



## **AssayMax Human Alpha1-Antitrypsin ELISA Kit (Plasma and Serum Samples)**

Catalog No. EA5001-1

### **Introduction**

Alpha-1 antitrypsin (A1AT) is a protein that protects the lungs. The liver usually makes the protein, and releases it into the bloodstream. A1AT is a major protease inhibitor that controls tissue degradation. A reduction of A1AT levels can cause a change in collagen metabolism (1). A1AT inhibits neutrophil elastase release into the lungs during inflammatory states (2). A1AT deficiency is an uncommon genetic disease (3) that can lead to emphysema (4), hepatitis, cirrhosis (5), and chronic obstructive pulmonary disease (COPD) (6).

### **Principal of the Assay**

The AssayMax Human A1AT ELISA (Enzyme-Linked Immunosorbent Assay) kit is designed for detection of human A1AT in plasma and serum. This assay employs a quantitative competitive enzyme immunoassay technique that measures human A1AT in less than 3 hours. A polyclonal antibody specific for human A1AT has been pre-coated onto a 96-well microplate with removable strips. A1AT in standards and samples is competed with a biotinylated A1AT sandwiched by the immobilized antibody and streptavidin-peroxidase conjugate. All unbound material is then washed away and a peroxidase enzyme substrate is added. The color development is stopped and the intensity of the color is measured.

### **Caution and Warning**

- **Prepare all reagents (working diluent buffer, wash buffer, standards, biotinylated-protein, and SP conjugate) as instructed, prior to running the assay.**
- **Prepare all samples prior to running the assay. The dilution factors for the samples are suggested in this protocol. However, the user should determine the optimal dilution factor.**
- **Spin down the SP conjugate vial before opening and using contents.**
- This kit is for research use only.
- The kit should not be used beyond the expiration date.
- The Stop Solution is an acid solution

### **Reagents**

- **Human A1AT Microplate:** A 96-well polystyrene microplate (12 strips of 8 wells) coated with a polyclonal antibody against human A1AT.

- **Sealing Tapes:** Each kit contains 3 pre-cut, pressure-sensitive sealing tapes that can be cut to fit the format of the individual assay.
- **Human A1AT Standard:** Human A1AT in a buffered protein base (80 µg, lyophilized).
- **Biotinylated A1AT:** 1 vial, lyophilized.
- **MIX Diluent Concentrate (10x):** A 10-fold concentrated buffered protein base (30 ml).
- **Wash Buffer Concentrate (20x):** A 20-fold concentrated buffered surfactant (30 ml, 1 bottle).
- **Streptavidin-Peroxidase Conjugate (SP Conjugate):** A 100-fold concentrate (80 µl).
- **Chromogen Substrate:** A ready-to-use stabilized peroxidase chromogen substrate tetramethylbenzidine (8 ml).
- **Stop Solution:** A 0.5 N hydrochloric acid to stop the chromogen substrate reaction (12 ml).

## Storage Condition

- Store components of the kit at 2-8<sup>0</sup>C or -20<sup>0</sup>C upon arrival up to the expiration date.
- Store SP Conjugate at -20<sup>0</sup>C
- Store Microplate, Diluent Concentrate (10x), Wash Buffer, Stop Solution, and Chromogen Substrate at 2-8<sup>0</sup>C
- Opened unused microplate wells may be returned to the foil pouch with the desiccant packs. Reseal along zip-seal. May be stored for up to 1 month in a vacuum desiccator.
- Diluent (1x) may be stored for up to 1 month at 2-8<sup>0</sup>C.
- Store Standard and Biotinylated Protein at 2-8<sup>0</sup>C before reconstituting with Diluent and at -20<sup>0</sup>C after reconstituting with Diluent.

## Other Supplies Required

- Microplate reader capable of measuring absorbance at 450 nm.
- Pipettes (1-20 µl, 20-200 µl, 200-1000µl and multiple channel).
- Deionized or distilled reagent grade water.

## Sample Collection, Preparation and Storage

- **Plasma:** Collect plasma using one-tenth volume of 0.1 M sodium citrate as an anticoagulant. Centrifuge samples at 2000 x g for 10 minutes and assay. Dilute samples 1:800 into MIX Diluent. The undiluted samples can be stored at -20<sup>0</sup>C or below for up to 3 months. Avoid repeated freeze-thaw cycles. (EDTA or Heparin can also be used as anticoagulant.)
- **Serum:** Samples should be collected into a serum separator tube. After clot formation, centrifuge samples at 2000 x g for 10 minutes. Remove serum and assay. Dilute samples 1:800 into MIX Diluent. The undiluted samples can be stored at -20<sup>0</sup>C or below for up to 3 months. Avoid repeated freeze-thaw cycles.

## Reagent Preparation

- Freshly dilute all reagents and bring all reagents to room temperature before use.
- **MIX Diluent Concentrate (10x):** If crystals have formed in the concentrate, mix gently until the crystals have completely dissolved. Dilute the MIX Diluent 1:10 with reagent grade water. Store for up to 1 month at 2-8<sup>0</sup>C.
- **Standard Curve:** Reconstitute the 80 µg of A1AT Standard with 2 ml of MIX Diluent to generate a working solution of 40 µg/ml. Allow the standard to sit for 10 minutes with gentle agitation prior to making dilutions. Prepare duplicate or triplicate standard points by

serially diluting the standard solution (40 µg/ml) 1:4 with MIX Diluent to produce 10, 2.5, 0.625, 0.156 and 0.039 µg/ml solutions. MIX Diluent serves as the zero standard (0 µg/ml). Any remaining solution should be frozen at -20°C.

Standard Point	Dilution	[A1AT] (µg/ml)
P1	Standard (40 µg/ml)	40.00
P2	1 part P1 + 3 parts MIX Diluent	10.00
P3	1 part P2 + 3 parts MIX Diluent	2.500
P4	1 part P3 + 3 parts MIX Diluent	0.625
P5	1 part P4 + 3 parts MIX Diluent	0.156
P6	1 part P5 + 3 parts MIX Diluent	0.039
P7	MIX Diluent	0.000

- **Biotinylated A1AT (2x):** Dilute Biotinylated A1AT with 4 ml MIX Diluent to produce a twofold stock solution. Allow the biotin to sit for 10 minutes with gentle agitation prior to making dilutions. The stock solution should be further diluted 1:2 with the MIX Diluent. Any remaining solution should be frozen at -20°C.
- **Wash Buffer Concentrate (20x):** If crystals have formed in the concentrate, mix gently until the crystals have completely dissolved. Dilute the Wash Buffer Concentrate 1:20 with reagent grade water.
- **SP Conjugate (100x):** Spin down the SP Conjugate briefly and dilute the desired amount of the conjugate 1:100 with MIX Diluent. Any remaining solution should be frozen at -20°C.

## Assay Procedure

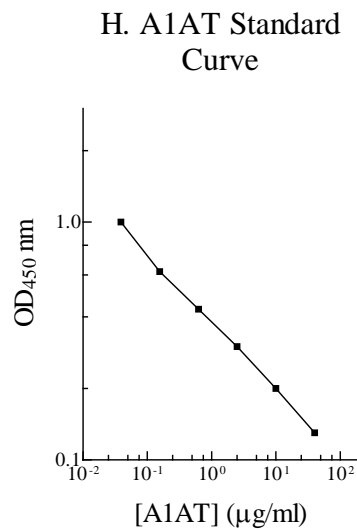
- Prepare all reagents, working standards and samples as instructed. Bring all reagents to room temperature before use. The assay is performed at room temperature (20-30°C).
- Remove excess microplate strips from the plate frame and return them immediately to the foil pouch with desiccant inside. Reseal the pouch securely to minimize exposure to water vapor and store in a vacuum desiccator.
- Add 25 µl of standard or sample per well, and immediately add 25 µl of Biotinylated A1AT to each well (on top of the Standard or sample) and mix gently. Cover wells with a sealing tape and incubate for two hours. Start the timer after the last sample addition.
- Wash five times with 200 µl of Wash Buffer manually. Invert the plate each time and decant the contents; hit it 4-5 times on absorbent paper towel to completely remove the liquid. If using a machine wash six times with 300 µl of Wash Buffer and then invert the plate, decant the contents; hit it 4-5 times on absorbent paper towel to completely remove the liquid.
- Add 50 µl of Streptavidin-Peroxidase Conjugate to each well and incubate for 30 minutes. Turn on the microplate reader and set up the program in advance.
- Wash the microplate as described above.
- Add 50 µl of Chromogen Substrate per well and incubate for about 20 minutes or till the optimal blue color density develops. Gently tap plate to ensure thorough mixing and break the bubbles in the well with pipette tip.
- Add 50 µl of Stop Solution to each well. The color will change from blue to yellow.
- Read the absorbance on a microplate reader at a wavelength of 450 nm **immediately**. If wavelength correction is available, subtract readings at 570 nm from those at 450 nm to correct optical imperfections. Otherwise, read the plate at 450 nm only. Please note that some unstable black particles may be generated at high concentration points after stopping the reaction for about 10 minutes, which will reduce the readings.

## Data Analysis

- Calculate the mean value of the duplicate or triplicate readings for each standard and sample.
- To generate a Standard Curve, plot the graph using the standard concentrations on the x-axis and the corresponding mean 450 nm absorbance on the y-axis. The best-fit line can be determined by regression analysis using log-log or four-parameter logistic curve-fit.
- Determine the unknown sample concentration from the Standard Curve and multiply the value by the dilution factor.

## Standard Curve

- The curve is provided for illustration only. A standard curve should be generated each time the assay is performed.



## Precision, Sensitivity and Specificity

- The minimum detectable dose of A1AT is typically ~0.04 µg/ml.
- Intra-assay and inter-assay coefficients of variation were 4.5 % and 7.2 % respectively.

## Cross-Reactivity

Species	% Cross Reactivity
Monkey	< 5
Mouse	< 2
Rat	< 1
Swine	< 1
Beagle	None
Bovine	None
Rabbit	None

## Linearity

Sample Dilution	Average Percentage of Expected Value	
	Plasma	Serum
1:400	102%	103%
1:800	100%	99%
1:1600	99%	97%

## Recovery

Standard Added Value	0.5 – 10 ug/ml
Recovery %	89-110 %
Average Recovery %	98.5 %

## Reference Value

- The normal blood levels of A1AT are 1.5 -3.5 g/l.

## References

- (1) Hauck EW *et al.* (2004) *Eur Urol.* 46(5): 623-8; discussion 628.
- (2) Chappell *et al.* (2004) *Hum Mutat.* 24(6): 535-6.
- (3) Strange C *et al.* (2006) *Respiration* 73(2):185-90
- (4) Abboud RT *et al.* (2005) *Treat Respir Med.* 4(1): 1-8.
- (5) Kok, KF *et al.* (2005) *Ned Tijdschr Geneesk.* 149(37): 2057-61.
- (6) Teramoto S (2007) *Intern Med.* 46(2): 77-9.

Version 1.9

## Related Products

- EA5101-1 AssayMax Human Alpha1-Antitrypsin ELISA Kit (Urine, Cell Culture Supernatant, Saliva, and Milk samples)