

DRG® Cytomegalovirus (CMV) IgM (EIA-3469)

Revised 7 Oct. 2010 rm (Vers. 1.1)

RUO in the USA

Introduction

The **DRG Cytomegalie Virus (CMV) IgM Enzyme Immunoassay Kit** provides materials for determination of IgM-class antibodies to Cytomegalie Virus in serum.

In the United States, this kit is intended for Research Use Only.

PRINCIPLE of the test

The **DRG Cytomegalie Virus (CMV) IgM ELISA Kit** is a solid phase enzyme-linked immunosorbent assay (ELISA). Donor 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 inactivated Cytomegalie Virus antigen (strain 169).

Pretreated donor specimens and **ready-for-use controls** are pipetted into these wells. During incubation Cytomegalie Virus-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 Cytomegalie Virus-specific IgM antibody in the donor specimen. Absorbance at 450 nm is read using an ELISA microtiter plate reader.

Precautions

- In the United States, this kit is intended 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 0.5 mol/L H₂SO₄. 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.
- 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.

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- 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. Safety Data Sheets for this product are available upon request directly from DRG International, Inc.
The Safety Data Sheets fit the demands of: EU-Guideline 91/155 EC.

Kit Components

Contents of the Kit

1. **Microtiterwells**, 12 x 8 (break apart) strips, 96 wells;
Wells coated with Cytomegalie Virus antigen.
(incl. 1 strip holder and 1 cover foil)
2. **Sample Diluent** ***, 1 vial, 100 mL, ready to use,
colored green; pH 7.2 ± 0.2.
3. **IgG-RF-Sorbent*****, 1 vial, 6.5 mL, ready to use,
colored yellow;
Contains anti-human IgG-class antibody.
4. **Standard (Standard 1 – 3)*****, 3 vials, 2.0 mL each, ready to use;
Concentrations: 50, 200, 400 U/mL,
colored yellow, white caps.
5. **Pos. Control** ***, 1 vial, 1.0 mL, ready to use;
colored yellow, red cap.
6. **Neg. Control** ***, 1 vial, 2.0 mL, ready to use;
colored yellow, yellow 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 0.5 mol/l H₂SO₄,
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 ± 0.2
see „Preparation of Reagents“.

* contains 0.03 % ProClin 300

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

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*** 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 ± 10 nm)
(e.g. the DRG International Microtiter Plate Reader)
- Calibrated variable precision micropipettes
- Incubator 37 °C
- 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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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. Donors receiving anticoagulant therapy 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 donor 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 donor 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 and mix well again.**
4. Take 100 µL of these pretreated samples for the ELISA.

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

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.

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- 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 donor samples and dispense conjugate without splashing accurately to the bottom of wells.
- During incubation cover microtiter strips with foil to avoid evaporation.

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Assay Procedure

Prior to commencing the assay, dilute *Wash Solution*, **prepare donor 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*
- 3 wells (e.g. C1-E1) for the *Standard 1-3*
- 1 well (e.g. F1) for the *Pos. Control*.

It is left to the user to determine standards, control and donor samples in duplicate.

2. Dispense
 - 100 µL** of *Neg. Control* into well B1
 - 100 µL** of *Standard 1* into well C1
 - 100 µL** of *Standard 2* into well D1
 - 100 µL** of *Standard 3* into well E1
 - 100 µL** of *Pos. Control* into well F1 and
 - 100 µL** of each pre-treated 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 10 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 donor samples can cause dark precipitates of the chromogen!



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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 donor 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.

Results

Validation of the Test Run

The test run may be considered valid provided the following criteria are met:

Substrate blank in A1:	Absorbance value lower than 0.100
Neg. Control in B1:	Absorbance value lower than 0.200
Standard 1 (Cut-off) in C1 :	Absorbance value between 0.250 – 0.600
Pos. Control in F1 :	Absorbance value greater than 0.600

Calculation of quantitative Results

In order to obtain **quantitative results in U/mL** plot the (mean) absorbance values of the 3 Standards 1, 2 and 3 on (linear/linear) graph paper in a system of coordinates against their corresponding concentrations (50, 200 and 400 U/mL) and draw a standard calibration curve (absorbance values on the vertical y-axis, concentrations on the horizontal x-axis). Read results from this standard curve employing the (mean) absorbance values of each donor specimen and control. All suitable computer programs available can be used for automated result reading and calculation. The following mathematical functions can be used: Linear regression or Point to Point calculation of the standard curve.

Interpretation of quantitative Results

Normal value ranges for this ELISA should be established by each laboratory based on its own donor populations in the geographical areas serviced.

The following values should be considered as a guideline:

POSITIVE	> 60 U/ml
GREY ZONE (equivocal):	50 - 60 U/ml
NEGATIVE:	< 50 U/ml

Calculation of qualitative Results

Absorbance value of **Standard 1 (Cut-off) = CO**

Example: 0.50 = CO

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Interpretation of qualitative Results

POSITIVE Donor (mean) absorbance values more than 20 % above CO
(Mean OD_{donor} > 1.2 x CO)

GREY ZONE Donor (mean) absorbance values from CO up to 20 % above CO
repeat test 2 - 4 weeks later - with new donor samples
(CO ≤ Mean OD_{donor} ≤ 1.2 x CO)
Results in the second test again in the grey zone ⇒ **NEGATIVE**

NEGATIVE Donor (mean) absorbance values below CO
(Mean OD_{donor} < CO)

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1. Lentz, E.B. et al., Detection of Antibody to CMV Induced Early Antigens and Comparison with Four Serologic Assays and Presence of Viruria in Blood Donors, J. of Clin. Microbiol., 26, 133-35 (1988)
2. Von Loon, H.M. et al., Direct Enzyme-Linked Immunosorbent Assay that uses Peroxidase-Labelled Antigens for Determination of Immunoglobulin M Antibody to CMV, Journal of Clinical Microbiology 13, 416-422 (1981)
3. Matas, A.J., Simmons, R.L., Fryd, D. and Jajarian, J.S., Persistent, Recurrent and Late CMV Infection, Transplantation Proceedings, Vol. XIII, Nr. 1, 114-124 (1981)

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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 Standards and Control into appropriate wells.
	Dispense 100 µl of sample into selected wells. (Please note special sample treatment, point 5.3!)
	Cover wells with foil. Incubate for 60 minutes at 37 °C (room temperature).
	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
	Dispense 100 µl of Enzyme-Conjugate into each well.
	Incubate for 30 minutes at room temperature.
	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
	Add 100 µl of Substrate Solution to each well.
	Incubate for 10 minutes at room temperature.
	Stop the reaction by adding 100 µl of Stop Solution to each well.
	Determine the absorbance of each well at 450 nm.