Certolizumab Pegol Antibody ELISA Assay Kit

Catalog Number:
IG-BB109 (1 x 96 wells)
For Research Use Only.

v. 2.0 (11.28.22)

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INTRODUCTION

The drug Certolizumab pegol (trade name Cimzia®) is a tumor necrosis factor alpha (TNFα) blocker and binds to human TNFα with a KD of 90pM. Certolizumab pegol is a recombinant, humanized antibody Fab' fragment, with specificity for TNFα, conjugated to an approximately 40kDa polyethylene glycol (PEG). The Fab' fragment is manufactured in E. coli and is subsequently subjected to purification and conjugation to PEG2MAL40K, to generate Certolizumab pegol. The ImmunoGuide Antibody to Certolizumab pegol ELISA kit has been designed for the measurement of free antibodies against this drug. It does not detect such antibodies which already are bound to the drug.

INTENDED USE

Enzyme immunoassay for the semi-quantitative determination of free antibodies to Certolizumab pegol (CZP) in serum and plasma.

ASSAY PRINCIPLE

This ImmunoGuide anti-drug antibody(ies) (ADA) kit is a bridging type ELISA for the determination of free antibodies against the drug Certolizumab pegol in serum and plasma samples. During the first incubation period, ADA in serum or plasma samples are captured by the drug coated on the microtiter wells. After washing away the unbound components from samples, a biotinylated drug conjugate is added and then incubated. ADA, if present in sample, will make a bridge, with its identical Fab arms, between the drug coated on the well and the other drug molecule labelled with biotin. Following incubation, wells are washed, and the horseradish peroxidase (HRP)-conjugated streptavidin is added and binds to the biotinylated Certolizumab pegol. Following incubation, wells are washed, and the bound enzymatic activity is detected by addition of tetramethylbenzidine (TMB) chromogensubstrate. Finally, the reaction is terminated with stop solution. The positive reaction is expected to be related to the presence of ADA in the sample.

WARNINGS AND PRECAUTIONS

1. Before starting the assay, read the instructions completely and carefully. Use the valid version of the package insert provided with the kit. Be sure that everything is understood. For further information (clinical background, test performance, automation protocols, alternative applications, literature, etc.) please refer to the local distributor.
2. In case of severe damage of the kit package, please contact Eagle Biosciences or your supplier in writing, latest one week after receiving the kit. Do not use damaged components in test runs but keep safe for complaint related issues.
3. Obey lot number and expiry date. Do not mix reagents of different lots. Do not use expired reagents.
4. Follow good laboratory practice and safety guidelines. Wear lab coats, disposable latex gloves and protective glasses where necessary.
5. Reagents of this kit containing hazardous material may cause eye and skin irritations. See MATERIALS SUPPLIED and labels for details.
6. Chemicals and prepared or used reagents have to be treated as hazardous waste according to the national biohazard safety guidelines or regulations.
7. Avoid contact with Stop solution. It may cause skin irritations and burns.
8. If any component of this kit contains human serum or plasma it is indicated and if so, it has been tested and were found to be negative for HIV I/II, HBsAg and HCV. However, the presence of these or other infectious agents cannot be excluded absolutely and therefore reagents should be treated as potential biohazards in use and for disposal.

9. Some reagents contain preservatives. In case of contact with eyes or skin, flush immediately with water.

STORAGE AND STABILITY

The kit is shipped at ambient temperature and should be stored at 2-8°C. Keep away from heat or direct sun light. The storage and stability of specimen and prepared reagents is stated in the corresponding chapters. The microtiter strips are stable up to the expiry date of the kit in the broken, but tightly closed bag when stored at 2–8°C.

KIT COMPONENTS/MATERIALS PROVIDED

Quantity	Component
1 x 12 x 8	Microtiter Plate Break apart strips pre-coated with the drug Certolizumab pegol (CZP).
5 x 1 mL	Anti-Drug Antibody (ADA) Standards A-D 30; 10; 3 and 0 Arbitrary Unit (AU)/mL Used for construction of the standard curve. Contains antibody against drug, preservative and stabilizer.Ready to use.
1 x 1 mL	Positive Control Lyophilized. Green colored. Contains antibody against drug, preservative, and stabilizer. The quantity of anti-drug is indicated on the vial label and/or CoA datasheet. The reconstituted positive control can be reused several times.
1 x 2 mL	Calibrator Yellow colored. Ready to use. Contains proteins and preservative.
1 x 50 mL	Dilution Buffer Ready to use. Contains orange dye, proteins and preservative.
1 x 12 mL	Assay Buffer Blue colored. Ready to use. Contains proteins and preservative.
1 x 12 mL	Biotinylated CZP Green colored. Ready to use. Contains biotinylated certolizumab pegol, proteins, stabilizers and preservative.
1 x 12 mL	Enzyme Conjugate Red colored. Ready to use. Contains horseradish peroxidase(HRP)conjugated streptavidin (HRP-Streptavidin), Proclin® and stabilizers.
1 x 12 mL	TMB Substrate Solution Ready to use. Contains 3,3',5,5'-Tetramethylbenzidine (TMB).
1 x 12 mL	Stop Solution Ready to use. 1 N Hydrochloric acid (HCl).
1 x 50 mL	Wash Buffer, Concentrate (20x) Contains buffer, Tween® 20 and Kathon™.
3 x 1	Adhesive Seal For sealing microtiter plate during incubation.

REQUIRED MATERIALS THAT ARE NOT PROVIDED

1. Micropipettes (< 3% CV) and tips to deliver 5-1000 µL.
2. Bidistilled or deionised water and calibrated glasswares (e.g. flasks orcylinders).
3. Wash bottle, automated or semi-automated microtiter plate washing system.
4. Microtiter plate reader capable of reading absorbance at 450 nm (reference wavelength at 600650 nm is optional).
5. Absorbent paper towels, standard laboratory glass or plastic vials, and a timer.

HANDLING/STORAGE

The usual precautions for venipuncture should be observed. It is important to preserve the chemical integrity of a blood specimen from the moment it is collected until it is assayed. Do not use grossly hemolytic, icteric or grossly lipemic specimens. Samples appearing turbid should be centrifuged before testing to remove any particulate material.
Storage: 2-8°C, Stability: 3d
Keep away from heat or direct sun light Avoid repeated freeze-thaw cycles

PROCEDURAL NOTES

1. Any improper handling of samples or modification of the test procedure may influence the results. The indicated pipetting volumes, incubation times, temperatures and pre-treatment steps have to be performed strictly according to the instructions. Use calibrated pipettes and devices only.
2. Once the test has been started, all steps should be completed without interruption. Make sure that required reagents, materials and devices are prepared readily at the appropriate time. Allow all reagents and specimens to reach room temperature (20-25 ℃) and gently swirl each vial of liquid reagent and sample before use. Mix reagents without foaming.
3. Avoid contamination of reagents, pipettes and wells/tubes. Use new disposable plastic pipette tips for each reagent, standard or specimen. Do not interchange the caps of vials. Always cap not used vials. Do not reuse wells or reagents.
4. Use a pipetting scheme to verify an appropriate plate layout.
5. Incubation time affects results. All wells should be handled in the same order and time sequences. It is recommended to use an 8-channel Micropipettor for pipetting of solutions in all wells.
6. Microplate washing is important. Improperly washed wells will give erroneous results. It is recommended to use a multichannel pipette or an automatic microplate washing system. Do not allow the wells to dry between incubations. Do not scratch coated wells during rinsing and aspiration. Rinse and fill all reagents with care. While rinsing, check that all wells are filled precisely with Wash Buffer, and that there are no residues in the wells.
7. Humidity affects the coated wells. Do not open the pouch until it reaches room temperature. Unused wells should be returned immediately to the resealed pouch including the desiccant.

PREPARATION OF COMPONENTS

Dilute/ dissolve	Component		Diluent	Relation	Remarks	Storage	Stability
10 mL	Wash Buffer	up to 200 mL	Distilled Water	1:20	Warm up at 37°C to dissolve crystals. Mix vigorously.	2-8 °C	4 w

DILUTIONS OF STANDARDS AND SAMPLES

Calibrators/Sample	To be diluted	With	Remarks
Calibrators 1-3 Serum/ Plasma	1:10	Dilution Buffer	For dilution at 1:10 10 L Sample + 90 L Dilution Buffer
For samples with an OD >Standard A	1:50	Dilution Buffer	For dilution at 1:50 5 L Sample + 245 L Dilution Buffer

TEST PROCEDURE

- Before performing the assay, samples and assay kit should be brought to room temperature (about 30 minutes beforehand) and ensure the homogeneity of the solution.
- All Standards should be run with each series of unknown samples.
- Standards should be subject to the same manipulations and incubation times as the samples being tested.
- All steps of the test should be completed without interruption.
- Use new disposable plastic pipette tips for each reagent, standard or specimen in order to avoid cross contamination.
- The total pipetting time needed for dispensing all samples into the wells should not exceed 5 minutes. If this is difficult to achieve the samples should be pre-dispensed in a separate neutral polypropylene microplate and then transferred into the reaction ELISA plate by a multi channel pipette.

ASSAY PROCEDURE

1.	Pipette 100 µl of Assay Buffer into each of the wells to be used.

2.	Pipette 50 µL of each Ready-to-Use Standards and 1:10 Diluted Calibrators-1, -2, -3 microtiter plate. described in section 10.2) into the respective wells of the mation Bubble for must be during the pipetting of standards and samples avoided. Wells A1: Standard A B1: Standard B C1: Standard C D1: Standard D E1: Calibrator-1 F1: Calibrator-2 G1: Calibrator-3 H1 and so on: Samples (Serum/Plasma)
3.	Cover the plate with adhesive seal. Shake plate carefully by tapping several times. Incubate the plate on bench top for 60 min at room temperature (RT, 20-25°C).
4.	Remove adhesive seal. Aspirate or decant the incubation solution. Wash the plate 5 X 350 µL of Diluted Wash Buffer per well. Remove excess solution by tapping the inverted plate on a paper towel.
5.	Pipette 100 µL of Biotinylated CZP into each well.
6.	Cover plate with adhesive seal. Shake plate carefully by tapping several times. Incubate the plate on a bench top for 60 min at RT.
7.	Remove adhesive seal. Aspirate or decant the incubation solution. Wash the plate 5 X 350 µL of Diluted Wash Buffer per well. Remove excess solution by tapping the inverted plate on a paper towel.
8.	Pipette 100 µL of Enzyme Conjugate (HRP-Streptavidin) into each well.
9.	Cover the plate with adhesive seal. Shake plate carefully by tapping several times. Incubate the plate on bench top for 30 min at RT.
10.	Remove adhesive seal. Aspirate or decant the incubation solution. Wash the plate 5 X 350 µL of Diluted Wash Buffer per well. Remove excess solution by tapping the inverted plate on a paper towel.
11.	Pipette 100 µL of Ready-to-Use TMB Substrate Solution into each well.
12.	Incubate 15 min at RT. Avoid exposure to direct sunlight..
13.	Stop the substrate reaction by adding 100 µL of Stop Solution into each well. Color changes from blue to yellow. Briefly mix contents by gently shaking the plate.
14.	Measure optical density (OD) with a photometer at 450 nm within 15 min after pipetting the Stop Solution.

QUALITY CONTROL

The test results are only valid if the test has been performed following the instructions.
Moreover the user must strictly adhere to the rules of GLP (Good Laboratory Practice) or other

applicable standards/laws. All standards/controls must be found within the acceptable ranges as stated above and/or label. If the criteria are not met, the run is not valid and should be repeated. In case of any deviation, the following technical issues should be reviewed: Expiration dates of (prepared) reagents, storage conditions, pipettes, devices, incubation conditions and washing methods.

CALCULATIONS OF RESULTS

The results are expressed in arbitrary units (AU/mL).
A standard curve should be constructed using the standard concentration (X-axis) versus the OD450 values (Y-axis). Construct a standard curve of difference data using software capable of generating four-parameter logistic (4PL) or point-to-point calculation curve fit.
11.4.1.3. To obtain the exact values of the samples, the concentration determined from the standard curve should be multiplied by the dilution factor.
11.4.1.4. Samples generating absorbance values greater than that of the highest standard should be further diluted using the dilution buffer and then reanalyzed. Also this second dilution has to be used for calculation of the final result.

Typical Calibration Curve
(All steps were performed at 23°C. Just an example. Do not use it for calculation!)

1:10 Diluted Standard	A	B	C	D	E
Concentration (ng/mL)	60	20	6	2	0
Mean OD450/620 nm	2.678	1.033	0.329	0.120	0.054

QUALITATIVE INTERPRETATION

The results are evaluated by dividing each individual OD results by the Cut-off Value. Cut-off Value is determined as described below:
The Mean OD450nm of Calibrator 1-3 = (OD450nm of Calibrator 1+ OD450nm of Calibrator 2+ OD450nm of Calibrator 3) / 3 (The sum OD450nm of calibrators is divided by 3)

If "Sample OD450nm" is less (<) than the "Cut-off Value", the sample is regarded as NEGATIVE for Anti-Drug-Antibody (ADA) specific for the drug in concern.

If "Sample OD450nm" is equal and higher ( ) than the "Cut-off Value", the sample is regarded as POSITIVE for Anti-Drug-Antibody (ADA) specific for the drug in concern. And if required, samples may be extrapolated for quantitative analysis.

Range	Interpretation
Cut-off Value	POSITIVE
< Cut-off Value	NEGATIVE

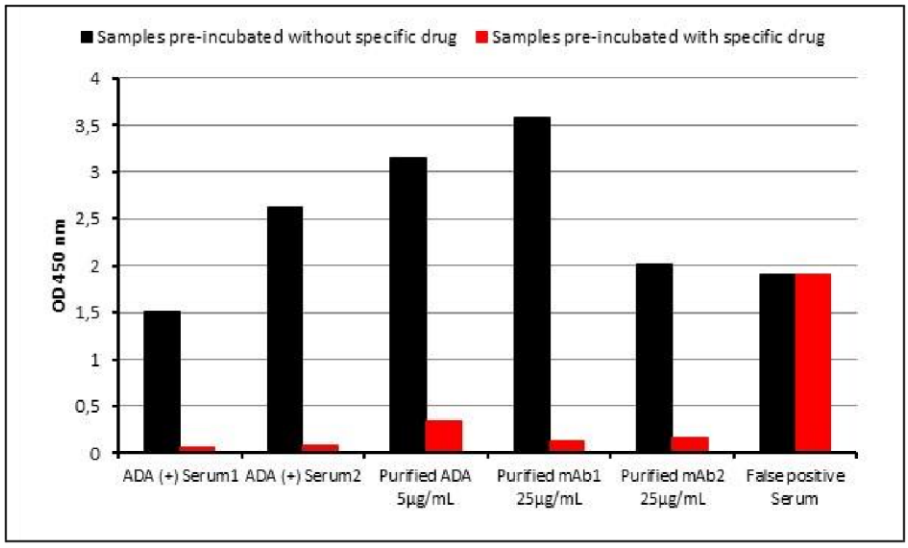
ASSAY CHARACTERISTICS

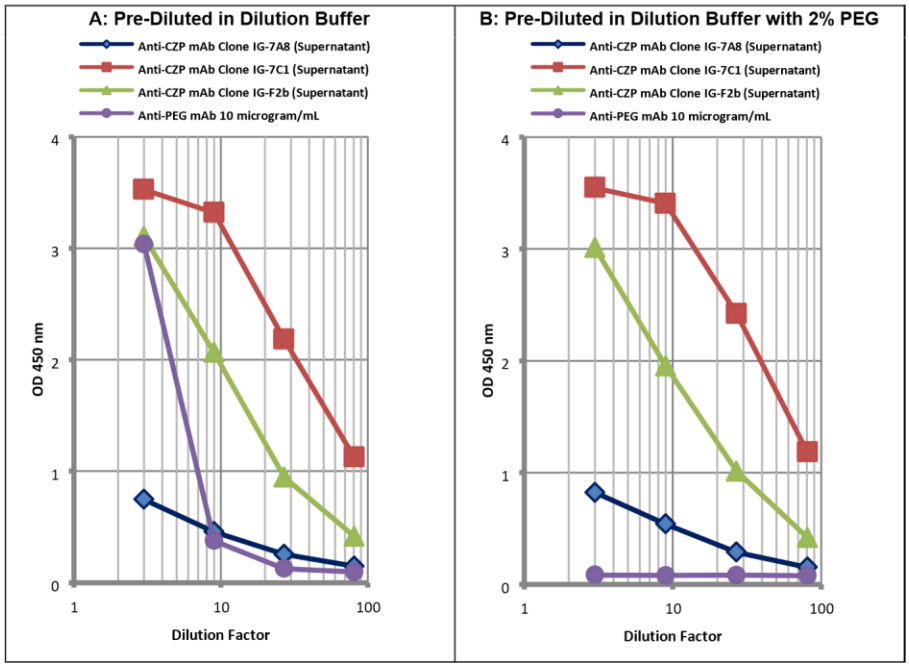
Specificity:

The detection of ADA formation is highly dependent on the sensitivity and specificity of the assay used.
The initial screening assay should be sensitive to low and high-affinity ADA. Endogenous and exogenous components in serum or plasma may influence assay results. Measuring immune responses to therapeutic protein products that possess Ig tails, such as mAb and Fc-fusion proteins, may be particularly difficult when RF is present in serum or plasma. RF is generally an IgM antibody that recognizes IgG, although other Ig specificities have been noted. Therefore, there is frequently a need to dilute patient samples and to make approach for minimizing interference from RF to maintain a reasonable ability to detect ADA. However, dilution and/or addition of RF-blocking reagents may not solve all potential interference related with matrix components contributing to non-specific signal in samples.
If the serum/plasma sample of a patient, a candidate for a specific monoclonal drug treatment, is negative at the time before starting drug therapy and become positive during treatment, it could be concluded that the induction of the specific ADA is suspected in this individual. As shown in Figure 1, the true positive reaction of the sample is inhibited by pre-incubation of the sample with the specific drug itself (samples are spiked with certain amount of drug). However, inhibition was not observed in false positive reaction related with other components in sample (Figure 1).
Based on the approach used in calculating the assay cut-off value of anti-drug antibody (ADA) ELISAs, approximately 1-5% of tested samples are expected to generate false-positive ADA response during initial screening analysis. Therefore, further confirmation of the specificity of the ADA activity in the samples, identified as positive, is also recommended by recent publications. In addition, the FDA released a guidance paper on immunogenicity testing of therapeutic proteins:
(http://www.fda.gov/downloads/Drugs/GuidanceComplianceRegulatoryInformation/Guidances/UCM192750.pdf)

In order to further confirm the specificity of the ADA positive signal, ImmunoGuide suggests a "Confirmatory Assay (competitive drug inhibition test)": Confirmatory Assay is performed by retesting the positive sample after dilution, at 1:10 as before, with phosphate buffered solution or kit's dilution buffer containing the drug in concern at a concentration of 50µg/mL that is exogenously added by the researcher.

If a positive result of a sample is related with the pre-existing or induced anti-PEG antibodies, it is possible to characterize the specificity of the antibodies with a competitive inhibition by making the 1:10 dilution of the sample in "dilution buffer supplemented with 2% PEG 8.000" instead. As shown in Figure 2, PEG did not inhibit the binding of various antibodies specific for the protein portion of the drug Certolizumab pegol. However, PEG at a defined concentration totally inhibited the positive reaction produced by a monoclonal antibody specific to PEG.



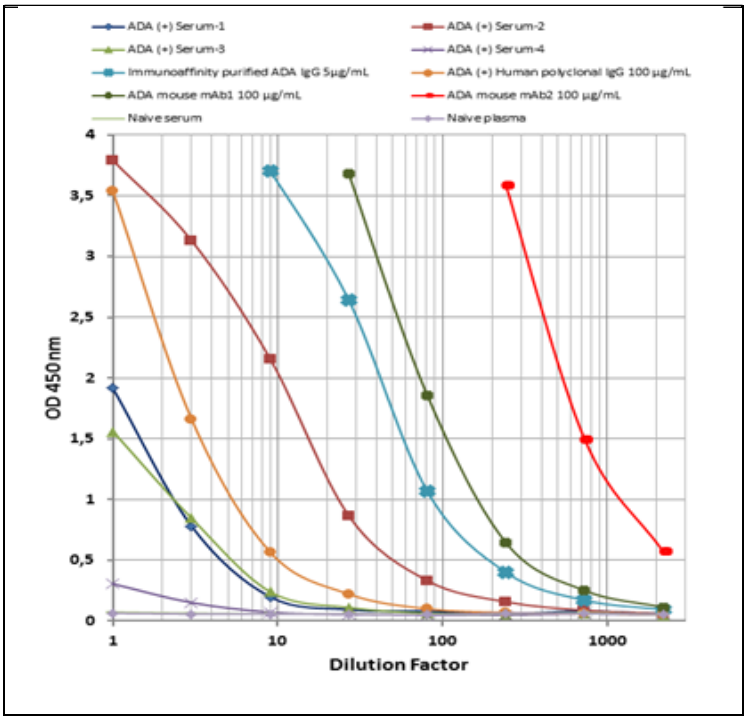


Sensitivity:

Generally, the sensitivity of the ADA assay is calculated as the lowest concentration of the positive control that can consistently generate a positive signal. However, as shown in Figure 2 below, data obtained at the ImmunoGuide Laboratory, the assay sensitivity also differs significantly depending on the high vs low affinity antibody used for the construction of the standard curve in the assay system. For example, when an immunoaffinity-purified ADA was exogenously added to serum, it was observed that the lowest detectable level that can be clearly distinguished from the negative control value is somewhere around 10ng/mL. It is much more lower when mAb2 is used instead.

In any case this number is highly depending on the characteristics of the ADA under investigation (e.g. affinity). Therefore this number may be significantly different for each individual sample under investigation.

Considering the fact that the antibodies under investigation are polyclonal ones, the affinities can be very different for each single sample. Therefore any attempt for a quantification of the results by a general standard curve also is very questionable (Figure 3). This is why we are giving the results in arbitrary units only.
Analytical sensitivity level of ImmunoGuide Anti-Drug-Antibody ELISAs is determined as 2 AU/mL and corresponding to the detection limit (limit of quantification) of 20 AU/mL for undiluted clinical samples because the serum or plasma samples are instructed to be diluted at 1:10 before starting the assay.



Precision:
Intra-assay CV: <10%.
Inter-assay CV: <10%.

Automation
The ImmunoGuide Anti Drug Antibody (ADA) ELISA kits are suitable also for being used by an automated ELISA processor.

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