Isotopes of Interest: Properties, Treatment, and Fact Sheets

Information in this table adapted from:

- Management of Persons Contaminated with Radionuclides: Handbook (NCRP Report No. 161, Vol. I), National Council on Radiation Protection and Measurements, Bethesda, MD, 2008.
- Tochner ZA, Glatstein E, *Internal Contaminant Radionuclides: Properties and Treatment* (Table 216-1) in "Chapter 216: Radiation Bioterrorism," in Harrison's Principles of Internal Medicine, 17th Edition, Fauci AS, Longo DL, Kasper DL, Braunwald E, Jameson JL, Loscalzo J, Hauser SL, eds., pp. 1358-1364, McGraw Hill, 2008.

Isotope	Ionizing radiation decay mode	Radioactive half-life	Major exposure pathways	Focal accumulation	Treatment: References for use	Fact sheets (CDC, ATSDR, EPA, Argonne Natl. Lab)
Americium (Am-241)	α	458 years	Inhalation Skin	Lungs Liver Bone Bone marrow	DTPA† *	CDC ATSDR EPA Argonne (PDF - 39 KB)
Californium (Cf-252)	α, γ	2.6 years	Inhalation Ingestion	Bone Liver	DTPA*	Argonne (PDF - 39 KB)
Cesium (Cs-137)	β, γ	30 years	Inhalation Ingestion	Follows potassium; renal excretion	Prussian blue, insoluble† *	CDC ATSDR EPA Argonne (PDF - 39 KB)
Cobalt (Co-60)	β, γ	5.26 years	Inhalation	Liver	Succimer (DMSA)§ (DailyMed) DTPA* EDTA§ N-Acetyl-L-cysteine§	CDC ATSDR EPA Argonne (PDF - 38 KB)

Curium (Cm-244)	α, γ, neutron	18 years	Inhalation Ingestion	Liver Bone	DTPA† *	Argonne (PDF - 42 KB)
Iodine (I-131)	β, γ	8.1 days	Inhalation Ingestion Skin	Thyroid	Potassium iodide† * Saturated solution of potassium iodide§ Propylthiouracil§ Methimazole§ Potassium iodate§	CDC ATSDR EPA Argonne (PDF - 38 KB)
Iridium (Ir-192)	β, γ	74 days	N/A	Spleen	Consider DTPA* Consider EDTA§	CDC Argonne (PDF - 95 KB)
Isotope	**Ionizing radiation decay mode**	**Radioactive half-life**	**Major exposure pathways**	**Focal accumulation**	**Treatment: References for use**	**Fact sheets (CDC, ATSDR, EPA, Argonne Natl. Lab)**
Phosphorus (P-32)	β	14.3 days	Inhalation Ingestion Skin	Bone Bone marrow Rapidly replicating cells	Hydration + Phosphate drugs • Sodium glycerophosphate§ • Sodium phosphate§ • Potassium phosphate§ • Calcium carbonate§ • Aluminum hydroxide§ • Aluminum carbonate§	

					• Sevelamer§ (DailyMed)	
Plutonium (Pu-239)	α	24,100 years	Inhalation (limited absorption)	Lung Bone Bone marrow Liver Gonads	DTPA§ DFOA§ EDTA§ DTPA + DFOA§	CDC ATSDR EPA Argonne (PDF - 58 KB)
Polonium (Po-210)	α	138.4 days	Inhalation Ingestion Skin	Spleen Kidneys Lymph nodes Bone marrow Liver Lung mucosa	Gastric Lavage Dimercaprol (BAL)* Succimer (DMSA)§ (DailyMed) D-Penicillamine§ (DailyMed)	CDC Argonne (PDF - 41 KB) HPS (PDF - 492 KB) NRC More references
Radium (Ra-226)	α, β, γ	1,602 years	Ingestion	Bone	Aluminum hydroxide* Barium sulfate* Sodium alginate§ Calcium phosphate§	ATSDR EPA Argonne (PDF - 52 KB)
Strontium (Sr-90)	β	28 years	Inhalation Ingestion	Bone	**Inhalation:** Calcium gluconate§ Barium sulfate§ **Ingestion:** Rx is the same as for radium (see above). Additional Rx may include stable strontium compounds: Strontium lactate§ Strontium gluconate§	CDC ATSDR EPA Argonne (PDF - 39 KB)
Isotope	**Ionizing radiation decay**	**Radioactive half-life**	**Major exposure pathways**	**Focal accumulation**	**Treatment: References for use**	**Fact sheets (CDC, ATSDR, EPA, Argonne Natl. Lab)**

	mode					
Thorium (Th-232)	α	1.41 x 10^{10} years	Inhalation Ingestion	Bone	Consider DTPA*	ATSDR EPA Argonne (PDF - 49 KB)
Tritium (H-3)	β	12.5 years	Inhalation Ingestion Skin	Whole body	Water diuresis*	EPA Health Protection Agency (UK)
Uranium (U-235)	α	7.1 x 10^{8} years	Inhalation Ingestion	Kidneys Bone	Sodium bicarbonate* For high level intake consider off-label diuretics and/or dialysis§	CDC ATSDR EPA Argonne (PDF - 46 KB)
Yttrium (Y-90)¶	β	64 hours	Inhalation Ingestion	Bone	DTPA* EDTA§	Argonne ¶ (PDF - 39 KB)

References for use
† **FDA approved:** Countermeasures so marked have been approved as treatment for internal contamination with the listed radioisotope by the US Food and Drug Administration (FDA).

* **NCRP preferred:** Countermeasures so marked have been listed as preferred treatments for internal contamination with the listed radioisotope by the National Council on Radiation Protection and Measurements [Management of Persons Contaminated with Radionuclides: Handbook (NCRP Report No. 161, Vol. I)]. Except where noted, use of these countermeasures has not been approved by the US Food and Drug Administration (FDA).

§ **NCRP suggested:** Countermeasures so marked have been listed as suggested treatments for internal contamination with the listed radioisotope by the National Council on Radiation Protection and Measurements [Management of Persons Contaminated with Radionuclides: Handbook (NCRP Report No. 161, Vol. I)]. Use of these countermeasures has not been approved by the US Food and Drug Administration (FDA).

See also:

- Summary of Radioactive Properties for Selected Radionuclides (PDF - 145 KB) (Human Health Fact Sheet, Argonne National Laboratories, 2005)

- Radiological and Chemical Fact Sheets to Support Health Risk Analyses for Contaminated Areas (PDF - 2.34 MB) (Argonne National Laboratories, 2007)

More Polonium-210 references

- Understanding Radiation - Topics: Polonium 210 (Health Protection Agency)
- Individual Monitoring Conducted by the Health Protection Agency in the London Polonium-210 Incident (Health Protection Agency)
- Jefferson RD, Goans RE, Blain PG, Thomas SH. Diagnosis and treatment of polonium poisoning. Clin Toxicol (Phila.) 2009 May; 47(5):379-92. [PubMed Citation]
- Harrison J, Leggett R, Lloyd D, Phipps A, Scott B. Polonium-210 as a Poison. J Radiol Prot. 2007 Mar;27(1):17-40. [PubMed Citation]
- Scott BR. Health risk evaluations for ingestion exposure of humans to polonium-210. Dose Response. 2007;5:94-122. (PDF - 175 KB)

¶ For Yttrium-90 radioactive properties and health concerns, see Strontium-90 Human Health Fact Sheet