MAYO CLINIC LABORATORIES

Test Definition: OXYWB

Oxysterols, Blood

Overview

Useful For

Investigating a possible diagnosis of acid sphingomyelinase deficiency, also known as Niemann-Pick disease type A or B, using dried blood spots created from a whole blood specimen

This test is **not recommended** for diagnosis of Niemann-Pick type C (NPC). If NPC is suspected, consider plasma oxysterols.

This test is **not useful** for the identification of carriers

Testing Algorithm

If the patient has abnormal newborn screening results for acid sphingomyelinase deficiency, also called Niemann-Pick type A or B disease, refer to the appropriate American College of Medical Genetics and Genomics Newborn Screening ACT Sheet.(1)

Method Name

Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS)

NY State Available

Yes

Specimen

Specimen Type

Whole blood

Ordering Guidance

Based on internal validation studies, this test using dried blood spots created from a whole blood specimen is less clinically sensitive and specific for diagnosing Niemann-Pick type C (NPC) (75% and 89%, respectively) than using plasma (98%). If there is a strong clinical suspicion for NPC, order OXNP / Oxysterols, Plasma.

This test is also available as a part of a panel, see HSMWB / Hepatosplenomegaly Panel, Blood. If this test (OXYWB) is ordered with either GPSYW / Glucopsychosine, Blood or CTXWB / Cerebrotendinous Xanthomatosis, Blood, the individual tests will be canceled and HSMWB ordered.

Specimen Required

Container/Tube:
Preferred: Lavender top (EDTA)
Acceptable: Green top (sodium heparin, lithium heparin) or yellow top (ACD B)
Specimen Volume: 1 mL

Collection Instructions: Send whole blood specimen in original tube. **Do not aliquot.**

Forms

If not ordering electronically, complete, print, and send a Biochemical Genetics Test Request (T798) with the specimen.

Specimen Minimum Volume

0.25 mL

Reject Due To

Gross hemolysis	OK
Gross lipemia	OK
Gross icterus	OK

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Whole blood	Refrigerated (preferred)	72 hours	
	Ambient	48 hours	

Clinical & Interpretive

Clinical Information

Niemann-Pick disease types A, B, and C (NPA, NPB, and NPC, respectively) are a group of autosomal recessive lysosomal storage disorders affecting metabolism of specific lipids within cells.

Niemann-Pick disease types A and B, also known as acid sphingomyelinase deficiency, result in extensive storage of sphingomyelin and cholesterol in the liver, spleen, lungs, and may also affect the brain. NPA disease is more severe than NPB, and it is characterized by early onset with feeding problems, dystrophy, persistent jaundice, development of hepatosplenomegaly, neurological deterioration, deafness, and blindness leading to death by 3 years of age. NPB disease is limited to visceral symptoms, such as hepatosplenomegaly, with survival into adulthood. Some patients have been described with intermediary clinical phenotypes. Large, lipid-laden foam cells are characteristic of the disease. Approximately 50% of patients with this condition have cherry-red spots in the macula.

Treatment is available in the form of enzyme replacement therapy, which helps to reduce the accumulation of sphingomyelin; however, it is not effective in treating the central nervous system.

The combined prevalence of NPA and NPB is estimated to be 1 in 250,000 individuals. NPA and NPB are inherited in an autosomal recessive manner and are caused by biallelic disease-causing variants in the *SMPD1* gene. Although there is a higher frequency of type A among the Ashkenazi Jewish population, both types are panethnic. Individuals with NPA and NPB typically have elevations of lyso-sphingomyelin (LSM) and LSM 509 combined with potential elevations in cholestane-3-beta, 5-alpha, 6-beta-triol (COT) and 7-ketocholesterol (7-KC). Molecular genetic testing for NPA and NPB disease is also available (CGPH / Custom Gene Panel, Hereditary, Next-Generation Sequencing, Varies; specify gene list

ID: IEMCP-W6S9XD).

Niemann-Pick disease type C is caused by a defect in cellular cholesterol trafficking, which results in the progressive accumulation of unesterified cholesterol in late endosomes/lysosomes. NPC is considered a lipid storage disorder with variable age of onset, from the neonatal period to adulthood, and highly variable clinical presentation. Most individuals are diagnosed during childhood with symptoms that include ataxia, vertical supranuclear gaze palsy, dystonia, progressive speech deterioration, and seizures. Infants may present with or without hepatosplenomegaly and respiratory failure. Those without liver and pulmonary disease may present with hypotonia and developmental delay. Adult-onset NPC is associated with a slower progression and is characterized by psychiatric illness, ataxia, dystonia, and speech difficulties.

New treatments are available for patients with NPC that help improve both the neurological and functional symptoms.

The incidence of NPC is approximately 1 in 120,000 to 150,000 live births. NPC is an autosomal recessive condition and is caused by biallelic disease-causing variants in either the *NPC1* or *NPC2* genes. Individuals with NPC exhibit elevated levels of oxysterol COT; LSM 509 and 7-KC may also be elevated. The diagnosis of NPC can be confirmed by demonstration of impaired cholesterol esterification and positive filipin staining in cultured fibroblasts. For molecular confirmation, genetic testing for NPC disease can be performed (CGPH / Custom Gene Panel, Hereditary, Next-Generation Sequencing, Varies; specify gene list ID: IEMCP-H683JG).

Reference Values

Cholestane-3-beta,5-alpha,6-beta-triol
Cutoff: < or =0.800 nmol/mL

Lyso-sphingomyelin
Cutoff: < or =0.100 nmol/mL

Interpretation

An elevation of lyso-sphingomyelin is highly suggestive of acid sphingomyelinase deficiency, also called Niemann-Pick type A or B disease.

An elevation of cholestane-3-beta, 5-alpha, 6-beta-triol is highly suggestive of Niemann-Pick type C disease.

Cautions

Nonspecific neonatal cholestasis may result in elevations of cholestane-3-beta, 5-alpha, 6-beta-triol and lyso-sphingomyelin 509.

Clinical Reference

1. Newborn Screening ACT Sheet [Decreased acid sphingomyelinase] Acid Sphingomyelinase Deficiency (ASMD). American College of Medical Genetics and Genomics; 2022. Revised May 2022. Accessed December 16, 2025. Available at www.acmg.net/PDFLibrary/Niemann-Pick.pdf
2. Wasserstein MP, Schuchman EH. Acid sphingomyelinase deficiency. In: Adam MP, Feldman J, Mirzaa GM, et al, eds. GeneReviews [Internet]. University of Washington, Seattle; 2006. Updated April 27, 2023. Accessed December 16, 2025. Available at www.ncbi.nlm.nih.gov/books/NBK1370/
3. Schuchman EH. The pathogenesis and treatment of acid sphingomyelinase-deficient Niemann-Pick disease. Int J Clin Pharmacol Ther. 2009;47 Suppl 1:S48-S57. doi:10.5414/cpp47048

4. Hollak CE, de Sonnaville ES, Cassiman D, et al. Acid sphingomyelinase (Asm) deficiency patients in The Netherlands and Belgium: disease spectrum and natural course in attenuated patients. Mol Genet Metab. 2012;107(3):526-533
5. Wasserstein M, Dionisi-Vici C, Giugliani R, et al. Recommendations for clinical monitoring of patients with acid sphingomyelinase deficiency (ASMD). Mol Genet Metab. 2019;126(2):98-105

Performance

Method Description
Whole blood is spotted onto filter paper and dried overnight. A 3-mm dried blood spot is extracted with internal standard. The extract is subjected to liquid chromatography tandem mass spectrometry (LC-MS/MS) analysis. The MS/MS is operated in the multiple reaction monitoring positive mode to follow the precursor to product species transitions for each analyte and internal standard. The ratio of the extracted peak areas to internal standard determined by the LC-MS/MS is used to calculate the concentration of in the sample.(Unpublished Mayo method)

PDF Report
No

Day(s) Performed
Tuesday, Thursday

Report Available
3 to 7 days

Specimen Retention Time
Whole blood: 7 days; Dried blood spot: Normal results: 2 months Abnormal result: Indefinitely

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Main Campus

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
82542

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
OXYWB	Oxysterols, B	92738-4

Result ID	Test Result Name	Result LOINC® Value
BA4354	Interpretation (OXYWB)	59462-2
BA4352	Cholestane-3beta,5alpha,6beta-triol	92756-6
BA4353	Lyso-sphingomyelin	92748-3
BA4355	Reviewed By	18771-6