ab108803 – Human Apolipoprotein AI ELISA Kit (APOA1)

Instructions for Use

For the quantitative measurement of Human Apolipoprotein AI (APOA1) in plasma, serum, urine, saliva, milk, CSF, cell culture, cell lysate, and tissue samples.

This product is for research use only and is not intended for diagnostic use.

Version 14a Last Updated 1 February 2024

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1. BACKGROUND

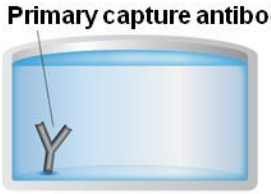
Abcam's Human Apolipoprotein AI ELISA Kit (APOA1) is designed for the quantitative measurement of apolipoprotein AI concentrations in plasma, serum, urine, saliva, milk, and CSF samples.

An Apolipoprotein AI specific antibody has been precoated onto 96-well plates and blocked. Standards or test samples are added to the wells and subsequently an Apolipoprotein AI specific biotinylated detection antibody is added and then followed by washing with wash buffer. Streptavidin-Peroxidase Complex is added and unbound conjugates are washed away with wash buffer. TMB is then used to visualize Streptavidin-Peroxidase enzymatic reaction. TMB is catalyzed by Streptavidin-Peroxidase to produce a blue color product that changes into yellow after adding acidic stop solution. The density of yellow coloration is directly proportional to the amount of Apolipoprotein AI captured in plate.

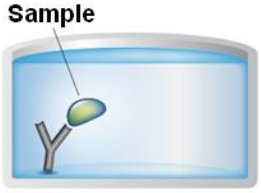
Human apolipoprotein AI comprises about 70% of the high-density lipoproteins (HDL) protein mass and apolipoprotein AII another 15–20%. APOA1, a 243-amino acid molecule that contains a series of highly homologous amphipathic alpha-helices, is a 28-kDa single polypeptide that lacks glycosylation or disulfide linkages. About 5–10% of Human plasma apolipoprotein AI exists in a lipoprotein-unassociated state. Apolipoprotein AI appears to have effects on reverse cholesterol transport, and anti-inflammation. Oxidation of specific amino acid residues in apolipoprotein AI may impair cholesterol efflux from macrophages. A majority of HDL functionality is derived from the ability of apolipoprotein AI to sequester phospholipids and cholesterol and interact with plasma enzymes and cellular receptors. During reverse cholesterol transport, HDL interacts with lecithin: cholesteryl acyltransferase (LCAT) and cellular receptors, including ATP-binding cassette transporter protein AI (ABCA1) and the scavenger receptor class B type I in an ordered fashion that is reflected by HDL particle lipid composition. A high-affinity HDL receptor for apolipoprotein AI is beta-chain of ATP synthase on the surface of hepatocytes. The plasma

concentration of apolipoprotein AI is one of the best indicators of susceptibility to cardiovascular disease.

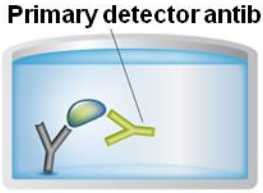
2. ASSAY SUMMARY



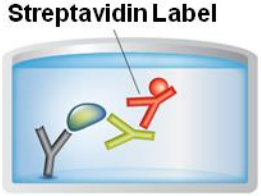
Prepare all reagents, samples and standards as instructed.



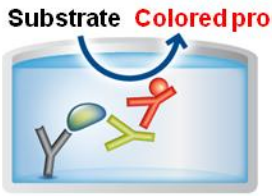
Add standard or sample to each well used. Incubate at room temperature.



Wash and add prepared biotin antibody to each well. Incubate at room temperature.



Wash and add prepared Streptavidin-Peroxidase Conjugate. Incubate at room temperature.



Add Chromogen Substrate to each well. Incubate at room temperature. Add Stop Solution to each well. Read immediately.

3. PRECAUTIONS

Please read these instructions carefully prior to beginning the assay.

Modifications to the kit components or procedures may result in loss of performance.

4. STORAGE AND STABILITY

Store kit at 4°C immediately upon receipt, apart from the SP Conjugate & Biotinylated Antibody, which should be stored at -20°C.

Refer to list of materials supplied for storage conditions of individual components. Observe the storage conditions for individual prepared components in sections 9 & 10.

5. MATERIALS SUPPLIED

Item	Amount	Storage Condition (Before Preparation)
Apolipoprotein AI Microplate (12 x 8 well strips)	96 wells	4°C
Apolipoprotein AI Standard	1 vial	-20°C
10X Diluent N Concentrate	30 mL	4°C
Biotinylated Human Apolipoprotein AI Antibody	1 vial	-20°C
100X Streptavidin-Peroxidase Conjugate (SP Conjugate)	80 µL	-20°C
Chromogen Substrate	7 mL	4°C
Stop Solution	11 mL	4°C
20X Wash Buffer Concentrate	2 x 30 mL	4°C
Sealing Tapes	3	N/A

6. MATERIALS REQUIRED, NOT SUPPLIED

These materials are not included in the kit, but will be required to successfully utilize this assay:

- 1 Microplate reader capable of measuring absorbance at 450 nm.
- Precision pipettes to deliver 1 µL to 1 mL volumes.
- Adjustable 1-25 mL pipettes for reagent preparation.
- 100 mL and 1 liter graduated cylinders.
- Absorbent paper.
- Distilled or deionized water.
- Log-log graph paper or computer and software for ELISA data analysis.
- 9 tubes to prepare standard or sample dilutions.

7. LIMITATIONS

- Do not mix or substitute reagents or materials from other kit lots or vendors.

8. TECHNICAL HINTS

- Samples generating values higher than the highest standard should be further diluted in the appropriate sample dilution buffers.
- Avoid foaming or bubbles when mixing or reconstituting components.
- Avoid cross contamination of samples or reagents by changing tips between sample, standard and reagent additions.
- Ensure plates are properly sealed or covered during incubation steps.
- Complete removal of all solutions and buffers during wash steps.
- **This kit is sold based on number of tests. A 'test' simply refers to a single assay well. The number of wells that contain sample, control or standard will vary by product. Review the protocol completely to confirm this kit meets your requirements. Please contact our Technical Support staff with any questions.**

9. REAGENT PREPARATION

Equilibrate all reagents to room temperature (18-25°C) prior to use. Prepare fresh reagents immediately prior to use. When diluting the concentrate, make sure to rinse the bottle thoroughly to extract any precipitates left in the bottle. Mix the 1x solution gently until the crystals have completely dissolved.

9.1 **1X Diluent N**

Dilute the 10X Diluent N Concentrate 1:10 with reagent grade water. Mix gently and thoroughly. *Store for up to 1 month at 4°C.*

9.2 **1X Wash Buffer**

Dilute the 20X Wash Buffer Concentrate 1:20 with reagent grade water. Mix gently and thoroughly.

9.3 **1X Biotinylated Apolipoprotein AI Detector Antibody**

9.3.1 The stock Biotinylated Apolipoprotein AI Antibody must be diluted with 1X Diluent N according to the label concentration to prepare 1X Biotinylated Apolipoprotein AI Antibody for use in the assay procedure. Observe the label for the "X" concentration on the vial of Biotinylated Apolipoprotein AI Antibody.

9.3.2 Calculate the necessary amount of 1X Diluent N to dilute the Biotinylated Apolipoprotein AI Antibody to prepare a 1X Biotinylated Apolipoprotein AI Antibody solution for use in the assay procedure according to how many wells you wish to use and the following calculation:

Number of Wells Strips	Number of Wells	(V_T) Total Volume of 1X Biotinylated Antibody (µL)
4	32	1,760
6	48	2,640
8	64	3,520
10	80	4,400
12	96	5,280

Any remaining solution should be frozen at -20°C.

Where:

C_S = Starting concentration (X) of stock Biotinylated Apolipoprotein AI Antibody (variable)

C_F = Final concentration (always = 1X) of 1X Biotinylated Apolipoprotein AI Antibody solution for the assay procedure

V_T = Total required volume of 1X Biotinylated Apolipoprotein AI Antibody solution for the assay procedure

V_A = Total volume of (X) stock Biotinylated Apolipoprotein AI Antibody

V_D = Total volume of 1X Diluent N required to dilute (X) stock Biotinylated Apolipoprotein AI Antibody to prepare 1X Biotinylated Apolipoprotein AI solution for assay procedures

Calculate the volume of (X) stock Biotinylated Antibody required for the given number of desired wells:

$$(C_F / C_S) \times V_T = V_A$$

Calculate the final volume of 1X Diluent N required to prepare the 1X Biotinylated Apolipoprotein AI Antibody:

$$V_T - V_A = V_D$$

Example:

NOTE: This example is for demonstration purposes only. Please remember to check your antibody vial for the actual concentration of antibody provided.

C_S = 50X Biotinylated Apolipoprotein AI Antibody stock

C_F = 1X Biotinylated Apolipoprotein AI Antibody solution for use in the assay procedure

V_T = 3,520 µL (8 well strips or 64 wells)

$$(1X/50X) \times 3{,}520\ \mu L = 70.4\ \mu L$$

$$3{,}520\ \mu L - 70.4\ \mu L = 3{,}449.6\ \mu L$$

V_A = 70.4 µL total volume of (X) stock Biotinylated Apolipoprotein AI Antibody required

V_D = 3,449.6 µL total volume of 1X Diluent N required to dilute the 50X stock Biotinylated Antibody to prepare 1X Biotinylated Apolipoprotein AI Antibody solution for assay procedures

9.3.3 First spin the Biotinylated Apolipoprotein AI Antibody vial to collect the contents at the bottom.

9.3.4 Add calculated amount V_A of stock Biotinylated Apolipoprotein AI Antibody to the calculated amount V_D of 1X Diluent N. Mix gently and thoroughly.

9.4 **1X SP Conjugate**

Spin down the 100X Streptavidin-Peroxidase Conjugate (SP Conjugate) briefly and dilute the desired amount of the conjugate 1:100 with 1X Diluent N.

Any remaining solution should be frozen at -20°C.

10. STANDARD PREPARATIONS

- **Prepare serially diluted standards immediately prior to use. Always prepare a fresh set of standards for every use.**
- **Any remaining standard should be stored at -20°C after reconstitution and used within 5 days.**
- **This procedure prepares sufficient standard dilutions for duplicate wells.**

10.1 Reconstitution of the Apolipoprotein AI Standard vial to prepare a 200 ng/mL Apolipoprotein AI **Stock Standard**:

10.1.1 First consult the Apolipoprotein AI Standard vial to determine the mass of protein in the vial.

10.1.2 Calculate the appropriate volume of 1X Diluent N to add when resuspending the Apolipoprotein AI Standard vial to produce a 200 ng/mL Apolipoprotein AI **Stock Standard** by using the following equation:

C_S = Starting mass of Apolipoprotein AI Standard (see vial label) (µg)

C_F = 200 ng/mL Apolipoprotein AI **Stock Standard** final required concentration

V_D = Required volume of 1X Diluent N for reconstitution (µL)

Calculate total required volume 1X Diluent N for resuspension:

$$(C_S / C_F) \times 1{,}000 = V_D$$

Example:

NOTE: This example is for demonstration purposes only. Please remember to check your standard vial for the actual amount of standard provided.

C_S = 180 ng of Apolipoprotein AI Standard in vial
C_F = 200 ng/mL Apolipoprotein AI **Stock Standard** final concentration
V_D = Required volume of 1X Diluent N for reconstitution

(180 ng / 200 ng/mL) x 1,000 = 900 µL

10.1.3 First briefly spin the Apolipoprotein AI Standard Vial to collect the contents on the bottom of the tube.

10.1.4 Reconstitute the Apolipoprotein AI Standard vial by adding the appropriate calculated amount V_D of 1X Diluent N to the vial to generate the 200 ng/mL Apolipoprotein AI **Stock Standard**. Mix gently and thoroughly.

10.2 Allow the reconstituted 200 ng/mL Apolipoprotein AI **Stock Standard** to sit for 10 minutes with gentle agitation prior to making subsequent dilutions

10.3 Label eight tubes #2-8.

10.4 Prepare the 100 ng/mL **Standard #2** by adding 120 µL of the reconstituted 200 ng/mL Apolipoprotein AI **Stock Standard** to tube #2.

10.5 Add 120 µL of 1X Diluent N to tube #2 – 8.

10.6 To prepare **Standard #3**, add 120 µL of the **Standard #2** into tube #3 and mix gently.

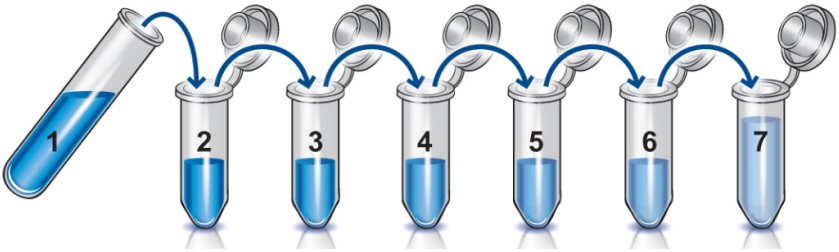
10.7 To prepare **Standard #4**, add 120 µL of the **Standard #3** into tube #4 and mix gently.

10.8 Using the table below as a guide, prepare subsequent serial dilutions.

10.9 1X Diluent N serves as the zero standard, 0 ng/mL (tube #8).

Standard Dilution Preparation Table

Standard #	Volume to Dilute (µL)	Volume Diluent N (µL)	Total Volume (µL)	Starting Conc. (ng/mL)	Final Conc. (ng/mL)
1	Step 10.1				200.0
2	120	120	240	200.0	100.0
3	120	120	240	100.0	50.0
4	120	120	240	50.0	25.0
5	120	120	240	25.0	12.5
6	120	120	240	12.5	6.25
7	120	120	240	6.25	3.125
8	-	120	120	-	0



11. SAMPLE PREPARATION

11.1 Plasma

Collect plasma using one tenth volume of 0.1 M sodium citrate as an anticoagulant. Centrifuge samples at 3000 x *g* for 10 minutes. Dilute samples 100,000-fold into 1X Diluent and assay. Depending on application needs, user should determine proper dilutions. The undiluted samples can be stored at -20°C or below for up to 3 months. Avoid repeated freeze-thaw cycles (EDTA and Heparin can also be used as an anticoagulant).

11.2 Serum

Samples should be collected into a serum separator tube. After clot formation, centrifuge samples at 3000 x *g* for 10 minutes and remove serum. Dilute samples 100,000-fold into 1X Diluent N and assay. Depending on application needs, user should determine proper dilutions. The undiluted samples can be stored at -20°C or below for up to 3 months. Avoid repeated freeze-thaw cycles.

11.3 Urine

Collect urine using sample pot. Centrifuge samples at 800 x *g* for 10 minutes. Dilute samples at 1:2 into 1X Diluent N or within the range of 1x – 10x, and assay. Depending on application needs, user should determine proper dilutions. The undiluted samples can be stored at -20°C or below for up to 3 months. Avoid repeated freeze-thaw cycles.

11.4 Saliva

Collect saliva using sample tube. Centrifuge samples at 800 x *g* for 10 minutes. Dilute samples at 1:32 into 1X Diluent N, or within the range of 3x – 300x, and assay. The undiluted samples can be stored at -20°C or below for up to 3 months. Avoid repeated freeze-thaw cycles.

11.5 **CSF**

Collect cerebrospinal fluid (CSF) using sample pot. Centrifuge samples at 3000 x g for 10 minutes. Dilute samples at 1:400 into 1X Diluent N or within the range of 5x – 500x and assay. The undiluted samples can be stored at -80°C for up to 3 months. Avoid repeated freeze-thaw cycles.

11.6 **Milk**

Collect milk using sample tube. Centrifuge samples at 800 x *g* for 10 minutes. Use undiluted samples or dilute into 1X Diluent N 320x or within the range of 30x – 3000x, and assay. Store undiluted samples at -20°C or below for up to 3 months. Avoid repeated freeze-thaw cycles.

12. PLATE PREPARATION

- The 96 well plate strips included with this kit are supplied ready to use. It is not necessary to rinse the plate prior to adding reagents.
- Unused well plate strips should be returned to the plate packet and stored at 4°C.
- For statistical reasons, we recommend each sample should be assayed with a minimum of two replicates (duplicates).
- Well effects have not been observed with this assay. Contents of each well can be recorded on the template sheet included in the Resources section.

13. ASSAY PROCEDURE

- **Equilibrate all materials and prepared reagents to room temperature (18 - 25°C) prior to use.**
- **It is recommended to assay all standards, controls and samples in duplicate.**

13.1 Prepare all reagents, working standards and samples as instructed. Equilibrate reagents to room temperature before use. The assay is performed at room temperature (18-25°C).

13.2 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.

13.3 Add 50 µL of Apolipoprotein AI Standard or sample per well. Cover wells with a sealing tape and incubate for two hours. Start the timer after the last sample addition.

13.4 Wash five times with 200 µL of 1X Wash Buffer manually. Invert the plate each time and decant the contents; tap it 4-5 times on absorbent paper towel to completely remove the liquid. If using a machine, wash six times with 300 µL of 1X Wash Buffer and then invert the plate, decant the contents; tap it 4-5 times on absorbent paper towel to completely remove the liquid.

13.5 Add 50 µL of 1X Biotinylated Apolipoprotein AI Antibody to each well and incubate for one hour.

13.6 Wash microplate as described above.

13.7 Add 50 µL of 1X SP Conjugate to each well and incubate for 30 minutes. Turn on the microplate reader and set up the program in advance.

13.8 Wash microplate as described above.

13.9 Add 50 µL of Chromogen Substrate per well and incubate in ambient light for about 25 minutes or till the optimal blue

colour density develops. Gently tap plate to ensure thorough mixing and break the bubbles in the well with pipette tip.

13.10 Add 50 µL of Stop Solution to each well. The color will change from blue to yellow.

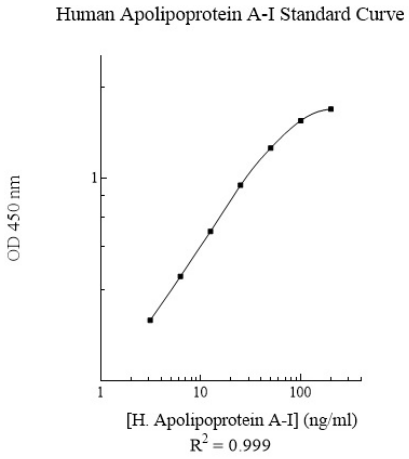
13.11 Read the absorbance on a microplate reader at a wavelength of 450 nm immediately. If wavelength correction is available, subtract readings at 570 nm from those at 450 nm to correct optical imperfections. Otherwise, read the plate at 450 nm only. Please note that some unstable black particles may be generated at high concentration points after stopping the reaction for about 10 minutes, which will reduce the readings.

14. CALCULATIONS

Calculate the mean value of the 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.

15. TYPICAL DATA

TYPICAL STANDARD CURVE – Data provided for demonstration purposes only. A new standard curve must be generated for each assay performed.



16. TYPICAL SAMPLE VALUES

SENSITIVITY –

The minimum detectable dose of Apolipoprotein AI is typically 0.95 ng/mL.

RECOVERY –

Standard Added Value: 12.5 – 100 ng/mL

Recovery %: 91 – 108.

Average Recovery %: 98

LINEARITY OF DILUTION –

	Average % Expected Value	
Sample Dilution	**Plasma**	**Serum**
25000X	109	107
50000X	95	97
100000X	95	93

PRECISION –

	Intra-Assay	Inter-Assay
% CV	4.6	10.0

17. ASSAY SPECIFICITY

Species	% Cross Reactivity
Canine	None
Bovine	None
Equine	None
Monkey	<5
Mouse	None
Rat	None
Swine	None
Rabbit	None

Protein	% Cross Reactivity
Human Apo C3	<10

No significant cross reactivity observed with Apo A2, Apo A4, Apo-AV, Apo-B, Apo C2, Apo E, and Apo M proteins.

18. TROUBLESHOOTING

Problem	Cause	Solution
Poor standard curve	Improper standard dilution	Confirm dilutions made correctly
	Standard improperly reconstituted (if applicable)	Briefly spin vial before opening; thoroughly resuspend powder (if applicable)
	Standard degraded	Store sample as recommended
	Curve doesn't fit scale	Try plotting using different scale
Low signal	Incubation time too short	Try overnight incubation at 4ºC
	Target present below detection limits of assay	Decrease dilution factor; concentrate samples
	Precipitate can form in wells upon substrate addition when concentration of target is too high	Increase dilution factor of sample
	Using incompatible sample type (e.g. serum vs. cell extract)	Detection may be reduced or absent in untested sample types
	Sample prepared incorrectly	Ensure proper sample preparation/dilution
Large CV	Bubbles in wells	Ensure no bubbles present prior to reading plate
	All wells not washed equally/thoroughly	Check that all ports of plate washer are unobstructed wash wells as recommended
	Incomplete reagent mixing	Ensure all reagents/master mixes are mixed thoroughly
	Inconsistent pipetting	Use calibrated pipettes and ensure accurate pipetting
	Inconsistent sample preparation or storage	Ensure consistent sample preparation and optimal sample storage conditions (eg. minimize freeze/thaws cycles)

Problem	Cause	Solution
High background/ Low sensitivity	Wells are insufficiently washed	Wash wells as per protocol recommendations
	Contaminated wash buffer	Make fresh wash buffer
	Waiting too long to read plate after adding STOP solution	Read plate immediately after adding STOP solution
	Improper storage of ELISA kit	Store all reagents as recommended. Please note all reagents may not have identical storage requirements.
	Using incompatible sample type (e.g. Serum vs. cell extract)	Detection may be reduced or absent in untested sample types

19. NOTES

Technical Support

For all technical or commercial enquiries please go to:
www.abcam.com/contactus
www.abcam.cn/contactus (China)
www.abcam.co.jp/contactus (Japan)