Overview

Useful For
Detecting mercury toxicity

Special Instructions
- Trace Metals Analysis Specimen Collection and Transport

Method Name
Inductively Coupled Plasma-Mass Spectrometry (ICP-MS)

NY State Available
Yes

Specimen

Specimen Type
Whole blood

Specimen Required

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

Container/Tube: Royal blue-top (EDTA) Vacutainer plastic trace element blood collection tube (T183)

Specimen Volume: Full tube

Collection Instructions:
1. See Trace Metals Analysis Specimen Collection and Transport in Special Instructions for complete instructions.
2. Send specimen in original tube.

Additional Information: If ordering the trace element blood collection tube from BD, order catalog #368381.

Specimen Minimum Volume
0.3 mL

Reject Due To

<table>
<thead>
<tr>
<th>Gross hemolysis</th>
<th>OK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross lipemia</td>
<td>OK</td>
</tr>
<tr>
<td>Gross icterus</td>
<td>OK</td>
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</table>

Specimen Stability Information
Clinical and Interpretive

Clinical Information

Mercury (Hg) is essentially nontoxic in its elemental form. If Hg(0) is chemically modified to the ionized, inorganic species, Hg(+2), it becomes toxic. Further bioconversion to an alkyl Hg, such as methyl Hg (CH[3]Hg[+]), yields a species of mercury that is highly selective for lipid-rich tissue such as neurons and is very toxic. The relative order of toxicity is:

Not Toxic - Hg(0) < Hg(+2) << CH(3)Hg(+) -- Very Toxic

Mercury can be chemically converted from the elemental state to the ionized state. In industry, this is frequently done by exposing Hg(0) to strong oxidizing agents such as chlorine.

Hg(0) can be bioconverted to both Hg(+2) and alkyl Hg by microorganisms that exist both in the normal human gut and in the bottom sediment of lakes, rivers, and oceans. When Hg(0) enters bottom sediment, it is absorbed by bacteria, fungi, and small microorganisms; they metabolically convert it to Hg(+2), CH(3)Hg(+), and (CH[3])(+2)Hg. Should these microorganisms be consumed by larger marine animals and fish, the mercury passes up the food chain in rather toxic form.

Mercury expresses its toxicity in 3 ways:

- Hg(+2) is readily absorbed and reacts with sulfhydryl groups of protein, causing a change in the tertiary structure of the protein—a stereoisomeric change—with subsequent loss of the unique activity associated with that protein. Because Hg(+2) becomes concentrated in the kidney during the regular clearance processes, this target organ experiences the greatest toxicity.

- With the tertiary change noted previously, some proteins become immunogenic, eliciting a proliferation of T lymphocytes that generate immunoglobulins to bind the new antigen; collagen tissues are particularly sensitive to this.

- Alkyl Hg species, such as CH(3)Hg(+), are lipophilic and avidly bind to lipid-rich tissues such as neurons. Myelin is particularly susceptible to disruption by this mechanism.

Members of the public will occasionally become concerned about exposure to mercury from dental amalgams. Restorative dentistry has used a mercury-silver amalgam for approximately 90 years as a filling material. A small amount of mercury (2-20 mcg/day) is released from a dental amalgam when it was mechanically manipulated, such as by chewing. The habit of gum chewing can cause release of mercury from dental amalgams greatly above normal. The normal bacterial flora present in the mouth converts a fraction of this to Hg(+2) and CH(3)Hg(+), which was shown to be incorporated into body tissues. The World Health Organization safety standard for daily exposure to mercury is 45 mcg/day. Thus, if one had no other source of exposure, the amount of mercury released from dental amalgams is not significant.

(1) Many foods contain mercury. For example, commercial fish considered safe for consumption contain <0.3 mcg/g of mercury, but some game fish contain >2.0 mcg/g and, if consumed on a regular basis, contribute to significant body burdens.

<table>
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<th>Specimen Type</th>
<th>Temperature</th>
<th>Time</th>
<th>Special Container</th>
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<tr>
<td>Whole blood</td>
<td>Refrigerated (preferred)</td>
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<tr>
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<td>Ambience</td>
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<td></td>
<td>Frozen</td>
<td>28 days</td>
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</table>
Therapy is usually monitored by following urine output; therapy may be terminated after urine excretion is <50 mcg/day.

**Reference Values**
Normal: 0-9 ng/mL

Reference values apply to all ages.

**Interpretation**
The quantity of mercury (Hg) found in blood and urine correlates with degree of toxicity. Hair analysis can be used to document the time of peak exposure if the event was in the past.

Normal whole blood mercury is usually <10 ng/mL.

Individuals who have mild exposure during work, such as dentists, may routinely have whole blood mercury levels up to 15 ng/mL.

Significant exposure is indicated when the whole blood mercury is >50 ng/mL if exposure is due to alkyl Hg, or >200 ng/mL if exposure is due to Hg(+2).

**Cautions**
To avoid contamination during specimen collection, it is essential to follow collection procedures as outlined in Trace Metals Analysis Specimen Collection and Transport in Special Instructions.

**Clinical Reference**

**Performance**

**Method Description**
Arsenic (As), cadmium (Cd), mercury (Hg), and lead (Pb) are analyzed by ICP-MS in kinetic energy discrimination (KED) mode using helium as a nonreactive gas to collide with polyatomic interferences such as argon chloride (ArCl). Internal standards used are gallium (Ga) for As, rhodium (Rh) for Cd, and lutetium (Lu) and iridium (Ir) summed for Hg and Pb. A salt matrix calibration is used. (Nixon DE, Burritt MF, Moyer TP: The determination of mercury in whole blood and urine by inductively coupled plasma mass spectrometry. Spectrochimica Acta Part B-Atomic Spectroscopy 1999; 54: 1141-1153; Hanley MM, Eckdahl SJ, Kiedrowski B, et al: A comparison of methods for attenuation of oxide interferences in cadmium and mercury analysis by ICP-MS [Paper 38169]. 38th Federation of Analytical Chemistry and Spectroscopy Societies, Reno, NV, October 2-6, 2011)

**PDF Report**
No

**Day(s) and Time(s) Test Performed**

Document generated March 25, 2020 at 7:35am CDT
Monday through Saturday; 2 p.m.

**Analytic Time**
1 day

**Maximum Laboratory Time**
3 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**
83825

**LOINC® Information**

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