

Hydrogen-3 (Tritium)

1. Radioactive Material Identification
Common Names: Tritium, Hydrogen-3
Atomic Number: 1
Chemical Form: Gas
Chemical Symbol: H-3 or ^3H
Mass Number: 3 (2 neutrons)
Physical Form: Tritiated water

2. Radiation Characteristics																									
Physical half-life: 12.3 years																									
Specific Activity (TBq/g): 357																									
<table border="1"> <thead> <tr> <th>Principle Emissions</th> <th>E_{Max} (keV)</th> <th>E_{eff} (keV)</th> <th>Dose Rate ($\mu\text{Sv/h/GBq}$ at 1m)</th> <th>Shielding Required</th> </tr> </thead> <tbody> <tr> <td>Beta* (β)</td> <td>18.6 (100%)</td> <td>5.7</td> <td>-</td> <td>-</td> </tr> <tr> <td>Gamma (γ) / X-rays</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>Alpha (α)</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>Neutron (n)</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Principle Emissions	E_{Max} (keV)	E_{eff} (keV)	Dose Rate ($\mu\text{Sv/h/GBq}$ at 1m)	Shielding Required	Beta* (β)	18.6 (100%)	5.7	-	-	Gamma (γ) / X-rays	-	-	-	-	Alpha (α)	-	-	-	-	Neutron (n)	-	-	-	-
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Progeny: Helium-3, He-3																									

3. Detection and Measurement	
Methods of detection (in order of preference):	
1. Liquid Scintillation Counting is the only readily available method for detecting Tritium.	
Dosimetry	
Whole Body _____	Skin _____ Extremity _____ Neutron _____
Internal: In the event of loss of containment by the sealed source, all precautions should be taken to prevent inhalation or ingestion of the material. Urine bioassay is the most readily available method to assess intake.	
Critical Organ(s): None	
Annual Dose Limits: Non-radiation workers: 0.1 rem per year Radiation workers: 5 rem per year, 10 rem total over five years Pregnant radiation workers: 0.4 rem over the balance of the pregnancy	

4. Preventative Measures	
Engineering Controls:	
Personal Protective Equipment: For normal handling of unsealed sources only. Always wear disposable gloves, safety glasses, and whatever personal protective equipment and clothing appropriate to the material handled.	
Special Storage Requirements: The inability of direct-reading instruments to detect tritium and the slight permeability of most material to tritiated water and hydrogen facilitates undetected spread of contamination. Use extreme care in handling and storage to avoid contamination, especially with high specific activity compounds.	

5. Control Levels		
Oral Ingestion	Inhalation	
ALI (kBq)	ALI (kBq)	DAC (Bq/ml)
2,960,000	2,960,000	0.74
Exemption Quantity (EQ):	37,000,000	Bq

6. Non-radiological Hazards

Prolonged exposure to airborne particles may result in coughing, dyspnea, decreased pulmonary functioning and respiratory hypersensitivity. Confirmed animal carcinogen with unknown relevance to humans.

OSHA Permissible Exposure Limit (PEL):
0.1 mg/m³

7. Emergency Procedures

Personal Decontamination Procedures

- Remove loose contamination. Use care to prevent the spread of contamination and be extra careful around wounds
- Wash contaminated areas. Use mild soap or detergent initially; use a mild abrasive soap for more persistent contamination
- Do not abrade skin, only blot dry

Spill and Leak Control

- Alert everyone in the area
- Confine the problem or emergency (includes the use of absorbent material)
- Clear area
- Summon aid
- If a release of powdered or gaseous material, evacuate all personnel from room immediately and turn off any equipment that needs constant attention. Prevent others from entering the room.

Damage to Sealed Radioactive Source Holder

- Evacuate the immediate vicinity around the source holder
- Place a barrier at a safe distance from the source holder (minimum 5 meters)
- Identify area as a radiation hazard
- Contact emergency number posted on local warning sign

Suggested Emergency Protective Equipment

- Gloves
- Footwear Covers
- Safety Glasses
- Outer layer or easily removed protective clothing (as situation requires)