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*This kit is intended for Research Use Only.**Not for use in diagnostic procedures.**Please use only the valid version of the package insert provided with the kit.***1 INTENDED USE**

Enzyme Immuno Assay (ELISA) for measurement of IgM antibodies to Coxsackievirus type B (CoxB) in human plasma and sera.

**2 PRINCIPLE OF THE TEST**

Microplates are coated with native Coxsackie virus B antigens derived from tissue culture, containing its major subtypes. In the 1<sup>st</sup> incubation, the solid phase is treated with diluted samples and anti-CoxB IgM are captured, if present, by the antigens. After washing out all the other components of the sample, in the 2<sup>nd</sup> incubation bound anti-CoxB IgM are detected by the addition of anti hIgM antibody, labeled with peroxidase (HRP). The enzyme captured on the solid phase, acting on the substrate/chromogen mixture, generates an optical signal that is proportional to the amount of anti-CoxB IgM antibodies present in the sample.

The presence of IgM in the sample may therefore be determined by means of a cut-off value able to discriminate between low and high samples.

Neutralization of IgG anti-CoxB, carried out directly in the well, is performed in the assay in order to block interferences due to this class of antibodies in the determination of IgM.

**3 COMPONENTS**

Each kit contains sufficient reagents to perform 96 tests.

**1. Microplate: MICROPLATE**

12 strips x 8 microwells coated with native Coxsackievirus B antigens derived from tissue culture. Plates are sealed into a bag with desiccant. Allow the microplate to reach room temperature before opening; reseal unused strips in the bag with desiccant and store at 4°C.

**2. Low Control: CONTROL –**

1 x 2.0 ml/vial. Ready to use. It contains, human IgM antibodies low to CoxB, 2% casein, 10 mM Na-citrate buffer pH 6.0 +/-0.1, 0.1% Tween 20, 0.09% Na-azide and 0.1% Kathon GC as preservatives. The Low Control is pale yellow color coded.

**3. High Control: CONTROL +**

1 x 2.0 ml/vial. Ready to use. It contains high titer human IgM antibodies high to CoxB, 2% casein, 10 mM Na-citrate buffer pH 6.0 +/- 0.1, 0.1% Tween 20, 0.09% Na-azide and 0.1% Kathon GC as preservatives. The High Control is green color coded..

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4. **Wash buffer concentrate:** **WASHBUF 20X**  
1 x 60 ml/bottle 20x concentrated solution.  
Once diluted, the wash solution contains 10 mM phosphate buffer pH 7.0+/-0.2, 0.05% Tween 20 and 0.05% Kathon GC.
5. **Enzyme conjugate :** **CONJ**  
1 x 16 ml/vial. Ready to use and red colour coded.  
It contains Horseradish peroxidase conjugated polyclonal antibodies to human IgM, 5% BSA, 10 mM Tris buffer pH 6.8+/-0.1, 0.1% Kathon GC and 0.02% gentamicine sulphate as preservatives.
6. **Chromogen/Substrate:** **SUBS TMB**  
1 x 16 ml/vial.  
It contains 50 mM citrate-phosphate buffer pH 3.5-3.8, 4% dimethylsulphoxide, 0.03% tetra-methyl-benzidine (or TMB) and 0.02% hydrogen peroxide (or H<sub>2</sub>O<sub>2</sub>).  
*Note: To be stored protected from light as sensitive to strong illumination.*
7. **Sulphuric Acid:** **H<sub>2</sub>SO<sub>4</sub> 0.3 M**  
1 x 15 ml/vial.  
It contains 0.3 M H<sub>2</sub>SO<sub>4</sub> solution.  
Attention !: Irritant (Xi R36/38; S2/26/30)
8. **Specimen Diluent:** **DILSPE**  
2 x 60 ml/vial.  
It contains 2% casein, 10 mM Na-citrate buffer pH 6.0 +/-0.1, 0.1% Tween 20, 0.09% Na-azide and 0.1% Kathon GC as preservatives.  
To be used to dilute the sample.
9. **Neutralizing Reagent:** **SOLN NEUT**  
1 x 8 ml/vial.  
It contains goat anti hIgG, 2% casein, 10 mM Na-citrate buffer pH 6.0 +/-0.1, 0.1% Tween 20, 0.09% Na-azide and 0.1% Kathon GC as preservatives.
10. **Plate sealing foils** n°2
11. **Package insert** n°1

**4 MATERIALS REQUIRED BUT NOT PROVIDED**

1. Calibrated Micropipettes (1000, 100 and 10ul) and disposable plastic tips.
2. EIA grade water (bidistilled or deionised, charcoal treated to remove oxidizing chemicals used as disinfectants).
3. Timer with 60 minute range or higher.
4. Absorbent paper tissues.
5. Calibrated ELISA microplate thermostatic incubator (dry or wet) set at +37°C (+/-0.5°C tolerance).
6. Calibrated ELISA microwell reader with 450nm (reading) and possibly with 620-630nm (blinking) filters.
7. Calibrated ELISA microplate washer.
8. Vortex or similar mixing tools.

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1. The kit has to be used by skilled and properly trained technical personnel only.
2. All the personnel involved in performing the assay have to wear protective laboratory clothes, talc-free gloves and glasses. The use of any sharp (needles) or cutting (blades) devices should be avoided. All the personnel involved should be trained in biosafety procedures, as recommended by the Center for Disease Control, Atlanta, U.S. and reported in the National Institute of Health's publication: "Biosafety in Microbiological and Biomedical Laboratories", ed. 1984.
3. All the personnel involved in sample handling should be vaccinated for HBV and HAV, for which vaccines are available, safe and effective.
4. The laboratory environment should be controlled so as to avoid contaminants such as dust or air-born microbial agents, when opening kit vials and microplates and when performing the test. Protect the Chromogen (TMB) from strong light and avoid vibration of the bench surface where the test is undertaken.
5. Upon receipt, store the kit at 2-8°C into a temperature controlled refrigerator or cold room.
6. Do not interchange components between different lots of the kits. It is recommended that components between two kits of the same lot should not be interchanged.
7. Check that the reagents are clear and do not contain visible heavy particles or aggregates. If not, advise the laboratory supervisor to initiate the necessary procedures for kit replacement.
8. Avoid cross-contamination between serum/plasma samples by using disposable tips and changing them after each sample.
9. Avoid cross-contamination between kit reagents by using disposable tips and changing them between the use of each one.
10. Do not use the kit after the expiration date stated on the external container and internal (vials) labels. A study conducted on an opened kit did not pointed out any relevant loss of activity up to six 6 uses of the device and up to 6 months.
11. Treat all specimens as potentially infective. All human serum specimens should be handled at Biosafety Level 2, as recommended by the Center for Disease Control, Atlanta, U.S. in compliance with what reported in the Institutes of Health's publication: "Biosafety in Microbiological and Biomedical Laboratories", ed. 1984.
12. The use of disposable plastic-ware is recommended in the preparation of the liquid components or in transferring components into automated workstations, in order to avoid cross contamination.
13. Waste produced during the use of the kit has to be discarded in compliance with national directives and laws concerning laboratory waste of chemical and biological substances. In particular, liquid waste generated from the washing procedure, from residuals of controls and from samples has to be treated as potentially infective material and inactivated before waste. Suggested procedures of inactivation are treatment with a 10% final concentration of household bleach for 16-18 hrs or heat inactivation by autoclave at 121°C for 20 min..
14. Accidental spills from samples and operations have to be adsorbed with paper tissues soaked with household bleach and then with water. Tissues should then be discarded in proper containers designated for laboratory/hospital waste.
15. The Sulphuric Acid is an irritant. In case of spills, wash the surface with plenty of water
16. Other waste materials generated from the use of the kit (example: tips used for samples and controls, used microplates) should be handled as potentially infective and disposed according to national directives and laws concerning laboratory wastes.

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## 6 SPECIMEN: PREPARATION AND WARNINGS

1. Blood is drawn aseptically by venipuncture and plasma or serum is prepared using standard techniques of preparation of samples for research laboratory analysis.  
No influence has been observed in the preparation of the sample with citrate, EDTA and heparin.
2. Samples have to be clearly identified with codes or names in order to avoid misinterpretation of results. Bar code labeling and electronic reading is strongly recommended.
3. Haemolysed (“red”) and visibly hyperlipemic (“milky”) samples have to be discarded as they could generate false results. Samples containing residues of fibrin or heavy particles or microbial filaments and bodies should be discarded as they could give rise to false results.
4. Sera and plasma can be stored at +2°C - 8°C for up to five days after collection. For longer storage periods, samples can be stored frozen at -20°C for several months. Any frozen samples should not be frozen/thawed more than once as this may generate particles that could affect the test result.
5. If particles are present, centrifuge at 2.000 rpm for 20 min or filter using 0.2 - 0.8 µ filters to clean up the sample for testing.

## 7 PREPARATION OF COMPONENTS AND WARNINGS

### Microplate:

Allow the microplate to reach room temperature (about 1 hr) before opening the container. Check that the desiccant is not turned to dark green, indicating a defect of manufacturing. In this case call the customer service. Unused strips have to be placed back into the aluminium pouch, in presence of desiccant supplied, firmly zipped and stored at +2°C - 8°C. When opened the first time, residual strips are stable till the indicator of humidity inside the desiccant bag turns from yellow to green.

### Low Control:

Ready to use components. Mix carefully on vortex before use.

### High Control:

Ready to use components. Mix carefully on vortex before use.

### Wash buffer concentrate:

The whole content of the concentrated solution has to be diluted 20x with bidistilled water and mixed gently end-over-end before use. During preparation avoid foaming as the presence of bubbles could impact on the efficiency of the washing cycles.

*Note: Once diluted, the wash solution is stable for 1 week at +2°C - 8°C.*

### Enzyme conjugate:

Ready to use. Mix well on vortex before use. Be careful not to contaminate the liquid with oxidizing chemicals, air-driven dust or microbes. If this component has to be transferred use only plastic, possibly sterile disposable containers.

### Chromogen/Substrate:

Ready to use. Mix well on vortex before use. Be careful not to contaminate the liquid with oxidizing chemicals, air-driven dust or microbes. Do not expose to strong illumination, oxidizing agents and metallic surfaces. If this component has to be transferred use only plastic, possible sterile disposable container

### Sample Diluent:

Ready to use component. Mix carefully on vortex before use.

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**Neutralizing Reagent:**

Ready to use component. Mix carefully on vortex before use.

**Sulphuric Acid:**

Ready to use. Mix well on vortex before use.

Legenda: R 36/38 = Irritating to eyes and skin.

S 2/26/30 = In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

**8 INSTRUMENTS AND TOOLS USED IN COMBINATION WITH THE KIT**

1. Micropipettes have to be calibrated to deliver the correct volume required by the assay and must be submitted to regular decontamination (household alcohol, 10% solution of bleach, hospital grade disinfectants) of those parts that could accidentally come in contact with the sample. They should also be regularly maintained in order to show a precision of 1% and a trueness of +/-2%. Decontamination of spills or residues of kit components should also be carried out regularly.
2. The ELISA incubator has to be set at +37°C (tolerance of +/-0.5°C) and regularly checked to ensure the correct temperature is maintained. Both dry incubators and water baths are suitable for the incubations, provided that the instrument is validated for the incubation of ELISA tests.
3. The ELISA washer is extremely important to the overall performances of the assay. The washer must be carefully validated and correctly optimised using the kit controls and reference panels, before using the kit for routine laboratory tests. Usually 4-5 washing cycles (aspiration + dispensation of 350 µl/well of washing solution = 1 cycle) are sufficient to ensure that the assay performs as expected. A soaking time of 20-30 seconds between cycles is suggested. In order to set correctly their number, it is recommended to run an assay with the kit controls and well characterized low and high reference samples, and check to match the values reported below in the section "Internal quality Control". Regular calibration of the volumes delivered by, and maintenance (decontamination and cleaning of needles) of the washer has to be carried out according to the instructions of the manufacturer.
4. Incubation times have a tolerance of +/-5%.
5. The ELISA microplate reader has to be equipped with a reading filter of 450nm and ideally with a second filter (620-630nm) for blanking purposes. Its standard performances should be (a) bandwidth < 10 nm; (b) absorbance range from 0 to > 2.0; (c) linearity to > 2.0; repeatability > 1%. Blanking is carried out on the well identified in the section "Assay Procedure". The optical system of the reader has to be calibrated regularly to ensure that the correct optical density is measured. It should be regularly maintained according to the manufacturer 's instructions.
6. When using an ELISA automated work station, all critical steps (dispensation, incubation, washing, reading, data handling) have to be carefully set, calibrated, controlled and regularly serviced in order to match the values reported in the sections "Internal Quality Control". The assay protocol has to be installed in the operating system of the unit and validated as for the washer and the reader. In addition, the liquid handling part of the station (dispensation and washing) has to be validated and correctly set. Particular attention must be paid to avoid carry over by the needles used for dispensing and for washing. This must be studied and controlled to minimize the possibility of contamination of adjacent wells. The use of ELISA automated work stations is recommended when the number of samples to be tested exceed 20-30 units per run.

**9 PRE ASSAY CONTROLS AND OPERATIONS**

1. Check the expiration date of the kit printed on the external label (primary container). Do not use if expired.
2. Check that the liquid components are not contaminated by visible particles or aggregates.
3. Check that the Chromogen (TMB) is colourless or pale blue by aspirating a small volume of it with a sterile plastic pipette.



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4. Check that no breakage occurred in transportation and no spillage of liquid is present inside the box (primary container). Check that the aluminium pouch, containing the microplate, is not punctured or damaged.
5. Dissolve the content of the Calibrator as reported.
6. Dilute all the content of the 20x concentrated Wash Solution as described above.
7. Allow all the other components to reach room temperature (about 1 hr) and then mix gently on vortex all liquid reagents.
8. Set the ELISA incubator at +37°C and prepare the ELISA washer by priming with the diluted washing solution, according to the manufacturer's instructions. Set the right number of washing cycles as found in the validation of the instrument for its use with the kit.
9. Check that the ELISA reader is turned on or ensure it will be turned on at least 20 minutes before reading.
10. If using an automated work station, turn on, check settings and be sure to use the right assay protocol.
11. Check that the micropipettes are set to the required volume.
12. Check that all the other equipment is available and ready to use.
13. In case of problems, do not proceed further with the test and advise the supervisor.

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## 10 ASSAY PROCEDURE

The assay has to be carried out according to what reported below, taking care to maintain the same incubation time for all the samples in testing.

1. Dilute samples **1:101** into a properly defined dilution tube (example: 1000 µl Sample Diluent + 10 µl sample).  
Do not dilute the Controls as they are ready to use.  
Mix carefully all the liquid components on vortex and then proceed as described below.
2. Place the required number of Microwells in the microwell holder. Leave A1 well empty for the operation of blanking.
3. Dispense 50 µl Neutralizing Reagent in all the wells, except A1 used for blanking operations and in the wells used for the Controls.
4. Dispense 100 µl of Low Control in duplicate, 100 µl of High Control in single and 100 µl of diluted samples in each properly identified well.
5. Incubate the microplate for **60 min at +37°C**

***Important note:** Strips have to be sealed with the adhesive sealing foil, supplied, only when the test is carried out manually. Do not cover strips when using ELISA automatic instruments.*

6. Wash the microplate with an automatic as reported previously (section 9.3).
7. Pipette 100 µl Enzyme Conjugate into each well, except the A1 well, and cover with the sealer. Check that this red coloured component has been dispensed in all the wells, except A1.

***Important note:** Be careful not to touch the plastic inner surface of the well with the tip filled with the Enzyme Conjugate. Contamination might occur.*

8. Incubate the microplate for **60 min at +37°C**.
9. Wash microwells as in step 6.
10. Pipette 100 µl Chromogen/Substrate mixture into each well, the blank well included. Then incubate the microplate at room temperature (**18-24°C**) for **20 minutes**.

***Important note:** Do not expose to strong direct illumination. High background might be generated.*

11. Pipette 100 µl Sulphuric Acid into all the wells using the same pipetting sequence as in step 9. Addition of acid will turn the high calibrators, the control serum and the high samples from blue to yellow.
12. Measure the colour intensity of the solution in each well, as described in section 9.5, at 450nm filter (reading) and possibly at 620-630 nm (background subtraction), blanking the instrument on A1.

### General Important notes:

1. If the second filter is not available ensure that no finger prints are present on the bottom of the microwell before reading at 450nm. Finger prints could generate false high results on reading.



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2. Reading has to be carried out just after the addition of the Stop Solution and anyway not any longer than 20 minutes after its addition. Some self oxidation of the chromogen can occur leading to high background.

### 11 ASSAY SCHEME

Method	Operations
Controls	100 µl
Neutralizing Reagent	50 µl
Samples diluted 1:101	100 µl
<b>1<sup>st</sup> incubation</b>	<b>60 min</b>
Temperature	+37°C
Wash step	4-5 cycles
Enzyme conjugate	100 µl
<b>2<sup>nd</sup> incubation</b>	<b>60 min</b>
Temperature	+37°C
Wash step	4-5 cycles
TMB/H2O2	100 µl
<b>3<sup>rd</sup> incubation</b>	<b>20 min</b>
Temperature	r.t.
Sulphuric Acid	100 µl
Reading OD	450nm

An example of dispensation scheme is reported in the table below:

#### Microplate

	1	2	3	4	5	6	7	8	9	10	11	12
<b>A</b>	BLK	S5										
<b>B</b>	LC	S6										
<b>C</b>	LC	S7										
<b>D</b>	HC	S8										
<b>E</b>	S1	S9										
<b>F</b>	S2	S10										
<b>G</b>	S3	S11										
<b>H</b>	S4	S12										

Legenda: BLK = Blank, LC = Low Control, HC = High Control S = Sample





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**12 INTERNAL QUALITY CONTROL**

A validation check is carried out on the controls and the calibrator any time the kit is used in order to verify whether the performances of the assay are as expected.

Control that the following data are matched:

Check	Requirements
Blank well	< 0.100 OD 450nm value
Low Control	< 0.200 mean OD 450nm value after blanking, coefficient of variation < 30%
High Control	OD 450nm > 0.500

If the results of the test match the requirements stated above, proceed to the next section. If they do not, do not proceed any further and operate as follows:

Problem	Check
<b>Blank well</b> > 0.100 OD450nm	that the Chromogen/Substrate solution has not got contaminated during the assay
<b>Low Control</b> > 0.200 OD450nm after blanking  coefficient of variation > 30%	that the washing procedure and the washer settings are as validated in the pre qualification study; that the proper washing solution has been used and the washer has been primed with it before use; that no mistake has been done in the assay procedure (dispensation of a high control instead of the low one); that no contamination of the low control or of their wells has occurred due spills of high samples or the enzyme conjugate; that micropipettes haven't got contaminated with high samples or with the enzyme conjugate that the washer needles are not blocked or partially obstructed.
<b>High Control</b> < 0.500 OD450nm	that the procedure has been correctly executed; that no mistake has been done in its distribution (dispensation of a wrong control) ; that the washing procedure and the washer settings are as validated in the pre qualification study; that no external contamination of the high control has occurred.

Should one of these problems have happened, after checking, report to the supervisor for further actions.

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### 13 RESULTS

Results are calculated from the mean OD 450nm value of the Low Control (LC) by means of a cut-off value (Co) determined with the following formula:

$$\text{Cut-Off} = \text{LC} + 0.250$$

**Important note:** When the calculation of results is performed by the operating system of an ELISA automated work station, ensure that the proper formulation is used to generate the correct interpretation of results.

An example of calculation is reported below.

*The following data must not be used instead of real figures obtained by the user.*

Low Control: 0.100 – 0.120 – 0.080 OD450nm  
 Mean Value: 0.100 OD450nm  
 Lower than 0.200 – Accepted

High Control: 1.000 OD450nm  
 Higher than 0.500 – Accepted

$$\text{Calibrator} = 0.100 + 0.250 = 0.350$$

Sample 1: 0.080 OD450nm  
 Sample 2: 1.800 OD450nm  
 Sample 1 S/Co < 0.9 = low  
 Sample 2 S/Co > 1.1 = high

### 14 REFERENCES

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