

³H

Nuclide Safety Data Sheet

Hydrogen-3 [Tritium]

radsafety@berkeley.edu

³H**I. PHYSICAL DATA**

Radiation:	Beta (100% abundance)
Energy:	Max.: 18.6 keV; Average: 5.7 keV
Half-life [T _½]:	Physical: 12.3 years
	Biological: 10 - 12 days
	Effective: 10 - 12 days*
	* Large liquid intake (3-4 liters/day) reduces effective T _½ by a factor of 2+; ³ H is easily flushed from the body
Specific Activity:	9650 Ci/g [357 TBq/g] max.
Beta Range:	Air: 6 mm [0.6 cm; 0.25 inches]
	Water/Tissue: 0.006 mm [0.0006 cm; 3/10,000 inches]
	Plastic: Insignificant [No ³ H betas pass through the dead layer of skin]

II. RADIOLOGICAL DATA

Radiotoxicity ¹ :	Least radiotoxic of all nuclides; CEDE, ingestion or inhalation: Tritiated water: 1.73E-11 Sv/Bq (0.064 mrem/uCi) of ³ H intake Organic Compounds: 4.2E-11 Sv/Bq (0.16 mrem/uCi) of ³ H intake
Critical Organ:	Body water or tissue
Intake Routes:	Ingestion, inhalation, puncture, wound, skin contamination (absorption).
Radiological Hazard:	External exposure – None from weak ³ H beta
	Internal exposure & contamination – primary concern.

III. SHIELDING

None required - not an external radiation hazard

IV. DOSIMETRY MONITORING

Urine bioassay is the most readily available method to assess intake [for ³H, no intake = no dose]

V. DETECTION & MEASUREMENT

Liquid Scintillation Counting is the only readily available method for detecting ³H*

* NOTE: PORTABLE SURVEY METERS WILL NOT DETECT LABORATORY QUANTITIES OF ³H

VI. SPECIAL PRECAUTIONS

- * Avoid skin contamination [absorption], ingestion, inhalation, & injection [all routes of intake].
- * Many tritium compounds readily penetrate gloves and skin; handle such compounds remotely and wear double gloves, changing the outer pair at least every 20 minutes.
- * While tritiated DNA precursors are considered more toxic than ³H₂O, they are generally less volatile and hence do not normally present a greater hazard
- * The inability of direct-reading instruments to detect tritium and the slight permeability of most material to [tritiated] water & hydrogen [tritium] facilitates undetected spread of contamination. Use extreme care in handling and storage [e.g. sealed double or multiple containment] to avoid contamination, especially with high specific activity compounds

VII. LAB PRACTICES

1. Disposable gloves, lab coats, and safety glasses are the minimum PPE [Personal Protective Equipment] required when handling radioactive material. Remove & discard potentially contaminated PPE prior to leaving the area where radioactive material is used.
2. Clearly outline radioactive material use areas with tape bearing the legend "radioactive." Cover lab bench tops where radioactive material will be handled with plastic-backed absorbent paper; change this covering periodically and whenever it's contaminated.
3. Handle radioactive solutions in trays large enough to contain the material in the event of a spill
4. Never eat, drink, smoke, handle contact lenses, apply cosmetics, or take/apply medicine in the lab; keep food, drinks, cosmetics, etc. out of the lab entirely. Do not pipette by mouth.
5. Never store [human] food and beverage in refrigerators/freezers used for storing radioisotopes.
6. Prevent skin contact with skin-absorbable solvents containing radioactive material.
7. Fume hoods and biological safety cabinets must be labeled "Caution Radioactive Material."

¹ Federal Guidance Report No. 11 [Oak Ridge, TN; Oak Ridge National Laboratory, 1988], p. 122, 156