MAYO CLINIC LABORATORIES

Test Definition: ALUCR

Aluminum/Creatinine Ratio, Random, Urine

Overview

Useful For

Monitoring aluminum exposure when a 24-hour urine cannot be collected

Monitoring metallic prosthetic implant wear when a 24-hour urine cannot be collected

This test is **not an acceptable substitute** for serum aluminum measurements and is **not recommended** for routine aluminum screening.

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
ALCU	Aluminum/Creat Ratio, U	No	Yes
CRETR	Creatinine, Random, U	No	Yes

Special Instructions

- Metals Analysis Specimen Collection and Transport

Method Name

ALCU: Triple-Quadrupole Inductively Coupled Plasma Mass Spectrometry (ICP-MS/MS)
CRETR: Enzymatic Colorimetric Assay

NY State Available

Yes

Specimen

Specimen Type

Urine

Ordering Guidance

The recommended test for routine aluminum screening is AL / Aluminum, Serum

For monitoring aluminum exposure or metallic prosthetic implant wear, the preferred test is ALU / Aluminum, 24 Hour, Urine.

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)
Collection Container/Tube: Clean, plastic urine collection container with no metal cap or glued insert
Submission Container/Tube: Plastic urine tube or clean, plastic aliquot container with no metal cap or glued insert
Specimen Volume: 3 mL
Collection Instructions:
1. Collect a random urine specimen.
2. See Metals Analysis Specimen Collection and Transport for complete instructions.

Specimen Minimum Volume
0.7 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	14 days	
	Frozen	28 days	

Clinical & Interpretive

Clinical Information
Under normal physiologic conditions, the usual daily dietary intake of aluminum (5-10 mg) is eliminated completely. Excretion is accomplished by avid filtration of aluminum from the blood by the glomeruli of the kidney. Patients in kidney failure lose the ability to clear aluminum and are candidates for aluminum toxicity.

Many factors increase the incidence of aluminum toxicity in patients with kidney failure:
-Aluminum-laden dialysis water can expose dialysis patients to aluminum.
-Aluminum-laden albumin can expose patients to an aluminum burden they cannot eliminate.
-The dialysis process is not highly effective at eliminating aluminum.
-Aluminum-based phosphate binder gels are administered orally to minimize phosphate accumulation; a small fraction of this aluminum may be absorbed and accumulated.

If it is not removed by kidney filtration, aluminum accumulates in the blood where it binds to proteins such as albumin and is rapidly distributed through the body. Aluminum overload leads to accumulation of aluminum at two sites: brain and bone. Brain deposition has been implicated as a cause of dialysis dementia. In bone, aluminum replaces calcium at the mineralization front, disrupting normal osteoid formation.

Urine aluminum concentrations are likely to be increased above the reference range in patients with metallic joint prosthesis. Prosthetic devices produced by Zimmer Company and Johnson and Johnson typically are made of aluminum, vanadium, and titanium. This list of products is incomplete, and these products change occasionally; see prosthesis product information for each device for composition details.

Reference Values

ALUMINUM
0-17 years: Not established
> or =18 years: <14 mcg/g creatinine

CREATININE, RANDOM
0-17 years: Not established
> or =18 years: 16-326 mg/dL

Interpretation

Daily excretion more than 10 mcg/24 hours indicates exposure to aluminum. Prosthesis wear is known to result in increased circulating concentration of metal ions.(1) Modest increase (10-20 mcg/24 hours) in urine aluminum concentration is likely to be associated with a prosthetic device in good condition. Urine concentrations more than 50 mcg/24 hours in a patient with an aluminum-based implant, not undergoing dialysis, suggest significant prosthesis wear. Increased urine trace element concentrations in the absence of corroborating clinical information do not independently predict prosthesis wear or failure.

In kidney failure, the ability of the kidney to excrete aluminum decreases, while the exposure to aluminum increases (aluminum-laden dialysis water, aluminum-laden albumin, and aluminum-laden phosphate binders).

Patients receiving chelation therapy with deferoxamine (for iron- or aluminum-overload states) also excrete considerably more aluminum in their urine than normal.

Cautions

Falsely increased results may be obtained if the specimen is collected in nonacid-washed polypropylene collection vessels or if metal caps are used to seal the container. Preanalytical steps (specimen collection and transport) are the most likely processes that can affect the quality of trace metals analysis in clinical samples. Specimens must be collected and processed following these instructions: Metals Analysis Specimen Collection and Transport.

Clinical Reference

1. 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
2. O'Shea S, Johnson DW. Review article: Addressing risk factors in chronic kidney disease mineral and bone disorder: Can we influence patient-level outcomes? Nephrology. 2009;14(4):416-427
3. Meyer-Baron M, Schuper M, Knapp G, van Thriel C. Occupational aluminum exposure: Evidence in support of its neurobehavioral impact. NeuroToxicology. 2007;28(6):1068-1078
4. Strathmann FG, Blum LM: Toxic elements. In: Rifai N, Chiu RWK, Young I, Burnham CAD, Wittwer CT, eds. Tietz Textbook of Laboratory Medicine. 7th ed. Elsevier; 2023:455.e55
5. US Department of Health and Human Services. Toxicological Profile for Aluminum. HHS: Agency for Toxic Substances and Disease Registry. 2006. Accessed March 18, 2026. Available at www.atsdr.cdc.gov/toxprofiles/tp22.pdf
6. Willhite CC, Karyakina NA, Yokel RA, et al. Systematic review of potential health risks posed by pharmaceutical, occupational and consumer exposures to metallic and nanoscale aluminum, aluminum oxides, aluminum hydroxide, and its soluble salts. Crit Rev Toxicol. 2014;44 Suppl 4(Suppl 4):1-80. doi:10.3109/10408444.2014.934439

Performance

Method Description

Aluminum

The metal of interest is analyzed by triple-quadrupole inductively coupled plasma mass spectrometry.(Unpublished Mayo method)

Creatinine

The enzymatic method is based on the determination of sarcosine from creatinine with the aid of creatininase, creatinase, and sarcosine oxidase. The liberated hydrogen peroxide is measured via a modified Trinder reaction using a colorimetric indicator. Optimization of the buffer system and the colorimetric indicator enables the creatinine concentration to be quantified both precisely and specifically.(Package insert: Creatinine plus ver 2. Roche Diagnostics; V15.0, 03/2019)

PDF Report

No

Day(s) Performed

Monday

Report Available

2 to 8 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

82570

82108

Test Definition: ALUCR

Aluminum/Creatinine Ratio, Random, Urine

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
ALUCR	Aluminum/Creat Ratio, Random, U	13470-0

Result ID	Test Result Name	Result LOINC® Value
CRETR	Creatinine, Random, U	2161-8
610839	Aluminum/Creat Ratio, U	13470-0