

## Anti-Cardiolipin IgM

### For *In vitro* diagnostic use only

Enzyme immunoassay for the determination of IgM antibodies to cardiolipin in human serum and plasma

#### INTENDED USE

**Anti-Cardiolipin is used for the quantitative determination of IgM antibodies to Cardiolipin in human serum or plasma for the diagnosis of anti-phospholipid antibody syndrome (APAS).**

APAS is an autoimmune disorder comprising such clinical symptoms like arterial or venous thrombosis, thrombocytopenia and recurrent foetal loss. Primary APAS as well as systemic lupus erythematosus (SLE) are characterized by the appearance of autoantibodies to negatively charged phospholipids including Cardiolipin antibodies (1). Although significance and pathological relevance of phospholipid antibodies are not completely revealed yet, the detection of such autoantibodies is widely established and plays an important role in the diagnostics of systemic autoimmune diseases.

Unlike Cardiolipin antibodies which appear in some infectious disease patients autoimmune patients exhibit Cardiolipin antibodies that seem to recognize Cardiolipin in association with a plasma protein cofactor. This cofactor has been identified as  $\beta$ 2 glycoprotein-I ( $\beta$ 2 GP-I) (apolipoprotein H) (2,3).  $\beta$ 2 GP-I, a serum protein with a molecular weight of 50 kDa, affects platelet aggregation and coagulation.

The positively charged fifth domain of  $\beta$ 2GP-I interacts with negatively charged phospholipids such as Cardiolipin. This interaction results in conformational changes of the protein and the creation of new epitopes apparently recognized by autoimmune Cardiolipin autoantibodies.

(1) Harris EN, Gharavi AE, Boey ML, Patel BM, Mackworth-Young GG, Loizou S and Hughes GRV: Anticardiolipin antibodies: detection by radioimmunoassay and association with thrombosis in systemic lupus erythematosus. *Lancet* 1983 11:1211

(2) Galli M, Comfurius P, Maassen C, Hemker HC, DeBaets MHVan Breda-Vriesman PJC, Barbui T, Zwaal RFA, Bevers EM: Anticardiolipin antibodies (ACA) directed not to cardiolipin but to a plasma protein factor. *Lancet* 1990 335:1544-1547

(3) McNeil HP, Simpson RJ, Chesterman CN, Krilis SA: Anti-phospholipid antibodies are directed against a complex antigen that includes a lipid-binding factor of coagulation: beta 2-glycoprotein I (apolipoprotein H). *Proc Natl Acad Sci USA* 1990 87:4120-4124

#### PRINCIPLE of the TEST

Anti-Cardiolipin is an enzyme immunoassay for the quantitative determination of IgM antibodies to Cardiolipin.

The antibodies of the standards, control and diluted patient samples react with an antigen complex consisting of Cardiolipin and its cofactor  $\beta$ 2 GP-I immobilized on the solid phase of microtiter plates. The use of highly purified  $\beta$ 2 GP-I guarantees the specific binding of autoimmune related Cardiolipin antibodies of the specimen under investigation. Following an incubation period of 30 min at room temperature, unbound serum components are removed by a wash step.

The bound IgM antibodies react specifically with anti-human-IgM conjugated to horseradish peroxidase (HRP) within the incubation

period of 30 min at room temperature (RT). Excessive conjugate is separated from the solid-phase immune complexes by the following wash step.

HRP converts the colorless substrate solution of 3,3',5,5'-tetramethylbenzidine (TMB) added into a blue product. The enzyme reaction is stopped by dispensing an acidic solution ( $H_2SO_4$ ) into the wells after 10 min at RT turning the solution from blue to yellow.

The optical density (OD) of the solution at 450 nm is directly proportional to the amount of specific antibodies bound. The standard curve is established by plotting the antibody concentrations of the standards (x-axis) and their corresponding OD values (y-axis) measured. The concentration of antibodies of the specimen is directly read off the standard curve.

#### PATIENT SAMPLES

##### Specimen collection 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.

##### Preparation before use

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

**Note: Patient samples have to be diluted 1 + 100 (v/v), e.g. 10  $\mu$ l sample + 1.0 ml sample diluent (C), prior to assay.**

The samples may be kept at 2 - 8 °C for up to three days. Long-term storage requires - 20 °C.

#### KIT COMPONENTS

1- Microtiter plate 12 breakable strips per 8 wells (total 96 Individual wells) coated with cardiolipin complex	1 Vacuum sealed with dessicant
2- Concentrated wash buffer sufficient for 1000 ml solution	100 ml Concentrate capped white
3- Sample diluent	100 ml ready for use capped black
4- Conjugate Containing anti human IgM (sheep) coupled with HRP	15 ml Ready for use capped green
5- TMB Substrate 3,3',5,5'-tetramethylbenzidine in citrate buffer containing hydrogen peroxide	15 ml ready for use capped blue
6- Stop solution 0.25 M sulfuric acid	15 ml ready for use capped yellow
7- Standard (human serum diluted)	1 ml each Ready to use capped white with number
8- Positive control (human serum diluted)	1 ml Ready for use capped red

#### Materials required

- micropipette 100 - 1000  $\mu$ l
- micropipette 10 - 100  $\mu$ l
- multi-channel pipette
- 50 - 200  $\mu$ l trough for multi-channel pipette
- 8-channel wash comb with vacuum pump and waste bottle or microplate washer

- microplate reader with optical filters for 450 nm and 620 nm or 690 nm
- distilled or de-ionized water

## Size and storage

Anti-Cardiolipin has been designed for 96 determinations.

The expiry date of each component is reported on its respective label that of the complete kit on the box labels.

Upon receipt, all components of the Anti-Cardiolipin have to be kept at 2 - 8 °C, preferably in the original kit box.

After opening all kit components are stable for at least 2 months, provided proper storage.

## Preparation before use

Allow all components to reach room temperature prior to use in the assay.

The microtiter plate is vacuum-sealed in a foil with desiccant. The plate consists of a frame and strips with breakable wells. Allow the sealed microplate to reach room temperature before opening. Unused wells should be stored refrigerated and protected from moisture in the original cover carefully resealed.

Prepare a sufficient amount of wash solution by diluting the concentrated wash buffer 10 times (1 + 9) with de-ionized or distilled water. For example, dilute 8 ml of the concentrate with 72 ml of distilled water per strip. The wash solution prepared is stable at 2 - 8 °C up to 30 days.

Make sure the soak time of the wash buffer in the wells is at least 5 seconds per wash cycle.

Avoid exposure of the TMB substrate solution to light!

## ASSAY PROCEDURE

**Dilute patient sera with sample diluent 1 + 100 (v/v), e.g. 10 µl serum + 1.0 ml sample diluent.**  
**Avoid any time shift during pipetting of reagents and samples.**

1. Bring all reagents to room temperature (18-25°C) before use. Mix gently without causing foam.
2. Dispense  
**100 µl** standards (1 - 5)  
**100 µl** positive control  
**100 µl** diluted patient samples into the respective wells.
3. Incubate **30 min** at room temperature (18-25°C).
4. Decant, then wash each well **five** times using **300 µl** wash solution.
5. Add **100 µl** of conjugate solution to each well.
6. Incubate **30 min** at room temperature (18-25°C).
7. Decant, then wash each well **five** times using **300 µl** wash solution.
8. Add **100 µl** of substrate to each well.
9. Incubate **10 min** protected from light at room temperature (18-25°C).
10. Add **100 µl** of stop solution to each well and mix gently.
11. Read the OD at **450 nm** versus 620 or 690 nm within **30 min** after adding the stop solution.

## DATA PROCESSING

We recommend log / lin processing for best results.

The standard curve is established by plotting the mean OD-values of the standards 1 - 5 on the ordinate, y-axis, (lin. scale) versus their respective anti-cardiolipin IgM concentrations on the abscissa, x-axis, (log. scale).

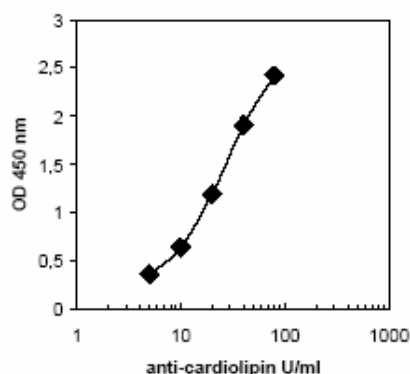
Cardiolipin antibody concentrations of the unknown samples are directly read off in GPL-U/ml or MPL-U/ml against the respective OD values.

Anti-Cardiolipin may be used also with Computer Assisted Analysis using software able to plot log/lin curves with four-parameter fit. Using the recommended dilution of 1 + 100 (v/v) for patient's sera, no correction factor is necessary, as all other components of the kit are supplied accordingly.

## Example of Typical Assay Results Cardiolipin IgM

well	OD (a)	OD (b)	OD (mean)	MPL U/ml
Standard 1	0.351	0.373	0.362	5
Standard 2	0.625	0.659	0.637	10
Standard 3	1.175	1.201	1.188	20
Standard 4	1.925	1.881	1.903	40
Standard 5	2.398	2.454	2.421	80
Patient 1	0.648	0.668	0.658	11

## TYPICAL STANDARD CURVES



Specimens with an OD > standard 5 should be diluted with cardiolipin antibody negative serum and tested again. Results are multiplied with the dilution factor chosen.

## Test validity

The test run is valid if:

- the mean OD of the standard 1 is  $\leq 0.5$
- the mean OD of the standard 5 is  $\geq 1.2$

If the above mentioned quality criteria are not met, repeat the test and make sure that the test procedure is followed correctly (incubation times and temperatures, sample and wash buffer dilution, wash steps etc.). In case of repeated failure of the quality criteria contact your supplier.

## REFERENCE VALUES

Cardiolipin antibodies	IgM
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<b>positive</b>	<b>≥ 10</b>
<b>negative</b>	<b>&lt; 10</b>

It is recommended that each laboratory establishes its own normal and pathological reference ranges for serum anti-cardiolipin levels, as usually done for other diagnostic parameters, too. Therefore, the above mentioned reference values provide a guide only to values which might be expected.

### Limitations of Method

Healthy individuals should be tested negative by the Anti-Cardiolipin. However, cardiolipin autoantibody positive apparently healthy persons do occur.

Any clinical diagnosis should not be based on the results of in vitro diagnostic methods alone. Physicians are supposed to consider all clinical and laboratory findings possible to state a diagnosis.

## CHARACTERISTIC ASSAY DATA

### Calibration

Anti-Cardiolipin is calibrated according to the reference sera of E.N. Harris, Louisville, USA.

### Linearity

Dilutions of selected specimens in Cardiolipin antibody free human serum are determined according to the expected theoretical values with Anti-Cardiolipin.

### Sensitivity

The analytical sensitivity of the Anti-Cardiolipin is 5 and 3 U/ml for anti-Cardiolipin IgM, respectively.

### Precision

#### Cardiolipin IgM

Intraassay		Interassay	
mean (U/ml)	CV %	mean (U/ml)	CV %
9.1	5.9	10.2	9.1
30.6	7.3	19.3	7.4
54.7	3.5	77.8	8.0

## SAFETY PRECAUTIONS

- **This kit is for in vitro use only.** Follow the working instructions carefully. Atlas and its authorized distributors shall not be liable for damages indirectly or consequentially brought about by changing or modifying the procedure indicated. The kit should be performed by trained technical staff only.
- The expiration dates stated on the respective labels are to be observed. The same relates to the stability stated for reconstituted reagents.
- Do not use or mix reagents from different lots.
- Do not use reagents from other manufacturers.

- All reagents should be kept at 2 - 8 °C in the original shipping container before use.
- Some of the reagents contain small amounts of Thimerosal (< 0.1 % w/v) and Kathon (1.0 % v/v) as preservatives. They must not be swallowed or allowed to come into contact with skin or mucosa.
- Source materials derived from human body fluids or organs used in the preparation of this kit were tested and found negative for HBsAg and for HIV as well as 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.

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CAL	IgM	$\geq$ OD 450 nm $\leq$	OD 450 nm	
1	5 U/ml	$\leq 0.5$	0.247	✓
2	10 U/ml		0.445	
3	20 U/ml		0.926	
4	40 U/ml		1.522	
5	80 U/ml	$\geq 1.2$	2.180	✓

CONTROL	+	20-40 U/ml	08.01.2007	29 U/ml	✓
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Anti- Cardiolipin	IgM
+	$\geq 10$
-	$< 10$