Overview

Useful For
Screening test for detection of arsenic exposure using random urine specimens

Method Name
Only orderable as part of profile. For more information see:

ARSCR / Arsenic/Creatinine, with Reflex, Random, Urine
HMCRU / Heavy Metal/Creatinine, with Reflex, Random, Urine

Inductively Coupled Plasma-Mass Spectrometry (ICP-MS)

NY State Available
Yes

Specimen

Specimen Type
Urine

Specimen Required
Only orderable as part of profile. For more information see:

ARSCR / Arsenic/Creatinine, with Reflex, Random, Urine
HMCRU / Heavy Metal/Creatinine, with Reflex, Random, Urine

Specimen Minimum Volume
3 mL

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

Specimen Stability Information

<table>
<thead>
<tr>
<th>Specimen Type</th>
<th>Temperature</th>
<th>Time</th>
<th>Special Container</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urine</td>
<td>Refrigerated (preferred)</td>
<td>28 days</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Frozen</td>
<td>28 days</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ambient</td>
<td>72 hours</td>
<td></td>
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</tbody>
</table>

Clinical and Interpretive
Clinical Information

Arsenic is a naturally occurring element that is widely distributed in the Earth's crust. Arsenic is classified chemically as a metalloid, having both properties of a metal and a nonmetal. Elemental arsenic is a steel grey solid material. However, arsenic is usually found in the environment combined with other elements such as oxygen, chlorine, and sulfur. Arsenic combined with these elements is called inorganic arsenic. Arsenic combined with carbon and hydrogen is referred to as organic arsenic. The organic forms (eg, arsenobetaine and arsenocholine) are relatively nontoxic, while the inorganic forms are toxic. The toxic inorganic forms are arsenite (As3+/AsIII) and arsenate (As5+/AsV). Inorganic AsV is readily reduced to inorganic As(III) which is then primarily broken down to less toxic methylated metabolites monomethylarsinic acid (MMA) and subsequently dimethylarsinic acid (DMA).

In the past, inorganic arsenic compounds were predominantly used as pesticides, primarily on cotton fields and in orchards. Inorganic arsenic compounds can no longer be used in agriculture. However, organic arsenic compounds, namely cacodylic acid, disodium methylarsenate (DSMA), and monosodium methylarsenate (MSMA), are still used as pesticides, principally on cotton. Some organic arsenic compounds are used as additives in animal feed. Small quantities of elemental arsenic are also added to other metals to form metal mixtures or alloys with improved properties. The greatest use of arsenic in alloys is in lead-acid batteries for automobiles. Another important use of arsenic compounds is in semiconductors and light-emitting diodes.

People are exposed to arsenic by eating food, drinking water, or breathing air. Of these, food is usually the largest source of arsenic. The predominant dietary source of arsenic is seafood, followed by rice/rice cereal, mushrooms, and poultry. While seafood contains the greatest amounts of arsenic, for fish and shellfish, this is mostly in an organic form of arsenic called arsenobetaine, which is much less harmful. Some seaweed may contain arsenic in the inorganic form, which is more toxic. In the United States, some areas also contain high natural levels of arsenic in rock, which can lead to elevated levels in the soil and drinking water. Occupational (eg, copper or lead smelting, wood treating, or pesticide application) exposure is another source where people may be introduced to elevated levels of arsenic. Lastly, hazardous waste sites may contain large quantities of arsenic and if not disposed of properly may get into the surrounding water, air, or soil.

A wide range of signs and symptoms may be seen in acute arsenic poisoning including headache, nausea, vomiting, diarrhea, abdominal pain, hypotension, fever, hemolysis, seizures, and mental status changes. Symptoms of chronic poisoning, also called arseniasis, are mostly insidious and nonspecific. The gastrointestinal tract, skin, and central nervous system are usually involved. Nausea, epigastric pain, colic abdominal pain, diarrhea, and paresthesias of the hands and feet can also occur.

Since arsenic is excreted predominantly by glomerular filtration, measurement of arsenic in urine is the most reliable means of detecting arsenic exposures within the last several days.

Reference Values

Only orderable as part of profile. For more information see:

ARSCR / Arsenic/Creatinine, with Reflex, Random, Urine

HMCRU / Heavy Metal/Creatinine, with Reflex, Random, Urine

Interpretation

Physiologically, arsenic exists in a number of toxic and nontoxic forms. The total arsenic concentration reflects all the arsenic present in the sample regardless of species (eg, inorganic vs methylated vs organic arsenic). The measurement of urinary total arsenic levels is generally accepted as the most reliable indicator of recent arsenic exposure. However, if the total urine arsenic concentration is elevated, arsenic speciation must be performed to identify if it is the toxic forms (eg, inorganic and methylated forms) or the relatively non-toxic organic forms (eg, arsenobetaine and arsenocholine).
The inorganic toxic forms of arsenic (eg, AsIII and AsV) are found in the urine shortly after ingestion, whereas the less toxic methylated forms (MMA and DMA) are the species that predominate longer than 24 hours after ingestion. In general, urinary AsIII and AsV concentrations peak in the urine at approximately 10 hours and return to normal 20 to 30 hours after ingestion. Urinary MMA and DMA concentrations normally peak at approximately 40 to 60 hours and return to baseline 6 to 20 days after ingestion.

This test can determine if you have been exposed to above-average levels of arsenic. It cannot predict whether the arsenic levels in your body will affect your health.

Cautions
Consumption of seafood before collection of a urine specimen for arsenic testing is likely to result in a report of an elevated concentration of arsenic found in the urine, which can be clinically misleading.

Clinical Reference

Performance
Method Description
Arsenic (As) in urine is analyzed by inductively coupled plasma-mass spectrometry (ICP-MS) in kinetic energy discrimination (KED) mode using gallium (Ga), rhodium (Rh), and iridium (Ir) as internal standards and a 5% nitric acid salt matrix calibration.(Unpublished Mayo method)

PDF Report
No

Day(s) and Time(s) Test Performed
Monday through Friday; 7 p.m.
Analytic Time
1 day

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.

LOINC® Information

<table>
<thead>
<tr>
<th>Test ID</th>
<th>Test Order Name</th>
<th>Order LOINC Value</th>
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<tbody>
<tr>
<td>ARSC</td>
<td>Arsenic/Creatinine Ratio, U</td>
<td>13463-5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Result ID</th>
<th>Test Result Name</th>
<th>Result LOINC Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>48541</td>
<td>Arsenic/Creatinine Ratio, U</td>
<td>13463-5</td>
</tr>
<tr>
<td>48542</td>
<td>Arsenic Concentration w/Reflex</td>
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