

Overview

Useful For

Detection of nonacute arsenic, mercury, and lead exposure

Special Instructions

- [Collecting Hair and Nails for Metals Testing](#)

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
ASNA	Arsenic, Nails	Yes	Yes
PBNA	Lead, Nails	Yes	Yes
HGNA	Mercury, Nails	Yes	Yes

Method Name

Inductively Coupled Plasma-Mass Spectrometry (ICP-MS)

NY State Available

No

Specimen

Specimen Type

Nail

Necessary Information

Indicate source of nails (fingernails or toenails), if known

Specimen Required

Supplies: Hair and Nails Collection Kit (T565)

Specimen Volume: 0.2 g

Collection Instructions:

1. Prepare and transport specimen per the instructions in the kit or see [Collecting Hair and Nails for Metals Testing](#) in Special Instructions.
2. Clippings should be taken from all 10 fingernails or toenails.

Reject Due To

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

Specimen Minimum Volume

0.05 g

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Nail	Ambient (preferred)		
	Frozen		
	Refrigerated		

Clinical & Interpretive**Clinical Information**

Arsenic

Arsenic circulating in the blood will bind to protein by formation of a covalent complex with sulfhydryl groups of the amino acid cysteine. Keratin, the major structural protein in hair and nails, contains many cysteine residues and, therefore, is one of the major sites for accumulation of arsenic. Since arsenic has a high affinity for keratin, the concentration of arsenic in nails is higher than in other tissues.

Several weeks after exposure, transverse white striae, called Mees' lines, may appear in the fingernails

Mercury

Once absorbed and circulating, mercury becomes bound to numerous proteins, including keratin. The concentration of mercury in nails correlates with the severity of clinical symptoms. If the nails can be segregated by length, such an exercise may be useful in identifying the time of exposure.

Lead

Nail analysis of lead can be used to corroborate blood analysis.

Reference Values

ARSENIC

0-15 years: not established

> or =16 years: <1.0 mcg/g of nails

LEAD

<4.0 mcg/g of nails

Reference values apply to all ages.

MERCURY

0-15 years: not established

> or =16 years: <1.0 mcg/g of nails

Interpretation

Nails grow at a rate of approximately 0.1 inch/month. Nail keratin synthesized today will grow to the distal end in approximately 6 months. Thus, a nail specimen collected at the distal end represents exposure of 6 months ago.

ARSENIC

Nail arsenic above 1.0 mcg/g dry weight may indicate excessive exposure. It is normal for some arsenic to be present in nails, as everybody is exposed to trace amounts of arsenic from the normal diet.

The highest hair or nail arsenic observed at Mayo Clinic was 210 mcg/g dry weight in a case of chronic exposure, which was the cause of death.

MERCURY

Normally, nails contain less than 1 mcg/g of mercury; any amount above this indicates that exposure to more than normal amounts of mercury may have occurred.

LEAD

Normally, the nail lead content is below 4.0 mcg/g. While nail lead content above 10.0 mcg/g may indicate significant lead exposure, nails are also subject to potential external contamination with environmental lead. Ultimately, the nail lead content needs to be interpreted in addition to the overall clinical scenario including symptoms, physical findings, and other diagnostic results when determining further actions.

Cautions

No significant cautionary statements

Clinical Reference

1. Hindmarsh JT, McCurdy RF: Clinical and environmental aspects of arsenic toxicity. *Crit Rev Clin Lab Sci.* 1986;23:315-347
2. Strumylaite L, Ryselis S, Kregzdyte R: Content of lead in human hair from people exposed to lead. *Int J Hyg Environ Health.* 2004;207:345-351
3. Barbosa F, Tanus-Santos J, Gerlach R, Parsons P: A critical review of biomarkers used for monitoring human exposure to lead: advantages, limitations, and future needs. *Environ Health Perspect.* 2005;113:1669-1674
4. Sanna E, Liguori A, Palmes L, et al: Blood and hair lead levels in boys and girls living in two Sardinian towns at different risks of lead pollution. *Ecotoxicol Environ Saf.* 2003;500:293-299
5. DiPietro ES, Phillips DL, Paschal DC, Neese JW. Determination of trace elements in human hair. *Biol Trace Elem Res.* 1989;22:83-100
6. Strathmann FG, Blum LM: Toxic elements. In: Nader R, Horwath AR, Wittwer CT, eds. *Tietz Textbook of Clinical Chemistry and Molecular Diagnostics.* 6th ed. Elsevier; 2018:chap 42

Performance**Method Description**

Arsenic, mercury, and lead in nails are analyzed by inductively coupled plasma-mass spectrometry (ICP-MS) in kinetic energy discrimination (KED) mode using gallium, iridium, and lutetium as internal standards, and a salt matrix calibration.(Unpublished Mayo method)

PDF Report

No

Specimen Retention Time

14 days

Performing Laboratory Location

Rochester

Fees & Codes**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 US Food and Drug Administration.

CPT Code Information

82175-Arsenic

83655-Lead

83825-Mercury

LOINC® Information

Test ID	Test Order Name	Order LOINC Value
HMNA	Heavy Metals, Nails	94574-1

Result ID	Reporting Name	LOINC®
2535	Arsenic, Nails	8157-0
ASNCS	Specimen Source	31208-2
2509	Mercury, Nails	8204-0
HGNCS	Specimen Source	31208-2
2506	Lead, Nails	8202-4
PBNCS	Specimen Source	31208-2