When nuclear medicine discusses gallium imaging, one name will keep coming up...

Neoscan
gallium citrate Ga 67
from medi-physics™

Neoscan can aid in demonstrating the presence and extent of Hodgkin’s disease, lymphoma and bronchogenic carcinoma. Positive uptake in the absence of prior symptoms warrants follow-up as an indication of a potential disease state.

Neoscan means gallium citrate Ga 67 from Medi-Physics, Inc. Neoscan can aid in demonstrating the presence and extent of Hodgkin’s disease, lymphoma and bronchogenic carcinoma. Positive uptake in the absence of prior symptoms warrants follow-up as an indication of a potential disease state.

Neoscan means gallium citrate Ga 67 that is produced by MPI on both the East and West Coasts and is available from 6 locations across the country for easy access when you need it. Neoscan is calibrated twice weekly in two convenient sizes: 3.0mCi and 13.2mCi.

Neoscan means gallium citrate Ga 67 that MPI will send to you with no additional delivery charge along with your supply of Sodium Iodide I 123, Technetium Prepared Products or Xenon 133-V.S.S. (xenon Xe 133).
With deliveries to meet your needs.

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Neoscan™
gallium citrate Ga 67

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

DESCRIPTION: Neoscan for diagnostic use is supplied as a sterile, apyrogenic aqueous solution for intravenous injection. Each milliliter of the solution contains 2 millicuries of gallium Ga 67 at calibration time, no-carrier-added, 2.5% sodium citrate, and 1% benzyl alcohol as a preservative. The pH is between 4.5-7.5. Gallium Ga 67, with a half-life of 78.1 hours, is cyclotron produced by the proton irradiation of zinc Zn 66-enriched zinc oxide. The radionuclidic composition, at calibration time, is not less than 98.9% of the total activity from gallium 67 with less than 1% of the total radioactivity due to gallium 66 and with zinc 65 and other radiocontaminants contributing less than 0.1% of the total activity.

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

PRECAUTIONS: A thorough knowledge of the normal distribution of intravenously administered gallium citrate Ga 67 is essential in order to accurately interpret pathologic studies. The finding of an abnormal gallium concentration usually implies the existence of underlying pathology, but further diagnostic studies should be done to distinguish benign from malignant lesions. Neoscan is intended for use as an adjunct in the diagnosis of certain neoplasms. Negative results do not preclude the presence of disease.

Gallium citrate Ga 67 as well as other radioactive drugs, must be handled with care. Appropriate safety measures should be used to minimize radiation exposure to clinical personnel and to patients, 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. Gallium citrate Ga 67 should be used in pregnant women only when clearly needed.

Gallium citrate Ga 67 has been found to accumulate in breast milk and should not be used in nursing mothers.

Safety and effectiveness in children have not been established.

ADVERSE REACTIONS: No adverse reactions have been reported with the use of Neoscan at this time.

DOSEAGE AND ADMINISTRATION: The recommended adult (70 kg) dose is 2-5 millicuries. Neoscan is intended for intravenous administration only. The patient dose should be measured by a suitable radioactivity calibration system immediately prior to administration.

Studies indicate the optimal tumor-to-background concentration ratios are often obtained about 48 hours after administration. However, considerable biological variability may occur in individuals, and acceptable images may be obtained as early as 6 hours and as late as 120 hours after injection.

Approximately 10% of the administered dose is excreted in the feces during the first week after injection. Daily laxatives and/or enemas are recommended from the first day of injection until the final images are obtained in order to cleanse the bowel of radioactive material and minimize the possibility of false positive studies.

Radiopharmaceuticals should be used only by persons 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: Neoscan is supplied as a no-carrier-added sterile apyrogenic aqueous solution for intravenous use. Each milliliter contains 2 mCi ± 10% gallium Ga 67 at the time of calibration with 2.5% sodium citrate. Benzyl alcohol 1% is present as a preservative. The pH is between 4.5-7.5.

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

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Supplied as $^{57}\text{Co}$ (2 and 3 mCi) and $^{133}\text{Ba}$ (0.5 and 1.0 mCi) 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 ±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 $^{57}\text{Co}$ or $^{133}\text{Ba}$ (10 and 100 µCi). 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 $^{57}\text{Co}$ (100 µCi) sealed in the tip of a ball-point pen shaped holder with a brass shield for the active end.

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

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

$^{129}\text{I}$ (0.1 µCi) gamma/X-ray spectrum is virtually identical to $^{128}\text{I}$, and has a half-life of $1.57 \times 10^7$ years. Calibration in terms of $^{128}\text{I}$ is available. The length is 100 mm, maximum diameter 15 mm—suitable for most manual and automatic counters. Active material is sealed in a plastic capsule attached to a handling rod. Other nuclides: $^{241}\text{Am}$, $^{133}\text{Ba}$, $^{57}\text{Co}$, $^{60}\text{Co}$, $^{137}\text{Cs}$, $^{54}\text{Mn}$, $^{22}\text{Na}$, $^{75}\text{Se}$, $^{123}\text{mTe}$, $^{88}\text{Y}$ and mock $^{131}\text{I}$.

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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 radioactive drugs, 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.

For ordering, customer service and technical information call toll-free: (800) 431-1146, until 7:00 p.m. Eastern Standard Time. In New York State, call (914) 351-2131, ext. 227.
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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 (1½" 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 99mTc needs of every lab.

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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.

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Small brown spheres number one for diagnosis.

Human Albumin Millimicrospheres labelled with Tc-99m appears to be an excellent agent for visualization of the Reticulo-Endothelial System and imaging of airways potency.

The answer lies in the particle size of the Millimicrospheres which reflects the strict quality control by Sorin Biomedica.

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"Smart" imaging device. Microprocessor-based logic lets you record permanently the diagnostic image, and all pertinent patient examination data.

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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.

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

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

**CONTRAINDICATIONS**

None.

**WARNINGS**

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

Ideally, examinations using radiopharmaceuticals, especially those electively in nature, of a woman of childbearing capability should be performed during the first 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.
The interview excerpted here was conducted with Glen W. Hamilton, M.D., Chief, Nuclear Medicine Section, Veteran's Administration Hospital, Seattle, Washington. Dr. Hamilton is also an Associate Professor of Medicine, University of Washington School of Medicine.

Q. Of the nuclear cardiology studies available in clinical practice today, which are the most difficult to interpret?

A. Thallium images are probably the most difficult to interpret, and pyrophosphate are probably the next. In about 60% of all abnormal studies, the abnormality is quite obvious. The remaining 40% are quite difficult to read. As the physician gains experience, he will be able to read about half of those with confidence, but about 20% of all thallium studies remain difficult to interpret. Experienced observers will have legitimate disagreement as to whether a given study is normal or abnormal.

Q. Which of these tests are generally the best in the assessment of left ventricular function? Is this also the best study for assessing wall motion?

A. The multiple gated blood pool study yields the greatest clinical information compared to the difficulty of performing the test and, therefore, is the one we use in our clinical practice when we wish to assess a patient's ventricular function. The best study for assessing wall motion is probably the multiple gated study. It is not perfect, in that the right ventricle and the left ventricle overlap in all but the LAO view... but for most laboratories it is the most practical way to assess wall motion.

Q. What studies would you recommend to a nuclear physician or cardiologist beginning nuclear cardiology in a community hospital?

A. I would recommend two studies: multiple gated blood pool studies, and thallium imaging. The ventricular function measurements obtained from multiple gated studies are useful not only in patients who have suspected coronary disease, but also in a wide variety of other patients, such as people with lung disease, older patients who have undetected ventricular dysfunction, or presurgical patients. Clearly, this is going to be the largest volume study, and that's the place where they should start. After doing resting ventricular function studies, they should progress to thallium imaging. Six months from now, there should be enough data available on rest/exercise ventricular function studies using multiple gated imaging to indicate whether this technique is of general usefulness.

Q. Which studies are the most difficult to perform?

A. Pyrophosphate studies are obviously the simplest to perform. The multiple gated blood pool study is performed quite simply. However, the equipment required is not present in every laboratory at the present time. Thallium, being a less ideal isotope, is probably the most difficult study, in terms of the technique required to achieve good diagnostic results.

Q. What may be the single most important use of these nuclear cardiology studies in five years?

A. First, I'm confident we will be noninvasively measuring ventricular function in a wide range of patients with various disease states — coronary artery disease, cardiomyopathy, chronic lung disease, valvular heart disease and many others. We will be able to follow these patients, correctly select the optimal time for surgical intervention, and alter medical therapy so that treatment is optimal. There's no question that this will happen. Secondly, if these tests turn out to be quite sensitive for the detection of coronary artery disease in its early presymptomatic stages, it may be possible to alter that disease by various interventions. This could become a very important national endeavor which could have far-reaching effects on health in this country.

Q. How widespread do you see these techniques becoming?

A. The need for studies of ventricular function will be comparable to the need for lung or bone scans. I really expect that most existing nuclear medicine laboratories, and, generally any hospital of two or three hundred beds, will be able to perform ventricular function studies within the next several years.

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

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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.

Above – Diffuse metastatic disease throughout torso and limbs.
The Damon Diagnostics LiquiSol™ Cortisol I^*RI A Test System is the first to combine the benefits of liquid and solid phase technology in a single tube radioimmunoassay procedure. Precise amounts of anti-Cortisol specific antibody in solution are encapsulated within a semi-permeable nylon membrane. Hundreds of thousands of microcapsules per test produce the following results:

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**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
A 19-year-old male with known eosinophilic granuloma involving the mandible bilaterally was referred for a bone scan to rule out occult sites of involvement. Bone imaging with OSTEOLITE showed increased uptake in the rami of the mandible on both sides. The medial portion of the mandible anteriorly and the remainder of the skull, the spine, ribs, pelvis and long bones show no abnormalities suggestive of multiple foci of disease. The increased area of uptake around the left ankle was attributed to soft tissue swelling due to a recent ankle sprain.

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 pertechnetate Tc 99m to form a diagnostic skeletal imaging agent for intravenous administration. Each vial contains 10mg medronate disodium, and 0.85mg sodium chloride dihydrate; pH is adjusted to between 7.0-7.5 with hydrochloric acid and/or sodium hydroxide solution. The contents of the vials are lyophilized and stored under nitrogen.

**Physical Characteristics:** Technetium Tc 99m decays by isomeric transition with a physical half-life of 6.02 hours. (Source: Martin, M. J. Nuclear Data Project, Oak Ridge National Laboratory, March, 1976.) Photos that are useful for imaging studies are listed in Table 1.

**Table 1. Principal Radiation Emission Data—Technetium Tc 99m**

<table>
<thead>
<tr>
<th>Mean %</th>
<th>Mean Disintegration Energy (keV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gamma</td>
<td>88.96</td>
</tr>
</tbody>
</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 2. Physical Decay Chart:**

<table>
<thead>
<tr>
<th>Fraction Remaining Hours</th>
<th>Fraction Remaining Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100.00</td>
</tr>
<tr>
<td>1</td>
<td>891.00</td>
</tr>
<tr>
<td>2</td>
<td>794.00</td>
</tr>
<tr>
<td>3</td>
<td>708.00</td>
</tr>
<tr>
<td>4</td>
<td>631.00</td>
</tr>
<tr>
<td>5</td>
<td>562.00</td>
</tr>
<tr>
<td>6</td>
<td>501.00</td>
</tr>
<tr>
<td>7</td>
<td>447.00</td>
</tr>
</tbody>
</table>

*Calibration Time

**External Radiation:** The specific gamma ray constant for Technetium Tc 99m is 0.8Kr/mC-hr at 1cm. The half-value layer is 0.2mm of Pb. To facilitate control of radiation exposure from millicurie amounts of Technetium Tc 99m, the use of a 6.35mm thick standard radiation shield lead shield will attenuate the radiation emitted by a factor greater than 10.

**Table 3. Radiation Attenuation By Lead Shielding**

<table>
<thead>
<tr>
<th>Shield Thickness (mm)</th>
<th>Coefficient of Attenuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>0.5</td>
</tr>
<tr>
<td>0.95</td>
<td>1.0</td>
</tr>
<tr>
<td>1.8</td>
<td>1.0</td>
</tr>
<tr>
<td>2.7</td>
<td>1.0</td>
</tr>
<tr>
<td>3.6</td>
<td>1.0</td>
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<tr>
<td>4.5</td>
<td>1.0</td>
</tr>
<tr>
<td>5.4</td>
<td>1.0</td>
</tr>
<tr>
<td>6.3</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**Clinical Pharmacology:** Upon intravenous injection, Technetium Tc 99m OSTEOLITE exhibits a specific affinity for areas of altered osteogenesis. In humans, blood levels fall to 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.

**Table 4. Absorbed Radiation Dose**

Technetium Tc 99m Medronate Sodium

<table>
<thead>
<tr>
<th>Total Body</th>
<th>Bone Total</th>
<th>Red Marrow</th>
<th>Kidneys</th>
<th>Liver</th>
<th>Bladder Wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.13</td>
<td>0.70</td>
<td>0.56</td>
<td>0.62</td>
<td>0.16</td>
<td>2.60</td>
</tr>
<tr>
<td>4.8 hr void</td>
<td>5.20</td>
<td>0.24</td>
<td>0.34</td>
<td>0.16</td>
<td>0.22</td>
</tr>
</tbody>
</table>


**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 vials 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:** Aspexically inject into 2-8ml of sodium pertechnetate Tc 99m (pertechnetate 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 ensure that it is clear and free of particulate matter.

The contents of the vials are not radioactive, however, after reconstitution with sodium pertechnetate Tc 99m the contents are 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) NRP-420C (30 vial kit)**
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Hospital________________ Doctrine__________________
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City__________________ State__________ Zip______
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- Reproducible
- Accurate
- Clinically validated

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Clinically Documented
All the kits are supported by Amersham's clinical investigations. The data obtained in these investigations is published in the package insert and underlines the Amersham advantages of these kits performing optimally in the clinical environment.

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*CHROMATOGRAPHY KIT A 202 For the radiochemical determination of Tc-99m labeled MAA, microspheres, sulfur colloid, polyphosphate, diphosphonate, pyrophosphate, DTPA, and glucoheptonate, phytate, methylene diphosphonate.

*CHROMATOGRAPHY KIT B 303 For the radiochemical determination of Tc-99m labeled DMSA and DHTA.

*CHROMATOGRAPHY KIT B 313 For the radiochemical determination of Tc-99m labeled H.S.A. (double chromatography system).

*ALUMINUM BREAKTHRU KIT C 404 For the determination of aluminum ion concentration in Tc-99m pertechnetate eluate.

*CHROMATOGRAPHY KIT D 505 For the radiochemical determination of I-131, I-125, and I-123 labeled sodium iodide, RISA, iodocholesterol, iodohippurate, and rose bengal.

*CHROMATOGRAPHY KIT E 606 For the radiochemical determination of In-111 DTPA and Y6-169 DTPA.

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Institution ____________________
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INTRODUCING...

Our latest Evolutionary Technetium delivery system.

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.

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Mallinckrodt's Ultra-Technekow® FM (TECHNETIUM Tc 99m) Generator.

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 insure 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>Curies</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>0.25</td>
</tr>
<tr>
<td>101</td>
<td>0.50</td>
</tr>
<tr>
<td>106</td>
<td>0.75</td>
</tr>
<tr>
<td>102</td>
<td>1.0</td>
</tr>
<tr>
<td>103</td>
<td>1.5</td>
</tr>
<tr>
<td>104</td>
<td>2.0</td>
</tr>
<tr>
<td>105</td>
<td>2.5</td>
</tr>
<tr>
<td>107</td>
<td>3.0</td>
</tr>
</tbody>
</table>

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.

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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.

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The elscint commitment to excellence
DTPA KIT
TECHNETIUM TC 99m PENTETATE KIT

Brief summary of package insert. Before using, please consult the full package insert included in every kit.

DESCRIPTION
The kit contains 10 vials, each vial containing 5 mg sterile, pyrogen-free Sodium salt of Diethylenetriamine-pentaacetic Acid (DTPA) and 0.25 mg Stannous Chloride.

Administration is by intravenous injection for diagnostic use. The product supplied is sterile and pyrogen-free.

When sterile, pyrogen-free Sodium Pertechnetate Tc 99m is added to the vial, a chelate, Technetium Tc 99m DTPA is formed.

HOW SUPPLIED
Diagnostic Isotopes' DTPA Kit is supplied as a sterile, pyrogen-free kit containing 10 vials. Each vial contains 5 mg of Sodium salt of DTPA and 0.25 mg of SnCl2. The pH is adjusted with HCl or NaOH prior to lyophilization. Following lyophilization the vials are sealed under a nitrogen atmosphere.

CLINICAL PHARMACOLOGY
Following its intravenous administration, technetium Tc 99m DTPA rapidly distributes itself throughout the extracellular fluid space from where it is (promptly) cleared from the body by glomerular filtration.

There should be little or no binding of the chelate by the renal parenchyma. A variable percentage of the Technetium Tc 99m DTPA binds to serum proteins; this ranges from 3.7% following the single injection to approximately 10% if the material is continuously infused. Although the chelate gives useful information on the glomerular filtration rate, the variable percent which is protein bound leads to a measured glomerular filtration rate which is lower than the glomerular filtration rate as determined by inulin clearances.

Technetium Tc 99m DTPA tends to accumulate in intracranial lesions with excessive neoangiogenesis or an altered blood-brain barrier. The chelate does not accumulate in the choroid plexus.

Since Technetium Tc 99m DTPA is excreted by glomerular filtration, the images of the kidneys obtained in the first few minutes after injection represent the vascular pool within the kidney. Subsequent images of the kidneys represent radioactivity which is in the urine of both the collecting system and the renal pelvis.

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

CONTRAINDICATIONS
None known.

WARNINGS
Technetium Tc 99m DTPA should not be administered to children or to patients who are pregnant, or to nursing mothers unless the benefits to be gained outweigh the potential hazards.

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

PRECAUTIONS
Technetium Tc 99m DTPA as well as other radioactive drugs must be handled with care and appropriate safety measures should be used to minimize external radiation exposure to clinical personnel. Also, care should be taken to minimize radiation exposure to 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.

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

DOSEAGE AND ADMINISTRATION
The suggested dose range for IV administration to be employed in the average patient (70 kg) is:

Kidney imaging and glomerular filtration rate estimation: 3 to 5 mCi.

Brain imaging or renal perfusion: 10 to 20 mCi.
By the time some people can say:

"DIETHYLENETRIAMINEPENTACETIC ACID AND STANNOUS CHLORIDE IN A LYOPHILIZED STATE UNDER NITROGEN"

You've got it mixed and ready to use!

Unless you're in the business, this tongue-twister may tie you up for some time. However, it only takes one minute of mixing time to prepare Diagnostic Isotopes' one-step Technetium Tc 99m DTPA agent for injection.

DTPA becomes Technetium Tc 99m DTPA after adding sodium pertechnetate Tc 99m. Technetium Tc 99m DTPA may be used to perform kidney imaging, brain imaging, to assess renal perfusion and to estimate glomerular filtration rate.

Each DTPA kit contains 10 vials. The product is sterile, pyrogen-free, has a labeling efficiency of over 90% and a shelf life of one year... all good reasons for ordering now.

See opposite page for a brief summary of the package insert.

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Kits Available: Polyphosphate, Diphosphonate, DTPA, MAA, HSA, MDP.
Prepared Radiopharmaceuticals Available: Gallium Citrate Ga 67,
Selenomethionine Se 75, Xenon-133 (solution or gas)
Diagnostic Products Corporation has eliminated the possibility of false negatives in vitamin B-12 testing. We've done it by purifying the intrinsic factor in our $^{57}\text{Co}$ Vitamin B-12 kit. So nonspecific R-proteins are removed. The result is extremely high specificity for cobalamin (B-12). And our new purified binder has no cross-reactivity with cobalamin analogues.

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12306 Exposition Boulevard, Los Angeles, CA 90064. Call toll-free (800) 421-7171 or collect in California (213) 826-0831. In Canada, call Intermedico collect (416) 444-0732.

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THE RIGHT ACTIVITY,
THE RIGHT DOSE.
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...you could have missed the diagnosis.
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**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.

---

30-year-old female, 7 years oral contraceptive use, presented with 10-day history of increasing shortness of breath, dyspnea and nonproductive cough. No history of hemoptysis, fever or thrombophlebitis. Bilateral wheezes and rhonchi. Chest X-ray normal. Sent to nuclear medicine with suspected pulmonary embolism. Perfusion lung images showed multiple peripheral defects, many concave and wedge-shaped. The ventilation study showed severe bilateral air trapping, particularly lower lobes, corresponding in distribution to perfusion defects. Studies compatible with alpha-1-antitrypsin deficiency, confirmed by laboratory tests.

---

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

Please see following page for full prescribing information.
Xenon Xe 133 Gas

DESCRIPTION: Xenon Xe 133 for diagnostic use is available at 5% gas in carbon dioxide base 85%. ACTIONS: Xenon Xe 133 is a radioisotopic gas which is a neutral uncharged molecule produced by neutron activation of xenon 132 followed by 13 nuclear disintegration and product. It tends to concentrate more in a body than in blood, plasma, water or protein tissues. In the concentration for diagnostic isotope xebra Xe 133 gas enters the alveolar wall and enters the pulmonary venous system as capillaries. The alveolar Xe 133 washout from the single breath is returned to the lungs and alveoli after a single pass through the pulmonary circulation.

CONTRAINDICATIONS: Xenon Xe 133 gas has not been proved valuable for the evaluation of pulmonary function and for measuring the lungs. It may also be applied to assessment of cardiac function.

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

BIBLIOGRAPHY: There has been no discussion on the need to administer to pregnant or lactating women because the safety of xenon 133 gas to these groups has not been evaluated.

PULMOTM

Technetium Tc 99m Aggregated Albumin Kit

AUGUST 1976

DIAGNOSTIC FOR INTRAVENOUS USE

DESCRIPTION: Each vial of PULMOTM is Tc 99m Aggregated Albumin Kit contains a preservative-free solution of high purity technetium Tc 99m aggregated albumin. Each vial contains 3.48 x 10E6, 1.3 x 10E7, 6.8 x 10E7, and 3.4 x 10E8 99mTc aggregated albumin particles to a maximum of 15.0 picograms of technetium Tc 99m per vial. The radiopharmaceutical is intended for intravenous injection. The specific activity of technetium Tc 99m aggregated albumin is greater than 5 x 10E6 99mTc particles per microliter of solution.

PHYSICAL CHARACTERISTICS: Technetium Tc 99m decays by electron capture with a physical half life of 6.03 hours. (1) Please refer to the label for storage and expiration dates.

Table 1. Principle Radiation Emission Data

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>Mean %</th>
<th>Energy</th>
<th>Energy</th>
<th>Mean</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tc 99m</td>
<td>100</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>Tc 99m</td>
<td>100</td>
<td>0.30</td>
<td>0.30</td>
<td>0.30</td>
<td>0.30</td>
</tr>
<tr>
<td>Tc 99m</td>
<td>100</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Tc 99m</td>
<td>100</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
</tr>
</tbody>
</table>

Table 2. Radiation Attenuation by Light Scattering

<table>
<thead>
<tr>
<th>Scattered Light (mm)</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.02</td>
<td>0.000</td>
</tr>
<tr>
<td>0.05</td>
<td>0.005</td>
</tr>
<tr>
<td>0.10</td>
<td>0.010</td>
</tr>
<tr>
<td>0.20</td>
<td>0.020</td>
</tr>
<tr>
<td>0.40</td>
<td>0.040</td>
</tr>
<tr>
<td>0.60</td>
<td>0.060</td>
</tr>
<tr>
<td>1.00</td>
<td>0.100</td>
</tr>
</tbody>
</table>

For correction of photoelectric and Compton scatter, the fractions that remain at selected areas are shown in Table 3.

Table 3. Pulmonary Decay Chart: Tc 99m Half-Life 6.03 Hours

<table>
<thead>
<tr>
<th>Hour</th>
<th>Fraction Remaining</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1000</td>
</tr>
<tr>
<td>1</td>
<td>861</td>
</tr>
<tr>
<td>2</td>
<td>788</td>
</tr>
<tr>
<td>3</td>
<td>712</td>
</tr>
<tr>
<td>5</td>
<td>685</td>
</tr>
<tr>
<td>7</td>
<td>652</td>
</tr>
<tr>
<td>9</td>
<td>621</td>
</tr>
</tbody>
</table>

The recommended number of aggregated albumin particles to be administered per day is 200 x 10E6 (200 million). The maximum number of aggregated particles is 200 x 10E6.

For ease and accuracy in preparing the agent, it is recommended that the suspension be diluted with a radioactive solution of 500 x 10E6 aggregated particles to further dilute to a volume of 1% of each treatment, for the dose required for each treatment.

Table 4. Table of Percentages of Patients who have been Treated

<table>
<thead>
<tr>
<th>Recombination Activity (mCi)</th>
<th>1 mCi</th>
<th>3 mCi</th>
<th>6 mCi</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.25</td>
<td>0.50</td>
<td>0.75</td>
</tr>
<tr>
<td>50</td>
<td>0.15</td>
<td>0.35</td>
<td>0.50</td>
</tr>
<tr>
<td>100</td>
<td>0.08</td>
<td>0.25</td>
<td>0.30</td>
</tr>
</tbody>
</table>

The number of particles per milliliter is 1 x 10E7, the number of particles per 0.25 x 10E6, and the number of particles per 0.50 x 10E6.

DOSIMETRY

The absorbed radiation dose (D) to an average person (107g) from a source of 1 x 10E7 particles is 0.025 mSv.

Table 5. Radiation Dose

<table>
<thead>
<tr>
<th>Tissue</th>
<th>Whole Body Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver</td>
<td>0.02</td>
</tr>
<tr>
<td>Bladder</td>
<td>0.003</td>
</tr>
<tr>
<td>Dose</td>
<td>0.003</td>
</tr>
</tbody>
</table>

(1) (Method of Calculation: A Scheme for Absorbed Dose Calculations for Biologically Relevant Radionuclides, Supplement 1, N. M. P. No. 1, 17, 1976)

BIBLIOGRAPHY: Tc 99m aggregated albumin is a system that contains 3.4 x 10E6 to 6.8 x 10E7 particles in a volume of 1% of 10E6 particles.

Table 6. Summary of the Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>0.025</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.003</td>
</tr>
</tbody>
</table>

PULMOTM contains no preservatives, after reconstitution the solution should be stored at room temperature and used immediately.

DIRECTIONS

Aspirate approximately equal amounts of aggregated albumin Tc 99m, containing about 20 to 50 million particles per ml, into a sterile syringe and use the solution without delay.

(1) (Method of Calculation: A Scheme for Absorbed Dose Calculations for Biologically Relevant Radionuclides, Supplement 1, N. M. P. No. 1, 17, 1976)

BIBLIOGRAPHY: Tc 99m aggregated albumin is a system that contains 3.4 x 10E6 to 6.8 x 10E7 particles in a volume of 1% of 10E6 particles.

Table 7. Summary of the Results

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</thead>
<tbody>
<tr>
<td>Average</td>
<td>0.025</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.003</td>
</tr>
</tbody>
</table>

PULMOTM contains no preservatives, after reconstitution the solution should be stored at room temperature and used immediately.

DIRECTIONS

Aspirate approximately equal amounts of aggregated albumin Tc 99m, containing about 20 to 50 million particles per ml, into a sterile syringe and use the solution without delay.
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Bronchogenic Carcinoma
Focal Inflammatory Lesions

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Diagnostic
Sterile Solution
ADDS A NEW INDICATION

Brief Summary:

INDICATIONS AND USAGE
Gallium Citrate Ga 67 may be useful to demonstrate the presence and extent of Hodgkin's Disease, lymphoma, bronchogenic carcinoma, and focal inflammatory lesions. 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
Gallium Citrate Ga 67 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. If this drug is administered to nursing mothers, artificial feeding should be temporarily substituted for the mother's milk. Ideally, examinations using radiopharmaceuticals, especially those elective in nature, of women of childbearing capability, should be performed during the first few (approximately ten) days following the onset of menses.

PRECAUTIONS
A thorough knowledge of the normal distribution of intravenous administered Gallium Citrate Ga 67 is essential in order to accurately interpret pathologic states. The finding of an abnormal Gallium Ga-67 concentration usually implies the existence of underlying pathology, but further diagnostic studies should be done to distinguish benign from malignant lesions. Gallium Citrate Ga 67 is intended for use as an adjunct in the diagnosis of certain neoplasms as well as focal areas of infection. Certain pathologic conditions may yield up to 40 percent false negative Gallium Ga-67 studies. Therefore, a negative study cannot be definitely interpreted as ruling out the presence of disease.

Adequate reproduction studies have not been performed in animals to determine whether the 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.

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 occupational workers.

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
None have been reported.

DOSE AND ADMINISTRATION
The recommended adult (70 kg) dose of Gallium Citrate Ga 67 is 2-5 mCi. Gallium Citrate Ga 67 is intended for intravenous administration only.

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

HOW SUPPLIED
Gallium Citrate Ga 67 sterile solution is available in 3 mCi, 6 mCi and 12 mCi vials on calibration date. Each ml contains 2 mCi of Gallium Ga-67 on the calibration date, as a complex formed from 8.3 mg gallium chloride Ga-67, 1.9 mg of sodium citrate, 7.6 mg of sodium chloride, 0.9% benzyl alcohol v/v as preservative. The pH is adjusted to between 5.5-8.0 with hydrochloric acid and/or sodium hydroxide solution.
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Wanted. Nuclear scientist to act as Chief of Nuclear Medicine Division at the University of Florida College of Medicine. A minimum of one year's training in nuclear medicine is required. Board certification in Radiology preferred but will consider candidates with training in Internal Medicine. Experience in nuclear cardiology is desirable. Rank and salary depending on qualifications and experience. Application deadline is August 24, 1979, Position available after July 1, 1979. Send curriculum vitae to Clyde M. Williams, Chairman, Department of Radiology, University of Florida College of Medicine, J. Hills Millen Health Center, Gainesville, Florida, 32610. An Equal Employment Opportunity Affirmative Action Employer.

AS OF JULY 1, 1979 LOS ANGELES County Harbor-UCLA Medical Center, Division of Nuclear Medicine, in Torrance, Ca. will have the following openings: 1 Nuclear Medicine Technologist I, 2 Nuclear Medicine Technologist II. Please contact: Tony Olguin (213) 533-2842 or write to Tony at Harbor-UCLA Medical Center, Nuclear Medicine Division, 1000 W. Carson Street, Torrance, CA 90609.

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NUCLEAR MEDICINE TECHNOLOGIST 500-bed New Haven area hospital seeking a registered nuclear medicine technologist interested in active participation in varied diagnostic imaging studies and research. Very active cardiac section. Opportunities for personal and professional growth. This position offers excellent starting salary plus a full range of benefits including hospital, medical and life insurance, tax-sheltered annuities and retirement plan. Submit resume to Personnel Department, The Hospital of St. Raphael, 1450 Chapel Street, New Haven, Conn. 06511.

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RADIOPHARMACEUTICAL CHEMIST: The University of Maryland is soliciting applicants for a joint appointment in the departments of Medicinal Chemistry/Pharmacognosy, and Medicine. Applicants must be experienced in the development of new radiotherapeutics. Salary and academic rank dependent on background and experience. Please send curriculum vitae to Dr. Ralph Blomster, Chairman, Department of Medicinal Chemistry and Pharmacognosy, School of Pharmacy, University of Maryland at Baltimore, 636 W. Lombard Street, Baltimore, Maryland 21201.

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- SULFUR COLLOID
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Fulltime position in Nuclear Medicine at Assistant Professor level at affiliated teaching Veterans Administration Med. Ctr. (Palo Alto).

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Interested persons please send complete curriculum vitae including names and addresses of 5 referees to:

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Nuclear Medicine - Rm. C022
Stanford University Medical Ctr.
Stanford, CA 94305
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This two and one half day postgraduate course, sponsored by the Harvard Medical School and the Children's Hospital Medical Center, will cover the fundamental aspects of pediatric nuclear medicine, including radiopharmaceuticals, instrumentation, dosimetry, technology, as well as established and newer clinical applications. It is desirable to specialists in nuclear medicine, pediatrics, pediatric surgery, or pediatric radiology.

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For further information, contact: S. Treves, M.D., Chief, Division of Nuclear Medicine, Children's Hospital Medical Center, 300 Longwood Avenue, Boston, MA 02115 - Telephone: (617) 734-6000, extension 3366.

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For information contact John A. Burdine, M.D., Chief, Nuclear Medicine Section, Departments of Internal Medicine and Radiology, 6720 Bertner Avenue, Houston, TX 77030; phone 713-521-2272.

Volume 20, Number 8
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Joseph P. Kriss, M.D.
Director, Div of Nuclear Medicine
Stanford University Medical Center
Stanford, CA 94305

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RADIO PHARMACIST

The Toronto General Hospital (a teaching hospital of the University of Toronto) has an opening for a suitably qualified Radio Pharmacist in the departments of Pharmaceutical Services and Nuclear Medicine. The position is supervisory in nature and calls for experience in all aspects of radio pharmacy, including quality control, assay and calibration, chromatography, record-keeping and research.

Please forward a resume outlining qualifications and work experience to:

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Hilja Ruun (Mrs.)
Employee Relations
101 College Street
Toronto, Ontario
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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.²³

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

²Information 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.
Organisation 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 "technetium-99m" image.

Medi-Physics Sodium Iodide I 123 is important for informative thyroid studies. The principal gamma emission of I 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 radioiodine uptake measurement may be performed simultaneously. Sodium Iodide I 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) 227-0483 for further information.

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

**SODIUM IODIDE I 123**

**CAPSULES AND SOLUTION FOR ORAL ADMINISTRATION**

**DESCRIPTION:** Sodium iodide I 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 millicuries per ml.

**INDICATIONS:** Sodium iodide I 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 capability 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 I 123 would be preferable to the use of I 131 in order to minimize radiation dosage.

**PRECAUTIONS:** Sodium iodide I 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 I 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 I 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 I 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 fasting state. One case of gastric odor on the breath was presumed to be attributable to the presence of telluron.

**DOSE 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 I 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 I 123 for oral administration is supplied in aqueous solution in glass vials and in capsules.
Brief summary of Package Insert. Before using, please consult the full Package Insert included in each kit.

**Description:** Each vial of OSTEOSCAN contains 5.9 mg etidronate disodium, 0.16 mg stannous chloride and 0.56 mg sodium ascorbate as active ingredients. Upon addition of ADJUVANT-FREE sodium pertechnetate Tc99m the etidronate disodium and stannous chloride combine with Tc99m to form a stable soluble complex.

**Clinical pharmacology:** When injected intravenously, Tc99m-labeled OSTEOSCAN has a specific affinity for areas of altered osteogenesis. Areas of bone which are undergoing neoplastic invasion often have an unusually high turnover rate which may be imaged with Tc99m-labeled OSTEOSCAN. Three hours after intravenous injection of Tc99m-labeled OSTEOSCAN, an estimated 40-50% of the injected dose has been taken up by the skeleton. At this time approximately 50% has been excreted in the urine and 5% remains in the blood. A small amount is retained by the soft tissue. The level of Tc99m-labeled OSTEOSCAN excreted in the feces is below the level detectable by routine laboratory techniques. Tc99m-labeled OSTEOSCAN is also taken up in areas of necrosis and severely injured myocardial cells. Approximately 1.5 hours following intravenous injection 0.01-0.02 percent of the administered dose per gram of tissue is taken up by an acutely infarcted myocardium.

**Indications:** OSTEOSCAN is a skeletal imaging agent used to demonstrate areas of altered osteogenesis and to a cardiac imaging agent used as an adjunct in the diagnosis of acute myocardial infarction. When used as an adjunct in the diagnosis of myocardial infarction the incidence of false negatives has been found to be approximately 14% and false positives about 10%. False negatives may result from failure to observe temporal requirements for good myocardial imaging; false positives may be related to coronary heart disease, left ventricular aneurysms, trauma, repeated cardioversion following coronary by-pass surgery or old myocardial infarcts.

**Contraindications:** None known.

**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. The technetium used to tag the product should be routinely tested for molybdenum and aluminum. If an unacceptable level of either is found, the technetium should not be used. Radiopharmaceuticals should be used only by physicians who are qualified by specific training in the safe use 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 insure minimum radiation exposure to the patient, consistent with proper patient management, and to insure minimum radiation exposure to occupational workers. Cardiac Imaging: Both prior to and following Tc99m-labeled OSTEOSCAN administration, patients should be encouraged to drink fluids. Patients should void as often as possible after the Tc99m-labeled OSTEOSCAN 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.

**Adverse reactions:** None known.

**Dosage and administration:** The recommended adult dose of Tc99m-labeled OSTEOSCAN is 10-15 mCi. The activity of each dose should be measured by a suitable radiation calibration system just prior to administration. The dose should be given intravenously by slow injection. For optimal results bone imaging should be done 2-4 hours post injection and cardiac imaging 1-1½ hours post injection. The acute myocardial infarct can be visualized from 1-9 days following onset of symptoms with maximum uptake at 2-3 days. It is recommended that three projections of the heart be made (antero, left anterior oblique and left lateral).

**References:**
Surgeons ask... Nuclear Medicine answers.

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See following page for brief summary of package insert
INDICATIONS
IBRIN is indicated for use in prospective studies for the early detection and
subsequent monitoring of developing deep-vein thrombosis in patients with
symptoms suggestive of deep-vein thrombosis with or without associ-
at ed pulmonary embolism or in patients with pulmonary embolism,
with or without evidence of peripheral deep-vein thrombosis. In patients
with established, old or “inactive” thrombus, the test will be positive only if
radioactive-labeled fibrin deposition occurs in a sufficient quantity to
allow detection. Its use is not contraindicated in patients on anticoagu-
lants.

CONTRAINDICATIONS
There are no known contraindications to the use of IBRIN. However, it
should be noted that the iodides given to block the uptake of I by the
thyroid gland are contraindicated in patients with a known sensitivity to the
iodides.

WARNINGS
This radiopharmaceutical should not be administered to patients under
18 years of age, to patients who are pregnant, or to patients who are lactat-
ing, unless the information to be gained outweighs the potential risk.
Ideal conditions for examination and laboratory testing include
 withhold the administration of IBRIN. Extraordinary precautions have been taken in the preparation of IBRIN
Fibrinogen 125 to eliminate the possible transmission of hepatitis.
Nonetheless, the remote risk of hepatitis associated with the administra-
tion of Fibrinogen 125 cannot be entirely eliminated. The finding of viral
hepatitis is highly unlikely.

PRECAUTIONS
Care should be taken to insure minimum radiation exposure to the patient,
consistent with proper patient management, and to insure minimum radia-
tion exposure to occupational workers.

Iodine-131 has been reported to be highly toxic to the thyroid gland
and to cause thyroiditis. Thorough medical examination and treatment
of patients with established, old or “inactive” thrombus, the test will be
positive only if radioactive-labeled fibrin deposition occurs in a sufficient
quantity to allow detection. Its use is not contraindicated in patients on anticoagu-
lants.

ADVERSE REACTIONS
There have been no reported incidence of allergic or anaphylactic reactions
following the intravenous administration of IBRIN.

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*Includes Coverage of Radiology, CT, Ultrasound and Nuclear Medicine*
TO MONITOR
The Chemotherapy Of
The Cancer Patient
Diagnostic Biochemistry Inc.

Presents

Doxorubicin [\textsuperscript{\textit{125}}I]
(Adriamycin)*
Radioimmunoassay
Kit
For Investigational Use Only.

High circulating levels of Adriamycin\textsuperscript{*} may result in irreversible myocardial damage, bone marrow depression, and gastrointestinal trauma.\textsuperscript{1,2} Knowledge of circulating Adriamycin\textsuperscript{*} concentrations therefore, is important.

Our \textsuperscript{125}I Doxorubicin (Adriamycin) Radioimmunoassay Kit features a rapid, simple procedure with 100 picogram sensitivity in serum, plasma or urine. Six precalibrated standards as well as a control serum are supplied. The stable \textsuperscript{125}I tracer and one hour incubation time makes this kit a unique tool in cancer management.

*Tradename Adria Labs.

Methotrexate [\textsuperscript{\textit{125}}I]
Radioimmunoassay
Kit

High dose Methotrexate therapy in combination with leucovorin "rescue" treatment creates a vital need for close monitoring of circulating Methotrexate plasma levels. Methotrexate overdose has been shown to be associated with severe myelosuppression, renal damage\textsuperscript{3} and hepatotoxicity.\textsuperscript{3}

Our \textsuperscript{125}I Methotrexate Radioimmunoassay Kit provides a rapid simple method, with sensitivity of 10 picograms in serum, plasma, cerebrospinal fluid or urine. Results can be reported in less than 1\frac{1}{2} hours. Precalibrated human serum standards and control serum are provided as well as a stable \textsuperscript{125}I tracer and antisemur.


For further information call or write:

Diagnostic Biochemistry Inc.

(714) 452-0950

10457-H ROSELLE STREET • SAN DIEGO, CA 92121
If you think computers are infallible, you should know Madge Fossi. Her task is to catch that rare error—to the benefit of everyone who wears a Nuclibadge II radiation dosimeter.

Madge marvels at the computer’s speed and accuracy, but that never stops her from checking and rechecking its work before personnel radiation exposure reports are sent to hospitals and other facilities using Nuclibadge II Radiation Monitoring Service.

Madge and the Searle computer are part of the team that evaluates exposed film and TLD chips, and issues the reports so essential to the long-term protection of hospital and research personnel working in radiation-risk areas. The computer-generated report details radiation exposures by individual. The report is so complete it meets federal, state, and local requirements, and it is so reliable it meets Madge Fossi’s own demanding criteria.

Where an exposure exceeds levels established by each client, Madge sees that it is reported immediately by phone. That’s where personal attention really pays off.

Another way it pays is in fast response to your questions or request for changes. Our toll-free hotline is available for that purpose, and badges for new employees are on the way to you within 24 hours.

All aspects of the Searle personalized service are just as timely. Emergency reports and additional monitors are airmailed within 24 hours; exposure reports are returned within days of receipt of exposed packet and new packets are sent in plenty of time for distribution before the next monitoring period.

Our color coding system lets you know at a glance that a person is wearing the correct badge, and we have just the right Nuclibadge II monitoring badge for every situation—whole-body, wrist, ring, or wallet card.

Put Madge Fossi, the computer, and the rest of the Searle team to work for your hospital. Call toll-free today about a customized radiation monitoring program, and learn more about Searle’s personal touch.

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(In Illinois, call collect, 312/635-3387)
Help your cardiologist study heart kinetics non-invasively with Brattle-gated scintiphotos.

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 RECORDER-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.

What’s the next step?
Get in touch
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.)

Brattle Instrument Corporation
243 Vassar Street • Cambridge, Massachusetts 02139 • 617-661-0300
Since 1962, UNION CARBIDE has played a vital role in nuclear medicine that has led to a broadly integrated product line of diagnostic chemicals and instrumentation...unit dose radiopharmaceuticals...reagent kits for a wide range of organs and functions...whole body imagers...gamma cameras...image processors...and emission systems for brain and body tomography.