



*Immunoassay Kits Beyond The Ordinary*

**Anti-Cardiolipin IgG EIA (27-GD26)**

Quantitative/semi-quantitative assay for cardiolipin IgG 96 tests

**Anti-Cardiolipin IgM EIA (27-GD27)**

Quantitative/qualitative assay for cardiolipin IgM 96 tests

**Anti-Cardiolipin IgA, IgG, IgM Screen EIA (27-GD28)**

Quantitative/qualitative assay for total cardiolipin antibodies 96 tests

**For Research Use Only. Not For Use In Diagnostic Procedures.**

Catalog Numbers:	27-GD26
	27-GD27
	27-GD28
Size:	96 Tests
Version:	100108 – ALPCO 4/21/08

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## 1. Intended use

The Anti-Cardiolipin IgG EIA, Anti-Cardiolipin IgM EIA and Anti-Cardiolipin IgA, IgG, and IgM Screen EIA are rapid ELISA methods for the detection of autoimmune anti-cardiolipin antibodies. They are intended as aids to the diagnosis and monitoring of thrombotic diseases associated with primary antiphospholipid syndrome (APS), and to the diagnosis of APS associated with systemic lupus erythematosus (SLE) and lupus-like disorders.

## 2. Explanation of the Test

APS is the most frequent cause of acquired thrombophilia. Patients with this disorder frequently have anti-cardiolipin antibodies (aCL) in their blood and are predisposed to venous and arterial thrombosis, thrombocytopenia and, in women, recurrent fetal loss. Although first described in patients with SLE, aCL are not confined to lupus patients but also occur frequently in non-lupus patients with primary APS.

Compared with infection-associated aCL, autoimmune aCL require the presence of the co-factor  $\beta$ 2-glycoprotein 1 ( $\beta$ 2-GP1) for optimal binding. Therefore, the antigen preparation used in these assays consists of purified cardiolipin in configuration with  $\beta$ 2-GP1. Assays that omit the co-factor are thought to detect aCL associated with non-autoimmune disorders e.g. syphilis, leprosy and infectious mononucleosis.

## 3. Principle of the test

Diluted serum samples are incubated with cardiolipin/  $\beta$ 2-GP1 immobilised on microtitre wells. After washing away unbound serum components, rabbit anti-human IgG or IgM or IgAGM conjugated to horseradish peroxidase is added to the wells, and this binds to surface-bound antibodies in the second incubation. Unbound conjugate is removed by washing, and a solution containing 3,3',5,5'-tetramethylbenzidine (TMB) and enzyme substrate is added to trace specific antibody binding. Addition of Stop Solution terminates the reaction and provides the appropriate pH for color development. The optical densities of the standards, positive control and samples are measured using a microplate reader at 450nm. Optical density is directly proportional to antibody activity in the sample.

## 4. Materials included in the kit

- **Microplate:** 96 wells in 12 X 8 break-apart strips, pre-coated with cardiolipin/ $\beta$ 2-GP1, with holder in a foil bag with desiccant
- **Reagent 1: Sample Diluent** 10 mM Tris-buffered saline, pH 7.2 with antimicrobial agent, 100ml, (blue), ready to use
- **Reagent 2: Wash Buffer** 100mM Tris-buffered saline with detergent, pH 7.2, 100 ml, concentrate (x10)
- **Reagent 3: Conjugate** rabbit anti-human IgG (red) or IgM (green) or IgAGM (brown) conjugated to horseradish peroxidase in protein stabilizing solution and antimicrobial agent, 12 ml, ready to use
- **Reagent 4: TMB Substrate** aqueous solution of TMB and hydrogen peroxide, 12 ml, ready to use
- **Reagent 5: Stop Solution** 0.25M sulphuric acid, 12 ml, ready to use

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- **Standards:** 1ml of 10mM Tris-buffered saline containing cardiolipin antibodies, ready to use. See table below for standard values.

Cardiolipin IgG GPLU/ml <sup>1</sup>	Cardiolipin IgM U/ml <sup>2</sup>	Cardiolipin Total U/ml <sup>2</sup>
0	0	0
20	8	20
50	25	50
100	50	100
200	100	200

<sup>1</sup> Calibrated against the UK Reference Preparation 97/656

<sup>2</sup> Arbitrary units

- **Standard for qualitative use:** 11 U/ml (Total Screen only), 1ml of 10mM Tris-buffered saline containing cardiolipin antibodies, ready to use
- **Positive Control:** 1ml of 10mM Tris-buffered saline containing cardiolipin antibodies, ready to use
- **Instructions for use**

## 5. Other equipment required

1. Test tubes for dilution • graduated cylinder for preparing wash buffer • precision pipettes and disposable tips to deliver 10µl, 100µl, 1ml • EIA microplate washer or multi-channel pipette or wash bottle • de-ionized water • absorbent paper • EIA microplate reader with 450nm and optional 620nm reference filter. Alternatively, a suitable automated system may be used.
2. Instrumentation, whether manual or automated, should meet the following criteria: Pipettes with better than 3% imprecision with no carry over between pipetting steps; microplate washers should remove 99% of fluid; automated machines should minimize time between washing and adding the next reagent.

## 6. Precautions

### 6.1 Safety Precautions

1. All reagents in this kit are for research use only. Not for use in diagnostic procedures.
2. Only experienced laboratory personnel should use this test. The test protocol must be followed strictly.
3. All human source material used in the preparation of standards and the positive control for this product have been tested and found negative for antibodies to HIV, HbsAg and HCV. No test method, however, can offer complete assurance that infectious agents are absent. Therefore, all reagents containing human material should be handled as if potentially infectious. Operators should wear gloves and protective clothing when handling any patient sera or serum based products.

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4. Reagents of this kit contain antimicrobial agents and the TMB Substrate solution contains 3,3',5,5'-tetramethylbenzidine. Avoid contact with the skin and eyes. Rinse immediately with plenty of water if any contact occurs.
5. The Stop Solution contains 0.25M sulphuric acid. Avoid contact with skin and eyes. Rinse immediately with plenty of water if contact occurs.
6. Any liquid that has been brought into contact with potentially infectious material has to be discarded in a container with a disinfectant. Disposal must be performed in accordance with local legislation.

## 6.2 Technical Precautions

1. Strips and solutions should not be used if the foil bag is damaged or liquids have leaked.
2. Allow all reagents and the microplate to reach room temperature before use. Ensure that the microplate foil bag containing any unused strips is well sealed and contains the desiccant to avoid moisture. Store at 2 – 8°C after use.
3. When automating, consider excess volumes required for setting up the instrument and dead volume of robot pipette.
4. Include the Positive Control in every test run to monitor for reagent stability and correct assay performance.
5. Strictly observe the indicated incubation times and temperature.
6. Ensure that no cross-contamination occurs between wells. Keep all pipettes and other equipment used for Conjugate completely separate from the TMB Substrate reagent.
7. When pipetting Conjugate or TMB Substrate, aliquots for the required numbers of wells should be taken to avoid multiple entry of pipette tips into the reagent bottles. Never pour unused reagents back into the original bottles.
8. Do not allow microwells to dry between incubation steps.
9. Strictly follow the described wash procedure. Insufficient washing may cause high background signal.
10. Avoid direct sunlight and exposure to heat sources during all incubation steps.
11. Replace color-coded caps on their correct vials to avoid cross-contamination
12. It is important to dispense all samples and the positive control into the wells without delay. Therefore ensure that all samples are ready to dispense.

## 7. Shelf life and storage conditions

On arrival, store the kit at 2 - 8°C. Once opened the kit is stable for 3 months (or until its expiry date if less than 3 months). Do not use kits beyond their expiry date. Do not freeze any kit component. The diluted Wash Buffer and Sample Diluent (see Technical Precautions) have a shelf life of 3 months if stored in a closed bottle at 2 – 8°C.

## 8. Specimen collection and storage

Serum samples may be used and should be stored at -20°C for long-term storage. Frozen samples must be mixed well after thawing and prior to testing. Repeated freezing and thawing can affect results. Addition of preservatives to the serum sample may adversely affect the results. Microbially contaminated, heat-treated or specimens containing particulate matter should not be used. Grossly haemolysed or lipaemic specimens should be avoided.

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## 9. Preparation of reagents

Dilute the Wash Buffer (**Reagent 2**) 1:10 in deionized water to make sufficient buffer for the assay run e.g. add 50ml wash buffer concentrate to 450ml water.

## 10. Assay Procedure

1. Dilute patient samples 1:101 in diluted Sample Diluent (eg 10 µl serum plus 1 ml diluent.)
2. Assemble the number of strips required for the assay.
3. For quantitative assays, dispense 100 ul of each Standard, the Positive Control and the diluted samples into appropriate wells

For the IgG semi-quantitative assay, dispense only the 20 GPLU/ml Standard, the Positive Control and diluted samples.

For qualitative assays, dispense the 8 U/ml Standard for IgM assays, or the 11 U/ml Standard for Screen assays together with the Positive Control and samples.

4. Incubate for **30** minutes at room temperature.
5. After 30 minutes, decant or aspirate the well contents and wash the wells 3 times using automated washing or the manual wash procedure (see below). Careful washing is the key to good results. **Do not allow the wells to dry out.**

### Manual Wash Procedure:

Empty the wells by inversion. Using a multi-channel pipette or wash bottle, fill the wells with wash buffer. Empty by inversion and blot the wells on absorbent paper. Repeat this wash process 2 more times.

6. Dispense 100µl of Conjugate (**Reagent 3**) into each well. Incubate the wells for **30** minutes at room temperature.
7. After 30 minutes, discard the well contents and carefully wash the wells 4 times with Wash Buffer. Ensure the wells are empty but do not allow them to dry out.
8. Using a repeating dispenser, rapidly dispense 100µl of TMB Substrate (**Reagent 4**) into each well. Incubate the plate for **10** minutes.
9. Add 100µl of Stop Solution (**Reagent 5**) to each well. To allow equal reaction times, the Stop Solution should be added to the wells in the same order as the TMB Substrate.
10. Read the optical density (OD) of each well at 450nm in a microplate reader within 10 minutes. A 620nm filter may be used as a reference wavelength.

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## 11. Quality control

Quality control data is supplied on the lot-specific QC certificate included in the kit. The positive control is intended to monitor for substantial reagent failure.

Any well positive by spectrophotometer but without visible color should be cleaned on the underside and re-read. If OD values below zero are observed, the wavelengths used should be verified, the reader re-blanked to air and the measurements repeated.

## 12. Interpretation of Results

### Quantitative results

Plot the OD of each standard against its concentration and draw the best-fit curve through the points. Read the unknowns off this curve. The following table is based on in-house studies of normal and diseased groups.

Range	Cardiolipin IgG (GPLU/ml) <sup>1</sup>	Cardiolipin IgM (U/ml) <sup>2</sup>	Cardiolipin Total (U/ml) <sup>3</sup>
Normal	<8	<8	<11
Borderline	8 – 11	8 – 10	11 – 13
Positive	>11	>10	>13

<sup>1</sup> Samples with values greater than 200 IgG anti-IgG phospholipid units/ml (GPL U/ml) should be repeated at a higher dilution e.g. 1:200.

<sup>2</sup> Samples producing values greater than 100 U/ml should be repeated at a higher dilution e.g. 1:200.

<sup>3</sup> Samples producing values greater than 200 U/ml should be repeated at a higher dilution e.g. 1:200.

### Semi-quantitative Results (Cardiolipin IgG only)

For semi-quantitative results, use following calculation:

$$\frac{\text{OD of Sample}}{\text{OD of 20 GPLU/ml Standard}} \times 20 = \text{sample value in GPLU/ml}$$

### Qualitative Results

Cardiolipin IgM: Samples with ODs greater than that of the 8 U/ml standard are positive.

Cardiolipin Screen: Samples with ODs greater than that of the 11 U/ml standard are positive

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### 13. Performance Characteristics

	Assay Sensitivity	CV% Intra-assay	CV% Inter-assay
IgG	0.6 GPLU/ml	5	12
IgM	0.2 U/ml	3.5	7
Screen	1.9 U/ml	5	9

#### Clinical evaluation

	ACA-IgG	ACA-IgM
Sensitivity	86%	72%
Specificity	96%	99%
PPV	92%	96%
NPV	93%	92%

#### **Method Summary**

- Dilute sera 1:100 with Sample Diluent (**Reagent 1**)
- Dispense Standards, the Positive Control and the diluted sample into the microplate wells
- Incubate for **30** minutes at room temperature.
- *Wash the wells three times.*
- Dispense 100µl of Conjugate (**Reagent 3**) into each well
- Incubate at room temperature for **30** minutes
- *Wash the wells four times.*
- Add 100µl of TMB Substrate (**Reagent 4**) to each well
- Incubate at room temperature for **10** minutes
- Add 100µl Stop Solution (**Reagent 5**) to each well
- Read the optical density at 450nm (single wavelength) or 450/620nm (dual wavelength).

## Further reading

- Clinical and Experimental Immunology, 1987, **68**: 222.
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- Springer Semin. Immunopathol., 1994, **16**: 223-245.
- Immunol. Allergy Clin. N. Am., 1994, **14**: 821-834.