



## ZYMUTEST ACA-APA

### IgG - Isotype

Ref RK029A (96 tests)

ELISA method for quantitative determination of Anti-Cardiolipin / Anti-Phospholipid antibodies

English, last revision: 11-2022

#### INTENDED USE:

The ZYMUTEST ACA-APA, IgG ELISA kit, is an optimized enzyme immuno-assay designed for measuring anti-cardiolipin / anti-phospholipid antibodies of the IgG isotype, in human plasma or serum, or in any biological fluid where these antibodies must be measured.

#### SUMMARY AND EXPLANATION:

The ZYMUTEST ACA-APA, IgG Kit, specifically measures human anti-cardiolipin / anti-phospholipid antibodies of the IgG isotype, reactive with immobilised and saturated cardiolipin. IgM or IgA isotypes are not measured. These isotypes can be assayed with ZYMUTEST ACA-APA IgM or ZYMUTEST ACA-APA IgA.

This optimised assay is designed with highly reactive cardiolipin, which has a well-controlled presentation, stabilised, and saturated. This reliable method then provides high reproducibility, high sensitivity and high specificity, and offers an optimised discrimination between normal individuals and pathologies with presence of anti-cardiolipin / antiphospholipid antibodies.

#### ASSAY PRINCIPLE:

The diluted assayed plasma sample or biological fluid is introduced into one of the microwells of the Cardiolipin coated plate. When present, anti-Cardiolipin / anti-phospholipid antibodies bind to immobilised and saturated Cardiolipin. Following a washing step, bound antibodies, of the IgG isotype, are revealed with a goat anti-human IgG (Fcγ specific)-peroxidase conjugate, which reacts specifically with IgG isotypes. Following a new washing step, the peroxidase substrate, Tetramethylbenzidine (TMB) in presence of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), is introduced and a blue colour develops. The colour turns yellow when the reaction is stopped with sulfuric acid. The colour developed is directly proportional to the amount of anti-Cardiolipin / anti-phospholipid antibodies, of the IgG isotype, present in the tested sample.

#### REAGENTS:

**COAT :** Micro ELISA plate, containing 12 strips of 8 wells, coated with anionic phospholipids, saturated, then stabilized; the plate is packed in an aluminium pouch hermetically sealed in presence of a desiccant.

**SD :** 2 vials containing 50 mL of Autoimmunity Sample Diluent, ready to use.

**CAL :** 3 vials of Anti-Cardiolipin, IgG, calibrator, lyophilised. When restored with 1 mL of Autoimmunity Sample Diluent, the ready to use calibrator is obtained (already diluted 1:100).

**C- :** 3 vials of negative control, lyophilised (diluted normal human plasma). When restored with 1 mL of Autoimmunity Sample Diluent, the ready to use negative control is obtained (already diluted 1:100).

**IC :** 3 vials of immunoconjugate (Anti-IgG (Fcγ)-HRP immunoconjugate), affinity purified goat antibodies specific for human IgG-Fcγ coupled to HRP, lyophilised.

**CD :** 1 vial of 25 mL of conjugate diluent, ready to use.

**WS :** 1 vial of 50 mL of Wash Solution, 20 fold concentrated.

**TMB :** 1 vial of 25 mL peroxidase substrate: 3,3',5,5' - Tetramethylbenzidine containing hydrogen peroxide, ready to use.

**SA :** 1 vial of 6 mL of 0.45M Sulfuric Acid (Stop Solution), ready to use.

The exact concentration (expressed in GPL units according to the KAPS standards) of control is indicated on the flyer provided in the kit. The concentration may slightly vary from lot to lot. For the assay, refer to the values indicated on the flyer provided in the kit used.

#### CAUTIONS AND WARNINGS:

- Any product of biological origin must then be handled carefully, as being potentially infectious.
- The disposal of waste materials must be carried out according to current local regulations
- Use only reagents from kits with the same lot number. Do not mix reagents from kits with different lots when running the assay; they are optimized for each lot of kits.
- Reagents must be handled with care, in order to avoid any contamination during use. Take care to limit as much as possible any evaporation of the reagents during use, by limiting the liquid-air surface exchange.
- In order to preserve the stability of the reagents, close the vials with their original screw cap following each use.
- Stability studies for 3 weeks at 30°C show that the reagents can be shipped at room temperature for a short period without damage.
- For in vitro diagnostic use.

#### PREPARATION AND STABILITY OF REAGENTS:

Bring the kit at room temperature, at least 30 min before use. Store the unused reagents at 2-8°C. Vials are closed under vacuum. Remove carefully the stopper, in order to avoid any loss of powder when opening the vials.

When appropriately used and stored, according to the recommended protocol and cautions, the kit can be used over a two month period, and strip by strip, if required.

**COAT (Micro ELISA plate):** Open the aluminium pouch and take off the required amounts of 8 well strips for the test series. When out of the pouch, the strips must be used within 30 minutes. Unused strips can be stored at 2-8°C for 4 weeks in their original aluminium pouch, in presence of the desiccant, hermetically closed and protected from any moisture, and stored in the provided plastic microplate storage bag (minigrip).

**SD (Autoimmunity Sample Diluent):** Ready to use. Stability of reagent, provided that any contamination or evaporation is avoided, kept in its original vial is:

- 4 weeks at 2-8°C

**CAL (Calibrator):** Reconstitute each vial with 1 mL of "Autoimmunity Sample Diluent", shake thoroughly for complete dissolution. The obtained calibrator is ready to use and it corresponds to a plasma containing IgG isotype antibodies to cardiolipin, already diluted 1:100.

Stability of reconstituted reagent, provided that any contamination or evaporation is avoided, kept in its original vial is:

- 5 days at 2-8°C.

**C- (Negative Control):** Reconstitute each vial with 1 mL of "Autoimmunity Sample Diluent", shake thoroughly for complete dissolution. The obtained negative control is ready to use and it corresponds to a normal human plasma, already diluted 1:100.

Stability of reconstituted reagent, provided that any contamination or evaporation is avoided, kept in its original vial:

- 2 weeks at 2-8°C.

**IC (Anti-IgG(Fcγ)-HRP immunoconjugate):** Reconstitute each vial with 7.5 mL of Conjugate Diluent at least 15 min before use. Let the pellet to be completely dissolved before use, and shake the vial gently in order to homogenize the content.

Stability of reconstituted reagent, provided that any contamination or evaporation is avoided, kept in its original vial:

- 4 weeks at 2-8°C.
- 24 hours at room temperature (18-25°C).

**CD (Conjugate Diluent):** Ready to use. This reagent contains 0.05% Kathon CG. Stability of reagent, provided that any contamination or evaporation is avoided, kept in its original vial:

- 4 weeks at 2-8°C

**WS (Wash Solution):** Incubate, if necessary, the vial in a water bath, at 37°C, until complete dissolution of crystals. Shake the vial and dilute the amount required 1:20 in distilled water (the 50 mL contained in the vial allow to prepare 1 liter of Wash Solution).

Stability of the wash solution, provided that any contamination or evaporation is avoided, kept in its original vial:

- 8 weeks at 2-8°C

Stability of the dilute wash solution, provided that any contamination or evaporation is avoided, kept in its original vial:

- When open, 7 days at 2-8°C

This reagent contains 0.05% Kathon CG.

**TMB :** Ready to use. Stability of reagent, provided that any contamination or evaporation is avoided, kept in its original vial:

- 4 weeks at 2-8°C

**SA (Stop Solution):** Stop solution containing 0.45M sulfuric acid, ready to use.

**STORAGE CONDITIONS:**

Unopened reagents must be stored at 2-8°C, in their original packaging box. They are then usable until the expiration date printed on the label.

**REAGENTS AND MATERIAL REQUIRED BUT NOT PROVIDED:**

**Reagents:**

- Distilled water.

**Materials:**

- 8-channel or repeating pipette allowing dispensing volumes of 50-300 µL.
- 1-channel pipettes at variable volumes from 0 to 20 µL, 20 to 200 µL and 200 to 1000 µL.
- Micro ELISA plate washing equipment and shaker.
- Micro ELISA plate reader with a wavelength set up at 450 nm.

**SPECIMEN COLLECTION:**

Preparation and storage of specimens must be performed according to the current local regulations (In the USA, refer to CLSI Document GP44-A4 for further instructions on specimen collection, handling and storage).

**Specimens:**

- Human plasma obtained from anticoagulated blood (trisodium citrate). EDTA collected human plasma may also be used.

**Collection:**

- Blood (9 vol.) must be collected on trisodium citrate anticoagulant (1 vol.) (0.109M), with caution, through a net venipuncture. The first tube must be discarded.

**Centrifugation:**

- Within 2 hours, use a validated method in the laboratory to obtain a platelet-poor plasma, e.g., a minimum of 15 minutes at 2500 g at room temperature (18-25°C) and plasma must be decanted into a plastic tube.

**Storage of plasma:**

- 4 hours at room temperature (18-25°C)
- 48 hours at 2-8°C.
- 1 month at -20°C.

Frozen plasma specimens should be rapidly thawed at 37°C, then gently mixed and tested immediately. Resuspend any precipitation by thorough mixing immediately after thawing and before testing.

**TEST PROCEDURE:**

**Assay procedure:**

- Calibrator and Negative Control are ready to use (already diluted 1:100)

2. The samples should be diluted using Autoimmunity Sample Diluent (SD) as described in the table below:

Samples	Dilution
Plasma	1:100
Serum	1:100
Biological fluid	1:100

When high amounts of anti-cardiolipin / anti-phospholipid antibodies are expected, dilute at 1:200 or 1:400 dilutions. Results must then be multiplied by 2 or 4.

3. Remove the required number of strips from the aluminium pouch and put the strips in the frame provided. In the different wells of the micro ELISA plate, introduce the reagents and perform the various assay steps as indicated on the following table:

Reagent	Volume	Procedure
Anti-Cardiolipin IgG Calibrator dilutions or Negative control  or 1:100 diluted sample or sample diluent (blank)	200 µL	Introduce the : - Calibrator dilutions or - Negative control or - Diluted sample or - Sample diluent into the micro ELISA plate wells (a)
<b>Incubate for 30 minutes at room temperature (18-25 °C) (b) (c)</b>		
Wash Solution (20 fold diluted in distilled water)	300 µL	Proceed to 5 successive washings using the washing instrument (c).
Conjugate (anti-IgG (Fcγ)-HRP immunoconjugate, restored with 7.5 mL of conjugate diluent)	200 µL	Immediately after the washing, introduce the anti-IgG (Fcγ)-HRP immunoconjugate in the micro ELISA plate wells.
<b>Incubate for 30 minutes at room temperature (18-25 °C) (b)</b>		
Wash Solution (20 fold diluted in distilled water)	300 µL	Proceed to 5 successive washings using the washing instrument (c).
TMB/H <sub>2</sub> O <sub>2</sub> Substrate	200 µL	Immediately after the washing, introduce the substrate into the wells. <b>Nota:</b> The substrate distribution, row by row, must be accurate and at exact time intervals (d)
Let the colour develop for exactly 5 min. at room temperature (18-25 °C) (b)		
0.45M Sulfuric Acid	50 µL	Following exactly the same time intervals than for the addition of substrate, stop the colour development by introducing the 0.45M Sulfuric Acid (d)
Wait for 10 minutes in order to allow the colour to stabilize and measure absorbance at 450 nm (A450). Subtract the blank value. (e)		

#### Remarks:

- Distribute calibrators, controls and tested specimen as rapidly as possible (within 10 minutes), in order to obtain a homogeneous immunological kinetics for antibodies binding. A too long delay between the distribution of the first and the last wells may induce an influence of immunological kinetics and produce wrong results.
- Avoid letting the plate in the bright sunlight during incubations and more particularly during colour development. A micro-ELISA plate shaker can be used.
- Never let the plates empty between the addition of the reagents or following the washing step. The next reagent must be added within 3 minutes, in order to prevent the plate from drying, which could damage the immobilized components. If necessary, keep the plate filled with Wash Solution and empty it just before the introduction of the next reagent. The washing instrument must be adjusted in order to wash the plates gently, and to avoid a too drastic emptying, which could lower plate reactivity.
- For addition of the TMB substrate, the time interval between each row must be accurate and exactly determined. It must be the same when stopping the reaction.
- For bichromatic readings, a reference wavelength at 690 nm or at 620 nm can be used.

#### VALIDATION:

- Calibrator and controls provided in the kit allow validating the right performance of the assay.
- Expected A450 values for undiluted calibrator and negative controls can present variations from lot to lot but, when the assay is performed at room temperature, between 18 and 25°C, they always are:

$$P = A450 \text{ for } 1:1 \text{ calibrator: } \geq 1.5$$

$$N = A450 \text{ for negative control: } \leq 0.25$$

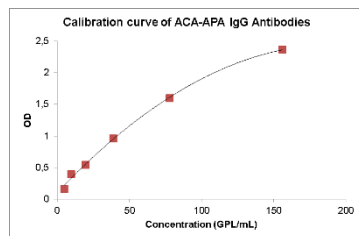
In addition, concentrations obtained for controls must be within the acceptance ranges indicated on the flyer provided in the kit. If controls are out of these ranges check carefully the assay conditions and re-run the assay, if required.

#### CALIBRATION:

The assay can be calibrated with the calibrator provided in the kit, and which concentration (C) is indicated in GPL units (GPL), on the flyer provided. Prepare the standard solutions for calibration by doing serial two-step dilutions of the calibrator in Autoimmunity Sample Diluent, from 1:1 to 1:32. A concentration range from C:1 to C:32 is obtained.

- The usual dynamic range is from 0 to about 80 GPL units.

The calibration curve below, obtained with the calibrator is indicated as an example only. The calibration curve generated for the series of measures performed must be used.



#### RESULTS:

- Results are expressed according to the A450 values obtained for samples, and controls and anti-cardiolipin / anti-phospholipid concentrations are calculated using the calibration curve.
- The calibration curve is obtained by plotting the anti-cardiolipin concentrations of calibration range expressed in GPL on the abscissae and the corresponding A450 on the ordinates. The anti-Cardiolipin, antibody concentration, of the IgG isotype, obtained for the sample tested at the standard 1:100 dilution, and expressed in GPL units, is directly deduced from the curve.
- When higher dilutions are used, (i.e. D), the concentration measured must be multiplied by the complementary dilution factor (i.e. D:100 ; for example x2 for 1:200 or x4 for 1:400), etc...
- Alternatively, an ELISA software (i.e. DYNEX, BIOLISE, etc...), can be used for the calculation of anti-cardiolipin/anti-phospholipid antibody concentrations.

#### INTERPRETATION OF RESULTS:

A single and standardised calibrator is used for the assay calibration and the calibration range is prepared using a serial two-fold dilution. This ensures a higher reliability of the assay, and a higher accuracy and reproducibility from lot to lot, and run to run, for the cut-off.

**Negative range:** The calibrator expressed in GPL unit is defined using the KAPS standard preparation for anti-cardiolipin antibodies, IgG/IgM (N. Harris). The upper limit of the normal range corresponds to the mean value obtained in a normal population plus 2 standard deviations (SD). This corresponds to 5 GPL. Therefore:

**Negative range: < 5 GPL/mL**

**Grey zone:** A "grey zone" is defined because some pathological samples (inflammation, infectious diseases, autoimmune diseases, gammopathy, elderly people...) can produce higher backgrounds, in auto-immune assays, than the normal individuals. This can mimic or mask a low reactivity. A value in this range can also mean that anti-cardiolipin/anti-phospholipid antibodies are being generated. When a patient is in the grey zone, it is recommended to perform a new testing on another sample, later, in order to follow a possible ongoing generation of autoantibodies to Cardiolipin of the IgG isotype.

**Grey Zone: ≥ 5 GPL/mL to < 10 GPL/mL**

**Positive range:** The positive range concerns the following anti-cardiolipin antibody concentrations:

**Positive range: ≥ 10 GPL/mL**

The positive range can be classified as follows:

**Low positive: ≥ 10 to < 35 GPL/mL**

**Moderate positive: ≥ 35 to < 80 GPL/mL**

**High positive: ≥ 80 GPL/mL**

**Note:** When a patient is tested positive, for the first time, for anti-cardiolipin/anti-phospholipid antibodies, a new testing or another blood specimen collected 3 to 6 months later is necessary.

#### LIMITATIONS:

- In order to get the optimal performance of the assay, the technical instructions must be strictly followed.
- Any reagent presenting an unusual aspect or contamination signs must be rejected.
- Any plasma containing a coagulum or contamination signs must be rejected.
- If the washing step is not correctly performed, the negative control can produce a high absorbance value. In order to avoid non-specific colour development, check that the washing step is performed efficiently.
- As for any autoantibody assay, clinical situation such as presence of inflammation, infectious diseases, auto-immune diseases, immun-complexes, high concentrations of IgG in the tested sample, can induce a high background, which can be within the grey zone or in the weak positive range. Check then for the possible presence of antibodies on another specimen collected later.

#### PATHOLOGICAL VARIATIONS:

Anti-cardiolipin/anti-phospholipid antibodies are usually absent in normal population.

Presence of anti-cardiolipin/anti-phospholipid antibodies at moderate or high concentrations is observed in the anti-phospholipid syndrome (APS), sometimes associated with thrombotic diseases, recurrent miscarriages, livedo reticularis, thrombocytopenia or neurological disorders.

The pathogenicity of anti-cardiolipin/anti-phospholipid antibodies is still under investigation. They are thought to contribute triggering various clinical manifestations (APS). Pathogenicity of the various isotypes is not completely documented, especially for IgM and IgA isotypes. Severity of the clinical manifestations associated with the presence of anti-cardiolipin/anti-phospholipid antibodies, increases with the IgG isotype, the antibody concentration and its affinity, and the time of exposure. IgG isotype is then, the most pathogenic.

#### APPLICATIONS:

Assay of anti-cardiolipin/anti-phospholipid antibodies of the IgG isotype, in the following clinical situations:

- Anti-phospholipid syndrome (APS).
- Pregnancies with recurrent miscarriage.
- Unexplained thrombosis.
- Any clinical situation where the assay of anti-Cardiolipin/anti-phospholipid antibodies is required.

#### PERFORMANCES:

- The lower limit of detection is ≤ 2 GPL/mL.
- Inter assay: <10%
- Intra assay: <10%

#### REFERENCES:

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- CLSI Document GP44-A4: "Procedures for the handling and processing of blood specimens for common laboratory tests".

#### SYMBOLS:

Used symbols and signs listed in the ISO standard 15223-1.

Changes compared to the previous version.