



EAGLE
BIOSCIENCES

Adalimumab ELISA Assay

Catalog Number:

KBI1015 (12 x 8 wells)

For Research Use Only. Not for use in diagnostic procedures.

v. 1.0

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Introduction

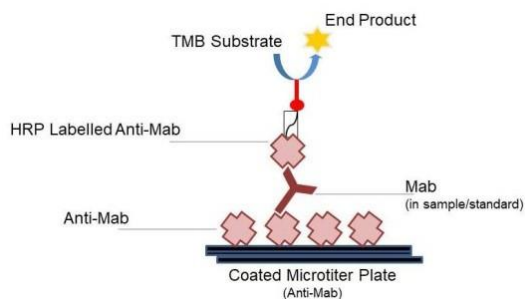
Adalimumab is a recombinant human IgG1 monoclonal antibody specific for human tumor necrosis factor alpha (TNF- α). Adalimumab is produced by recombinant DNA technology in a mammalian cell expression system and is purified by a process that includes specific viral inactivation and removal steps. Adalimumab binds specifically to (TNF- α) and blocks its interaction with the p55 and p75 cell surface TNF receptors. TNF is a naturally occurring cytokine that is involved in normal inflammatory and immune responses. Elevated levels of TNF are found in the synovial fluid of rheumatoid arthritis, including juvenile idiopathic arthritis, psoriatic arthritis, and ankylosing spondylitis patients and play an important role in both the pathologic inflammation and the joint destruction that are hallmarks of these diseases. Increased levels of TNF are also found in psoriasis (Ps) plaques.

Intended Use:

The Adalimumab (Humira™) ELISA is used as an analytical tool for quantitative determination of Adalimumab in serum, plasma and cell culture supernatant.

Assay Principle

The method employs the quantitative sandwich enzyme immunoassay technique. Antibodies to Adalimumab are pre-coated onto microwells. Samples and standards are pipetted into microwells and human Adalimumab present in the sample are bound by the capture antibody. Then, a HRP (horseradish peroxidase) conjugated anti-Adalimumab antibody is pipetted and incubated. After washing microwells in order to remove any non-specific binding, the ready to use substrate solution (TMB) is added to microwells and color develops proportionally to the amount of Adalimumab in the sample. Color development is then stopped by addition of stop solution. Absorbance is measured at 450 nm.





Kit Components/Materials Provided

Part	Description	Quantity
Anti-Adalimumab Coated Microtiter Plate	96 well polystyrene microplate (12 strips of 8 wells) coated with Anti-Adalimumab monoclonal antibody.	1 x 96 wells
Adalimumab Standard	Recombinant Adalimumab in a buffered protein base with 1:1000 dilution human serum and preservative sodium azide < 0.01% – Standards: 0, 5, 10, 20, 40, 80, 160 and 320 ng/ml.	8 x 0.5 ml
Anti-Adalimumab:HRP Conjugate	Anti-Adalimumab conjugated to Horseradish Peroxidase with protein stabilizer and preservatives 0.02% methylisothiazolone and 0.02% bromonitrodioxane.	12 ml
Sample Diluent	Buffered protein base with preservative thiomersol < 0.01%	2 x 50 ml
(20X) Wash Buffer	20-fold concentrated solution of buffered surfactant with preservative thiomersol < 0.01%. May turn yellow over time.	25 ml
TMB Substrate	Stabilized chromogen	12 ml
Stop Solution	2N sulfuric acid	12 ml
Instruction Manual		1 no

Required Materials that are not supplied

- Microtiter Plate Reader able to measure absorbance at 450 nm.
- Adjustable pipettes and multichannel pipettor to measure volumes ranging from 25µl to 1000µl
- Deionized (DI) water
- Wash bottle or automated microplate washer
- Graph paper or software for data analysis
- Timer
- Absorbent Paper

Handling/Storage

1. All reagents should be stored at 2°C to 8°C for stability.
2. All the reagents and wash solutions should be used within 12 months from manufacturing date.
3. Before using, bring all components to room temperature (18-25°C). Upon assay completion ensure all components of the kit are returned to appropriate storage conditions.
4. The Substrate is light-sensitive and should be protected from direct sunlight or UV sources.

Health Hazard Warnings

1. Reagents that contain preservatives may be harmful if ingested, inhaled or absorbed through the skin.
2. For Research Use Only



Sample Preparation and Storage

Blood is taken by venipuncture. Serum is separated after clotting by centrifugation. Plasma can be used, too. Lipaemic, hemolytic or contaminated samples should not be run. Repeated freezing and thawing should be avoided. If samples are to be used for several assays, initially aliquot samples and keep at -20°C .

For Cell Culture Supernatant – If necessary, centrifuge to remove debris prior to analysis. Samples can be stored at -20°C or -80°C . Avoid repeated freeze-thaw cycles.

Preparation Before Use:

Allow samples to reach room temperature prior to assay. Take care to agitate patient samples gently in order to ensure homogeneity.

Test Sample preparation - Samples have to be diluted 1:1000 (v/v), e.g. 1 ul sample + 999 ul sample diluent prior to assay. The samples may be kept at $2 - 8^{\circ}\text{C}$ for up to three days. Long-term storage requires -20°C .

Reagent Preparation (all reagents should be diluted immediately prior to use):

1. Label any aliquots made with the kit Lot No and Expiration date and store it at appropriate conditions mentioned.
2. Bring all reagents to Room temperature before use.
3. To make Wash Buffer (1X); dilute 25 ml of 20X Wash Buffer in 475 ml of DI water.

Procedural Notes

1. In order to achieve good assay reproducibility and sensitivity, proper washing of the plates to remove excess un-reacted reagents is essential.
2. High Dose Hook Effect may be observed in samples with very high concentrations of Adalimumab. High Dose Hook Effect is due to excess of antibody for very high concentrations of Adalimumab present in the sample. High Dose Hook effect is most likely encountered from samples early in the purification process. If Hook Effect is possible, the samples to be assayed should be diluted with a compatible diluent. Thus if the Adalimumab concentration of the undiluted sample is less than the diluted sample, this may be indicative of the Hook Effect.
3. Avoid assay of Samples containing sodium azide (NaN_3), as it could destroy the HRP activity resulting in under-estimation of the amount of Adalimumab.
4. It is recommended that all Standards and Samples be assayed in duplicates.
5. Maintain a repetitive timing sequence from well to well for all the steps to ensure that the incubation timings are same for each well.
6. If the Substrate has a distinct blue color prior to use it may have been contaminated and use of such substrate can lead to compromisation of the sensitivity of the assay.
7. The plates should be read within 30 minutes after adding the Stop Solution.
8. Make a work list in order to identify the location of Standards and Samples.



Assay Procedure

1. It is strongly recommended that all Standards and Samples be run in duplicates or triplicates. A standard curve is required for each assay. All steps must be performed at 37°C
2. Pipette **100 ul** of **Standards** or diluted **Samples** into the respective wells.
3. Cover the plate and incubate for 60 minutes at 37°C
4. Aspirate and wash plate 4 times with **Wash Buffer (1X)** and blot residual buffer by firmly tapping plate upside down on absorbent paper. Wipe of any liquid from the bottom outside of the microtiter wells as any residue can interfere in the reading step.
5. Add **100 ul** of **Anti-Adalimumab:HRP Conjugate** into each well.
6. Cover the plate and incubate for 60 minutes at 37°C
7. Aspirate and wash plate 4 times with **Wash Buffer (1X)** and blot residual buffer by firmly tapping plate upside down on absorbent paper. Wipe of any liquid from the bottom outside of the microtiter wells as any residue can interfere in the reading step.
8. Add **100 ul** of **TMB Substrate** in each well.
9. Incubate the plate at 37°C for 30 minutes in dark. DO NOT SHAKE or else it may result in higher backgrounds and worse precision. Positive wells should turn bluish in color.
10. Pipette out **100 ul** of **Stop Solution**. Wells should turn from blue to yellow in color.
11. Read the absorbance at 450 nm with a microplate reader.



Calculations of Results

Determine the Mean Absorbance for each set of duplicate or triplicate Standards and Samples. Using Semi-Log graph paper, plot the average value (absorbance 450nm) of each standard on the Y-axis versus the corresponding concentration of the standards on the X-axis. Draw the best fit curve through the standard points. To determine the unknown Adalimumab concentrations, find the unknown's Mean Absorbance value on the Y-axis and draw a horizontal line to the standard curve. At the point of intersection, draw a vertical line to the X-axis and read the Adalimumab Concentration. If samples were diluted, multiply by the appropriate dilution factor. Software which is able to generate a cubic spline curve-fit is best recommended for automated results.

Note:

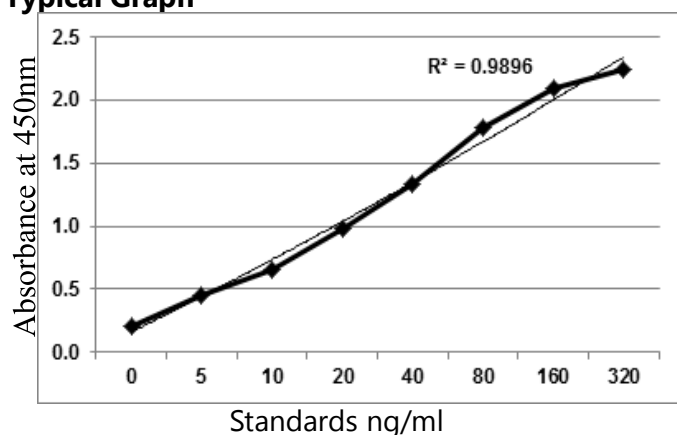
It is recommended to repeat the assay at a different dilution factor in the following cases:

- If the sample absorbance value is below the first standard.
- If the absorbance value is equivalent or higher than the 100 ng/ml standard.

Typical Data

Standards (ng/ml)	Abs A	Interpolated Conc	% Recov Ag Actual conc
0	0.202	--	--
5	0.456	5.3	105.1
10	0.649	10.0	99.9
20	0.978	20.4	102.1
40	1.333	37.7	94.3
80	1.781	82.6	103.3
160	2.092	170.6	106.6
320	2.245	294.0	91.9

Typical Graph





Quality Control

It is recommended that for each laboratory assay appropriate quality control samples in each run to be used to ensure that all reagents and procedures are correct.

Performance Characteristics of the Kit:

This kit has been validated as per EMA/FDA guidelines in line with ICH Code for Harmonization of Biological Assays.

Sensitivity:

Limit Of Detection: It is defined as the lowest detectable concentration corresponding to a signal of Mean of '0' standard plus $2 \times SD$.

10 replicates of '0' standards were evaluated and the LOD was found to be less than 4.8 ng/ml

Calibration:

This Kit has been Calibrated against an International Standard from the National Institute of Biologicals and Control (NIBSC), Potters Bar, Hertfordshire EN6 3QG, UK. 1 ng of supplied standard equals 0.01 IU of TNFalpha binding activity. Please note that the calibration is lot specific.

The Standards provided in the kit are also calibrated against commercially sourced Humira™ and alternate biosimilar recombinant Adalimumab injection.

Precision:

Precision is defined as the percent coefficient of variation (%CV) i.e. standard deviation divided by the mean and multiplied by 100. Assay precision was determined by both intra (n=5 assays) and inter assay (n=5 assays) reproducibility on two pools with low (5ng/ml), medium (40ng/ml) and high (320ng/ml) concentrations. While actual precision may vary from laboratory to laboratory and technician to technician, it is recommended that all operators achieve precision below these design goals before reporting results.

Pool	Intra Assay %CV	Inter Assay %CV
Low	<10%	<10%
Medium	<5%	<5%
High	<5%	<5%



Safety Precautions

- **This kit is For Research Use only.** Follow the working instructions carefully.
- The expiration dates stated on the kit are to be observed. The same relates to the stability stated for reagents
- Do not use or mix reagents from different lots.
- Do not use reagents from other manufacturers.
- Avoid time shift during pipetting of reagents.
- All reagents should be kept in the original shipping container.
- Some of the reagents contain small amount of sodium azide (< 0.1 % w/w) as preservative. They must not be swallowed or allowed to come into contact with skin or mucosa.
- Source materials maybe derived from human body fluids or organs used in the preparation of this kit were tested and found negative for HBsAg and HIV as well as for HCV antibodies. However, no known test guarantees the absence of such viral agents. Therefore, handle all components and all patient samples as if potentially hazardous.
- Since the kit contains potentially hazardous materials, the following precautions should be observed:
 - Do not smoke, eat or drink while handling kit material
 - Always use protective gloves
 - Never pipette material by mouth
 - Wipe up spills promptly, washing the affected surface thoroughly with a decontaminant.

In any case GLP should be applied with all general and individual regulations to the use of this kit.



References

1. Adalimumab for maintenance of clinical response and remission in patients with Crohn's disease: the CHARM trial ... JF Colombel, WJ Sandborn, P Rutgeerts, R Enns... - Gastroenterology, 2007 - Elsevier
2. Adalimumab, a fully human anti-tumor necrosis factor α monoclonal antibody, for the treatment of rheumatoid arthritis in patients taking concomitant methotrexate: the ... ME Weinblatt, EC Keystone, DE Furst... - Arthritis & ..., 2003 - Wiley Online Library
3. randomized, double-blind clinical trial of combination therapy with adalimumab plus methotrexate versus methotrexate alone or adalimumab alone in patients with ... FC Breedveld, MH Weisman... - ... : Official Journal of ..., 2006 - Wiley Online Library
4. Human anti-tumor necrosis factor monoclonal antibody (adalimumab) in Crohn's disease: the CLASSIC-I Trial ... SB Hanauer, WJ Sandborn, P Rutgeerts, RN Fedorak... - Gastroenterology, 2006 - Elsevier
5. Radiographic, clinical, and functional outcomes of treatment with adalimumab (a human anti-tumor necrosis factor monoclonal antibody) in patients with active ... EC Keystone, AF Kavanaugh, JT Sharp... - Arthritis & ..., 2004 - Wiley Online Library
6. Adalimumab for maintenance treatment of Crohn's disease: results of the CLASSIC II trial ... WJ Sandborn, SB Hanauer, PJ Rutgeerts, RN Fedorak... - Gut, 2007 - gut.bmj.com
7. Adalimumab induction therapy for Crohn disease previously treated with infliximab: a randomized trial ... WJ Sandborn, P Rutgeerts, R Enns... - Annals of internal ..., 2007 - Am Coll Physicians
8. Adalimumab therapy for moderate to severe psoriasis: a randomized, controlled phase III trial ... A Menter, SK Tyring, K Gordon, AB Kimball... - Journal of the American ..., 2008 - Elsevier
9. Adalimumab induces and maintains clinical remission in patients with moderate-to-severe ulcerative colitis ... WJ Sandborn, G Van Assche, W Reinisch, JF Colombel... - Gastroenterology, 2012 - Elsevier
10. Adalimumab for the treatment of patients with moderately to severely active psoriatic arthritis: results of a double-blind, randomized, placebo-controlled trial ... PJ Mease, DD Gladman, CT Ritchlin... - ... : Official Journal of ..., 2005 - Wiley Online Library



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For further information about this kit, its application or the procedures in this kit, please contact the Technical Service Team at Eagle Biosciences, Inc. at info@eaglebio.com or at 866-411-8023.