Overview

Useful For
Monitoring metallic prosthetic implant wear and local tissue destruction in failed hip arthroplasty constructs.

This test is **not useful for** assessment of nutritional status or potential cobalt 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
Synovial Fluid

Ordering Guidance
This test should only be used in individuals with metallic prosthetic implants. The significance of cobalt concentrations in synovial fluid in patients without implants is unknown.

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 at least 96 hours.

**Supplies:** Metal Free B-D Tube (EDTA), 6 mL (T183)

**Container/Tube:** Royal blue top (metal-free EDTA)

**Specimen Volume:** 1 mL

**Collection Instructions:** [See Trace Metals Analysis Specimen Collection and Transport](#) in Special Instructions for complete instructions.

**Additional Information:** Cobalt is present in the black rubber plunger seals found in most disposable syringes. As a result, synovial fluid should not be collected in these devices as contamination may occur.

Specimen Minimum Volume
0.4 mL

Reject Due To

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<td>Gross lipemia</td>
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### Clinical and Interpretive

#### Clinical Information

Per FDA recommendations, orthopedic surgeons should consider measuring and following serial Co concentrations in EDTA anticoagulated whole blood in symptomatic patients with metal-on-metal hip implants as part of their overall clinical evaluation. However, a recent publication(1) has shown synovial fluid measurements were superior to whole blood and serum Co concentrations in predicting local tissue destruction in failed hip arthroplasty constructs.

Prosthetic devices produced by Depuy Company, Dow Corning, Howmedica, LCS, PCA, Osteonics, Richards Company, Tricon, and Whiteside are typically made of chromium, Co, and molybdenum. This list of products is incomplete, and these products' compositions change occasionally; see each prostheses' product information for composition details.

Cobalt (Co) is a naturally occurring, hard, grey element widely distributed in the environment. It is used to produce alloys in the manufacturing of aircraft engines, cutting tools, and some artificial hip and knee joint prosthesis devices.

Co is an essential cofactor for vitamin B12, which is necessary for neurological function, brain function, and the formation of blood. For most people, food is the largest source of Co intake. The greatest environmental exposure occurs in mining processes, cemented tungsten-carbide industry, Co powder industry, and alloy production industry.

Co is not highly toxic; however large doses may produce adverse clinical manifestations. Acute symptoms include pulmonary edema, allergy, nausea, vomiting, hemorrhage, and renal failure. Chronic exposure to Co-containing hard metal (dust or fume) can result in a serious lung disease called “hard metal lung disease,” which is a type of pneumoconiosis (lung fibrosis). Furthermore, inhalation of Co particles can cause respiratory sensitization, asthma, shortness of breath, and decreased pulmonary function. Even though the primary route of occupational exposure to Co is the respiratory tract, skin contact is also important because dermal exposures to hard metal and cobalt salts can result in significant systemic uptake. Sustained exposures can cause skin sensitization, which may result in eruptions of contact dermatitis. In cases of suspected toxicity, blood, serum, or urine concentrations of Co can be checked. Vitamin B12 should be used to assess nutritional status.

#### Reference Values

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<th>Age Group</th>
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<td>0-17 years</td>
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<td>&gt; or =18 years</td>
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#### Interpretation
Based on an internal study, synovial fluid cobalt concentrations of 17.2 ng/mL or above were more likely due to a metal reaction (e.g., adverse local tissue reaction [ALTR]/adverse reaction to metal debris [ARMD]) versus a nonmetal reaction in patients undergoing metal-on-metal revision (sensitivity of 80.8% and specificity of 81.5%).

**Cautions**

This test is intended for monitoring of implant wear and should not be ordered to assess nutritional status or potential cobalt toxicity.

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. Elevated trace element concentrations in the absence of corroborating clinical information do not independently predict prosthesis wear or failure.

**Clinical Reference**

1. Houdek MT, Wyles CC, Jannetto PJ, et al: Synovial fluid metal levels are superior to whole blood and serum metal ion levels in predicting local tissue destruction in failed hip arthroplasty constructs. Orthopaedic Proceed. 2018;100-B(SUPP_1):39


**Performance**

**Method Description**

Cobalt is analyzed by inductively coupled plasma-mass spectrometry (ICP-MS). (Unpublished Mayo method)

**PDF Report**

No

**Day(s) Performed**

Thursday

**Report Available**

1 to 7 days

**Specimen Retention Time**

14 days

**Performing Laboratory Location**

Rochester
Test Definition: COSY
Cobalt, Synovial Fl

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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