

# ZYMUTEST Anti-PROTEIN C IgG-Isotype # ARK026A

Auto-antibodies to Protein C, IgG isotypes, by ELISA

For *in vitro* use only

For research use only



Manufactured By: HYPHEN BioMed

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## INTENDED USE:

The ZYMUTEST anti-Protein C, IgG ELISA kit, is a standardised and optimised enzyme immuno-assay designed for measuring autoantibodies to Protein C of the IgG isotype, in human plasma or in any biological fluid where autoantibodies to Protein C must be measured.

## ASSAY PRINCIPLE:

The assay of human autoantibodies to Protein C with the ZYMUTEST anti-Protein C, IgG kit, is designed with highly purified human Protein C coated onto a micro ELISA plate.

The diluted plasma sample or biological fluid is introduced into one of the microwells of the coated plate. When present, anti-Protein C autoantibodies bind to immobilised Protein C. Following a washing step, bound autoantibodies of the IgG isotype are revealed with a goat anti-human IgG (Fc $\gamma$  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 $_2$ O $_2$ ), 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-Protein C autoantibodies, of the IgG isotype, present in the tested sample.

## TESTED SAMPLES:

- Trisodium citrate or Na $_2$  EDTA anticoagulated human plasma or human serum.
- Any biological fluid where human autoantibodies to Protein C, of the IgG isotype, must be assayed.

## REAGENTS:

1. **COAT:** Micro ELISA plate, containing 12 strips of 8 wells, coated with highly purified human Protein C, saturated, then stabilized; the plate is packed in an aluminium pouch hermetically sealed, in presence of a desiccant.
2. **SD:** Two vials containing 50 ml of **Autoimmunity Sample Diluent**, ready to use. Contains Sodium Azide
3. **CAL:** Three vials of **Anti-Protein C, IgG, calibrator**, lyophilised. When restored with 1 ml of **Autoimmunity Sample Diluent**, the ready to use calibrator is obtained (already diluted 1:100).  
This calibrator has a defined anti-Protein C concentration, expressed in **Arbitrary Units (AU)**, and indicated on the flyer provided with the kit.
4. **C-:** Three 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).
5. **IC:** Three vials of **immunoconjugate (Anti-IgG (Fc $\gamma$ )-HRP immunoconjugate)**, affinity purified goat antibodies specific for human IgG-Fc $\gamma$ , coupled to HRP, lyophilised.
6. **CD:** One vial of 25 ml of **conjugate diluent**, ready to use.
7. **WS:** One vial of 50 ml of 20 fold concentrated **Wash Solution**.
8. **TMB:** One vial of 25 ml peroxidase substrate: 3,3',5,5' - **Tetramethylbenzidine** containing hydrogen peroxide, ready to use.
9. **SA:** One vial of 6 ml of **0.45M Sulfuric Acid (Stop Solution)**, ready to use.

**Nota:** Use only components from a same kit lot number. Do not mix components from different lots when running the assay.

## REAGENTS AND EQUIPMENT REQUIRED BUT NOT PROVIDED:

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

## REAGENTS PREPARATION, STORAGE AND STABILITY:

In their original packaging box, before use, when stored at 2-8°C, the unopened reagents are stable until the expiration date printed on the box.

1. **Micro ELISA plate:** open the plastic 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 microplate storage bag (minigrip).
2. **Autoimmunity-Sample Diluent:** It is ready to use. When open, it can be used for 4 weeks, stored at 2-8 °C, and provided that any bacterial contamination is avoided during use.  
**Warning:** The **Autoimmunity-Sample Diluent** contains sodium azide, which may react with lead and copper plumbing to form highly explosive metal azides. Flush with large volumes of water when discarding into a sink.
3. **Calibrator:** restore each vial with 1 ml autoimmunity sample diluent in order to obtain the ready to use negative control. It corresponds to a normal human plasma, already **diluted 1:100**. Following reconstitution, the calibrator is stable for 5 days at 2-8°C, provided that any bacterial contamination is avoided during use.
4. **Negative control:** restore each vial with 1 ml autoimmunity sample diluent in order to obtain the ready to use negative control. It corresponds to a normal human plasma, already **diluted 1:100**. Following reconstitution, the negative control is stable for 2 weeks at 2-8°C, provided that any bacterial contamination is avoided during use.

**Warning:** The Protein C used for coating the plates is a purified fraction extracted from human plasma. The negative control is also prepared with human plasma, tested with registered methods and found negative for HIV antibodies, HBs Ag and HCV antibodies. However, no assay may warrant the total absence of infectious agents. Any product of human origin must then be handled with all the required cautions, as being potentially infectious.

5. **Anti-IgG (Fc $\gamma$ )-HRP immunoconjugate:** each vial must be restored with 7.5 ml of **conjugate diluent**. Let the pellet to be completely dissolved before use, and shake the vial gently in order to homogenize the content. The restored conjugate is stable for at least 24 hours at room temperature or for at least 4 weeks at 2-8°C.
6. **Conjugate diluent:** It is ready to use. When open, it can be used for 4 weeks, stored at 2-8 °C, and provided that any bacterial contamination is avoided during use.
7. **Wash Solution:** Incubate the vial for 15-30 minutes in a water bath, at 37°C, until complete dissolution of solids, when present. Shake the vial and dilute the amount required 1:20 in distilled water (the 50 ml contained in the vial allow preparing 1 liter of Wash Solution). The Wash Solution must be stored at 2-8°C in its original vial and used within 4 weeks following opening. The diluted Wash Solution must be used within 7 days, when protected from any contamination.
8. **TMB substrate:** It is ready to use. When open, it can be used for 4 weeks, stored at 2-8°C, and provided that any bacterial contamination is avoided during use.
9. **0.45M Sulfuric Acid:** It is ready to use.

**Cautions:** Sulfuric Acid, although diluted to 0.45M is caustic. As for any similar chemical, handle Sulfuric acid with great care. Avoid any skin and eye contact. Wear protection glasses and gloves when handling.

**Nota:** Bring the kit at room temperature, at least 30 min. before use. Store the unused reagents at 2-8°C.

## PROCEDURE:

### Sample collection:

Blood plasma (9 vol.) must be collected on 0.109 M citrate anticoagulant (1 vol.); plasma supernatant is decanted following a 20 min. centrifugation at 2,500 g; citrated plasma should be tested within 4 hours or stored frozen at -20°C or below for up to 6 months, and thawed for 15 min. at 37°C just before use. Thawed specimen must be tested within 2 hours. EDTA collected human plasma may also be used.

Auto-antibodies to Protein C can also be assayed on serum.

Plasma or serum is tested at 1:100 dilution in Autoimmunity Sample Diluent. When high amounts of auto-antibodies to Protein C are expected, samples must be assayed at 1:200 or 1:400 dilution. Results must then be multiplied by 2 or 4.

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6580 Gove Court • Mason, OH 45040

Phone: 513.770.1991

Toll Free: 866.783.3797

Fax: 513.573.9241

Email: info@aniara.com

www.aniara.com

### Assay procedure:

**Calibration curve:** The assay can be calibrated with the calibrator provided in the kit, and which concentration (C) is indicated in arbitrary units, (AU) on the flyer provided. Prepare the standard solutions for calibration by doing a 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.

Remove the required number of strips from the aluminium pouch, for the series of measures to be performed. Then 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-Protein C IgG Calibrator or Negative control or 1:100 diluted sample or sample diluent (blank)	200 µl	Introduce the : – Calibrator or – Negative control or – Diluted sample or – Sample diluent into the micro ELISA plate wells.
<b>Incubate for 30 minutes at room temperature (18-25 °C) (a, b).</b>		
Wash Solution (20 fold diluted in distilled water)	300 µl	Proceed to 5 successive washings using the washing instrument (b)
Conjugate (anti-IgG Fcγ) HRP immunoconjugate, restored with 7.5 ml of conjugate diluent)	200 µl	Introduce the anti-IgG (Fcγ) HRP immunoconjugate into the microELISA plate wells.
<b>Incubate for 30 minutes at room temperature (18-25 °C) (a).</b>		
Wash Solution (20 fold diluted in distilled water)	300 µl	Proceed to 5 successive washings using the washing instrument (b).
TMB / H <sub>2</sub> O <sub>2</sub> Substrate	200 µl	Immediately after the washing, introduce the substrate into the wells. The substrate distribution, row by row, must be accurate and at exact time intervals (c).
<b>Let the colour to develop for 5 minutes at room temperature (18-25 °C) (a).</b>		
0.45 M Sulfuric Acid	50 µl	Following exactly the same time intervals than for the addition of substrate, stop the colour development by introducing the 0.45 M sulfuric acid (c)
Wait for 10 minutes in order to allow the colour to stabilize and measure absorbance at 450 nm (A <sub>450</sub> ) (d). Subtract the blank value.		

### Nota:

- 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 immobilised 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 intervals 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.

### QUALITY CONTROL:

- Calibrator and controls provided in the kit allow validating the right performance of the assay.
- Expected A<sub>450</sub> values for undiluted calibrator and the negative control can present variations from lot to lot but they always are:

$$P = A_{450} \text{ for 1:1 calibrator: } \geq 1.5$$

$$N = A_{450} \text{ for negative control: } \leq 0.25$$

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.

### EXPRESSION OF RESULTS:

- Results are expressed according to the A<sub>450</sub> values obtained for samples, controls and using the calibration curve.
- The calibration curve is obtained by plotting the anti-Protein C concentrations expressed in AU on the abscissae and the corresponding A<sub>450</sub> on the ordinates (see model on the flyer). The anti-Protein C, autoantibody concentration, of the IgG isotype, for the sample tested at the standard 1:100 dilution, and expressed in AU, 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).
- Alternatively, an ELISA software (i.e. Dynex, Biolise, etc...), can be used for the calculation of 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-step dilutions. 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 Arbitrary Unit (AU), is defined respectively to the upper limit of the normal range, which corresponds to the mean value obtained in a normal population plus 2 standard deviations (SD). By definition, this corresponds to 10 AU. Therefore:

$$\text{Negative range: } < 10 \text{ AU/ml}$$

**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. 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 Protein C of the IgG isotype.

$$\text{Grey Zone: } \geq 10 \text{ AU/ml to } < 20 \text{ AU/ml}$$

### Positive range:

The positive range concerns the following anti-Protein C autoantibody concentrations:

$$\text{Positive range: } \geq 20 \text{ AU/ml}$$

The positive range can be classified as follows:

Low positive:	$\geq 20$ to $< 50$ AU/ml
Moderate positive:	$\geq 50$ to $< 100$ AU/ml
High positive:	$\geq 100$ AU/ml

### Limitations of the assay:

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 situations 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:

- Autoantibodies to Protein C are usually not found in normal population.
- These autoantibodies could be observed in some (rare) infectious diseases, associated or not with a lupus anticoagulant activity.
- Their presence at high concentrations can be associated with an increased risk of thrombotic diseases. They can be associated with a decreased Protein C activity or concentration.
- As the clinical significance and the pathological associations of anti-Protein C auto-antibodies is not well defined, the assay must be used only for research purposes.

### Applications:

Assay of autoantibodies to Protein C of the IgG isotype in plasma or serum, in the following clinical situations:

- Recurrent unexplained miscarriages.
- Infectious diseases, or viral infections of the childhood.
- Unexplained lupus anticoagulant, without or with thrombosis.
- Acquired Protein C deficiency.

Any clinical situation where the assay of anti-Protein C autoantibodies is required. This assay is usually associated to the assay of IgM isotype auto-antibodies.

This assay is a research method for investigation use only.

### Assay specificity:

The ZYMUTEST anti-Protein C, IgG, specifically measures human autoantibodies to Protein C of the IgG isotype, reactive with immobilised Protein C. IgM or IgA isotypes are not measured.

### REFERENCES:

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