MAYO CLINIC LABORATORIES

Test Definition: A1APP

Alpha-1-Antitrypsin Phenotype, Serum

Overview

Useful For

Identification of homozygous and heterozygous phenotypes of the alpha-1-antitrypsin deficiency

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
A1AP2	Alpha-1-Antitrypsin Phenotype	No	Yes
AATP	Alpha-1-Antitrypsin, S	Yes, (Order AAT)	Yes

Testing Algorithm

For information see Alpha-1-Antitrypsin-A Comprehensive Testing Algorithm.

Special Instructions

- Alpha 1 Antitrypsin-A Comprehensive Testing Algorithm

Method Name

A1AP2: Isoelectric Focusing

AATP: Nephelometry

NY State Available

Yes

Specimen

Specimen Type

Serum

Specimen Required

Supplies: Sarstedt Aliquot Tube, 5 mL (T914)

Collection Container/Tube:

Preferred: Red top

Acceptable: Serum gel

Submission Container/Tube: Plastic vial

Specimen Volume: 1.25 mL

Collection Instructions: Centrifuge and aliquot serum into a plastic vial.

Forms

If not ordering electronically, complete, print, and send 1 of the following with the specimen:

-Gastroenterology and Hepatology Test Request (T728)
-General Request (T239)

Specimen Minimum Volume
0.5 mL

Reject Due To

Gross hemolysis	OK
Gross lipemia	Reject
Gross icterus	OK

Specimen Stability Information

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

Clinical & Interpretive

Clinical Information
Alpha-1-antitrypsin (A1A) is the most abundant serum protease inhibitor and inhibits trypsin and elastin, as well as several other proteases. The release of proteolytic enzymes from plasma onto organ surfaces and into tissue spaces results in tissue damage unless inhibitors are present. Congenital deficiency of A1A is associated with the development of emphysema at an unusually early age and with an increased incidence of neonatal hepatitis, usually progressing to cirrhosis.

The gene for A1A appears to be coded at a single locus whose alleles are inherited in a co-dominant manner. Most normal individuals have the M phenotype (M, M1, or M2). Over 99% of M phenotypes are genetically homozygous M (MM). In the absence of family studies, the phenotype (M) and quantitative level can be used to infer the genotype MM. The most common alleles associated with a quantitative deficiency are Z and S.

For more information see Alpha-1-Antitrypsin-A Comprehensive Testing Algorithm.

Reference Values
ALPHA-1-ANTITRYPSIN
100-190 mg/dL

ALPHA-1-ANTITRYPSIN PHENOTYPE
The interpretive report will identify the alleles present. For rare alleles, the report will indicate whether they have been associated with reduced quantitative levels of alpha-1-antitrypsin.

Interpretation

There are greater than 40 alpha-1-antitrypsin (A1A) phenotypes (most of these are associated with normal quantitative levels of protein). The most common normal phenotype is M (M, M1, or M2), and greater than 90% of individuals of European descent are genetically homozygous M (MM).

Alpha-1-antitrypsin deficiency is usually associated with the Z phenotype (homozygous ZZ), but SS and SZ are also associated with decreased A1A levels.

Cautions

This assay identifies the phenotype of the circulating alpha-1-antitrypsin (A1A) protein. If the patient is already on replacement therapy or has recently been transfused, the phenotype will detect patient and replacement or transfused plasma A1A protein. This test also cannot detect a null allele which could be responsible for an A1A deficiency.

If 2 bands are seen, such as an M band and a Z bands, it is reported as MZ (eg, heterozygous)

If 1 band is seen, such as the Z band and the quantitative level is consistent with a homozygote, the phenotype is assumed to be homozygous and is reported as ZZ.

Clinical Reference

1. Morse JO. Alpha-1-antitrypsin deficiency. N Engl J Med. 1978;299:1045-1048;1099(20) 1099-1105
2. Donato LJ, Jenkins SM, Smith C, et al. Reference and interpretive ranges for alpha(1)-antitrypsin quantitation by phenotype in adult and pediatric populations. Am J Clin Pathol.2012;138(3):398-405
3. Stoller JK, Lacbawan FL, Aboussouan SF: Alpha-1 antitrypsin deficiency. In: Adam MP, Ardinger HH, Pagon RA, et al, eds. GeneReviews.[Internet]. University of Washington, Seattle; 2006. Updated June 1, 2023. Accessed May 21, 2025. Available at www.ncbi.nlm.nih.gov/books/NBK1519/
4. Rosenberg W, Badrick T, Tanwar S: Liver disease. In: Rifai N, Horvath AR, Wittwer CT, eds. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 6th ed. Elsevier; 2018:1348-1397

Performance

Method Description

Alpha-1-Antitrypsin Phenotype
Phenotyping is done by isoelectric focusing in agarose gels. Certain alleles are associated with various serum levels of alpha-1-antitrypsin, and their respective proteins exhibit differential mobility on electrophoresis.(Package insert: Hydragel 18 A1AT Isofocusing. Sebia. 01/2020)

Alpha-1-Antitrypsin
In this Siemens Nephelometer II method, the light scattered by the antigen-antibody complexes is measured. The intensity of the measured scattered light is proportional to the amount of antigen-antibody complexes in the sample under certain conditions. If the antibody volume is kept constant, the signal behaves proportionally to the antigen volume. A reference curve is generated by a standard with a known antigen content on which the scattered light signals of the samples can be evaluated and calculated as an antigen concentration. Antigen-antibody complexes are formed when a sample containing antigen and the corresponding antiserum are put into a cuvette. A light beam is generated with a light emitting diode (LED), which is transmitted through the cuvette. The light is scattered onto the

immuno-complexes that are present. Antigen and antibody are mixed in the initial measurement, but no complex is formed yet. An antigen-antibody complex is formed in the final measurement. The result is calculated by subtracting value of the final measurement from the initial measurement. The distribution of intensity of the scattered light depends on the ratio of the particle size of the antigen-antibody complexes to the radiated wavelength.(Instruction manual: Siemens Nephelometer II. Siemens, Inc; V 2.4, 07/2019; Addendum to the Instruction Manual 2.3, 08/2017)

PDF Report
No

Day(s) Performed
Monday through Friday

Report Available
2 to 6 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 has been cleared, approved, or is exempt by the US Food and Drug Administration and is used per manufacturer's instructions. Performance characteristics were verified by Mayo Clinic in a manner consistent with CLIA requirements.

CPT Code Information
82103
82104

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
A1APP	Alpha-1-Antitrypsin Phenotype	32769-2

Result ID	Test Result Name	Result LOINC® Value
AATP	Alpha-1-Antitrypsin, S	6771-0
8166	Alpha-1-Antitrypsin Phenotype	32769-2