RADIATION SAFETY DATA – ^{125}I

^{125}I is mostly used in labeling proteins to high specific activity, a use that has declined with the development of alternative detection methods. As an x-ray/gamma emitter, a specialized gamma counter is required for efficient counting. The volatility of many forms, high penetration of the released x-rays, and strong concentration in the thyroid gland can make work with ^{125}I hazardous.

Physical Data

Decay mode	electron capture to ^{125}Te (stable)
Physical half-life	60 days
Major emissions	photons (x-rays, soft gamma rays) in range 27-36 keV avg; 1.46 per disintegration electrons in range 22-36 keV avg, 0.46 per disintegration

Biological Data

Dose to thyroid	~1300 mrem per μCi taken into the adult body (oral)
Other doses	~40 mrem committed effective dose equivalent (risk equivalent to uniform whole body dose) per μCi taken into the adult body (oral) 2.8 rem/hr at 1 cm per mCi
Annual limit on intake	Ingestion - 40 μCi Inhalation - 60 μCi

The critical organ for ^{125}I uptake is the thyroid gland. Intake of inorganic iodide results in average uptake of 30% to thyroid and fairly uniform distribution of the remainder. The biological half-life is about 120 days in the thyroid, and about 2 hours for the remainder. Intake of organic iodine results in uniform distribution throughout the body, with biological half-life of about 12 days.

The penetrating ability of the released x-rays makes shielding in all directions important.

Common Hazards – Precautions

Detection of contamination requires a portable survey instrument fitted with a thin-crystal scintillation probe appropriate probe. Efficiency for a 1 mm thick by 1 in diameter probe is ~8%. Swipes may be counted by gamma counter (~80% efficiency) or LSC (efficiency approaches 80%).

Although ^{125}I emits x-ray radiation, which is generally more penetrating than beta radiation, the low energy of emission means relatively thin shields of high-density

materials (lead or steel) provide adequate shielding. First half-value layer for shielding is 0.02 mm lead.

^{125}I is or can become volatile in many forms.

Specific Requirements for Handling at OSU

Persons working with more than 100 μCi of ^{125}I must have thyroid counts before initial use and after each run. Contact the Radiation Safety Office to arrange for these scans.

Film and finger badges are required for individuals working with > 10 μCi of ^{125}I. Survey meters equipped with a thin-crystal scintillation probe are required when handling >10 μCi.

Liquid waste must be stored in appropriate containers with properly fitting screw caps supplied by the Radiation Safety Office. These containers must be inside a secondary container capable of holding the entire fluid in the event of bottle rupture. Volatile compounds must be stored in a fume hood until collected by Radiation Safety. Dry solid waste should be held in the provided 15-gallon drums. Drain disposal is not permitted; the second rinse of a container is considered to be free of ^{125}I.

Remote handling tools are required to prevent any part of body from coming to within 10 cm (4 inches) of unshielded sources of concentrated ^{125}I.

Work with more than a few μCi must be performed in an operating fume hood.

The Oregon State limit for ^{125}I release in a fume hood is 3×10^{-10} μCi/ml (8.495×10^{-6} μCi/ft^3). A 3 foot fume hood drawing 100 linear feet/minute with the sash at 15" draws 375 ft^3/minute. Use these figures to estimate volatile release when preparing Radiation Use Authorization applications.