

Radiopharmaceutical-Technetium Labeled	Trade Name “Common name”	Clinical Use	Dosages* (mCi)
<b>99mTc Physical Half-life (P) 6h</b> Technetium-99m-pertechnetate (from Molybdenum-99 generator) High Specific Activity from LEU of U235 fission Q9969 \$10	“Tech” “TcO4” “Tc99m” “99mTc”	Labeling chelates Thyroid Imaging Salivary gland function Dacryoscintigraphy Cystography Meckel’s	Range 10 10 0.1 1 10
Tc99m pertechnetate labeled carbon sys.	Technegas aerosol, 9/2023 Cyclomedica; C9150 per study dose	Ventilation	30
Tc99m-bicisate (ECD)	Neurolite Lantheus; A9557 per study dose; up to 25 mCi	Brain perfusion imaging	25
Tc99m-disofenin (DISIDA)	Hepatolite (Pharma is DC Dec 2019)	Hepatobiliary Imaging Gallbladder EF	5
Tc99m-exametazine (HMPAO)	Ceretec-available from DraxImage and GE; A9521 up to 25 mCi A9569 WBC per study dose	Brain perfusion imaging-stabilized Infection WBC label-unstabilized	25 Range
Tc99m-macroaggregated albumin	“MAA” Curium and DraxImage; A9540 up to 10 mCi	Pulmonary perfusion and embolism, Pre Y-90 SIR Spheres distribution test	Particle dependent 3-5
Tc99m-mebrofenin	Choletec “Mebro” Bracco, Sun Pharma; A9537 up to 15 mCi	Hepatobiliary Imaging Gallbladder EF	5
Tc99m-medronate	“MDP” DraxImage MDP-25; Cardinal Health, Sun Pharma A9503	Bone imaging	25
Tc99m-mertiatide	“MAG3” Curium, DraxImage, Sun Pharma; A9562 up to 15 mCi	Renal imaging (ERPF)	10
Tc99m-oxidronate	“HDP” Curium; A9561; up to 30 mCi	Bone imaging	25
Tc99m-pentetate Pentetate Kit Jubilant-Drax (12/89)	“DTPA” DraxImage; A9539 up to 25 mCi A9567 up to 75 mCi	Renal imaging (GFR function, renal flow studies) Lung Ventilation for matching with MAA Cardiac first pass Cerebral-Peritoneal shunt	3, 10 35-75 25 1
Tc99m-pyrophosphate Cis-Pyro Sun Pharm (6/87) Technescan PYP Kit Curium (5/74)	“Hot pyp” A9538 up to 25 mCi “Cold pyp” or “pyp”	Amyloidosis TTR-CM (transthyretin-cardiomyopathy) Myocardial infarct imaging Cisternography-2013 Tin used for labeling RBC	15 25 1 0
Tc99m-red blood cells	Ultratag Curium; A9560; per study dose; up to 30 mCi	GI bleeds Hemangioma ENVG (MUGA) RNVG (MUGA) L to R shunt Spleen (heat damaged RBC’s)	30 30 30 30 30 30
Tc99m-sestamibi Cardinal Health, Curium, DraxImage, Lantheus, Sun Pharma A9500 Per study dose up to 40 mCi	Cardiolite, “Sestamibi” or “mibi”	Myocardial perfusion Breast tumor Parathyroid	10/30 25 25

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Tc99m-succimer	“DMSA” Nephroskan Feb 2022 Theragnostics Distributed by GE; A9551 up to 10 mCi	Renal cortical imaging	5 0.1 to 0.05 ped
Tc99m-sulfur colloid AN-Sulfur Colloid Sun Pharm (4/79) Sulfur Colloid Kit Jubilant-Drax (11/23)	“Sulfur colloid”	Liver-spleen, Bone marrow Lymphoscintigraphy Gastric emptying Gastric reflux Aspiration/Salivagram Cystography (augmented bladder) Peritoneo-venous shunt (LeVeen shunt)	5 0.4 1 0.3 0.2 1 0.5
Tc99m-tetrofosmin Myoview GE (2/96 – 0.23 mg) Myoview 30 GE (3/05 - 0.69 mg)	Myoview A9502 Per study dose	Myocardial perfusion imaging	10/30
Tc99m-tilmanocept	Lymphoseek (Cardinal Health 2017) A9520 up to 0.5 mCi	Lymphoscintigraphy	0.5

\*ACR–SPR (American College of Radiology-Society of Pediatric Radiology) Technical Standard for Diagnostic Procedures Using Radiopharmaceuticals. Available at: <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/Radiopharmaceuticals.pdf>. Revised 2016. American College of Radiology. ACR-AAPM practice parameter for reference levels and achievable administered activity for nuclear medicine and molecular imaging. 2015; Available at: <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/RefLevels-NucMed.pdf>.

Radiopharmaceutical	Trade Name “Common name”	Clinical Use	Dosages (mCi)
Carbon-11 choline (2013) (P = 20 min)	Mayo Clinic-Rochester, Minn, Zevacor ANDA A9515 up to 20 mCi	Prostate cancer recurrence	10-20
Copper (Cu)-64 dotatate (8/20) (P = 12.6hr)	DETECTNET (Curium) Available everyday & Friday after 10:30 Pass-through until Jan 1 2024; A9592 \$1003.61/1 mCi; 69945-0064-01; WAC \$3850; AWP \$4620	Somatostatin receptor positive neuroendocrine tumors	4.4
Flourine-18 florbetaben (P = 109 min)	NEURACEQ Life Molecular Imaging (Primal) Contract manufacturing Distributed by SOFIE-DALLAS -TU/WED/TH after 1200 Q9983 up to 8.1 mCi	Risk of Alzheimer’s	8
Flourine-18 florbetapir	AMYVID (Lilly) Contract manufacturing Distributed by Petnet and some Cardinal PET facilities; A9586 up to 10 mCi	Risk of Alzheimer’s	10
Fluorine-18 flortaucipir (5/20)	TAUVID™ (Avid Radiopharmaceuticals, Inc bought by Lilly) Contract Manufacturing Distributed by Petnet and some Cardinal PET facilities; A9601 per 1 mCi	Risk of Alzheimer’s	10
Fluorine-18 flutemetastat (5/23)	POSLUMA (Blue Earth Diag.) Distributed by PetNet-Dallas & Tulsa; A9608 \$614.78/mCi	Prostate cancer initial or recurrence	8
Fluorine-18 fludeoxyglucose	“FDG” Various ANDA; A9552 up to 45 mCi	Primarily metastasis, but all metabolism and glycolysis, e.g., active inflammation, tissue repair	10
Fluorine-18 fluciclovine (5/16)—Replaced by Posluma	AXUMIN (Blue Earth Diagnostics) Distributed by Petnet: Tulsa said they need to get it from Dallas.; A9588 per 1 mCi	Prostate cancer recurrence	10
Fluorine-18 fluorodopa (1/22)	Feinstein Institute, Manhasset, NY (Tom Chaly); NDA 200655 must have ANDA - GE FASTLAB 2 HPLC+). CMS has removed the NCD, PET centers could get the coverage for Fluorodopa PET studies through the local CMS contractors.A9602 \$446.88/mCi	Suspected parkinsonian syndromes-CMP or ANDA	5
Fluorine-18 fluoroestradiol (5/20)	CERIANTA™ (GE bought Zionexa, US) Contract manufacturing through PETNET – Dallas making on Monday and Wednesday; A9591 per 1 mCi	Estrogen receptor (ER)-positive lesions as an adjunct to biopsy in patients with recurrent or metastatic breast cancer	6
Fluorine-18 flurpiridaz (10/2024)	FLYRCADO (GE)	myocardial blood flow (MBF) 2.5 to 3 mCi rest/9 to 9.5 stress (1 hr apart); if pharmalogic use 6 to 6.5 mCi for stress (0.5 hr apart)	3/9
Fourine-18 flutemetamole (10/13)	VIZAMYL (GE) Contract manufacturing Distributed by Pharmalogic and Cardinal PET facilities Q9982 Up to 5 mCi	Risk of Alzheimer’s	5
Fluorine-18 piflufolastat (PSMA) (5/21)	PYLARIFY (GE owned Progenics) Distributed by any contract manufacturer – right now Sofie DALLAS –delivery starting at 1 pm to OKC and PetNet in Tulsa (July 2023) A9595 \$580.35/mCi	Prostate cancer initial and recurrence	8-10
Flourine-18 sodium fluoride	“NaF” Various ANDA; A9580 up to 30 mCi	Bone metastasis	5
Gallium-68 dotatoc (8/19) (P = 68 min)	Univ of Iowa Hosp & Clinics; Various ANDA	Somatostatin receptor positive neuroendocrine tumors	4
Gallium-68 dotatate (6/16)	NETSPOT (Advanced Accelerator Applications-Novartis) Generator distribution various; A9587 per 0.1 mCi; 69488-0001-40; WAC \$3000; AWP \$3600	Somatostatin receptor positive neuroendocrine tumors Pass-through ended Jan 2022	5.4

Radiopharmaceutical	Trade Name “Common name”	Clinical Use	Dosages (mCi)
Gallium-68 PSMA – CALI-cGMP 212 (approved 12/2020)  Gallium-68 PSMA (KIT)	CALI-cGMP under 212: PSMA-11 with HBED-CC chelator; A9594 per \$789.30/1 mCi FDA approved: Telix: Feb 2022 <sup>68</sup> Ga-HBED-PSMA-11 (gozetotide- <b>Ilucix</b> ); A9596 \$995.31/mCi; 74725-0100-25; WAC \$4920; AWP \$5904 Novartis/AAA: Mar 2022 <sup>68</sup> Ga-HBED-PSMA-11 (gozetotide- <b>Locametz</b> ) A9800 \$873.44/mCi; 69488-0017-61; WAC \$5768; AWP \$6921 Not approved yet: <u>Theragnostics/GE: now AAA agreement distribution: (GalliProst) <sup>68</sup>Ga-THP-PSMA THP-no heating</u>	Prostate-specific membrane antigen (PSMA) positive lesions in men with prostate cancer with suspected metastasis who are candidates for <u>initial definitive therapy</u> or with suspected recurrence based on <u>elevated</u> serum prostate-specific antigen (PSA) level	3-7 PI 3-5 reg \$ 6 =\$\$ 7 =\$\$\$
Nitrogen-13 ammonia (P = 10m)	“Ammonia” Various ANDA; A9526 up to 40 mCi	Myocardial perfusion	10-20
Rubidium-82 Chloride (Sr-82 generator) (P = 75s)	Cardio-Gen-82 (Bracco) Ruby-Fill (DraxImage); A9555 up to 60 mCi per study dose	PET cardiac perfusion imaging	30-60
<b>Cyclotron Products non-PET</b>			
Gallium-67 citrate (P=78h)	“Gallium” (Lantheus DC 2022); A9556 per mCi	Soft-tissue tumor Inflammatory process imaging	7
Indium-111 chloride (P=68h)	Indiclor (Curium)	Labeling monoclonal antibodies and peptides	3 to 9
Indium-111 pentetate MPI Indium DTPA GE (2/82)	Indium DTPA (GE) A9548 per 0.5 mCi	Cerebral Spinal Fluid (CSF) kinetics	0.5
Indium-111 oxyquinoline	Indium Oxine (GE 12/85) and (BWXT 7/2018); A9547 per 0.5 mCi; A9570 WBC per study dose	Labeling leukocytes and platelets	0.7
Indium-111 pentetreotide	Octreoscan (Covidian); A9572 up to 6 mCi	Imaging neuroendocrine tumors	6
Iodine-123 iobenguane (metaiodobenzylguanidine) (P=13.2h) A9582	Adreview-GE (AWP/ASP \$4,195); A9582 up to 15 mCi; 17156-0235-01; AWP \$5838	Neuroendocrine tumor imaging 78803 (\$1,327.27) Sympathetic nerve activity in heart failure 0332T	7.5
Iodine-123 ioflupane (A9584)	DatScan – <b>GE</b> ; 17156-0210-01; AWP \$2961 ioflupane- <b>Curium</b> (3/2022) M-F early delivery; A9584 up to 5 mCi;	Dopamine receptor imaging for Parkinson’s disease 78803 (\$1,324.27)	5
Iodine-123 sodium iodide	“123 caps” Curium, Cardinal A9509 Use for 1-4 mCi doses of I-123 for whole body imaging for less than 1 mCi and thyroid imaging see A9516 100 to 999 mCi	Thyroid imaging and uptake	0.3
Thallium-201 Chloride (P=73h) Thallous Chloride Curium (10/79)	“Thallium” (Lantheus DC 2022); (Curium Not Returned to market 12/2022) TRACE (Discontinued Mount Sinai Medical Center, FL. 11/2001)	Myocardial perfusion imaging Parathyroid Tumor imaging	4
<b>Naturally Radioactive Products</b>			
Carbon-14 Urea (P=5,730y)	Pytest TriMed 2023 (from AVENT DC Dec 2023) 510-947-6828 trimedamericas.com	Detection of H. Pylori infection	0.001

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<b>Reactor Products</b>			
Strontium-89 (P=52.7d)	Metastron (GE DC MF FEB 2019; available BioMed through Triad-Drax 2020); A9600 \$3975/mCi	Palliative treatment of bone pain of skeletal metastases	4
Iodine-125 human serum albumin (P=60d)	Jeanatope, “RISA” (IsoTex); A9532 per 5 mcrCi	Plasma volume determination	0.005 – 0.01
Iodine-125 iothalamate	Glofil (IsoTex)	Measurement of glomerular filtration	0.01-0.03
Iodine-131 human serum albumin (P=8d)	Megatope (IsoTex); A9524 per 5 mcrCi	Vascular volume studies-protein turnover studies	0.01
Iodine-131 metaiodobenzylguanidine	I-131 MIBG;	Pheochromocytomas and neuroblastomas Diagnostic	0.5
Iodine-131 sodium iodide	“Iodine” Draximage, International Isotopes; A9517 \$23.73/per mCi	Whole Body Scan Thyroid therapy	2 10 - 200
Xenon-133 gas (5.2d)	“Xenon” Curium, Lantheus ; A9558 per 10 mCi	Pulmonary ventilation imaging	10-20
Yttrium-90 ibitumomab (P=64h)	ZEVALIN (Spectrum); A9543 \$65,476.58 up to 40 mCi	Non-Hodgkin's lymphoma	32 max
Radium-223 dichloride (P=11.4d) Ac227>Th227>Ra223	XOFIGO (Bayer distributed by Cardinal Health-DENVER)-A9606 \$157.91/mcrCi	CRPC with symptomatic bone metastases 4-apha decays with gamma 81 keV (15%), 84 (24%), and 154 5%	About 0.14 total x6
Lutetium Lu-177 dotatate (P=6.6d)	LUTAHERA (AAA) Feb 2018 (DISTRIBUTED TO HOSPITAL IN VIAL) Lu-177m (Tp1/2 160 days) contaminant [Lu-176(n,g)Lu177 & Lu177m] A9513 \$/mCi	NE Tumors with somatostatin receptors	200 q8 wks x 4 doses
Lutetium Lu-177 vipivotide tetraxetan (March 2022)	Pluvicto -Endocyte/Novartis/AAA lutetium-177 (Lu-177) PSMA 617 [n.c.a Yb-177(n,g) Lu-177] A9607 \$229.76/mCi	Metastatic Prostate Treatment -	200 q6wks x6 doses

\*Usual dosage range of radiopharmaceutical used, dosages are adjusted for patients weight, sex, and clinical diagnosis. Pediatric doses are appropriately lowered on an age and weight bases. ACR–SPR (American College of Radiology-Society of Pediatric Radiology) Technical Standard for Diagnostic Procedures Using Radiopharmaceuticals. Available at: <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/Radiopharmaceuticals.pdf>. Revised 2016. American College of Radiology. ACR-AAPM practice parameter for reference levels and achievable administered activity for nuclear medicine and molecular imaging. 2015; Available at: <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/RefLevels-NucMed.pdf>.

Investigational Radiopharmaceuticals		Indication
F-18	126 FDA registered ongoing clinical trials <b>FLT (AML) and FMISO (hypoxia)</b>	<b>18F-flurpiridaz (MBF)</b> -NOS (inflammation in every disease state)-FMAU (uracil agent –cancer) –FEOBV (Parkinson) -FTT (PARP inhibitor breast/ovarian) –FAZA (lung) –FCH (hepatocarcinoma) –TFB (thyroid) -CETO (primary aldosteronism) –FSPG (liver) -PSS232 (amyotrophic lateral sclerosis)
Zr-89	7	-panitumumab (squamous cell head and neck) –DFO-YS5 (multiple myeloma) –Df crefmirlimab (CD8 Tcells) –AP-101 (ALS)
Ac-225	15	-FPI (neurotensin receptor tumors) –daratumumab (AML)
Lu-177	55	-dotatate (Breast, pancreatic, meningioma, CNS) – PMSA (prostate)

Brachytherapy Devices	Trade Name “Common name”	Indication
Iodine-125 iodohydroxybenzenesulfonate (LIQUID) & Cesium-131 Chloride in NS (LIQUID)	Iotrex Cesitrex	Use in GliaSite device for recurrent malignant gliomas – MFG change now IsoRay in Richland, WA (2014)
Ir-192 (P=74d)	Checkmate	Decrease in-stent restenosis
Sr-90 (P=29y)	Novoste BetaCath	Decrease in-stent restenosis
P-32 (P=14d)	Guidant Galileo	Decrease in-stent restenosis
Y-90 glass (64h)	TheraSphere	Hepatocarcinoma
Y-90 resin-polymer	SIR-Spheres	Hepatocarcinoma/Colorectal mets 27-81 mCi

Discontinued Radiopharmaceuticals	Trade Name “Common name”	FDA Indication and off label uses
Chromium-51 sodium chromate (P=27.7d)	Chromitope	Labeling RBC's (DC MFG 2011)
Cobalt-57 cyanocobalamin (P=270d)	Rubratope	Detection of pernicious anemia (DC MFG 2006)
Cobalt -57 & -58 cyanocobalamin	Dicopac	Detection of pernicious anemia
Indium-111 capromab pendetide	ProstaScint – Ayto Bio distributed by Cardinal	Monoclonal antibody for imaging prostate cancer DC MFG 5 2018
Indium-111 Imciromab	Myoscint	MAB for diagnosis of myocardial necrosis
Indium-111 satumomab pendetide	OncoScint CR/OV	MAB Colorectal and ovarian cancer
Iodine-131 iodohippurate	Hippuran	Renal imaging and function studies (ERPF)
Iodine-131 metaiodobenzylguanidine (7/2018)	AZEDRA (Lantheus owns Progenics) A9590 per \$338.06/1 mCi	TX Pheochromocytomas and neuroblastomas Diagnostic (DC MFG 3/2024) (±2.5) mL of solution with a total radioactivity of 240–413 mCi/vial
Krypton-81m gas (Rb-81 generator) (P=13s)		Pulmonary ventilation imaging
Phosphorus-32 Chromic phosphate	P-32 Phosphocol	TX intracavitary malignancies DC MFG 2009
Phosphrous-32 Sodium phosphate	“P-32”	Therapy of polycythemia vera DC MFG 2009
Samarium-153 lexidronam (EDTMP)	Quadramet (Lantheus)(Jazz)	Palliative treatment of bone pain of skeletal metastases DC MFG 10/2021
Technetium-99m-pertechnetate (from Molybdenum-99 generator) Low Specific Activity from Mo98 (Feb 2018) Northstar	Radiogenix	Same as U235 source (DC MFG Nov 2023)
Tc99m-albumin colloid	Microlite	Imaging RES (liver/spleen)
Tc99m-arcitumomab	CEA-Scan	Monoclonal antibody for colorectal cancer DC MFG 2007
Tc99m-apcitide	AcuTect	Peptide imaging of DVT DC MFG 2006
Tc99m-depreotide	Neotect	Somatostatin receptor-bearing pulmonary masses (NSCLC)
Tc99m-fanolesomab	NeutroSpec	MAB Infection-DC MFG 11/05
Tc99m-glucaptate	“Gluco”	Renal cortical imaging DC MFG 12/08
Tc99m-human serum albumin	“HSA”	Imaging of cardiac chambers
Tc99m-lidofenin	“HIDA”	Hepatobiliary imaging
Tc99m-nofetumomab merpentan	Verluma	MAB Fab fragment for imaging SCLC
Tc99m-teboroxime	Cardiotec	Myocardial perfusion imaging
Iodine-131 tositumomab	Bexxar	Treatment of Non-Hodgkin's Lymphoma DC MFG 2/2014 (112 to 168 mCi with avg 110 mCi)

## CMS Payment Status

### TABLE 35: DRUGS AND BIOLOGICALS FOR WHICH PASS - THROUGH PAYMENT STATUS WILL END BY DECEMBER 31, 2023

A9591 Fluoroestradiol F 18, diagnostic, 1 millicurie - G -9370 - 10/01/2020 to 09/30/2023  
 C9067 Gallium ga-68, dotatoc, diagnostic, 0.01 mCi - G - 9323 10/01/2020 to 09/30/2023  
 A9592 Copper Cu-64, dotatate, diagnostic, 1 millicurie - G 9383 01/01/2021 to 12/31/2023

### TABLE 36: DRUGS AND BIOLOGICALS WITH PASS-THROUGH PAYMENT STATUS EXPIRING IN CY 2024

2023 HCPS code/2024 HCPS code	G= Status Indicator	2023 APC	Pass-through dates
A9593 Gallium ga-68 psma-11, diagnostic, (ucsf), 1 millicurie	G	9409	07/01/2021 to 06/30/2024
A9594 Gallium ga-68 psma-11, diagnostic, (ucla), 1 millicurie	G	9410	07/01/2021 to 06/30/2024
A9595 Piflufolastat f-18, diagnostic, 1 millicurie	G	9430	01/01/2022 to 12/31/2024

### TABLE 37: DRUGS AND BIOLOGICALS WITH PASS-THROUGH PAYMENT STATUS EXPIRING AFTER CY 2024

A9596 Gallium ga-68 gozetotide, diagnostic, (illuccix), 1 millicurie G 9443 07/01/2022 to 06/30/2025  
 A9800 Gallium ga-68 gozetotide, diagnostic, (locametz), 1 millicurie G 9055 10/01/2022 to 09/30/2025  
 A9607 Lutetium lu 177 vipivotide tetraxetan, therapeutic, 1 millicurie G 9054 10/01/2022 09/30/2025  
 A9602 Fluorodopa f-18, diagnostic, per millicurie G 9053 10/01/2022 to 09/30/2025  
 Q9969 non-HEU sourced Tc-99m per dose through 2025