Test requisition # 1234567 Physician : SAMPLE

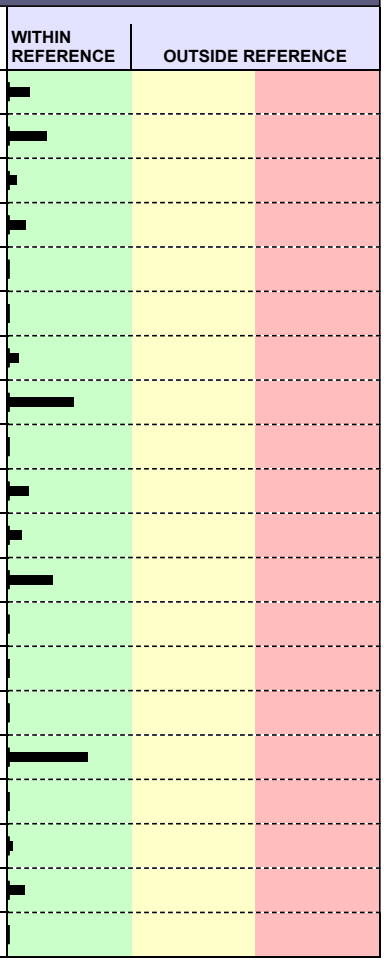
MOSAIC DIAGNOSTICS
Formerly Great Plains Laboratory

ORDER: 999999-9999
TEST: XXXXX
CLIENT REF: XXX
PATIENT: Patient Sample
ID: Rxxx
SEX: Female
AGE: 62 DOB: 09/22/1963

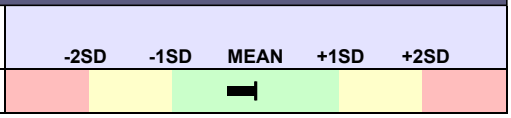
CLIENT #: 12345
Mosaic Diagnostics LLC
9221 Quivira Road
Overland Park, KS 66215 U.S.A.

Toxic Metals; urine 24 hour

TOXIC METALS		RESULT µg/g Creat	REFERENCE INTERVAL	RESULT µg/24 hr	REFERENCE INTERVAL
Aluminum	(Al)	2.8	< 25	3.5	< 20
Antimony	(Sb)	0.051	< 0.18	0.062	< 0.2
Arsenic	(As)	3.4	< 50	4.2	< 60
Barium	(Ba)	0.82	< 5	1.0	< 7
Beryllium	(Be)	<dl	< 0.01	<dl	< 0.01
Bismuth	(Bi)	<dl	< 1	<dl	< 2
Cadmium	(Cd)	0.08	< 0.9	0.10	< 1.2
Cesium	(Cs)	4.4	< 10	5.3	< 10
Gadolinium	(Gd)	<dl	< 0.8	<dl	< 0.6
Lead	(Pb)	0.17	< 1.2	0.20	< 1.2
Mercury	(Hg)	0.18	< 1.3	0.22	< 2
Nickel	(Ni)	2.1	< 5	2.5	< 7
Palladium	(Pd)	<dl	< 0.3	<dl	< 0.3
Platinum	(Pt)	<dl	< 0.1	<dl	< 0.1
Tellurium	(Te)	<dl	< 0.5	<dl	< 0.5
Thallium	(Tl)	0.26	< 0.5	0.32	< 0.5
Thorium	(Th)	<dl	< 0.02	<dl	< 0.02
Tin	(Sn)	0.13	< 5	0.16	< 4
Tungsten	(W)	0.044	< 0.4	0.054	< 0.4
Uranium	(U)	<dl	< 0.03	<dl	< 0.03



URINE CREATININE	RESULT mg/24 hr	REFERENCE INTERVAL
Creatinine	1220	600 – 2100



SPECIMEN DATA

Comments:
Date Collected: 12/07/2025
Date Received: 12/10/2025
Date Reported: 12/11/2025
Methodology: ICP-MS QQQ, Creatinine by Jaffe Reaction

Collection Period: 24 hours
pH upon receipt: Acceptable
Urine Volume: 1400 mL

< dl: less than detection limit
Results are creatinine corrected to account for urine dilution variations. **Reference intervals are based upon NHANES (cdc.gov/nhanes) data if available, and are representative of a large population cohort under non-provoked conditions.** Chelation (provocation) agents can increase urinary excretion of metals/elements.

MOSAIC DIAGNOSTICS
Formerly Great Plains Laboratory

ORDER: 999999-9999
TEST: XXXXX
CLIENT REF: XXX
PATIENT: Patient Sample
ID: Rxxx
SEX: Female
AGE: 62 DOB: 09/22/1963

CLIENT #: 12345
Mosaic Diagnostics LLC
9221 Quivira Road
Overland Park, KS 66215 U.S.A.

Essential Elements; urine 24 hour

ESSENTIAL ELEMENTS		RESULT mEq/g Creat	REFERENCE INTERVAL	RESULT mEq/24 hr	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Sodium	(Na)	76.7	45 – 200	93.5	40 – 250	
Potassium	(K)	67.4	20 – 110	82.2	25 – 120	
		RESULT µg/mg Creat		**RESULT mg/24 hr**		
Phosphorus	(P)	366	180 – 1100	446	200 – 1600	
Calcium	(Ca)	133	30 – 350	162	40 – 350	
Magnesium	(Mg)	75.5	25 – 230	92.1	35 – 250	
Zinc	(Zn)	0.09	0.1 – 1.5	0.11	0.12 – 1.5	
Copper	(Cu)	0.0076	0.006 – 0.026	0.0093	0.005 – 0.023	
Sulfur	(S)	636	250 – 1050	776	280 – 1600	
Molybdenum	(Mo)	0.0263	0.013 – 0.13	0.0320	0.015 – 0.15	
Boron	(B)	3.9	0.6 – 4	4.8	1.1 – 7	
Lithium	(Li)	0.596	0.009 – 0.2	0.727	0.01 – 0.25	
Selenium	(Se)	0.027	0.03 – 0.25	0.032	0.03 – 0.27	
Strontium	(Sr)	0.120	0.045 – 0.3	0.147	0.05 – 0.3	

		RESULT µg/g Creat	REFERENCE INTERVAL	RESULT µg/24 hr	REFERENCE INTERVAL	68th 95th
Cobalt	(Co)	0.37	< 1.7	0.45	< 1.7	
Iron	(Fe)	3	< 50	4	< 50	
Manganese	(Mn)	0.15	< 0.6	0.18	< 0.5	
Chromium	(Cr)	0.13	< 2	0.16	< 2.5	
Vanadium	(V)	0.009	< 0.8	0.011	< 0.8	

URINE CREATININE	RESULT mg/24 hr	REFERENCE INTERVAL	-2SD -1SD MEAN +1SD +2SD
Creatinine	1220	600 – 2100	

SPECIMEN DATA

Comments:
Date Collected: 12/07/2025
Date Received: 12/10/2025
Date Reported: 12/11/2025
Collection Period: 24 hours
pH upon receipt: Acceptable
Urine Volume: 1400 mL
Methodology: ISE, Spectrophotometry, ICP-MS QQQ, Creatinine by Jaffe Reaction

< dl: less than detection limit
Results are creatinine corrected to account for urine dilution variations. **Reference intervals are based upon NHANES (cdc.gov/nhanes) data if available, and are representative of a large population cohort under non-provoked conditions.** Chelation (provocation) agents can increase urinary excretion of metals/elements.

Introduction

This analysis of urinary elements was performed by ICP-Mass Spectroscopy following acid digestion of the specimen. Urine element analysis is intended primarily for: diagnostic assessment of toxic element status, monitoring detoxification therapy, and identifying or quantifying renal wasting conditions. It is difficult and problematic to use urinary elements analysis to assess nutritional status or adequacy for essential elements. Blood, cell, and other elemental assimilation and retention parameters are better indicators of nutritional status.

- 24 Hour Collections
  "Essential and other" elements are reported as mg/24 h; mg element/urine volume (L) is equivalent to ppm. "Potentially Toxic Elements" are reported as µg/24 h; µg element/urine volume (L) is equivalent to ppb.
- Timed Samples (< 24 hour collections)
  All "Potentially Toxic Elements" are reported as µg/g creatinine; all other elements are reported as µg/mg creatinine. Normalization per creatinine reduces the potentially great margin of error which can be introduced by variation in the sample volume. It should be noted, however, that creatinine excretion can vary significantly within an individual over the course of a day.

If one intends to utilize urinary elements analysis to assess nutritional status or renal wasting of essential elements, it is recommended that unprovoked urine samples be collected for a complete 24 hour period. For provocation (challenge) tests for potentially toxic elements, shorter timed collections can be utilized, based upon the pharmacokinetics of the specific chelating agent. When using EDTA, DMPS or DMSA, urine collections up to 12 hours are sufficient to recover greater than 90% of the mobilized metals. Specifically, we recommend collection times of: 9 - 12 hours post intravenous EDTA, 6 hours post intravenous or oral DMPS and, 6 hours post oral bolus administration of DMSA. What ever collection time is selected by the physician, it is important to maintain consistency for subsequent testing for a given patient.

If an essential element is sufficiently abnormal per urine measurement, a descriptive text is included with the report. Because renal excretion is a minor route of excretion for some elements, (Cu, Fe, Mn Zn), urinary excretion may not influence or reflect body stores. Also, renal excretion for many elements reflects homeostasis and the loss of quantities that may be at higher dietary levels than is needed temporarily. For these reasons, descriptive texts are provided for specific elements when deviations are clinically significant. For potentially toxic elements, a descriptive text is provided whenever levels are measured to be higher than expected. If no descriptive texts follow this introduction, then all essential element levels are within acceptable range and all potentially toxic elements are within expected limits.

Reference intervals and corresponding graphs shown in this report are representative of a healthy population under non-provoked conditions. Descriptive texts appear in this report on the basis of measured results and correspond to non-challenge, non-provoked conditions.

Chelation (provocation) agents can increase urinary excretion of metals/elements. Provoked reference intervals have not been established therefore non-provoked reference intervals shown are not recommended for comparison purposes with provoked test results. Provoked results can be compared with non-provoked results (not reference intervals) to assess body burden of metals and to distinguish between transient exposure and net retention of metals. Provoked results can also be compared to previous provoked results to monitor therapies implemented by the treating physician. Additionally, Ca-EDTA provoked results can be used to calculate the EDTA/Lead Excretion Ratio (LER) in patients with elevated blood levels.

CAUTION: Even the most sensitive instruments have some detection limit below which a measurement cannot be made reliably. Any value below the method detection limit is simply reported as "< dl." If an individual excretes an abnormally high volume of urine, urinary components are likely to be extremely dilute. It is possible for an individual to excrete a relatively large amount of an element per day that is so diluted by the large urine volume that the value measured is near the dl. This cannot automatically be assumed to be within the reference range.

This analysis of urinary essential elements was performed by ICP-Mass Spectroscopy. Analysis of essential and other elements in urine is used primarily to identify and characterize renal wasting conditions. Analysis of essential elements in urine is not a direct approach for assessing nutritional status or adequacy. Blood, cell, and other assimilation and retention parameters are optimal direct indicators of essential element status.

If one intends to utilize urinary elements analysis to assess nutritional status or renal wasting of essential elements, it is recommended that unprovoked urine samples be collected for a complete 24 hour period. For 24 hour urine collections essential elements are reported as mg/24 h. For timed or first morning urine collections, elements are normalized per gram creatinine to avoid the potentially great margin of error which can be introduced by variation in the sample volume (concentration). It should be noted that creatinine excretion for an individual may vary to some extent over the course of a day, and from day to day.

If an essential element is sufficiently abnormal per urine measurement, a descriptive text is included with the report. If there are no descriptive texts following this introduction, all essential element levels are within acceptable range. All reference ranges are age and sex specific.

This analysis of urinary toxic metals and essential elements was performed by ICP-Mass Spectroscopy. Analysis of metals in urine is traditionally used for evaluation of very recent or ongoing exposure to potentially toxic metals. The urinary excretion of certain metals is known to be increased (provoked) to a variable extent after administration of specific chelating agents. Reference values and corresponding graphs are representative of a healthy population under non-provoked conditions; reference values have not been established for provoked urine samples.

Analysis of essential and other elements in urine is used primarily to identify and characterize renal wasting conditions. Analysis of essential elements in urine is not a direct approach for assessing nutritional status or adequacy. Blood, cell, and other assimilation and retention parameters are optimal direct indicators of essential element status.

If one intends to utilize urinary elements analysis to assess nutritional status or renal wasting of essential elements, it is recommended that unprovoked urine samples be collected for a complete 24 hour period. For 24 hour urine collections essential elements are reported as mg/24 h, and toxic metals are reported as µg/24 h. For timed, random or first morning urine collections, elements and metals are normalized per gram creatinine to avoid the potentially great margin of error that can be introduced by variation in the sample volume (concentration). It should be noted that creatinine excretion for an individual may vary to some extent over the course of a day, and from day to day.

If an essential element is sufficiently abnormal per urine measurement, a descriptive text is included with the report. For potentially toxic elements, a descriptive text is provided whenever levels are measured to be higher than the unprovoked reference values. If there are no descriptive texts following this introduction, all essential element levels are within acceptable range and all potentially toxic metals are at levels below the unprovoked reference values. All reference ranges and reference values are age and sex specific.

Boron High

Boron (B) is introduced to the body mainly through food (noncitrus fruits, leafy vegetables, nuts, legumes, wine, cider, beer) and drinking water but is also found in food preservatives (sodium borate), and insecticides (boric acid). Evidence for biological essentiality in animals (including humans) has been presented. It has been proposed that boron contributes to living systems by acting indirectly as a proton donor and that it exerts a particular influence on cell membrane and structure and function. In humans boron is responsible for the hydroxylation of various substances in the body. It may enhance the production of various hormones such as testosterone, estrogen, DHEA, and 1,25 dihydroxycholecalciferol. Boron is very readily absorbed and excreted in the urine yet its concentration remains quite low in the serum. Based on urinary recovery findings, more than 90% of ingested B is usually absorbed. Boron is distributed throughout the tissues and organs of animals and humans at concentrations mostly between 4.6 and 55.5 nmol (0.05 and 0.6 µg)/g fresh weight. Among the organs that contain the highest amounts of B are bone, spleen, and thyroid. It appears to be most concentrated in the thyroid gland.

Boron has a low order of toxicity even with intakes as high as 40mg/day in some parts of the world. However, high body burden of the element may be harmful, especially to young animals (including human neonates). Reports have shown that when doses equivalent to more than 46 mmol (0.5 g) B daily were consumed, disturbances in appetite, digestion, and health occurred. Acute toxicity signs include nausea, vomiting, diarrhea, dermatitis, and lethargy. High B ingestion also induces riboflavinuria.

Lithium High

The concentration of lithium (Li) in this urine specimen is unexpectedly high. Li occurs almost universally at low concentrations in water and in plant and animal food products. Li has important functions in the nervous system, and possibly the immune system. Assimilation of Li from food, water and even commonly available organic Li supplements (when taken as directed) would not be expected to be associated with abnormally high levels of Li in urine. In contrast, much higher doses of inorganic Li carbonate, which are often prescribed for specific mood disorders, would be expected to be associated with markedly elevated urine Li if ingestion was recent or chronic.

Occupational/accidental assimilation of excessive amounts of Li could possibly be associated with the manufacture or improper handling of lightweight metal alloys, glass, lubrication greases, and batteries.

Li, when assimilated in excessive quantities, may cause dermatitis, nausea, confusion, course hand tremor, slurred speech, edema, or hypotension. Li toxicity may be more pronounced with low sodium intake. Point-in-time Li doses/exposure are rapidly excreted in urine, and blood analysis may not be indicative of exposure after 5 to 7 days.

Selenium Low

Urine accounts for about one-half of the total body excretion of dietary selenium when normal amounts are ingested. Seafood, organ meats, cereal grains, and seleniferous vegetables (garlic, onions) are good dietary sources. Selenium is also excreted in sweat, and lesser amounts are present in fecal matter. Because diets are highly variable in selenium content, urine is not a reliable indicator of selenium adequacy or function.

Low urinary selenium may be a consequence of: junk food diet or highly-processed food diet, gastrointestinal dysfunctions, renal insufficiency (in which case other elements will be subnormal in urine but possibly elevated in blood), and long-term parenteral nutrition or special diets that are low in selenium.

Selenium is a necessary element for proper activity of two enzymes in human metabolism: glutathione peroxidase (GPx) and iodothyronine deiodinase (ITD). Selenium deficiency may cause weakness or rate limitation for one or both of these enzymes. GPx oxidizes glutathione while reducing oxidized lipids. Weak GPx activity may allow excessive inflammation to occur. ITD deiodinates thyroxine prohormone and catalyzes T4 _ T3. Selenium deficiency may be a cause of insufficient T3 and thyroid dysfunction (Berry J.M. Nature 349, 1991 pp.438-40).

Symptoms consistent with selenium deficiency include: myalgia, increased inflammatory responses, hypothyroidism with low T3. Cardiomyopathy and Keshan disease can occur in cases of severe, chronic Se deficiency. Subnormal selenium may accentuate the effects of cadmium, mercury or arsenic overload. Confirmatory tests for selenium status include packed red bloodcell elements, and hair elemental analysis (provided that antidandruff shampoos have not been used.

Zinc Low

Low urinary zinc is not likely to correspond to global zinc deficiency because the major route for zinc excretion is via the bile, intestinal transport and feces. Typically, from two to ten percent of total zinc excretion occurs via urine; a similar amount occurs in sweat; the remainder (about 80 to 95%) occurs via biliary secretion to the intestine and is excreted in feces. Urine levels may fluctuate without reflecting or influencing body stores.

Zinc can be low (along with other elements) in urine in renal insufficiency. Creatinine clearance and blood metabolite levels should be measured if a renal transport disorder is suspected.

Low urine zinc may be a consequence of: junk food diet or highly-processed food diet, gastrointestinal dysfunctions, excess dietary copper or iron (impairing intestinal uptake of zinc), excess dietary fiber or folate (particularly if dietary zinc level is low to begin with), and inadequate levels of binding ligands for Zn uptake. Binding ligands are: citrate, histidine, cysteine, other organic and amino acids. Excessive loss of zinc to sweating during prolonged physical exertion can cause temporary, low levels of urinary zinc. It has been demonstrated experimentally that lead and nickel increase zinc excretion and that zinc deficiency enhances absorption of lead.

Symptoms and manifestations of zinc deficiency include: impaired sense of taste and/or smell, poor visual adaptation to darkness, slowed hair growth or hair loss, slowed wound healing, subnormal sperm count, loss of libido, immune suppression (poor neutrophil function, low phagocytic activity), poor appetite, anorexia in severely Zn-deficient individuals, and cessation of growth.

Other laboratory tests that are useful in assessing zinc adequacy include: measurement of zinc in whole blood or erythrocytes. RBC Zn is low in chronic Zn deficiency but is not low in short term depletion conditions. Hair zinc analysis can be confirmatory: low means low, but elevated hair zinc often appears to reflect maldistribution and need for zinc. Due to the high affinities of EDTA, DMPS and DMSA, low urinary zinc after administration of these chelating agents is suggestive of zinc deficiency. Other clinical findings that would be consistent with zinc insufficiency include: enlarged prostate, myalgia, (mild) lactic acidosis, history of alcoholism, failure to thrive (infants, children), protein malabsorption, acrodermatitis enteropathica, and subnormal plasma/serum protein levels.