

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.

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**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/](http://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             |