^3H	Nuclide Safety Data Sheet Hydrogen-3 [Tritium]	^3H

I. PHYSICAL DATA

Radiation:	Beta (100% abundance)	
Energy:	Max.: 18.6 keV; Average: 5.7 keV	
Half-Life [T½] :	Physical T½:	12.3 years [link to web decay calculator][1]
	Biological T½:	10 - 12 days
	Effective T½:	10 - 12 days*

* Large liquid intake (3-4 liters/day) reduces effective T½ by a factor of 2+; ^3H 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:	0.006 mm [0.0006 cm; 3/10,000 inches]
	Solids/Tissue:	insignificant [No ^3H betas pass through the dead layer of skin]

II. RADIOLOGICAL DATA

Radiotoxicity[2]: Least radiotoxic of all nuclides; CEDE, ingestion or inhalation:
- Tritiated water: 1.73E-11 Sv/Bq (0.064 mrem/uCi) of ^3H intake
- Organic Compounds: 4.2E-11 Sv/Bq (0.16 mrem/uCi) of ^3H intake

Critical Organ: Body water or tissue

Exposure Routes: ingestion, inhalation, puncture, wound, skin contamination absorption

Radiological Hazard:
- External Exposure - None from weak ^3H beta
- Internal Exposure & Contamination - Primary concern

III. SHIELDING

None required - not an external radiation hazard

IV. DOSIMETRY MONITORING

Urine bioassay is the only readily available method to assess intake [for tritium, no intake = no dose]
Be sure to provide a urine sample to Radiation Safety whenever your monthly ^3H use exceeds 10 mCi, or after any accident/incident in which an intake is suspected

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 that ^3H_2O, 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.

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[1] URL for web-based decay calculator: http://phantom.ehs.uiuc.edu/~rad/ram/raddecay.html

[2] Federal Guidance Report No. 11 [Oak Ridge, TN; Oak Ridge National Laboratory, 1988], p. 122, 156; Radionuclide and Radiation Protection Data Handbook [Delacroix, et al; Radiation Protection Dosimetry, Kent, England: Nuclear Technology Publishing 1998], p. 19.

VII. GENERAL PRECAUTIONS

1. Maintain your occupational exposure to radiation As Low As Reasonably Achievable [ALARA].
2. Ensure all persons handling radioactive material are trained, registered, & listed on an approved protocol.
3. Review the nuclide characteristics on (reverse side) prior to working with that nuclide. Review the protocol(s) authorizing the procedure to be performed and follow any additional precautions in the protocol. Contact the responsible Principal User to view the protocol information.
4. Plan experiments to minimize external exposure by reducing exposure time, using shielding and increasing your distance from the radiation source. Reduce internal and external radiation dose by monitoring the worker and the work area after each use of radioactive material, then promptly cleaning up any contamination discovered. Use the smallest amount of radioisotope possible so as to minimize radiation dose and radioactive waste.
5. Keep an accurate inventory of radioactive material, including records of all receipts, transfers & disposal. Perform and record regular lab surveys.
6. Provide for safe disposal of radioactive waste by following institutional Waste Handling & Disposal Procedures. Avoid generating mixed waste (combinations of radioactive, biological, and chemical waste). Note lab staff may not pour measurable quantities of radioactive material down the drain.
7. Follow the Institute policy for security of radioactive material including locking unoccupied labs where radioactive materials are stored.
8. If there is a question regarding any aspect of the radiation safety program or radioactive material use, contact Radiation Safety.

VIII. 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. Alternatively cover benches with thick plastic sheeting (i.e., painter's drop cloth), periodically wipe it clean and replace it if torn.
3. Label each unattended radioactive material container with the radioactive symbol, isotope, activity, and, except for waste, the ICN [inventory control number]. Place containers too small for such labels in larger labeled containers.
4. Handle radioactive solutions in trays large enough to contain the material in the event of a spill.
5. 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.
6. Never store [human] food and beverage in refrigerators/freezers used for storing radioisotopes.
7. Prevent skin contact with skin-absorbable solvents containing radioactive material.
8. Fume hoods and biological safety cabinets for use with non-airborne radioactive material must be approved (through the protocol) and must be labeled "Caution Radioactive Material".
9. All volatile, gaseous, or aerosolized radioactive material must be used only in a properly operating charcoal and/or HEPA filtered fume hood or Biological Safety Cabinet bearing a Caution Airborne Radioactivity hood label, unless otherwise specified in writing by the Radiation Safety Officer. In particular, radioactive iodination must be performed only in these specially designed fume hoods. The Radiation Safety Officer (through a protocol) must approve all such use.
10. Take special precautions when working with radioactive compounds that tend to become volatile [e.g. ^{35}S labeled amino acids, ^{125}I - iodine tends to volatilize in acidic solutions]. These precautions may include: using the materials only within an approved fume hood, protecting the house vacuum system with primary and secondary vapor trapping devices, and covering active cell cultures with carbon-impregnating paper.
11. Use sealed containers and appropriate secondary containment to carry radioactive material between rooms Notify Radiation Safety staff before taking any radioactive material off site.