Overview

Useful For
Detecting cobalt toxicity
Monitoring metallic prosthetic implant wear

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
Serum

Advisory Information
COWB / Cobalt, Blood is the FDA recommended test for monitoring cobalt in metal-on-metal implant patients.

Specimen Minimum Volume
0.4 mL

Reject Due To
<table>
<thead>
<tr>
<th>Condition</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Gross hemolysis</td>
<td>OK</td>
</tr>
<tr>
<td>Gross lipemia</td>
<td>OK</td>
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<tr>
<td>Gross icterus</td>
<td>OK</td>
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</tbody>
</table>

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>Serum</td>
<td>Refrigerated (preferred)</td>
<td>28 days</td>
<td>METAL FREE</td>
</tr>
<tr>
<td></td>
<td>Ambient</td>
<td>28 days</td>
<td>METAL FREE</td>
</tr>
<tr>
<td></td>
<td>Frozen</td>
<td>28 days</td>
<td>METAL FREE</td>
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Clinical and Interpretive

Clinical Information
Cobalt is rare but widely distributed in the environment, used in the manufacture of hard alloys with high melting points and resistance to oxidation; cobalt alloys are used in manufacture of some artificial joint prosthesis devices.
Cobalt salts are used in the glass and pigment industry. Previously, cobalt salts were sometimes used as foam stabilizers in the brewing industry; this practice was banned due to the cardiovascular diseases it induced. The radioactive isotope of cobalt, (60)Co, is used as a gamma emitter in experimental biology, cancer therapy, and industrial radiography.

Cobalt is an essential cofactor in vitamin B12 metabolism. Cobalt deficiency has not been reported in humans.

Cobalt is not highly toxic, but large doses will produce adverse clinical manifestations. Acute symptoms are pulmonary edema, allergy, nausea, vomiting, hemorrhage, and renal failure. Chronic symptoms include pulmonary syndrome, skin disorders, and thyroid abnormalities. The inhalation of dust during machining of cobalt alloyed metals can lead to interstitial lung disease.

Serum cobalt concentrations are likely to be increased above the reference range in patients with joint prosthesis containing cobalt. Prosthetic devices produced by Depuy Company, Dow Corning, Howmedica, LCS, PCA, Osteonics, Richards Company, Tricon, and Whiteside are typically made of chromium, cobalt, and molybdenum. This list of products is incomplete, and these products change occasionally; see prosthesis product information for each device for composition details.

**Reference Values**

0.0-0.9 ng/mL

<10 ng/mL (MoM implant)

Reference values apply to all ages.

The reported unit of measurement for cobalt of ng/mL is equivalent to mcg/L.

**Interpretation**

Concentrations greater than or equal to 1.0 ng/mL indicate possible environmental or occupational exposure. Cobalt concentrations associated with toxicity must be interpreted in the context of the source of exposure. If cobalt is ingested, concentrations greater than 5 ng/mL suggest major exposure and likely toxicity. If cobalt exposure is due to orthopedic implant wear, there are no large case number reports associating high circulating serum cobalt with toxicity.

There are no Occupational Health and Safety Administration (OSHA) blood or urine criteria for occupational exposure to cobalt.

Prosthesis wear is known to result in increased circulating concentration of metal ions. Modest increase (4-10 ng/mL) in serum cobalt concentration is likely to be associated with a prosthetic device in good condition. Serum concentrations above 10 ng/mL in a patient with cobalt-based implant suggest significant prosthesis wear. Increased serum trace element concentrations in the absence of corroborating clinical information do not independently predict prosthesis wear or failure. However, the FDA recommends testing cobalt in EDTA anticoagulated whole blood in symptomatic patients with metal-on-metal implants.

**Cautions**

This test should not be ordered to assess vitamin B12 activity.

Because this test uses mass spectrometry detection, the radioactive form of cobalt, (60)Co, is not quantified.

Specimen collection procedures for cobalt require special specimen collection tubes, rigorous attention to ultraclean specimen collection and handling procedures, and analysis in an ultraclean facility. Unless all of these precautions
are taken, elevated serum cobalt results may be an incidental and misleading finding.

**Clinical Reference**


**Performance**

**Method Description**

Cobalt in serum is analyzed by inductively coupled plasma-mass spectrometry (ICP-MS) in kinetic energy discrimination (KED) mode using rhodium (Rh) as an internal standard and a salt matrix calibration. (Unpublished Mayo method)

**PDF Report**

No

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

Monday, Wednesday, Friday; 5 p.m.

**Analytic Time**

1 day

**Maximum Laboratory Time**

5 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**

83018

**LOINC® Information**

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<th>Test Order Name</th>
<th>Order LOINC Value</th>
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<tbody>
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<table>
<thead>
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