Test Definition: NIU

Nickel, 24 Hr, U

Overview

Useful For

Preferred test for biomonitoring patients for nickel exposure to minimize any potential diurnal variation

Special Instructions

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

Method Name

Inductively Coupled Plasma-Mass Spectrometry (ICP-MS)

NY State Available

Yes

Specimen

Specimen Type

Urine

Advisory Information

This test is preferred for the determination of nickel exposure but serum concentrations can be used to verify an elevated urine concentration. For more information see NIS / Nickel, Serum.

Necessary Information

24-Hour volume is required.

Specimen Required

Patient Preparation: High concentrations of gadolinium and iodine are known to interfere with most metals tests. If gadolinium- or iodine-containing contrast media has been administered, a specimen should not be collected for 96 hours.

Supplies: Plastic, 10-mL urine tube (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. Refrigerate specimen within 4 hours of completion of 24-hour collection.

See Trace Metals Analysis Specimen Collection and Transport in Special Instructions for complete instructions.

Additional Information: SeeUrine Preservatives-Collection and Transportation for 24-Hour Urine Specimens inSpecial Instructions 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	OK
Refrigerate	Preferred
Frozen	OK
50% Acetic Acid	OK
Boric Acid	No
Diazolidinyl Urea	No
6M Hydrochloric Acid	No
6M Nitric Acid	OK
Sodium Carbonate	No
Thymol	No
Toluene	No

Specimen Minimum Volume

0.9 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	Refrigerated (preferred)	28 days	
	Ambient	28 days	
	Frozen	28 days	

Clinical and Interpretive

Clinical Information

Nickel (Ni) is a highly abundant element with a silvery-white appearance. Nickel is frequently combined with other metals to form alloys and is essential for the catalytic activity of some plant and bacterial enzymes but has no known role in humans.

Nickel and its compounds have no characteristic odor or taste. Ni compounds are used for Ni plating, to color ceramics, to make some batteries, and as substances known as catalysts that increase the rate of chemical reactions. One of the most toxic nickel compounds is nickel carbonyl, Ni(CO)4, which is used as a catalyst in

petroleum refining and in the plastics industry, is frequently employed in the production of metal alloys (which are popular for their anticorrosive and hardness properties), in nickel-cadmium rechargeable batteries, and is used as a catalyst in hydrogenation of oils. Ni(CO)4 is very toxic.

Occupational exposure to Ni occurs primarily via inhalation of Ni compounds. Inhalation of dust high in Ni content has been associated with development of lung and nasal cancer.

Food is the major source of exposure to Ni. Foods naturally high in Ni concentrations include chocolate, soybeans, nuts, and oatmeal. Individuals may also be exposed to Ni by breathing air, drinking water, or smoking tobacco containing Ni. Stainless steel and coins contain Ni. Some jewelry is plated with Ni or made from Ni alloys. Patients may be exposed to Ni in artificial body parts made from Ni-containing alloys.

The most common harmful health effect of Ni in humans is an allergic reaction. Approximately 10% to 20% of the population is sensitive to Ni. The most serious harmful health effects from exposure to Ni, such as chronic bronchitis, reduced lung function, and cancer of the lung and nasal sinus, have occurred in people who have breathed dust containing certain Ni compounds while working in Ni refineries or nickel-processing plants.

Urine is the specimen of choice for the determination of Ni exposure but serum concentrations can be used to verify an elevated urine concentration.

Patients undergoing dialysis are exposed to Ni and accumulate Ni in blood and other organs; there appear to be no adverse health effects from this exposure. Hypernickelemia has been observed in patients undergoing renal dialysis. At the present time, this is considered to be an incidental finding as no correlation with toxic events has been identified. Routine monitoring of patients undergoing dialysis is currently not recommended.

Reference Values

0-17 years: not established

> or =18 years: <3.6 mcg/24h

Interpretation

Values of 3.6 mcg/24-hour specimen and higher represent possible environmental or occupational exposure.

Hypernickelemia, in the absence of exposure, may be an incidental finding or could be due to specimen contamination.

Cautions

Specimen collection procedures for nickel (Ni) require special collection containers, rigorous attention to ultraclean specimen collection and handling procedures, and analysis in an ultraclean facility. Unless all of these procedures are followed, increased urinary Ni results may be an incidental and misleading finding.

This test cannot determine the source compound (eg, Ni sulfate) responsible for the exposure.

Clinical Reference

1. Moreno ME, Acosta-Saavedra LC, Meza-Figueroa D, et al: Biomonitoring of metal in children living in a mine tailings zone in Southern Mexico: A pilot study. Int J Hyg Environ Hlth 2010;213:252-258

2. Schulz C, Angerer J, Ewers U, et al: Revised and new reference values for environmental pollutants in urine or blood of children in Germany derived from the German Environmental Survey on Children 2003-2006 (GerES IV). Int J Hyg Environ Health 2009;212:637-647

3, US Department of Health and Human Services: Toxicological profile for nickel. Agency for Toxic Substances and

Disease Registry. 2005 Accessed: 03/2020. Available at: https://www.atsdr.cdc.gov/ToxProfiles/tp15.pdf

4. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics Edited by N Rifai, AR Horvath, CT Wittwer. Sixth edition. Elsevier, 2018

Performance

Method Description

This assay is performed on an inductively coupled plasma-mass spectrometer (ICP-MS). Calibrating standards and blanks are diluted with an aqueous acidic diluent containing internal standards. Quality control specimens and patient samples are diluted in an identical manner. In turn, all diluted blanks, calibrating standards, quality control specimens, and patient specimens are aspirated into a pneumatic nebulizer and the resulting aerosol directed to the hot plasma discharge by a flow of argon. In the annular plasma the aerosol is vaporized, atomized, and then ionized. The ionized gases plus neutral species formed in the annular plasma space are aspirated from the plasma through an orifice into a quadrupole mass spectrometer. The mass range from 1 to 263 amu is rapidly scanned multiple times and ion counts tabulated for each mass of interest. Instrument response is defined by the linear relationship of analyte concentration versus ion count ratio (analyte ion count/internal standard ion count). Analyte concentrations are derived by reading the ion count ratio for each mass of interest and determining the concentration from the response line.(Unpublished Mayo method)

PDF Report

No

Day(s) and Time(s) Test Performed

Thursday; 8 a.m.

Analytic Time

1 day

Maximum Laboratory Time

7 days

Specimen Retention Time

14 days

Performing Laboratory Location

Rochester

Fees and 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 Regional Manager. 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. This test has not been cleared or approved by the U.S. Food and Drug Administration.

CPT Code Information

83885

LOINC® Information

Test ID	Test Order Name	Order LOINC Value
NIU	Nickel, 24 Hr, U	5705-9

Result ID	Test Result Name	Result LOINC Value
8626	Nickel, 24 Hr, U	5705-9
TM18	Collection Duration	13362-9
VL30	Urine Volume	3167-4