Test Definition: TIU24

Titanium, 24 Hour, Urine

Overview

Useful For

Monitoring exposure and elimination of titanium in a 24-hour urine specimen

Special Instructions

- Urine Preservatives-Collection and Transportation for 24-Hour Urine Specimens
- Metals Analysis Specimen Collection and Transport

Method Name

Triple-Quadrupole Inductively Coupled Plasma-Mass Spectrometry (ICP-MS/MS)

NY State Available

Yes

Specimen

Specimen Type

Urine

Shipping Instructions

Ship specimen on ice.

Necessary Information

24-Hour volume (in milliliters) is required

Specimen Required

Patient Preparation: High concentrations of gadolinium and iodine are known to potentially interfere with most inductively coupled plasma mass spectrometry-based metal tests. If either gadolinium- or iodine-containing contrast media has been administered, a specimen should not be collected for 96 hours.

Supplies: Urine Tubes, 10 mL (T068)
Container/Tube: Plastic, 10-mL urine tube or clean, plastic aliquot container with no metal cap or glued insert.
Specimen Volume: 10 mL
Collection Instructions:
1. Collect urine for 24 hours.
2. Leave specimen ambient until received at the collection center.
3. Weigh urine for total volume.
4. Pour off aliquot, freeze, and send to laboratory frozen.
4. See Metals Analysis Specimen Collection and Transport for complete instructions.
Additional Information: See Urine Preservatives-Collection and Transportation for 24-Hour Urine Specimens for multiple

collections.

Urine Preservative Collection Options

Note: The addition of preservative or application of temperature controls **must occur within 4 hours of completion** of the collection.

Ambient (no additive)	No
Refrigerate (no additive)	No
Frozen (no additive)	Preferred
50% Acetic Acid	OK
Boric Acid	No
Diazolidinyl Urea	No
6M Hydrochloric Acid	No
6M Nitric Acid	No
Sodium Carbonate	No
Thymol	No
Toluene	No

Specimen Minimum Volume

0.3 mL

Reject Due To

All specimens will be evaluated at Mayo Clinic Laboratories for test suitability.

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Urine	Frozen	28 days	

Clinical & Interpretive

Clinical Information

Titanium is the ninth most abundant element in the earth's crust. Its light weight and high strength are useful in alloys for diverse applications. There is no evidence that titanium is an essential element. Due in part to titanium's oxide formation propensity, the element is considered to be nontoxic. Soils, drinking water, and air all contain trace amounts of titanium. The food processing industry uses large quantities of titanium as a food additive; processed foods contain higher levels than are found in most produce and organic foodstuffs. The average daily oral intake through food consumption is 0.1 to 1 mg/day, which accounts for more than 99% of exposure. Gastrointestinal absorption of titanium is low (approximately 3%), and most of the ingested titanium is rapidly excreted in the urine and stool. The total body burden of titanium is usually in the range of 9 to 15 mg, a significant portion of which is contained in the lung. Titanium dust entering the respiratory tract is nonirritating and is almost completely non-fibrogenic in humans.

Titanium-containing alloys are used in some artificial joints, prosthetic devices, and implants. Titanium dioxide allows osseointegration between an artificial medical implant and bone. Despite their wide use, exposure to these materials has not been linked to toxicity. In one study, patients monitored up to 36 months following joint replacement with titanium-containing joints showed a statistically significant increase in detectable titanium. While titanium concentrations are not a measure of toxicity, they can be useful in determining whether implant breakdown is occurring.

Reference Values

0-17 years: Not established
> or =18 years: <1 mcg/24 h

Interpretation

Elevated concentrations of urinary titanium have been reported after documented exposures.

Cautions

Titanium is a trace metal commonly used in alloys and readily present in the environment. Thus, contamination of the collection site and of the specimen must be avoided. Failure to use metal-free collection procedures and devices may cause falsely increased results. See Specimen Required for collection and processing information.

Clinical Reference

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2. Barry J, Lavigne M, Vendittoli PA. Evaluation of the method for analyzing chromium, cobalt and titanium ion levels in the blood following hip replacement with a metal-on-metal prosthesis. J Anal Toxicol. 2013;37(2):90-6
3. Sarmiento-Gonzalez, A, et al. High resolution ICP-MS determination of Ti, V, Cr, Co, Ni, and Mo in human blood and urine of patients implanted with a hip or knee prothesis. Anal Bioanal Chem. 2008;391(7):2583-9
4. Kim KT, Eo MY, Nguyen TTH, Kim SM. General review of titanium toxicity. Int J Implant Dent. 2019;5(1):10. Published 2019 Mar 11. doi:10.1186/s40729-019-0162-x
5. Jacobs JJ, Skipor AK, Patterson LM, et al. Metal release in patients who have had a primary total hip arthroplasty. A prospective, controlled, longitudinal study. J Bone Joint Surg Am. 1998;80(10):1447-1458
6. Liu TK, Liu SH, Chang CH, Yang RS. Concentration of metal elements in the blood and urine in the patients with cementless total knee arthroplasty. Tohoku J Exp Med. 1998;185(4):253-262
7. Jin T, M Berlin: Titanium. Nordberg GF, Fowler BA, Nordberg M, Friberg LT, et al, eds. Handbook on the Toxicology of Metals. 3rd ed. Academic Press Amsterdam; 2004:861-870
8. Chao EY, Frassica F, Prichard DJ, Moyer TP. Metal ion release in patients with porous coated megaprostheses. 41st Annual Meeting of the Orthopaedic Research Society, Orlando, Florida, 1995 Feb 13-16

Performance

Method Description

Titanium in urine is analyzed by inductively coupled plasma triple-quadrupole mass spectrometry in mass shift mode using ammonia as a reaction gas, gallium as an internal standard, and a salt matrix calibration.(Unpublished Mayo method)

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PDF Report
No

Day(s) Performed
Wednesday

Report Available
1 to 3 days

Specimen Retention Time
14 days

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Superior Drive

Fees & Codes

Fees
- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

Test Classification
This test was developed and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA requirements. It has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information
83018

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
TIU24	Titanium, 24 HR, U	29929-7

Result ID	Test Result Name	Result LOINC® Value
614613	Titanium, 24 HR, U	29929-7
TIME8	Collection Duration (h)	13362-9
VL73	Volume (mL)	3167-4