



REPLY TO
ATTENTION OPM

DEPARTMENT OF THE ARMY
OFFICE OF THE SURGEON GENERAL
WASHINGTON, D.C. 20314

DASG-HEQ

20 March 1973

Mr. John Bowyer
Isotopes Branch
Division of Materials Licensing
US Atomic Energy Commission
Washington, DC 20545

Dear Mr. Bowyer:

Inclosed are 15 case reports from Fitzsimons Army Medical Center, USAEC Byproduct Material License Number 05-00046-13, on the use of Tc-99m Stannous Polyphosphate for Bone Imaging.

If your review so indicates, it is recommended that the 25-patient restriction be removed.

Sincerely,

Incl
as

For *James E. Anderson*
JAMES E. ANDERSON
Colonel, MSC
Chief, Environmental Quality Division

CF:
CDR, USAEHA

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DEPARTMENT OF THE ARMY

FITZSIMONS GENERAL HOSPITAL

DENVER, COLORADO 80240

MEDEO-X

9 March 1973

SUBJECT: Transmittal of Case Reports - Tc-99m Stannous Polyphosphate
for Bone Imaging

DASG

ATTN: DASG-HEP

WASH, DC 20314

1. Reference: Amendment 26, USAEC Byproduct Material License Number 05-00046-13, 29 December 1972. Issued to Fitzsimons General Hospital.
2. Attached as inclosures are the summaries of the first 15 cases subjected to the procedures prescribed in the referenced amendment.
3. It is requested that these summaries be forwarded as soon as possible to the Materials Branch, Division of Materials Licensing, USAEC, for Mr. Bowyer's review. He has discussed them briefly by telephone with Dr. Verdon of the FGH Nuclear Medicine Service and is anticipating their receipt.
4. It is further requested that removal of the 25-patient restriction included in the referenced amendment be explored with Mr. Bowyer and this office notified of his response.

CHARLES E. WHITE

LTC, MSC

Radiological Physicist

^{99m}Tc-STANNOUS POLYPHOSPHATE FOR
BONE IMAGING

Fitzsimons General Hospital

New England Nuclear Corp.

Date	Patient No.	Sex	Age Yrs.	Wt. Lbs.	Lot No.	Dose in mCi	Volume Injected	Interval Between Dose and Imaging	Indications for Imaging	Post Image Diagnosis	Any Adverse Effect	Was Image Clinically Useful		Confirmation of Diagnosis by Other Methods		
												Yes	No	Concur **	Do not Concur **	N. Perfor
23 Jan 73	1 BL	M	54	152	4003	9.6	1 ml	3 hrs.	Pain	Metastatic Ca	no	X		Clinical X		
23 Jan 73	2 EM	M	67	170	4003	8.22	1 ml	3 hrs.	Pain	Post Trauma	no	X		X-ray X		
30 Jan 73	AG 3	F	39	138	4003	10	.9 ml	3 hrs.	Pain	Metastatic Ca	no	X		Clinical X		
31 Jan 73	4 RL	M	19	145	4003	10	1.41 ml	3 hrs.	Staging Disease	No Bone Metastases	no	X		Clinical X-ray		
31 Jan 73	5 BF	F	35	130	4003	10	1.62 ml	3 hrs.	Follow up X-ray Rx	Response to X-ray Rx	no	X		Clinical X-ray		
Feb 73	6 ME	F	47	175	4003	10	.79 ml	3 hrs.	Pain	Metastatic Ca	no	X		Clinical X		

*Describe as positive (+) or negative (-).

If positive (+), on a separate sheet, include brief clinical history and describe the reaction as well as your interpretation of the nature and cause of the reaction.

**Indicate Means

John D. Kelly

^{99m}Tc-STANNOUS POLYPHOSPHATE FOR
BONE IMAGING

New England Nuclear Corp.

Fitzsimons General Hospital

Date	Patient No.	Sex	Age Yrs.	Wt. Lbs.	Lot No.	Dose in mCi	Volume Injected	Interval Between Dose and Imaging	Indications for Imaging	Post Image Diagnosis	Any Adverse Effect	Was Image Clinically Useful		Confirmation of Diagnosis by Other Methods		
												Yes	No	Concur **	Do not Concur **	N Perf
14 Feb 73	7 EM	F	25	108	4003	10	.81 ml	3 hrs.	Pain, Wt. loss	Rib Fractures	no	X		X-ray X		
14 Feb 73	8 LA	M	53	210	4003	10	1.1 ml	3 hrs.	Follow-up Disease	? Metastases	no	X		Clinical X		
15 Feb 73	9 DS	F	41	134	4003	10	1 ml	3 hrs.	Pain, Rib Fracture	Metastatic Ca	no	X		Clinical X-ray		
22 Feb 73	10 GS	F	35	122	4003	10	3.6 ml	3 hrs.	Staging of Disease	No Metastases	no	X		Surgical X-ray Clinical		
22 Feb 73	11 AC	M	63	205	4003	10	3.8 ml	3 hrs.	Pain	Metastatic Ca	no	X		Clinical X-ray X		
23 Feb 73	12 SS	F	51	170	4003	10	2.1 ml	3 hrs.	Pain	Arthritis	no	X		Clinical X-ray X		

*Describe as positive (+) or negative (-).

If positive (+), on a separate sheet, include brief clinical history and describe the reaction as well as your interpretation of the nature and cause of the reaction.

**Indicate Means

^{99m}Tc-STANNOUS POLYPHOSPHATE FOR
BONE IMAGING

Fitzsimons General Hospital


New England Nuclear Corp.

Date	Patient No.	Sex	Age Yrs.	Wt. Lbs.	Lot No.	Dose in mCi	Volume Injected	Interval Between Dose and Imaging	Indications for Imaging	Post Image Diagnosis	Any Adverse Effect	Was Image Clinically Useful		Confirmation of Diagnosis by Other Methods		
												Yes	No	** Concur	** Do not Concur	No Perform
27 Feb 73	13 JT	F	37	175	4003	10	.6 ml	3 hrs.	Pain	Metastatic Ca	no	X		Clinical X		
Feb 73	14 MR	F	44	135	4003	10	.77 ml	3 hrs.	Anemia ? Bone Marrow Metastases	Hypoplastic Anemia - No Metastases	no	X		Clinical X-ray X		
1 Mar 73	15 CG	M	58	200	4003	10	1.2 ml	3 hrs.	Staging of Disease	No Bone Metastases	no	X		Surgical X-ray Clinical		

*Describe as positive (+) or negative (-).

If positive (+), on a separate sheet, include brief clinical history and describe the reaction as well as your interpretation of the nature and cause of the reaction.

**Indicate Means

 New England Nuclear

M.D.

Case 1. BL. Study performed 23 January 1973. 55 yr old Caucasian male, weight 152 lbs. He was injected with 9.6 mCi Technetium polyphosphate. His diagnosis is that of proven oat cell carcinoma of the lung with suspected metastases to the liver and bone. Initial strontium bone scan had been performed and was suspicious of increased activity in the proximal aspect of the left femur. This could not be clearly delineated by strontium. Technetium polyphosphate bone scan was performed which clearly revealed the presence of increased activity in the proximal left femur. Patient was having symptoms in the left leg and hip at this time and it is felt that this probably represents metastatic disease. He has been treated with x-ray therapy for this area with relief in symptoms. It is to be emphasized here that the reason the strontium scan was questionable was because of the symptoms the patient was having, mainly that of pain, he could not lie still for long periods of time which is necessary in strontium scanning. Accordingly with the increased dose of technetium polyphosphate, rapid imaging was performed and the lesion was clearly delineated. He was subjected to appropriate treatment with relief of symptoms.

Case 2. EM. Scan performed 23 January 1973. 67 yr old Caucasian male, weight 170 lbs, who was injected with 8.22 mCi of technetium polyphosphate. Patient's history is that he is two years post resection of a malignant melanoma of the right lower extremity with associated negative groin dissection. He was found to have a solitary pulmonary nodule which was removed in 1972 and found to be metastatic tumor. Now has pain in the right lower posterior thoracic area. The possibility of metastases to ribs was considered and a strontium bone scan was performed on 19 January 1973 and revealed an increased area in the right lower thorax in the rib area but this was noted to be in the

region of his previous surgical site. Accordingly, since the strontium scan could not delineate whether or not this was metastases or post trauma, technetium polyphosphate scan was obtained and his entire body was scanned with no evidence of increased areas noted. Due to the better delineation, it was noted that this positive area clearly conformed to the region of his fractured and regenerating ribs. It is felt that this represented trauma from his surgery with no evidence of other metastatic disease. No therapy was indicated, however, he will be followed routinely with polyphosphate bone scans to determine if there is any change in the positive area.

Case 3. AG. Scan performed 30 January 1973. 39 yr old female, weight 138 lbs, injected with 10 mCi of technetium polyphosphate. The patient had a right radical mastectomy approximately two years ago and has been followed for pain in her back with negative x-rays and a strontium bone scan of a very striking degree of positivity. (4+) However, the lesion could not clearly be delineated into how many vertebral bodies were involved and exactly where in the spine the lesion was. Because of increasing symptoms warranting radiation therapy and complicated by the fact that she had previously received radiation to an anterior port which covered part of the spinal cord, it was felt that as precise a delineation of where the lesions were need be undertaken so that increased radiation to the spinal cord would not be given. Technetium polyphosphate scan was performed and revealed a strikingly positive scan involving three vertebral bodies which were quite clearly marked off for the radiation therapist to treat. Also, because of the renal excretion of polyphosphate, we were able to accurately locate where the vertebral bodies were in relationship to the kidneys and this turned out to be T12, L1 and L2. Mrs. Garner received x-ray therapy with no complications and significant.

improvement of symptoms.

Case 4. RL. Scan performed 31 January 1973. 19 yr old white male with known Hodgkin's disease, weight 145 lbs, injected with 10 mCi technetium polyphosphate. In an attempt to stage his Hodgkin's disease, he had previous bone scans with strontium which were normal in August 1972. Now he has shown evidence of progression of his basic disease, requiring various modalities of therapy and currently is on massive chemotherapy. Polyphosphate bone scan was requested to more clearly delineate the extent of involvement of his Hodgkin's disease. Bone scan was performed and was perfectly normal with no areas of increased concentration throughout the entire skeletal system. It was felt that on the basis of his study, we could say that there was no bone involvement from his Hodgkin's disease.

Case 5. BF. Scan performed 30 January 1973. 35 yr old Caucasian female, weight 130 lbs, injected with 10 mCi technetium polyphosphate. Known to have metastatic melanoma with involvement of the brain and thoracic spine. Previously treated with x-ray therapy and now is on chemotherapy. She has had complete remission of her symptoms following radiation therapy which was based on positive bone scans performed with strontium. At this time, repeat bone scans performed and investigation of the entire skeletal system was undertaken with no evidence of abnormal concentration. It is felt that the negative bone scan with polyphosphate represents a good response to radiation therapy since from a clinical point of view, symptoms have subsided following x-ray therapy.

Case 6. ME. Scan performed 14 February 1973. 47 yr old female, weight 175 lbs, received 10 mCi of polyphosphate. Her history is that she had adenocarcinoma of the right lung treated in 1964 by pneumonectomy and x-ray

therapy. Evaluated now for evidence of recurrent lesions in the left pulmonary lung field and pain in the lumbar spine area. Technetium polyphosphate bone scan was obtained and revealed an abnormal area of concentration in several areas of the spine in the region of T8 and T9 and L2 to L4. These were not seen on x-ray. She is currently undergoing radiation therapy for relief of symptoms.

Case 7. BM. Scan performed 14 February 1973. 25 yr old white female, weight 108 lbs, received 10 mCi technetium polyphosphate. The patient has Hodgkin's disease, treated with radiation therapy in February 1972 for what was felt to be Stage I Hodgkin's disease. Because of a rapid loss of weight, namely 40 lbs in a several month period of time, the possibility of more extensive disease with bone involvement was seriously considered. Strontium bone scan was performed in November 1972 and was strikingly positive with activity throughout the lower thoracic and upper lumbar spine and a positive area in the pelvis. This area could not be clearly delineated as to whether or not this represented stool containing strontium 85, so cleansing enemas were performed and one week later repeat strontium study was performed which showed the hot spot in the pelvis had cleared but that the concentration was still noted in the region of the lower thoracic and upper lumbar spine. Technetium polyphosphate bone scan was performed to determine the extent of disease and possible involvement throughout more of the bony skeleton. The scan was strikingly positive with multiple areas of increased concentration noted throughout the thoracic and lumbar spine area. Most of the areas of increased concentration were felt to represent fractures of the ribs when review of her chest x-ray revealed that she had suffered multiple rib fractures, etiology of which is undetermined. However, there is an area of increased

concentration in the lumbar spine which is felt to represent tumor involvement of vertebral body.

Case 8. LA. Scan performed 14 February 1973. 53 yr old male, 210 lbs, received 10 mCi technetium polyphosphate. The patient underwent exploratory laparotomy in February 1972 and was found to have carcinoma of the cecum. Previous bone scan with strontium in March 1972 was normal. Polyphosphate bone scan was obtained to determine the possibility of involvement of at his one year follow-up. There is an area of increased concentration in the L3, L4 region which appears to involve two vertebral bodies not seen on x-ray and currently he is not symptomatic to the point of acquiring radiation therapy, however, he will be followed closely with repeat scans to see if this lesion develops further.

Case 9. DS. Scan performed 15 February 1973. 41 yr old female, 134 lbs, received 10 mCi technetium polyphosphate. Adenocarcinoma of the right breast treated with radical surgery January 1972. December 1972 developed recurrence of tumor at the incision site. Previous strontium 85 bone scan was negative. In February 1973 developed a pathological fracture of the 7th right rib posteriorly and back pain. Studies with polyphosphate revealed increased concentration in the region of the pathological rib fracture and also evidence of activity throughout the T1 - T2 area, T11 and T12 area and a questionable area in the lumbar spine. She is currently receiving x-ray therapy to these areas for control of symptoms.

Case 10. GS. Scan performed 22 February 1973. 35 yr old female, weight 122 lbs, received 10 mCi technetium polyphosphate. The patient underwent radical hysterectomy in mid 1972 for carcinoma of the cervix. She is now found to have a mass 6 cm in size in the vaginal cuff and prior to doing

radical pelvic surgery, it was elected to do a bone scan to see if there was involvement of pelvic bones by this carcinoma. X-ray of the pelvis was normal. Polyphosphate bone scan was performed and was normal. Radical surgery was then undertaken with serious consideration of operating for cure.

Case 11. AC. Scan performed 22 February 1973. 63 yr old male, 205 lbs, received 10 mCi technetium polyphosphate. Diagnosis of carcinoma of the prostate had been made by needle biopsy in early 1971. Bone scan and x-rays performed with strontium at that time were normal. Seen now approximately two years later with pain in the right hip and right thigh. X-rays of these areas were normal. Technetium polyphosphate bone scan was performed and was abnormal with areas of increased concentration noted in the cervical spine, the lower right thoracic cage, lower thoracic spine and mid lumbar spine, and increased activity in the right knee joint area. On the basis of this scan, it was felt that he had multiple bony metastases and is now being followed and treated by radiation therapy.

Case 12. SS. Scan performed 23 February 1973. 51 yr old female, 170 lbs, received 10 mCi. In early 1971, she had a right radical mastectomy for carcinoma of the breast with 35 of 36 nodes being positive. Previous strontium 85 scan revealed increased concentration in the right SI joint, however, it was felt that this could represent arthritis due to marked scoliosis of the lower spine. Pain persisted in this area and technetium polyphosphate scan was performed for evaluation of the entire skeletal system to see if evidence of metastatic disease was present. Again, only increased concentration was noted in the right SI joint and it is felt that this probably represents stress of arthritic changes due to pressure put on this joint by the marked scoliosis of her spine. She will be followed with serial scans to see if changes occur.

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Case 13. JT. Scan performed 27 February 1973. 37 yr old female, 175 lbs, received 10 mCi. The patient had a left radical mastectomy in November 1970 for carcinoma of the breast and was noted to have a lytic lesion of the lumbar spine which had previously been treated with x-ray therapy. She now complains of pain in the thoracic lumbar spine area. Metastatic bone survey by x-ray revealed no abnormal areas. Previous bone scan in November 1972 was normal with strontium 85. Bone scan performed 27 February 1973 was abnormal revealing increased concentration in the region of the upper lumbar spine approximately in the area of L2 to L3. The previous irradiated region of L5 was unremarkable on this study. There is a questionable area of increased uptake in the upper cervical spine in the region of C2 to C4. The remainder of the bone scan was normal. The patient is now being followed and treated in radiation therapy.

Case 14. MR. Scan performed 27 February 1973. 44 yr old Negro female, 135 lbs, received 10 mCi of technetium polyphosphate. The patient had thyroid carcinoma previously treated with over 500 mCi of I-131 for ablation. She developed evidence of hypoplastic anemia and now a question of bone marrow metastases from her thyroid carcinoma as contributing to her anemia was seriously considered. Thyroid evaluation studies revealed no increased concentration of I-131 throughout the bone. A technetium polyphosphate bone scan was performed and was normal. It is felt that there is no evidence of metastatic disease to bone marrow in this patient and that her hypoplastic anemia is related to previous I-131 therapy and that no consideration for retreatment with I-131 need be undertaken.

Case 15. CG. Scan performed 1 March 1973. 58 yr old male, 200 lbs,

received 10 mCi technetium polyphosphate. The patient is being evaluated for a pulmonary lesion felt to be bronchogenic carcinoma. As part of his evaluation to determine the extent of operability, brain scan, liver scan and technetium polyphosphate bone scan were performed. The technetium polyphosphate bone scan was normal as was the liver and brain and it is felt that this patient does not have evidence of metastases at this time to his brain, liver and bone and surgeons have been made aware of this information prior to surgical intervention. This represents a tremendous use of the preoperative bone scan in an attempt to determine the extent of surgical procedures^{7. 136} performed.