

## DRG® Epstein-Barr Virus EBV (EBNA-1) IgM ELISA (EIA-4247)



Revised 28 Jan. 2011 rm (Vers. 7.1)

**RUO** in the USA

**This kit is intended for Research Use Only.**

**Not for use in diagnostic procedures.**

### Introduction

The **DRG Epstein-Barr Virus (EBNA-1) IgM Enzyme Immunoassay Kit** provides materials for determination of IgM-class antibodies to *Epstein-Barr virus nuclear-1 antigen (EBV-EBNA-1)* in serum.

### PRINCIPLE of the test

The **DRG Epstein-Barr Virus (EBNA-1) IgM ELISA Kit** is a solid phase enzyme-linked immunosorbent assay (ELISA). Samples are diluted with *Sample Diluent* and additionally incubated with *IgG-RF-Sorbent*, containing hyper-immune anti-human IgG-class antibody to eliminate competitive inhibition from specific IgG and to remove rheumatoid factors. This pretreatment avoids false negative or false positive results.

Microtiter wells as a solid phase are coated with recombinant EBV nuclear-1 antigen.

**Diluted** specimens and **ready-for-use controls** are pipetted into these wells. During incubation EBNA-1-specific antibodies of positive specimens and controls are bound to the immobilized antigens.

After a washing step to remove unbound sample and control material horseradish peroxidase conjugated anti-human IgM antibodies are dispensed into the wells. During a second incubation this anti-IgM conjugate binds specifically to IgM antibodies resulting in the formation of enzyme-linked immune complexes.

After a second washing step to remove unbound conjugate the immune complexes formed (in case of positive results) are detected by incubation with TMB substrate and development of a blue color. The blue color turns into yellow by stopping the enzymatic indicator reaction with sulfuric acid.

The intensity of this color is directly proportional to the amount of EBNA-1-specific IgM antibody in the specimen. Absorbance at 450 nm is read using an ELISA microtiter plate reader.

### Precautions

- This kit is for research use only.
- All reagents of this test kit which contain human serum or plasma have been tested and confirmed negative for HIV I/II, HBsAg and HCV by FDA approved procedures. All reagents, however, should be treated as potential biohazards in use and for disposal.
- Controls and Standards have been found to be non-infectious in cell cultures.
- Avoid contact with *Stop Solution* containing 0.2 mol/L H<sub>2</sub>SO<sub>4</sub>. It may cause skin irritation and burns.
- Never pipette by mouth and avoid contact of reagents and specimens with skin and mucous membranes.
- Do not smoke, eat, drink or apply cosmetics in areas where specimens or kit reagents are handled.
- Wear disposable latex gloves when handling specimens and reagents. Microbial contamination of reagents or specimens may give false results.
- Handling should be in accordance with the procedures defined by an appropriate national biohazard safety guideline or regulation.

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- Do not use reagents beyond expiry date as shown on the kit labels.
- All indicated volumes have to be performed according to the protocol. Optimal test results are only obtained when using calibrated pipettes and microtiter plate readers.
- Do not mix or use components from kits with different lot numbers. It is advised not to exchange wells of different plates even of the same lot. The kits may have been shipped or stored under different conditions and the binding characteristics of the plates may result slightly different.
- Chemicals and prepared or used reagents have to be treated as hazardous waste according the national biohazard safety guideline or regulation.
- For information on hazardous substances included in the kit please refer to Material Safety Data Sheets. Material Safety Data Sheets for this product are available upon request directly from DRG.

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**RUO** in the USA

### Kit Components

#### Contents of the Kit

1. **Microtiterwells**, 12 x 8 (break apart) strips, 96 wells;  
Wells coated with rec. EBV nuclear-1 antigen.  
(incl. 1 strip holder and 1 cover foil)
2. **Sample Diluent** \*\*\*, 1 vial, 100 mL, ready to use,  
colored yellow; pH  $7.2 \pm 0.2$ .  
Contains anti-human IgG-class antibody.
3. **IgG-RF-Sorbent**\*\*\*, 1 vial, 6.5 mL, ready to use,  
colored yellow;  
Contains anti-human IgG-class antibody.
4. **Pos. Control** \*\*\*, 1 vial, 2.0 mL, ready to use;  
colored yellow, red cap.
5. **Neg. Control** \*\*\*, 1 vial, 2.0 mL, ready to use;  
colored yellow, yellow cap.
6. **Cut-off Control** \*\*\*, 1 vial, 2.0 mL, ready to use;  
colored yellow, black cap.
7. **Enzyme Conjugate** \*\*, 1 vial, 20 mL, ready to use,  
colored red,  
antibody to human IgM conjugated to horseradish peroxidase.
8. **Substrate Solution**, 1 vial, 14 mL, ready to use,  
Tetramethylbenzidine (TMB).
9. **Stop Solution**, 1 vial, 14 mL, ready to use,  
contains 0.2 mol/l  $H_2SO_4$ .  
Avoid contact with the stop solution. It may cause skin irritations and burns.
10. **Wash Solution** \*, 1 vial, 30 mL (20X concentrated for 600 mL), pH  $7.2 \pm 0.2$   
see „Preparation of Reagents“.

\* contains 0.03 % ProClin 300

\*\* contains 0.03 % ProClin 300 + 0.01 % Gentamicin sulphate

\*\*\* contains 0.03 % ProClin 300 + 0.015 % 5-bromo-5-nitro-1,3-dioxane (BND) +  
0.010 % 2-methyl-2H-isothiazol-3-one (MIT)

#### Equipment and material required but not provided

- A microtiter plate calibrated reader (450/620nm  $\pm 10$  nm)  
(e.g. the DRG Instruments Microtiter Plate Reader)
- Calibrated variable precision micropipettes
- Incubator 37 °C

## DRG® Epstein-Barr Virus EBV (EBNA-1) IgM ELISA (EIA-4247)



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**RUO** in the USA

- Manual or automatic equipment for rinsing wells
- Vortex tube mixer
- Deionised or (freshly) distilled water
- Timer
- Absorbent paper

### Storage and stability of the Kit

When stored at 2 °C to 8 °C unopened reagents will retain reactivity until expiration date. Do not use reagents beyond this date.

Opened reagents must be stored at 2 °C to 8 °C. Microtiter wells must be stored at 2 °C to 8 °C. Once the foil bag has been opened, care should be taken to close it tightly again.

Opened kits retain activity for four months if stored as described above.

### Preparation of Reagents

Allow all reagents and required number of strips to reach room temperature prior to use.

### *Wash Solution*

Dilute *Wash Solution 1+19* (e.g. 10 mL + 190 mL) with fresh and germ free redistilled water.

Consumption: ~ 5 mL per determination.

Crystals in the solution disappear by warming up to 37 °C in a water bath.

*The diluted Wash Solution is stable for 4 weeks at 2 °C to 8 °C.*

### Disposal of the Kit

The disposal of the kit must be made according to the national regulations. Special information for this product is given in the Material Safety Data Sheets (see chapter 13 of this data sheet).

### Damaged Test Kits

In case of any severe damage to the test kit or components, DRG has to be informed in writing, at the latest, one week after receiving the kit. Severely damaged single components should not be used for a test run. They have to be stored until a final solution has been found. After this, they should be disposed according to the official regulations.

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**RUO** in the USA**SPECIMEN**

Serum can be used in this assay.

Do not use haemolytic, icteric or lipaemic specimens.

**Specimen Collection****Serum:**

Collect blood by venipuncture (e.g. Sarstedt Monovette # 02.1388.001), allow to clot, and separate serum by centrifugation at room temperature. Do not centrifuge before complete clotting has occurred. Samples containing anticoagulant may require increased clotting time.

**Specimen Storage**

Specimens should be capped and may be stored for up to 24 hours at 2 °C to 8 °C prior to assaying.

Specimens held for a longer time should be frozen only once at –20 °C prior to assay. Thawed samples should be inverted several times prior to testing.

**Specimen Dilution**

Prior to assaying each specimen is first to be diluted with *Sample Diluent*. For the absorption of rheumatoid factor these prediluted samples then have to be incubated with *IgG-RF-Sorbent*

1. Dilute each specimen **1+50** with *Sample Diluent*;  
e.g. 10 µL of specimen + 0.5 mL of *Sample Diluent*. **Mix well.**
2. Dilute this prediluted sample **1+1** with *IgG-RF-Sorbent*  
e.g. 60 µL prediluted sample + 60 µL *IgG-RF-Sorbent*. **Mix well**
3. **Let stand for at least 15 minutes at room temperature, mix well or overnight at 2°C – 8°C and mix well again.**
4. Take 100 µL of these pretreated samples for the ELISA.

**Please note:** Controls are ready for use and must not be diluted!

**DRG® Epstein-Barr Virus EBV (EBNA-1) IgM ELISA (EIA-4247)**



Revised 28 Jan. 2011 rm (Vers. 7.1)

**RUO** in the USA

**test procedure**

**General Remarks**

- Please read the test protocol carefully before performing the assay. Result reliability depends on strict adherence to the test protocol as described.
- **It is very important to bring all reagents, samples and controls to room temperature before starting the test run!**
- Once the test has been started, all steps should be completed without interruption.
- Use new disposal plastic pipette tips for each standard, control or sample in order to avoid cross contamination
- Absorbance is a function of the incubation time and temperature. Before starting the assay, it is recommended that all reagents are ready, caps removed, all needed wells secured in holder, etc. This will ensure equal elapsed time for each pipetting step without interruption.
- As a general rule the enzymatic reaction is linearly proportional to time and temperature.
- Close reagent vials tightly immediately after use to avoid evaporation and microbial contamination.
- After first opening and subsequent storage check conjugate and control vials for microbial contamination prior to further use.
- To avoid cross-contamination and falsely elevated results pipette samples and dispense conjugate without splashing accurately to the bottom of wells.
- During incubation cover microtiter strips with foil to avoid evaporation.

## DRG® Epstein-Barr Virus EBV (EBNA-1) IgM ELISA (EIA-4247)



Revised 28 Jan. 2011 rm (Vers. 7.1)

**RUO** in the USA

### Assay Procedure

Prior to commencing the assay, dilute *Wash Solution*, **prepare samples as described in point 5.3** and establish carefully the **distribution and identification plan** supplied in the kit for all specimens and controls.

1. Select the required number of microtiter strips or wells and insert them into the holder.

Please allocate at least:

- 1 well (e.g. A1) for the substrate blank,
- 1 well (e.g. B1) for the *Neg. Control*,
- 2 wells (e.g. C1+D1) for the *Cut-off Control* and
- 1 well (e.g. E1) for the *Pos. Control*.

It is left to the user to determine controls and samples in duplicate.

2. Dispense

**100 µL** of *Neg. Control* into well B1

**100 µL** of *Cut-off Control* into wells C1 and D1

**100 µL** of *Pos. Control* into well E1 and

**100 µL** of each diluted sample with new disposable tips into appropriate wells.

Leave well A1 for substrate blank!

3. Cover wells with foil supplied in the kit. Incubate for **60 minutes at 37 °C**.

4. Briskly shake out the contents of the wells.

Rinse the wells **5 times** with diluted *Wash Solution* (**300 µL per well**). Strike the wells sharply on absorbent paper to remove residual droplets.

#### Important note:

The sensitivity and precision of this assay is markedly influenced by the correct performance of the washing procedure!

5. Dispense **100 µL Enzyme Conjugate** into each well, **except A1**.

6. Cover wells with foil. Incubate for **30 minutes at room temperature (20 °C to 25 °C)**.

*Do not expose to direct sun light!*

7. Briskly shake out the contents of the wells.

Rinse the wells **5 times** with diluted *Wash Solution* (300 µL per well). Strike the wells sharply on absorbent paper to remove residual droplets.

8. Add **100 µL** of *Substrate Solution* into all wells.

9. Cover wells with foil. Incubate for **exactly 15 minutes at room temperature (20 °C to 25 °C) in the dark**.

10. Stop the enzymatic reaction by adding **100 µL** of *Stop Solution* to each well.

Any blue color developed during the incubation turns into yellow.

**Note:** Highly positive samples can cause dark precipitates of the chromogen!

11. Read the optical density at **450/620 nm** with a microtiter plate reader **within 30 minutes** after adding the *Stop Solution*.

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### Measurement

**Adjust** the ELISA microplate or microstrip reader **to zero** using the **substrate blank in well A1**.

If - due to technical reasons - the ELISA reader cannot be adjusted to zero using the substrate blank in well A1, subtract the absorbance value of well A1 from all other absorbance values measured in order to obtain reliable results!

**Measure the absorbance** of all wells **at 450 nm** and record the absorbance values for each control and sample in the distribution and identification plan.

Dual wavelength reading using 620 nm as reference wavelength is recommended.

Where applicable **calculate the mean absorbance values** of all duplicates.

### Calculation

#### Mean absorbance value of Cut-off Control [CO]

Calculate the mean absorbance value of the two (2) Cut-off Control determinations (e.g. in C1/D1).

**Example:**  $(0.54 + 0.56) : 2 = 0.55 = CO$

### REFERENCES / Literature

1. Lamy ME., Favart AM., Cornu A. et al., "Study of Epstein-Barr virus (EBV) antibodies: IgG and IgM anti-VCA, IgG anti EA and Ig anti-EBNA obtained with an original microtiter technique. Serological criterions of primary and recurrent EBV infections and follow-up of infectious mononucleosis. Seroepidemiology of EBV in Belgium based on 5178 sera from patients". Acta Clin. Belg., 37 (5): 281-298, (1982)
2. Lennette E., „Epstein-Barr Virus“, in Manual of Clinical Microbiology, 4th ed. Washington D.C., Am. Soc. Microbiol. P 728-732, (1985)
3. Luka J., chase PC., Pearson GR., "A sensitive enzyme-linked Immunosorbent assay (ELISA) against the major EBV-associated antigens. I-Correlation between ELISA and immunofluorescence titers using purified antigens", J. Immunol. Metho., 67: 145-156, (1984)






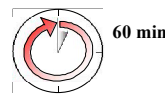








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**RUO** in the USA

### Short Instructions for Use


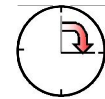


	All reagents and specimens must be allowed to come to room temperature (18-25°C) before use.
	Leave well A1 for substrate Blank. Dispense 100 µl of Controls into appropriate wells.
	Dispense 100 µl of sample into selected wells. <b>(Please note special sample treatment, point 5.3!)</b>
	Cover wells with foil. Incubate for <b>60 minutes</b> at 37 °C.
	Briskly shake out the contents of the wells.
	Rinse the wells <b>5 times</b> with diluted Wash Solution (300 µl per well).
	Strike the wells sharply on absorbent paper to remove residual droplets.
	Dispense 100 µl of Enzyme-Conjugate into each well.
	Incubate for <b>30 minutes</b> at room temperature.
	Briskly shake out the contents of the wells.
	Rinse the wells <b>5 times</b> with diluted Wash Solution (300 µl per well).
	Strike the wells sharply on absorbent paper to remove residual droplets.

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	<p>Add 100 µl of Substrate Solution to each well.</p>
	<p>Incubate for <b>15 minutes</b> at room temperature.</p>
	<p>Stop the reaction by adding 100 µl of Stop Solution to each well.</p>
	<p>Determine the absorbance of each well at 450 nm.</p>