed.

Nursing Mothers

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

 Pediatric Use

Safety and effectiveness in children have not been established.

ADVERSE REACTIONS

No adverse reactions specifically attributable to the use of Technetium Tc 99m Medronate have been reported.

DOSEAGE AND ADMINISTRATION

The suggested dose range for i.v. administration, after reconstitution with oxidant-free sodium pertechnetate Tc 99m Injection, to be employed in the average patient (70 kg) is:

- Bone imaging: 10-20 mCi Technetium Tc 99m Medronate
- Scanning post-injection is optimal at about 1-4 hours.
- Slow administration of the drug over a period of 30 seconds is recommended.
- The patient dose should be measured by a suitable radioactivity calibration system immediately prior to administration.
- 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

Diagnostic Isotopes' Technetium Tc 99m Medronate Kit is supplied as a sterile, pyrogen-free kit containing 10 vials.

Each 10 ml vial contains 10 mg medronic acid, 0.17 mg (minimum) stannous chloride (maximum stannous and stannic chloride 0.29 mg), and 2 mg ascorbic acid. The pH has been adjusted to 4-8 with either HCl or NaOH prior to lyophilization. Following lyophilization, the vials are sealed under a nitrogen atmosphere.

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<tr>
<th></th>
<th>DBI RADIOIMMUNOASSAY</th>
<th>IMMUNOENZYME ASSAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT INCUBATION:</td>
<td>15 minutes at 37°C</td>
<td>1 minute</td>
</tr>
<tr>
<td>SENSITIVITY:</td>
<td>0.0004 μM (700 times more sensitive)</td>
<td>0.3 μM</td>
</tr>
<tr>
<td>EXOGENOUS INTERFERENCE:</td>
<td>None</td>
<td>Lypemic Icterus Hemolysis</td>
</tr>
<tr>
<td>STANDARDS SUPPLIED:</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>PRICE:</td>
<td>*57½ cents per tube</td>
<td>$1.86 per tube</td>
</tr>
</tbody>
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Multi-gated blood pool studies can be acquired in either single or sequential modes with the ejection fraction data displayed for one study or up to eight stress or intervention studies at once.

Regional wall motion changes within the heart can be displayed through "stroke volume" and "ejection fraction" images. Additionally, paradox images enhance the diagnosis of dyskinetic myocardial segments for complete cardiac analysis.

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The ACAP Program provides an automated wall detection method for outlining left ventricular borders and provides accurate, reproducible left ventricular ejection fractions.
**Acquisition and Processing Features**

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**Extended Wall Motion Analysis**

Display of regional volume changes on a pixel by pixel basis is provided in a static gray scale format via “functional” images. Analysis of dyskinetic wall motion is obtained by use of the “paradox” image. Overlap of the diastolic and systolic borders over the “stroke volume” image are possible to aid in ROI assignment over the left ventricle.

ECAP and ACAP are part of our commitment to nuclear cardiology. For complete information on ECAP, ACAP, and/or our line of nuclear cardiology products, Pho/Gamma* LEM*, Pho/Gamma SFOV and LFOV™, Pho/Con®, Gamma/Cor*, Slant Hole Collimator, or Image Magnifier-Rotator, call or write today.

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The RAO view shows akinesis of the lower antero-lateral wall and apex; and contraction of the inferior wall and high up the antero-lateral wall. The LAO view shows good contraction posteriorly and akinesis of the septal aspect of the chamber. Patient was injected IV with 20mCi of 99mTc-labelled Human Serum Albumin. The agent was prepared using the New England Nuclear Electrolysis Kit for labelling HSA. Write or call for a portfolio of Brattle-gated lung, liver and heart studies.

No knobs, no meters, no errors
The spartan panel above tells the second-best part of our story. If you want to photograph peak systole, press the SYSTOLE button. If, say, you want systole only at full expiration, press the EXPIRATION button as well. If only breathing is relevant, don't press the heart button.

The Brattle is connected to the patient and to your gamma (or x-ray or ultrasonic) camera. Whenever the patient is in the selected phase, both the scope and the scaler on your gamma camera are gated ON, and film is exposed. Otherwise, they are OFF.

Brattles lock onto patients — and stay locked on
It doesn't matter if the patient's heart rate and breathing depth change while he's under the collimator because we stay right with him. Brattles contain an ECG to track heart, a plethysmograph to track respiration, and a tiny computer to deduce systole and diastole times from the heart signal. And because it's all built in, your operator need not be a physiologist.

We don't cover our tracks — we print them
The panel lights flash whenever the patient reaches the selected phases; and pushing the REORDER-ON button gets you an ECG tracing marked with breathing and camera-on times. You can verify function before, during and after exposure.

A single pair of axillary electrodes captures both heart and breath
It's easy. And we supply disposable, pre-filled electrodes.

Some Brattles have been in clinical use for over three years — in community and major hospitals
More than half of our instruments are in community hospitals and the list is growing rapidly. Upon request, we'll supply names of happy users in your area.

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Ask your NEN man about Brattles and HSA Kits. He can show you a portfolio of clinical pictures and arrange to have one of our people give you a demo. Or write or call us direct. We'll send you brochures on this and other models, and will give you your own set of clinical pictures and a bibliography on gated scintigraphy. If you wish, we'll even make you a Brattle owner. (This is the best part of our story.)

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