MAYO CLINIC LABORATORIES

Test Definition: HMNA

Heavy Metals, Nails

Overview

Useful For

Detection of nonacute arsenic, mercury, and lead exposure using nail specimens

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

Special Instructions

- Collecting Hair and Nails for Metals Testing

Method Name

Triple-Quadrupole Inductively Coupled Plasma Mass Spectrometry (ICP-MS/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)

Source: Fingernails or toenails

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.
2. Clippings should be taken from all 10 fingernails or toenails.

Specimen Minimum Volume

0.05 g

Reject Due To

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

Specimen Stability Information

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

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.

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(4):315-347
2. Strumylaite L, Ryselis S, Kregzdyte R. Content of lead in human hair from people with various exposure levels in Lithuania. Int J Hyg Environ Health. 2004;207(4):345-351
3. Barbosa F Jr, Tanus-Santos JE, Gerlach RF, Parsons PJ. A critical review of biomarkers used for monitoring human exposure to lead: advantages, limitations, and future needs. Environ Health Perspect. 2005;113(12):1669-1674
4. Sanna E, Liguori A, Palmes L, Soro MR, Floris G. Blood and hair lead levels in boys and girls living in two Sardinian towns at different risks of lead pollution. Ecotoxicol Environ Saf. 2003;55(3):293-299
5. DiPietro ES, Phillips DL, Paschal DC, Neese JW. Determination of trace elements in human hair. Reference intervals for 28 elements in nonoccupationally exposed adults in the US and effects of hair treatments. Biol Trace Elem Res. 1989;22(1):83-100
6. Strathmann FG, Blum LM. Toxic elements. In: Rifai N, Chiu RWK, Young I, Burnham CAD, Wittwer CT, eds. Tietz Textbook of Laboratory Medicine. 7th ed. Elsevier; 2023:chap 44

Performance

Method Description
The metal analytes of interest are analyzed by triple-quadrupole inductively coupled plasma mass spectrometry.(Unpublished Mayo method)

PDF Report
No

Day(s) Performed

Wednesday

Report Available
2 to 14 days

Specimen Retention Time
14 days

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Superior Drive

Fees & 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 account representative. 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. It has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information
82175
83655
83825

LOINC® Information

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

Result ID	Test Result Name	Result LOINC® Value
2535	Arsenic, Nails	8157-0
ASNSC	Specimen Source	31208-2
2509	Mercury, Nails	8204-0
HGNSC	Specimen Source	31208-2
2506	Lead, Nails	8202-4
PBNSC	Specimen Source	31208-2