Isotopes of Interest: Properties and Treatment

Isotope Name & Symbol	Ionizing Radiation Type	Radiological Half-life	Biological Half-life (days)	Exposure Type	Mode of Contamination	Focal Accumulation in Body	Treatment
Americium (Am-241)	α	458 years	73,000	Internal	Inhalation, skin wounds	Lungs, liver, bones, bone marrow	Chelation with DTPA[2]
Californium (Cf-252)	α, γ	2.6 years		Internal	Lungs, GI tract	Bone, liver	Chelation with DTPA[2]
Cesium (Cs-137)	β, γ	30 years	70	External, Internal	Lungs, GI tract, wounds, follows potassium	Renal excretion	Ion exchange with Prussian blue[2]
Cobalt (Co-60)	β, γ	5.26 years	9.5	External, Internal	Lungs	Liver	Gastric lavage; Limited animal data suggest that DTPA, EDTA, L-cysteine, NAC (N-Acetyl-Cysteine), and glutathione may be effective in increasing urinary excretion.[3]

Curium (Cm-244)	α, γ, neutron	18 years	7300 (liver) 18,250 (bones)	Internal	Inhalation, GI tract	Liver, bones (soluble Cm compounds)	Chelation with DTPA[2]
Iodine (I-131)	β, γ	8.1 days	138	Internal	Inhalation, GI tract, wounds	Thyroid	Potassium iodide[2], propylthiouracil[1], methimazole[1], sodium iodide[1]
Iridium (Ir-192)	β, γ	74 days	50	External, internal	Not available	Spleen	Not available
Phosphorus (P-32)	β	14.3 days	1155	Internal	Inhalation, GI tract, wounds	Bones, bone marrow, rapidly replicating cells	Lavage, Aluminum hydroxide[1], Dibasic phosphates[1]
Plutonium (Pu-239)	α	2.2×10^4 years	73,000	Internal	Limited lung absorption, high retention	Lung, bones, bone marrow, liver, gonads	Chelation with DTPA[2]
Polonium (Po-210)	α	138.4 days	60	Internal	Inhalation, GI tract, wounds	Spleen, kidneys, lymph nodes, bone marrow, liver, mucus lining cells of the lung	Lavage, Dimercaprol[1]

Radium (Ra-226)	α, β, γ	1602 years	16,400	External, Internal	GI tract	Bones	$MgSO_4$ lavage[1], Ammonium chloride[1], Calcium[1], Alginates[1], Calcium gluconate[1]
Strontium (Sr-90)	β	28 years	18,000	Internal	Moderate GI tract	Bones - similar to calcium	Stable strontium[1], Calcium [1], Ammonium chloride[1], Calcium gluconate[1], Sodium alginate[1], Aluminum-contaning antacids[1]
Thorium (Th-232)	α	1.41×10^{10} years	8,030 (bones) 700 (liver, total body)	Internal	Inhalation, GI tract	Bones	Chelation with DTPA[2]
Tritium (H-3)	β	12.5 years	12	Internal	Inhalation, GI tract, wounds	Total body	Dilution with controlled water intake, Diuretics

Uranium (U-235)	α	7.1 x 10^8 years	15	Internal	GI tract	Kidneys, bones	Sodium bicarbonate[1]
Yttrium (Y-90)	β	64 hours		Internal	Inhalation, GI tract	Bones	Chelation with DTPA[2]

1 Not FDA approved for this indication / Off-label use
2 FDA approved for this indication
3 References:

- Llobet JM, Domingo JL, Corbella J. Comparison of antidotal efficacy of chelating agents upon acute toxicity of Co(II) in mice. Res Commun Chem Pathol Pharmacol. 1985 Nov;50(2):305-8. [PubMed Citation]
- Llobet JM, Domingo JL, Corbella J. Comparison of the effectiveness of several chelators after single administration on the toxicity, excretion and distribution of cobalt. Arch Toxicol. 1986 Apr;58(4):278-81. [PubMed Citation]
- Generic procedures for medical response during a nuclear or radiological emergency (PDF - 2225 KB) (IAEA April 2005)