

HYDROGEN-3 [³H]

PHYSICAL DATA

- Beta Energy:
18.6 keV (maximum)
5.7 keV (average) (100% abundance)
- Physical Half-Life:
12.3 years
- Biological Half-Life:
10-12 days
- Effective Half-Life:
10-12 days *

*Forcing liquids to tolerance (3-4 liters/day) will reduce the effective half-life of ³H by a factor of 2 or 3. (Relatively easy to flush out of system with fluids.)

- Specific Activity:
9640 Ci/gram
- Maximum Beta Range in Air:
6 mm = 0.6 cm = 1/4"
- Maximum Beta Range in Water:
0.006 mm = 0.0006 cm = 3/10,000"
- Penetrability in Matter or Tissue:
Insignificant [0% of beta particle energy transmitted through dead layer of skin]

RADIOLOGICAL DATA

- Least radiotoxic of all radionuclides.
- Critical Organ: Body Water or Tissue
- Routes of Intake: Ingestion, Inhalation, Puncture, Wound, Skin Contamination (Absorption)
- External exposure from weak ³H beta energy - not a radiological concern
- Internal exposure & contamination are primary radiological concerns

SHIELDING

- None required

SURVEY INSTRUMENTATION

- **CANNOT** detect ³H using a G-M or NaI survey meter
- Liquid scintillation counter (indirect) is the only monitoring method

RADIATION MONITORING DOSIMETERS

- (Whole Body Badge or Finger Rings): Not Needed (beta energy too low)

RADIOACTIVE WASTE

- Solid, liquids, scintillation vials, pathological materials, animal carcasses

GENERAL RADIOLOGICAL SAFETY INFORMATION

- Inherent Volatility (at STP): **Substantial**
- Oxidation of ^3H gas in air is usually slow (< 1% per day)
- Absorption of ^3H inhaled in air is much less when it is present as elemental ^3H than as tritiated water (HTO).
- Tritium penetrates the skin, lungs, and GI tract either as tritiated water or in the gaseous form.
- As gaseous hydrogen, ^3H entering the lung or GI tract is completely absorbed and rapidly dispersed within the body.
- Some ^3H is incorporated into cellular components and has a long turnover rate.
- Forcing fluids reduces integrated internal exposures from ^3H .
- Monitor for ^3H contamination using only wipe-testing (bench tops, floors, refrigerator/freezer handles, phone, etc.)
- Always wear a lab coat & disposable gloves when handling ^3H .
- Skin contamination, inhalation, ingestion, or absorption through the skin is assumed to be completely and instantaneously absorbed and rapidly mixed with total body water.
- The volume of total body water (standard man) is 42,000 ml.
- The concentration of ^3H in urine assumed to be the same as in total body water.
- Detection limit of ^3H in urine: 1.08E^{-5} uCi/ml (approximately)
- Beta dose rates from 1.0 mCi ^3H point source:

<u>Distance</u>	<u>Rad/hr</u>
0.25 cm	10,293.00
0.50 cm	28.12
0.56 cm	1.12