^{201}Tl	Nuclide Safety Data Sheet Thallium – 201 **www.nchps.org**	^{201}Tl

I. PHYSICAL DATA

Radiation: Gamma: 71 keV (47%); 135 keV (3%); 167 keV (10%)

Gamma Constant: 2.372E-5 mSv/hr per MBq at 1 meter[1] [8.78E-5 mrem/hr per uCi at 1 m]

Half-Life [$T_{½}$] : Physical $T_{½}$: 3.04 days[2]
Biological $T_{½}$: ~ 10 days[3]
Effective $T_{½}$: ~ 2.3 days

Specific Activity: 2.14E5 Ci/g [7.90E15 Bq/g] [2]

II. RADIOLOGICAL DATA

Radiotoxicity[4]: Ingested: 1.2E-10 Sv/Bq [0.44 mrem/uCi] stomach wall
8.1E-11 Sv/Bq [0.30 mrem/uCi] CEDE
Inhaled: 1.7E-10 Sv/Bq [0.63 mrem/uCi] Lung
6.3E-11 Sv/Bq [0.23 mrem/uCi] CEDE

Critical Organ[4]: Lung (inhalation); stomach wall (ingestion)

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

Radiological Hazard: External & Internal Exposure; Contamination

III. SHIELDING[2]

Gamma:	Half Value Layer (HVL)	Tenth Value Layer (TVL)
Lead [Pb]	<1 mm	1 mm

- The accessible dose rate should be background but must be < 2 mR/hr

IV. DOSIMETRY MONITORING

- Always wear radiation dosimetry monitoring badges [body & ring] whenever handling ^{201}Tl

V. DETECTION & MEASUREMENT

Portable Survey Meters: Geiger-Mueller [e.g. Bicron PGM] to assess shielding effectiveness

Wipe Test: Gamma Counter, Well Gamma Counter, or Liquid Scintillation Counter

VI. SPECIAL PRECAUTIONS

- Store ^{201}Tl behind lead (Pb) shielding
- Use tools to indirectly handle unshielded sources and potentially contaminated vessels; avoid direct hand contact
- Ensure that an appropriate, operational survey meter (e.g. Bicron PGM) is present in the work area and turned on whenever ^{201}Tl is handled, so that any external exposure issues will be immediately apparent and hence quickly addressed
- Shield waste containers as needed to maintain accessible dose rate ALARA and < 2 mR/hr
- ^{201}Tl's short half life (73.1 hours) makes rigorous inventory tracking unnecessary. Also, storage for decay can often be accomplished at the point of use, since ^{201}Tl compounds will decay to background levels within a month or two.

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[1] Shleien et al, Eds. Handbook of Health Phys. & Rad. Health, 3rd ed. (Baltimore, MD: Williams & Wilkins, 1998), p. 6-13

[2] Delacroix et al, Radiation Protection Dosimetry - Radionuclide and Radiation Protection Data Handbook (Kent, England: Nuclear Technology Publishing, 1998), p. 116

[3] Saha, G. Fundamentals of Nuclear Pharmacy, 2nd ed. (New York: Springer-Verlag, 1984), p. 246

[4] Federal Guidance Report No. 11 (Oak Ridge, TN; Oak Ridge National Laboratory, 1988), p. 174, 148

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 Investigator 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 that lab staff may not pour measurable quantities of radioactive material down the drain.
7. 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.