

UNMH/SRMC RADIOPHARMACEUTICALS AND PHARMACEUTICALS—REVISED 8/2018

All doses must be within the prescribed range, or +/-20% of the prescribed activity (if no range given)

Note: All therapies (I-131, Sr-89, Ra-223 etc) and all administrations of I-131 > 30 µCi require a written directive signed by an Authorized User

Note: Pediatric Patients are <18 years old; for pediatric patients > 100kg, consult with the radiologist about the administered activity

Procedure	Radiopharmaceutical/ Pharmaceutical	Adult Dose	Peds Dose	Peds Min	Peds Max	Ref	Comments
Bone Marrow	Tc-99m sulfur colloid	10 mCi	0.14 mCi/kg	1 mCi	10 mCi	1,4a	
Bone Scan (MDP)	Tc-99m MDP	25 mCi	0.25 mCi/kg	1.0 mCi	17.5 mCi	2,3,6	
Bone Scan (High-resolution bone PET)	F-18 NaF	10 mCi	0.06 mCi/kg	0.5 mCi	4.2 mCi	2,4,6	
Brain DaTScan	DaTscan (I-123 Ioflupane)	3-5 mCi	N/A	N/A	N/A	1,4,9	*contraindicated in pregnancy or in liver or renal failure
	SSKI®	1 drop	N/A	N/A	N/A	1,9,10	1 drop of SSKI = 300 mg KI = 229 mg iodide (min. 100 mg iodine to be given, per DaTscan info)
Brain SPECT	*Tc-99m ECD (Neurolite) or HMPAO (Ceretek)	30 mCi	0.3 mCi/kg	3 mCi	25 mCi	1,3,6	*Tc-99m HMPAO (Ceretek) must be injected through a filter (provided by the radiopharmacy) *ECD or <u>stabilized</u> HMPAO preferred; unstabilized HMPAO expires too quickly

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	Tl-201 chloride	3 mCi	0.07 mCi/kg	0.75 mCi	3 mCi	1,7	
	Acetazolamide (Diamox)*	1000 mg	14 mg/kg		Adult dose	4	Slow intravenous push 15-20 min prior to radiopharmaceutical administration; *contraindicated with known sulfa allergy*
Cardiac Perfusion (stress/redistribution)	Tl-201 chloride	Stress: 3 mCi Reinjection (if needed): 1 mCi	0.035 mCi/kg		2.5 mCi	1,3,6	
Cardiac Perfusion (rest/stress 1-day protocol)	Tc-99m tetrofosmin or sestamibi	Rest: 8 mCi (<100 kg) 10 mCi (100-150 kg) 12 mCi (>150 kg) Stress: 30 mCi (<100 kg) 35 mCi (100-150 kg) 40 mCi (>150 kg)	Rest: 0.07 mCi/kg Stress: 0.28 mCi/kg		Rest: 6 mCi Stress: 24 mCi	1,3,6	If doing a <u>gated</u> resting study only (e.g., as part of a FDG PET + resting gated perfusion viability study), use the stress dose
Cerebral Blood Flow (Brain Death study)	Preferred: Tc-99m ECD (Neurolite) or <u>stabilized HMPAO*</u> (Ceretek). DO NOT use unstabilized HMPAO Tc-99m pertechnetate (consult with attending radiologist; also if ECD)	30 mCi	0.3 mCi/kg	5 mCi	30 mCi	4,6	*Stabilized Tc-99m HMPAO (Ceretek) must be injected through a filter (provided by the radiopharmacy); must be injected within 4 hrs of reconstitution. ECD

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	or stabilized HMPAO unavailable)						must be injected within 6 hours of reconstitution. DO NOT use unstabilized HMPAO (must be injected within 30 min of reconstituion)
Cisternogram/Cisternogram for CSF Leak	In-111 DTPA pyrogen free	0.5 mCi	0.007 mCi/kg	0.1 mCi	.5 mCi	1	
CSF Shunt Study	Tc-99m pertechnetate (<10% of a generator elution)	0.2 mCi (200 microcuries) in 0.1 mL	Adult dose			1	Preferred Injected volume should be ≤ 10% of the volume of the fresh Mo-99/Tc- 99m generator eluate; it will generally be much less
	In-111 DTPA pyrogen free	0.5 mCi in 0.1 mL	0.007 mCi/kg	0.1 mCi	.5 mCi	1	alternate
Gallium Scan	Ga-67 citrate	5 mCi for planar only 10 mCi if SPECT or SPECT needed (typically needed)	0.7 mCi/kg for planar only 0.14 mCi/kg if SPECT needed		5 mCi for planar only 10 mCi if SPECT-CT will be needed (typically needed)	1,3,4,5,6	Consult with nuclear medicine attending physician prior to ordering
Gastric Emptying	Tc-99m sulfur colloid	1 mCi	Pediatric	0.25	0.5 mCi	2,4,5,6	Standard meal is SC

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(standardized meal)			dosing: (<1 y.o., use 0.25 and > 1 y.o. use 0.5.)	mCi			in 120 g Egg Beaters, 2 slices of bread, 30 g strawberry jam, 120 cc water; may use 1 can (8 oz) Ensure Plus or Boost Plus, any flavor, if patient cannot eat the solid meal
Gastric Emptying (liquid) / Reflux / Aspiration	Tc-99m sulfur colloid	1 mCi	Pediatric dosing: (<1 y.o. use 0.25; 1-14 y.o. use 0.5; >14 y.o. use 1.0)	0.25 mCi	1.0 mCi	2,4,5,6	
Gastrointestinal Bleed	Tc-99m pertechnetate, UltraTag Kit (<i>in vitro</i>)	30 mCi	0.25 mCi/kg	2.5 mCi	17.5 mCi	1,5,6	
GFR (Glomerular Filtration Rate)	Tc-99m DTPA	3 mCi	0.043 mCi/kg	0.5 mCi	3 mCi	8	
Hepatobiliary	Tc-99m IDA (mebrofenin, Choletec)	5 mCi 2 mCi for reinjection	0.05 mCi/kg	0.5 mCi*	3.5 mCi	2,3,4,6	*use 1 mCi for neonatal jaundice *reinjection dose half initial dose for pediatric patients
	Sincalide (CCK)	0.02 µg/kg if via pump infusion, 60 minutes. 0.01 µg/kg if via 2-	Adult dose			4	*do not use hand infusion for GBEF unless specified by the attending

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		3 minute hand infusion.					radiologist
	Ensure Plus or Boost Plus	1 can or box (8 oz), any flavor	Adult dose (less if unable)			**	For prolonged fast (>24 hrs), give 1 can/box orally. Wait 4 hrs prior to starting study. For GBEF, give 1 can, image for 60 mins.
Hemangioma	Tc-99m pertechnetate, UltraTag Kit (<i>in vitro</i>)	25 mCi	0.28 mCi/kg	2.5 mCi	20 mCi	1,4,6	
Liver-Spleen	Tc-99m sulfur colloid	5 mCi	0.05 mCi/kg	0.2 mCi	3.5 mCi	1,4,6	
Liver MAA	Tc-99m MAA	5 mCi Order 1 syringe, 7 mCi to allow for the 5 mCi* amount to be drawn at time of injection.	**	**	**Adult dose		*May be changed at the discretion of the administering physician **Consult with nuclear medicine attending physician
Lung Perfusion	Tc-99m MAA	4 mCi if Xe ventilation or no ventilation; 5 mCi if Tc-99m DTPA aerosol ventilation 2.5 mCi if pregnant or breast-feeding	0.03 mCi/kg if Xe vent; 0.07 mCi/kg if aerosol vent	0.4 mCi	2.1 mCi if Xe ventilation or no ventilation; 4 mCi if aerosol ventilation	2,3,4,6	
Lung Ventilation (gas)	Xe-133 gas	5-25* mCi	Adult			1,3,6	*Upper limit slightly

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			dose				higher than SNMMI to allow for variability in Xe vials
Lung Ventilation (aerosol)	Tc-99m DTPA	30 mCi to aerosolizer	Adult dose			1,3	
Lymphoscintigraphy for BREAST	Tc-99m tilmanocept (Lymphoseek) – preferred	All surgeries: 2 syringes; use entire dose If same-day: 0.25 mCi each (total 0.5 mCi) If next-day: 1.0 mCi each (total 2.0 mCi)	Adult dose			1,4	All dose should be used
	Tc-99m sulfur colloid	Next-day surgery: 4 syringes, 1.0 mCi each, NOT Millipore filtered Same-day surgery: 4 syringes, each 0.5 mCi, Millipore filtered	Adult dose			1,4	Provide 2 syringes and keep the 3 rd in reserve if additional injections are required; injected amount is at the discretion of the administering provider
Lymphoscintigraphy for MELANOMA	Tc-99m sulfur colloid (PREFERRED)	All surgeries: 4 syringes, 1.0 mCi each, NOT Millipore filtered	Adult dose			1,4	Provide 3 syringes and keep the 4 th in reserve if additional injections are required; injected amount is at the

Procedure	Radiopharmaceutical/ Pharmaceutical	Adult Dose	Peds Dose	Peds Min	Peds Max	Ref	Comments
							discretion of the administering provider
	Tc-99m tilmanocept (Lymphoseek) – preferred	All surgeries: 4 syringes; use entire dose If same-day: 0.125 mCi each (total 0.5 mCi) If next-day: 0.5 mCi each (total 2.0 mCi)	Adult dose			1,4	All dose should be used
Lymphoscintigraphy for Lower Extremity Edema	Tc-99m sulfur colloid	5 syringes, each 0.5 mCi, Millipore filtered	Adult dose			1,4	Provide 4 syringes and keep the 5 th in reserve if additional injections are required; injected amount is at the discretion of the injecting physician
Meckel Scan	Tc-99m pertechnetate	10 mCi	0.05 mCi/kg	0.25 mCi	3.5 mCi	2,5,6	
MIBG	I-123 MIBG	10 mCi	0.14 mCi/kg	1 mCi	10 mCi	2,5	
	SSKI	1 drop (300 mg of potassium iodide)	Adult dose			1,9	Administer <u>at least 1 hr prior</u> to I-123 MIBG
MUGA	Tc-99m pertechnetate (with Ultratag kit if in	30 mCi (for <i>in vitro</i> or <i>in vivo</i> labeling)	0.36 mCi/kg	2 mCi	25 mCi	2,3,6	Use <i>in vitro</i> labeling (Ultratag) for all

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	<i>vitro</i> labeling) Stannous pyrophosphate	Reconstitute vial with 3 mL normal saline; administer 1 mL of solution	1 mL				patients unless otherwise instructed by the radiologist
OctreoScan	In-111 OctreoScan (pentetreotide)	6 mCi	0.08 mCi/kg		6 mCi	1,5	
Parathyroid Scan	Tc-99m sestamibi	30 mCi (with SPECT) 10 mCi for injection only (presurgery)	0.3 mCi/kg	1 mCi	20 mCi	1,5,6	
PET (FDG)	F-18 FDG	15 mCi	0.14 mCi/kg (body); 0.10 mCi/kg (brain)	1 mCi	10 mCi (body); 7 mCi (brain)	2,3,6	
PET (Ga-68 DOTATATE)	Ga-68 DOTATATE (NETSPOT®)	0.054 mCi/kg; max dose 5.4 mCi	Adult dose	Adult dose	Adult dose	11	
PYP Cardiac Amyloidosis Scan	Tc99m PYP individual dose ordered from Cardinal	15 mCi	N/A	N/A	N/A	12	Peds dose protooled by Radiologist.
Renal Cortical Scan	Tc-99m DMSA	5 mCi	0.05 mCi/kg	0.5 mCi	3.5	2,5,6	
Renogram	Tc-99m MAG-3*	6 mCi	0.15 mCi/kg	1 mCi	4 mCi	2,5,6	*preferred over DTPA
	Tc-99m DTPA	10 mCi	0.2 mCi/kg	1 mCi	5 mCi	5,6	
	Furosemide (Lasix)	40 mg	1 mg/kg	1 mg	Adult dose	1	*May substitute bumetanide at 1/40 of furosemide dose

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							if furosemide is unavailable
	Captopril	50 mg				1	Consult with attending radiologist for pediatric dose
Splenic Imaging (heat-damaged red blood cells)	Tc-99m <i>in vitro</i> labeled heat damaged red cells	3 mCi	0.03 mCi/kg	0.5 mCi	3 mCi	1,4*	*dose from retired SNMMI procedure standard
Thyroid Cancer Diagnostic Imaging	I-123 sodium iodide	4 mCi	0.07 mCi/kg		4 mCi	1,3,6	
	I-131 sodium iodide	5 mCi	0.07 mCi/kg		5 mCi	1,3,6	Only if I-123 not available; consult with attending radiologist; written directive required
Thyroid Uptake/Scan	I-123 sodium iodide	0.15-0.45 mCi (150-450 µCi)	0.006 mCi/kg	0.025 mCi (25 µCi)	Adult dose	1,3,5,6	Preferred when thyroid scan is to be performed; may substitute I-131/TcO4- with radiologist approval
Thyroid Uptake	I-131 sodium iodide	0.004-0.015 mCi (4-15 µCi)	Adult dose			1,3,6	
Thyroid Scan	Tc-99m pertechnetate	10 mCi	0.14 mCi/kg	1 mCi	10 mCi	1,3,6	
WBC Imaging	In-111 oxine	0.2-0.6 mCi (200-600 µCi)	0.004-0.007 mCi/kg		Adult dose	1,3,6	Range due to variable labeling efficiency
	Tc-99m HMPAO (Ceretek)	5-10 mCi	0.14-0.28 mCi/kg		Adult dose	1,3,5	Range due to variable labeling efficiency

References for Administered Activities:

- 1) Nuclear Medicine Procedure Manual, Division of Nuclear Medicine, Mallinckrodt Institute of Radiology; gamma.wustl.edu/index2.html
- 2) North American Consensus Guidelines for Administered Radiopharmaceutical Activities in Children and Adolescents; http://interactive.snm.org/docs/Pediatric_dose_consensus_guidelines_Final_2010.pdf
- 3) Image Wisely, <http://www.imagewisely.org/Imaging-Professionals/Nuclear-Medicine#Topic0>
- 4) Society of Nuclear Medicine and Molecular Imaging Procedure Standards, www.snmmi.org
 - a. SNMMI Procedure Standard for In-111 Leukocyte Scintigraphy for Suspected Infection/Inflammation 3.0 (2004)—specific reference is provided because the dose calculator tool below references use of Tc-99m SC for liver-spleen scans, not for bone marrow imaging
- 5) ACR Practice Guidelines – Nuclear Medicine Guidelines, www.acr.org
- 6) SNMMI Nuclear Medicine Radiation Dose Tool, <http://www.snmmi.org/ClinicalPractice/doseTool.aspx?ItemNumber=11216&navItemNumber=11218>
- 7) Kinuya, K, et al, “Thallium-201 brain SPECT to diagnose aggressiveness of meningiomas,” *Ann Nucl Med* 2003; 17(6), 463-7. <http://www.jsnm.org/files/paper/anm/ams176/ANM17-6-07.pdf>; Kita, T, et al, “Does supplementation of contrast MR imaging with thallium-201 brain SPECT improve differentiation between benign and malignant ring-like contrast-enhanced cerebral lesions?,” *Ann Nucl Med* 2007” 2007 Jul;21(5):251-6.
- 8) Gates, GF, “Computation of glomerular filtration rate with Tc-99m DTPA: an in-house computer program.” *J Nucl Med.* 1984 May;25(5):613-8. <http://jnm.snmjournals.org/content/25/5/613.full.pdf>
- 9) DaTscan® (I-123 ioflupane) prescribing information
- 10) SSKI® prescribing information
- 11) NETSPOT® Prescribing Information, 2016-6
- 12) ASNC.org website, Table 1. Imaging Parameters for Cardiac Tc99m PYP imaging.