MAYO CLINIC LABORATORIES

Test Definition: MNS

Manganese, Serum

Overview

Useful For

Monitoring manganese exposure using serum specimens

Nutritional monitoring

Special Instructions

- Metals Analysis Specimen Collection and Transport

Method Name

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

NY State Available

Yes

Specimen

Specimen Type

Serum

Specimen Required

Patient Preparation: High concentrations of gadolinium, iodine, and barium are known to interfere with most metal tests. If gadolinium-, iodine, or barium-containing contrast media has been administered, a specimen **should not** be collected for 96 hours.
Supplies: Metal Free Specimen Vial (T173)
Collection Container/Tube: Plain, royal blue-top Vacutainer plastic trace element blood collection tube
Submission Container/Tube: 7-mL Mayo metal-free, screw-capped, polypropylene vial
Specimen Volume: 0.3 mL
Collection Instructions:
1. Allow the specimen to clot for 30 minutes, and then centrifuge to separate serum from the cellular fraction. Serum must be removed from cellular fraction within 4 hours of collection. Avoid hemolysis.
2. Remove the stopper. Carefully pour specimen into a Mayo metal-free, polypropylene vial, while avoiding transfer of the cellular components of blood. **Do not** insert a pipet into the serum to accomplish transfer, and **do not** ream the specimen with a wooden stick to assist with serum transfer.
3. See Metals Analysis Specimen Collection and Transport for complete instructions.

Specimen Minimum Volume

0.2 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	OK
Gross icterus	OK

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Refrigerated (preferred)	28 days	METAL FREE
	Ambient	28 days	METAL FREE
	Frozen	28 days	METAL FREE

Clinical & Interpretive

Clinical Information

Manganese (Mn) is a trace essential element with many industrial uses. Mining and iron and steel production have been implicated as occupational sources of exposure. It is principally used in steel production to improve hardness, stiffness, and strength. Mn is a normal constituent of air, soil, water, and food. The primary non-occupational source of exposure is by eating food or Mn-containing nutritional supplements. Vegetarians who consume foods rich in Mn such as grains, beans, and nuts, as well as heavy tea drinkers may have a higher intake than the average person. People who smoke tobacco or inhale second-hand smoke are also exposed to Mn at higher levels than nonsmokers.

Inhalation is the primary source of entry for Mn, but is also partially absorbed (3%-5%) through the gastrointestinal tract. Only very small amounts of Mn are absorbed dermally. Signs of toxicity may appear quickly, and neurological symptoms are rarely reversible. Mn toxicity is generally recognized to progress through 3 stages. Levy describes these stages. "The first stage is a prodrome of malaise, somnolence, apathy, emotional lability, sexual dysfunction, weakness, lethargy, anorexia, and headaches. If there is continued exposure, progression to a second stage may occur, with psychological disturbances, including impaired memory and judgement, anxiety, and sometimes psychotic manifestations such as hallucinations. The third stage consists of progressive bradykinesia, dysarthria axial and extremity dystonia, paresis, gait disturbances, cogwheel rigidity, intention tremor, impaired coordination, and a mask-like face. Many of those affected may be permanently and completely disabled."(1) Mn is removed from the blood by the liver where it's conjugated with bile and excreted.

As listed in the United States National Agriculture Library, Mn adequate intake is 1.6 to 2.3 mg/day for adults. This level of intake is easily achieved without supplementation by a diverse diet including fruits and vegetables, which have higher amounts of Mn than other food types. Patients on a long-term parenteral nutrition should receive Mn supplementation and should be monitored to ensure that circulatory levels of Mn are appropriate.

Reference Values

0-17 years: Not established
> or =18 years: 0.5-1.2 ng/mL

Interpretation

Serum manganese results above the reference values suggest recent exposure. Serum concentrations in combination with brain magnetic resonance imaging scans and neurological assessment may be used to detect excessive exposure.

Cautions

Specimens collected from healthy, unexposed adults have extremely low levels of manganese (Mn). Because of the high environmental concentration of Mn, contamination is always a possibility when considering elevated results. Precautions must be taken to ensure the specimen is not contaminated. Metal-free serum collection procedures must be followed, and centrifuged serum must be aliquoted into an acid-washed Mayo metal-free vial.

Clinical Reference

1. Levy BS, Nassetta WJ. Neurologic effects of manganese in humans: A review. Int J Occup Environ Health. 2003;9(2):153-163. doi:10.1179/oeh.2003.9.2.153
2. Chiswell B, Johnson D. Manganese: In: Seiler HG, Sigel A, Sigel H, eds. Handbook on Metals in Clinical and Analytical Chemistry. CRC Press; 1994:479-494
3. Finley JW, Davis CD. Manganese deficiency and toxicity: Are high or low dietary amounts of manganese cause for concern? Biofactors. 1999;10(1):15-24. doi:10.1002/biof.5520100102
4. Rifai N, Chiu RWK, Young I, Burnham CAD, Wittwer CT, eds: Tietz Textbook of Laboratory Medicine. 7th ed. Elsevier; 2023
5. O'Neal SL, Zheng W. Manganese toxicity upon overexposure: a decade in review. Curr Environ Health Rep. 2015;2(3):315-328. doi:10.1007/s40572-015-0056-x
6. Glasdam SM, Glasdam S, Peters GH. The importance of magnesium in the human body: A systematic literature review. Adv Clin Chem. 2016;73:169-193. doi:10.1016/bs.acc.2015.10.002

Performance

Method Description

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

PDF Report

No

Day(s) Performed

Tuesday

Report Available

2 to 8 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

83785

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
MNS	Manganese, S	5683-8

Result ID	Test Result Name	Result LOINC® Value
8413	Manganese, S	5683-8