

## 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	<a href="#">Ionizing radiation decay mode</a>	<a href="#">Radioactive half-life</a>	<a href="#">Biological half-life</a>	<a href="#">Major exposure pathways</a>	Focal accumulation	Treatment: <a href="#">References for use</a>	Fact sheets ( <a href="#">CDC</a> , <a href="#">ATSDR</a> , <a href="#">EPA</a> , <a href="#">Argonne Natl. Lab</a> )
Americium (Am-241)	$\alpha$	458 years	73,000 days	Inhalation Skin	Lungs Liver Bone Bone marrow	<a href="#">DTPA† *</a>	<a href="#">CDC</a> <a href="#">ATSDR</a> <a href="#">EPA</a> <a href="#">Argonne</a> (PDF - 39 KB)
Californium (Cf-252)	$\alpha, \gamma$	2.6 years	N/A	Inhalation Ingestion	Bone Liver	<a href="#">DTPA*</a>	<a href="#">Argonne</a> (PDF - 39 KB)
Cesium (Cs-137)	$\beta, \gamma$	30 years	70 days	Inhalation Ingestion	Follows potassium; renal excretion	<a href="#">Prussian blue, insoluble† *</a>	<a href="#">CDC</a> <a href="#">ATSDR</a> <a href="#">EPA</a> <a href="#">Argonne</a> (PDF - 39 KB)
Cobalt (Co-60)	$\beta, \gamma$	5.26 years	9.5 days	Inhalation	Liver	<a href="#">Succimer (DMSA)§</a> (DailyMed) <a href="#">DTPA*</a> <a href="#">EDTA§</a> N-Acetyl-L-cysteine§	<a href="#">CDC</a> <a href="#">ATSDR</a> <a href="#">EPA</a> <a href="#">Argonne</a> (PDF - 38 KB)

Curium (Cm-244)	$\alpha$ , $\gamma$ , neutron	18 years	Liver: 7,300 days Bone: 18,250 days	Inhalation Ingestion	Liver Bone	<a href="#">DTPA† *</a>	<a href="#">Argonne</a> (PDF - 42 KB)
Iodine (I-131)	$\beta$ , $\gamma$	8.1 days	138 days	Inhalation Ingestion Skin	Thyroid	<a href="#">Potassium iodide† *</a> Saturated solution of potassium iodide§ <a href="#">Propylthiouracil§</a> Methimazole§ Potassium iodate§	<a href="#">CDC</a> <a href="#">ATSDR</a> <a href="#">EPA</a> <a href="#">Argonne</a> (PDF - 38 KB)
Iridium (Ir-192)	$\beta$ , $\gamma$	74 days	50 days	N/A	Spleen	Consider <a href="#">DTPA*</a> Consider <a href="#">EDTA§</a>	<a href="#">CDC</a> <a href="#">Argonne</a> (PDF - 95 KB)
<b>Isotope</b>	<a href="#">Ionizing radiation decay mode</a>	<a href="#">Radioactive half-life</a>	<a href="#">Biological half-life</a>	<a href="#">Major exposure pathways</a>	<b>Focal accumulation</b>	<b>Treatment: References for use</b>	<b>Fact sheets (<a href="#">CDC</a>, <a href="#">ATSDR</a>, <a href="#">EPA</a>, <a href="#">Argonne Natl. Lab</a>)</b>
Phosphorus (P-32)	$\beta$	14.3 days	1,155 days	Inhalation Ingestion Skin	Bone Bone marrow Rapidly replicating cells	Hydration + Phosphate drugs <ul style="list-style-type: none"> <li>• <a href="#">Sodium glycerophosphate§</a></li> <li>• <a href="#">Sodium phosphate§</a></li> <li>• <a href="#">Potassium phosphate§</a></li> <li>• <a href="#">Calcium carbonate§</a></li> <li>• <a href="#">Aluminum hydroxide§</a></li> </ul>	

						<ul style="list-style-type: none"> <li><a href="#">Aluminum carbonate</a>§</li> <li><a href="#">Sevelamer</a>§ (DailyMed)</li> </ul>	
Plutonium (Pu-239)	α	2.2 x 10 <sup>4</sup> years	73,000 days	Inhalation (limited absorption)	Lung Bone Bone marrow Liver Gonads	<a href="#">DTPA</a> § <a href="#">DFOA</a> § <a href="#">EDTA</a> § DTPA + DFOA§	<a href="#">CDC</a> <a href="#">ATSDR</a> <a href="#">EPA</a> <a href="#">Argonne</a> (PDF - 58 KB)
Polonium (Po-210)	α	138.4 days	60 days	Inhalation Ingestion Skin	Spleen Kidneys Lymph nodes Bone marrow Liver Lung mucosa	Gastric Lavage <a href="#">Dimercaprol (BAL)</a> * <a href="#">Succimer (DMSA)</a> § (DailyMed) <a href="#">D-Penicillamine</a> § (DailyMed)	<a href="#">CDC</a> <a href="#">Argonne</a> (PDF - 41 KB) <a href="#">HPS</a> (PDF - 492 KB) <a href="#">NRC</a> <a href="#">More references</a>
Radium (Ra-226)	α, β, γ	1,602 years	16,400 days	Ingestion	Bone	<a href="#">Aluminum hydroxide</a> * <a href="#">Barium sulfate</a> * <a href="#">Sodium alginate</a> § <a href="#">Calcium phosphate</a> §	<a href="#">ATSDR</a> <a href="#">EPA</a> <a href="#">Argonne</a> (PDF - 52 KB)
Strontium (Sr-90)	β	28 years	18,000 days	Inhalation Ingestion	Bone	<b>Inhalation:</b> <a href="#">Calcium gluconate</a> § <a href="#">Barium sulfate</a> §  <b>Ingestion:</b> Rx is the same as for radium (see above). Additional Rx may include stable strontium compounds: <a href="#">Strontium lactate</a> § <a href="#">Strontium gluconate</a> §	<a href="#">CDC</a> <a href="#">ATSDR</a> <a href="#">EPA</a> <a href="#">Argonne</a> (PDF - 39 KB)

Isotope	<a href="#">Ionizing radiation decay mode</a>	<a href="#">Radioactive half-life</a>	<a href="#">Biological half-life</a>	<a href="#">Major exposure pathways</a>	Focal accumulation	Treatment: <a href="#">References for use</a>	Fact sheets ( <a href="#">CDC</a> , <a href="#">ATSDR</a> , <a href="#">EPA</a> , <a href="#">Argonne Natl. Lab</a> )
Thorium (Th-232)	$\alpha$	1.41 x 10 <sup>10</sup> years	Bone: 8,030 days Liver/total body: 700 days	Inhalation Ingestion	Bone	Consider <a href="#">DTPA</a> *	<a href="#">ATSDR</a> <a href="#">EPA</a> <a href="#">Argonne</a> (PDF - 49 KB)
Tritium (H-3)	$\beta$	12.5 years	12 days	Inhalation Ingestion Skin	Whole body	<a href="#">Water diuresis</a> *	<a href="#">EPA</a> <a href="#">Health Protection Agency (UK)</a>
Uranium (U-235)	$\alpha$	7.1 x 10 <sup>8</sup> years	15 days	Ingestion	Kidneys Bone	<a href="#">Sodium bicarbonate</a> *  For high level intake consider off-label diuretics and/or dialysis§	<a href="#">CDC</a> <a href="#">ATSDR</a> <a href="#">EPA</a> <a href="#">Argonne</a> (PDF - 46 KB)
Yttrium (Y-90) <sup>†</sup>	$\beta$	64 hours	N/A	Inhalation Ingestion	Bone	<a href="#">DTPA</a> * <a href="#">EDTA</a> §	<a href="#">Argonne</a> <sup>†</sup> (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](#)