RADIATION SAFETY DATA – ^{131}I

^{131}I is mostly used in labeling proteins to high specific activity, a use that has declined with the development of alternative detection methods. The volatility of many forms, high penetration of the released x-rays, and strong concentration in the thyroid gland can make work with ^{131}I hazardous.

Physical Data

Decay mode	beta emission to ^{131}Xe (stable)
Physical half-life	8.04 days
Major emissions	beta minus: 0.606 MeV max, 0.192 avg, 0.89 per disintegration photons: (x-rays, gamma rays) 0.364 MeV, 0.81 per disintegration; 0.637 MeV, 0.073 per disintegration; 0.284 MeV, 0.061 per disintegration

Biological Data

Dose to thyroid (inhalation)	~1100 mrem per μCi taken into the adult body
Other doses	~30 mrem committed effective dose equivalent (risk equivalent to uniform whole body dose) per μCi taken into the adult body (inhalation) 3.5 rem/hr at 1 cm per mCi
Annual limit on intake	Ingestion - 40 μCi Inhalation - 70 μCi

The critical organ for ^{131}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 pancake GM or scintillation probe. Efficiency for a 1 in thick by 1 in diameter probe is ~8%; for a pancake GM probe, ~. Swipes may be counted by gamma counter (~20% efficiency) or LSA (efficiency approaches 100%).

^{131}I emits gamma radiation, which is generally more penetrating than beta radiation. First half-value layer for shielding is 2.3 mm lead.

^{131}I is or can become volatile in many forms.

Specific Requirements for Handling at OSU

Persons working with more than 100 μCi of ^{131}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 ^{131}I. Survey meters equipped with a pancake GM or 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 (except iodination 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 ^{131}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 ^{131}I. Double gloves should be worn since some forms of iodine can penetrate disposable gloves.

Work with more than a few μCi must be performed in an operating fume hood. Solutions containing iodide ions should not be made acidic or frozen.

The Oregon State limit for ^{131}I release via a fume hood is 2×10^{-10} μCi/ml. A 3-foot fume hood drawing 100 linear feet/minute with the sash at 15" draws 375 ft^3/minute (1.062×10^7 ml/min). Use these figures to estimate volatile release when preparing Radiation Use Authorization applications.