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Urine Element Analysis

Clinical Information for Professionals

Urine Element Analysis

Elemental Analysis

Urine element analysis is traditionally used to assess exposure to toxic elements like lead, mercury or arsenic, but can also be used to measure some essential elements. Measurement of toxic and essential elements in hair, urine and blood has been used clinically for decades.

Essential Elements

Essential elements are involved in virtually all metabolic and biochemical processes, and urine levels are reflective of recent intake for some elements. Consequently, urine testing for essential elements may be used to Cautiously assess current nutritional status. For example, urine boron levels reflect intake of boron. Urine element levels may also correlate with patient symptoms: i.e. urine selenium correlates fairly well with hypothyroid symptoms. Low or very low levels of various essential elements in urine may indicate poor absorption or assimilation of nutrients. The presence of toxic elements may also interfere with normal excretion of essential elements.

Toxic Elements

Acute significant exposure to toxic elements is rare and may even constitute a medical emergency, whereas chronic low-level exposure often goes undetected. Toxic elements appear in urine soon after exposure, which makes urine element testing useful for assessing recent exposure. Although urine is the primary route of elimination, toxic elements can also be incorporated into hair, bone or other tissues when exposure is excessive or continual. The sequestration of toxic elements in body tissue stores may contribute to symptom development. For example, mercury and lead accumulation can cause higher rates of Parkinsonism, cognitive decline, depression, nausea, fatigue, developmental delays, neurological and movement disorders. Cadmium toxicity is associated with increased risk for osteoporosis, kidney damage and cancer. In fact, many symptoms of chronic heavy metal toxicity are similar to those of neurological, kidney and digestive disorders, making it nearly impossible to identify the root cause without testing. Our Essential & Toxic Elements Reference Guide for Practitioners gives more detailed information on the effects and sources of various toxic and essential elements.

Many practitioners measure essential elements pre- and post-provocation as well. Low levels of essential elements pre-provocation may necessitate careful supplementation to prevent worsening of existing deficiencies if a course of chelation is undertaken. Movement of zinc and copper from Pre to Post is a marker of absorption of chelating agents.

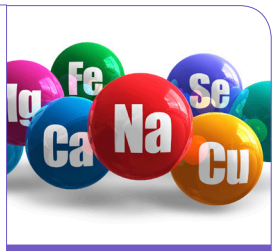
Pre and Post Provocation

Pharmaceutical chelating agents like DMPS, DMSA and EDTA do not actually 'burrow' into cells and remove toxic elements. Chelating agents extract toxic and essential elements from the interstitial fluid around cells in tissue and bring them into systemic circulation. Once in circulation, the toxic (and essential) elements are available for excretion in urine. Export of toxins to interstitium is a glutathione-dependent step.

Many healthcare professionals measure urine elements before and after administration of a chelating agent. This is called pre- and post-provocation testing. Urine element tests are used to determine whether toxic element exposure is current (pre-provocation) and to what degree toxic elements have been retained and stored in tissue (post-provocation). There is controversy regarding the meaning of post-provocation levels of elements since the reference ranges and graphs are based on measurement of unprovoked specimens. Thus, graphing of the post-provocation sample using pre-provocation ranges may not accurately reflect the clinical picture. Practitioners must always be considered in the context of the individual patient's clinical presentation.

Urine versus Hair Elements

Hair element analysis is useful for assessing chronic exposure, because toxic elements can be sequestered and stored in hair tissue. Oral or intravenous chelation is often used to mobilize toxic elements from storage sites in tissue.



Essential Elements
Toxic Elements

Urine Elements test can be used to measure and monitor exposure to toxic elements, and as an indicator of current nutritional status

Provocation Agents (Pharmaceutical Chelating

The following agents are commonly used to mobilize elements from tissue and facilitate their excretion in urine.

DMPS (2,3-dimercapto-1-propanesulfonic acid) is a synthetic amino acid chelating agent. DMPS forms a water soluble complex with toxic elements and is believed to eliminate heavy metals through the kidneys, liver, and gastrointestinal tract. DMPS accelerates excretion of inorganic and organic mercury, arsenic, bismuth and lead. Mobilization of toxic elements after DMPS treatment may aggravate symptoms related to toxic elements.

DMSA (meso-2,3-dimercaptosuccinic acid) is preferred for treatment of lead toxicity. DMSA also binds arsenic and mercury, facilitating their elimination through the liver, kidneys and bowel.

Calcium EDTA (ethylenediaminetetraacetic acid) given intravenously chelates lead (replacing it with calcium) and cadmium. EDTA is also available in suppository and oral forms, but oral absorption is poor (~5%). Note: EDTA does not bind mercury.

Chelating Agent	Half-Life
DMSA (oral)	~3 hrs
DMPS (oral)	~9 hrs
DMPS (iv)	~1 hr
EDTA (iv)	~1 hr

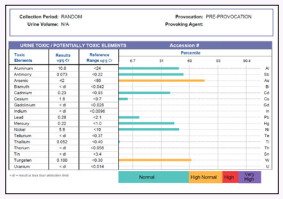
Note: pharmaceutical chelating agents can significantly increase the excretion of certain essential elements including: zinc, copper, manganese, and molybdenum.

Element Profile - Typical Patient

Clinical Considerations

TOXIC elements

PRE



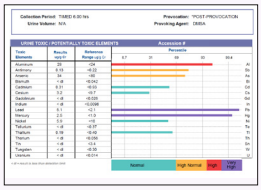
A **pre-provocation** result showing little or no recent exposure to **toxic elements** does not preclude the possibility that toxic elements are present in tissue. Further investigations may include:

- laboratory tests to ensure patient has normal kidney function.
- a challenge with a provoking agent to mobilize sequestered toxic elements from storage sites in tissue.

Results must be considered in the context of the individual patient's clinical presentation.

TOXIC elements

POST



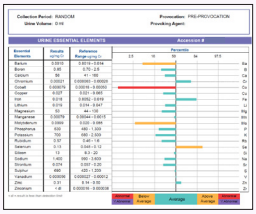
A **post-provocation** result showing a significant increase in **toxic element** levels (measured against non-provoked reference ranges) suggests toxic elements in intersitial fluid were mobilized by the chelating agent.

When toxic elements in a post-provocation sample are significantly elevated, consideration may be given to further increasing excretion of the toxic element(s) via a variety of methods including (but not limited to) the following:

- chelation (i.v. or oral) , homeopathic drainage, sauna (steam or infrared), dry brushing.

ESSENTIAL elements

PRE

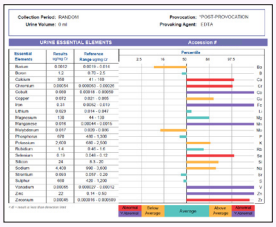


Pre-provocation levels for essential elements do not necessarily reflect intake or tissue levels. Because urine is not the primary route of excretion for some essential elements, low levels (e.g. iron and cobalt) may be misinterpreted as deficiencies. However, if all the essential element levels are low, it may indicate issues with absorption and assimilation of nutrients, similar to what may be seen in hair element analysis.

Results must be always be considered in the context of the individual patient's clinical presentation.

ESSENTIAL elements

POST



A **post-provocation** result for **essential elements** may be used to monitor the success of chelation. Chelating agents normally increase excretion of copper and zinc, so increased excretion of these elements is suggestive of an effective chelation.

URINE ESSENTIAL ELEMENTS

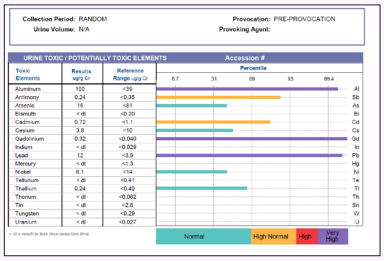
Essential Elements	Results ug/mg CR	Reference Range ug/mg CR	Percentile
Copper	0.072	0.021 - 0.065	2.5 16 50 84 97.5 Cu
Zinc	22	0.14 - 0.50	Zn

Increased levels of copper and zinc seen post-provocation relative to the pre-provocation sample suggest effective absorption/dosing of chelating agent, although this is not evidence that the agent used will mobilize toxic elements in every case.

Common Profiles

Clinical Considerations

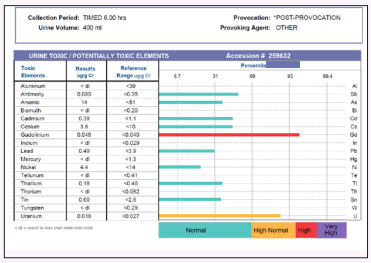
Elevated Toxic Elements PRE-provocation



A **pre-provocation** result showing **toxic elements** in the high normal/high/very high range suggests recent exposure. Elevated toxic elements in a pre-provocation sample may also occur as a result of 'leakage' from tissue stores.

For example: with osteoporosis, lead stored in bone is continually released. Also, gadolinium and cadmium stored in kidney is released on a daily basis.

Little or No Elevation in Toxic Elements POST-provocation

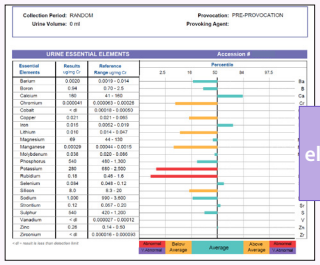


A **post-provocation** result showing little or no movement of **toxic elements** from body stores relative to the pre-provocation levels can occur:

- if there are limited amounts or no toxic elements in tissue.
- chelation was inadequate (e.g. poorly absorbed, incorrect dose, agent does not bind) or one or more urine voids were missed.
- with glutathione deficiency. Glutathione is required for the transport of toxic elements (e.g. Hg, Cd, Pb) to interstitial fluid.

Measurement of essential elements pre and post-provocation may provide additional information.

Low Essential Elements PRE-provocation

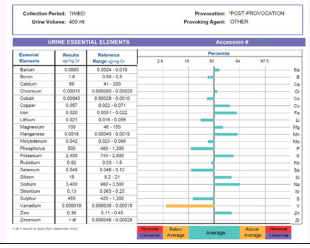


essential element levels mostly low

A **pre-provocation** result with low levels for chelatable **essential element**s may be an indicator that nutritional support should be provided prior to administering a provoking agent. Even with normal pre-provocation essential element levels, nutritional status must be carefully monitored if chelation is undertaken.

In all cases, results must be considered in the context of the individual patient's clinical presentation.

Monitoring Effectiveness of Chelation



A **post-provocation** result for **essential elements** may be used to monitor the success of chelation. Chelating agents normally increase excretion of copper and zinc, so increased excretion of these elements is suggestive of an effective chelation, although it does not mean the agent used will mobilize toxic elements in every case.

A post-provocation sample showing a very small increase in the excretion of zinc and copper relative to the pre-provocation sample may be an indication of inadequate chelation (e.g. poorly absorbed, incorrect dose, agent does not bind) or that part of the timed urine collection was missed.

URINE ESSENTIAL ELEMENTS

Essential Elements	Results ug/mg CR	Reference Range ug/mg CR	Percentile 2.5 16 50 84 97.5
Copper	0.057	0.022 - 0.071	Cu
Zinc	0.36	0.11 - 0.45	Zn

Low levels of essential elements both pre and post provocation could be an indication of decreased nutrient intake or poor digestion or assimilation of nutrients.

References

1. Crinnion W. The Benefits of Pre- and Post-challenge Urine Heavy Metal Testing: Part 1. Alt Med Rev. 2009;14(1):3-8
2. Crinnion W. The Benefits of Pre- and Post-challenge Urine Heavy Metal Testing: Part 2. Alt Med Rev. 2009;14(3):103-108
3. Eliaz I. et al. The Effect of Modified Citrus Pectin on Urinary Excretion of Toxic Elements. Phytotherapy. 2006;20: 859-864
4. Murran P. Mercury elimination with oral DMPS, DMSA, vitamin C and glutathione: an observational clinical review. Alt Ther. 2006;12(3):70-75
5. Porru S et al. The use of chelating agents in occupational lead poisoning. Occup Med. 1996;46(1):41-8
6. Thilo-Korner DGS et al. Environmental Infection and Heavy Metal Analysis in More Than 400 Patients.Part I: Metal Analysis of Aluminium, Lead, Selenium, Zinc. J Nutr Environ Med. 2000;10:133-43.

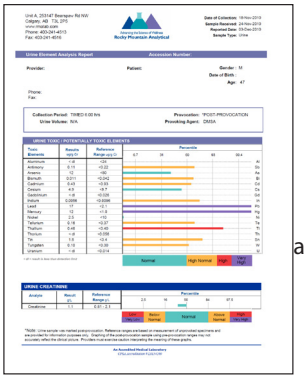
Urine Element Report Features

Creatinine Normalization

Results are reported in mass of analyte per mass of creatinine to compensate for differences in urine dilution. Note that in samples with very low creatine due to a dilute sample or excessive water intake, some elements will fall below the detection limit and no bar will be seen. It is therefore possible to see a bar on pre-provocation which disappears post provocation with low creatinine on the provoked sample.

Reporting Toxic Elements

The toxic/potentially toxic elements results are calculated using cumulative statistics, and the result for each element is represented by a coloured bar. If you took one hundred normal, healthy people of the same gender and age as the patient being tested; 68/100 would get a green bar, 27/100 would get a yellow bar, 4/100 would get a red bar and just one person would display a purple bar for any given element.



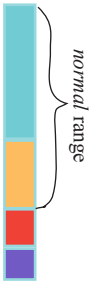
A red or purple bar for toxic element means the toxic element is present at a higher concentration than normally found in a healthy population.

In other words, a result with a red bar is rare, and a result with a purple bar is rarer still. Having one or more red or purple bars significantly increases the chance that the element in question is causing a problem. An orange bar means the element might have the potential to cause a problem, and a green bar means the element is likely harmless. In all cases though, the test results must be weighed against the clinical picture. **For example, having a green bar does not automatically rule out toxicity, and having a red or purple bar does not prove that the element in question is causing symptoms.**

Reporting Essential Elements

Essential elements are also reported via coloured bars, but since essential elements can be higher or lower than normal, the bars can go either left or right of centre. As with toxic elements, the green bar represents 68/100 healthy people (34/100 to the left, 34/100 to right), the yellow bar represents 27/100 healthy people (half to left, half to right), and the red and purple bars represent 4 and 1 person out of a hundred respectively (again, half to the left, half to the right). Having a red or purple bar means the patient's result is abnormal or significantly abnormal relative to the middle 95% of healthy people. A preponderance of bars shifted to the left (low levels of essential elements) may be indicative of malabsorption or insufficient nutrient intake.

Essential	
Optimal / Low normal	Results displayed as green bars are in the optimal range for a healthy population. (68% of results lie within one standard deviation [SD] of the mean).
Sub-optimal / High normal	Results displayed as yellow bars are still within acceptable limits, but may be sub-optimal for a healthy population. (27% of results lie more than one SD, but less than 2 SDs, higher or lower than the mean).
Abnormal / High	Results displayed as red bars are considered abnormal relative to a healthy population. (~5% of results are more than 2 SDs but less than 3 SDs higher or lower than the mean).
Significant Abnormal Very High	Results displayed as purple bars are significantly abnormal relative to a healthy population. (less than 1% of results are more than 3 SDs higher or lower than the mean).



Toxic	
Optimal / Low normal	Results displayed as green bars fall in the first 68% of the reference population.
Sub-optimal / High normal	Results displayed in yellow fall between the 68% and 95% of the reference population.

Essential / Non Toxic Elements			
Barium	Iron	Potassium	Strontium
Boron	Lithium	Rubidium	Sulphur
Calcium	Magnesium	Selenium	Vanadium
Chromium	Manganese	Silicon	Zinc
Cobalt	Molybdenum	Sodium	Zirconium
Copper	Phosphorus		

Toxic / Potentially Toxic Elements			
Aluminum	Cesium	Mercury	Thorium
Antimony	Gadolinium	Nickel	Tin
Arsenic	Indium	Tellurium	Tungsten
Bismuth	Lead	Thallium	Uranium
Cadmium			