11. Assay Procedure Continued…

6. Dispense 100µl of Conjugate **(Reagent 3)** into each well. Incubate the wells for 20 minutes at room temperature.
7. After 20 minutes, discard the well contents and carefully wash the wells 4 times with Wash Buffer. Ensure that the wells are empty but do not allow 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.

12. Quality Control

Quality control data is supplied on the lot-specific QC certificate included in the kit. Controls are intended to monitor for substantial reagent failure. Any well positive by spectrophotometer but without visible colour 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.

13. Interpretation of Results

Semi-Quantitative Results
Plot the optical densities of the standards against their concentrations and draw a line through the points. Read the concentrations of the unknowns from this graph. Concentrations below 3 IU/ml are considered negative for anti-CMV IgG. Values above 3 IU/ml are regarded as positive. Values above 30 IU/ml should be re-assayed at a higher dilution.

Qualitative Results
Negative samples: OD < 3 IU/ml standard OD
Positive samples: OD >/= 3 IU/ml standard OD

1. A negative result indicates no current or previous infection with CMV. Such individuals are presumed to be susceptible to primary infection. However, specimens taken too early during a primary infection may not have detectable levels of IgG antibody. If a primary infection is suspected, another specimen should be taken in 8-14 days and tested concurrently in the same assay with original specimen to look for seroconversion.
2. A positive result indicates a current or previous infection with CMV.
3. To evaluate acute and convalescent sera, both samples must be tested in the same assay. If the acute specimen is negative and the convalescent specimen is positive, seroconversion has taken place and a primary CMV infection is indicated.

14. Limitations of the Procedure

1. The presence of IgG antibodies to CMV does not necessarily assure protection from future infection with CMV.
2. The antibody titre of a single serum specimen cannot be used to determine recent infection. Paired samples (acute and convalescent) should be collected and tested concurrently to demonstrate seroconversion.
3. Test results for demonstration of seroconversion should be interpreted in conjunction with the clinical evaluation and the results of other diagnostic procedures.
4. A positive CMV IgG test in neonates should be interpreted with caution since passively acquired maternal antibody can persist for up to 6 months. However, a negative test for IgG antibody in the neonate may help exclude congenital infection. The most definitive diagnosis of active CMV infection requires viral isolation.
5. Specimens containing antibodies to nuclear antigens may give false positive results.
6. The incidence of CMV infection varies with age, geographical location, and socio-economic status.

15. Performance Characteristics

Comparative Study
The Genesis Diagnostics CMV IgG kit was compared with another commercially available ELISA procedure for the detection of IgG antibodies to CMV. The Genesis kit showed 100% agreement with the other ELISA. The results are summarised below.

n=55	Reference +	Reference -
Genesis +	27	0
Genesis -	0	28

16. Reproducibility

Within Assay Precision
CV%: <12%

Between Assay Precision
CV%: <12%

17. Method Summary

- Dilute sera 1:100 with sample diluent **(Reagent 1)**
- Dispense 100µl of standard as required
- Incubate for **20 minutes** at room temperature.
- *Wash the wells three times*
- Dispense 100µl of Conjugate **(Reagent 3)** into each well
- Incubate at room temperature for **20 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

18. Further Reading

Drew WL: Diagnosis of cytomegalovirus infection. Rev Infect Dis 10:5468-5475, 1988
Booth JC *et al*: Comparison of enzyme-linked immunosorbent assay, radioimmunoassay, complement fixation, anticomplement immunofluorescence and passive agglutination techniques for detecting cytomegalovirus IgG antibody. J Clin Pathol 35: 1345-1348, 1982
Dylewski JS *et al*: Large scale serological screening for cytomegalovirus antibodies in homosexual males by enzyme-linked immunosorbent assay. J Clin Micro 19: 200-203, 1984

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G•E•N•E•S•I•S
Diagnostics

CMV IgG ELISA Kit

Qualitative/semi-quantitative assay for anti-CMV IgG antibodies

Product Code: GD084

For Research Use Only. Not for use in diagnostic procedures

Not for sale or use in the EU

1. Materials Included in the Kit

- **Microplate** 96 wells in 12 X 8 break-apart strips, pre-coated with inactivated CMV antigen.
- **Reagent 1**: **Sample Diluent** 150mM Tris-buffered saline, pH 7.2 with antimicrobial agent, 10ml, (blue), **concentrate** (x15)
- **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) conjugated to horseradish peroxidase in protein stabilising solution and antimicrobial agent, 12ml, 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
- **Standards:** 3 U/ml (yellow), 10 & 30 U/ml (blue), 1ml of 10mM Tris-buffered saline with human serum IgG antibodies to Rubella, ready to use
- **Positive control:** 20 U/ml, 1ml of 10mM Tris-buffered saline containing human serum antibodies to Rubella, 100 U/ml, (red), ready to use.
- **Negative control:** 1ml of 10mM Tris-buffered saline containing normal human serum, (green), ready to use.
- **Instructions for use**

264-084-05

2. Other Equipment Required

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 • distilled or de-ionised water • absorbent paper • EIA microplate reader with 450nm and optional 620nm reference filter. Alternatively, a suitable, self-validated automated system may be used.

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 minimise time between washing and adding the next reagent.

3. Intended Use

The CMV IgG kit is a rapid ELISA designed for the semi-quantitative or qualitative detection of IgG antibodies to cytomegalovirus (CMV) in human serum or plasma. The test kit is for research use only.

4. Explanation of the Test

CMV infections can be classified as congenital (acquired before birth), perinatal (acquired at birth) or postnatal (acquired after birth). Some 95% of newborn infants congenitally infected with CMV exhibit no clinically overt disease at birth. Disease in the remaining 5% can be severe and may result in neurological damage in survivors or death early after birth.

The prognosis for congenitally infected infants who are asymptomatic at birth is variable. Many subsequently develop hearing loss and varying degrees of mental retardation and central nervous system disorders. Surveys show the incidence of congenital CMV infection to be between 0.5 – 2.5%.

Perinatal infected infants start shedding the virus 3 –12 weeks after delivery and generally remain asymptomatic. Postnatal CMV infections are usually asymptomatic and are acquired through close contact with individuals who are shedding the virus. A small percentage of individuals develop a negative heterophile-antibody infectious mononucleosis syndrome characterised by fever, lethargy and atypical lymphocytosis.

In immunocompromised patients e.g. allograft recipients, cancer patients and AIDS patients, CMV infections occur frequently, often from re-activation of latent infection, and may be life-threatening. CMV infections may occur following blood transfusions. Most transfusion acquired CMV infections are either sub-clinical or characterised by CMV mononucleosis. However, in immunocompromised patients, considerable morbidity and mortality can result from a transfusion-acquired CMV infection.

Serologic tests which measure IgG antibodies to CMV can aid in the diagnosis of CMV infection when paired acute and convalescent sera are tested simultaneously and seroconversion or a significant rise in titre can be demonstrated. Also serologic testing of blood transfusion donors and recipients can help prevent transfusion-acquired infection.

5. Principle of the Test

Diluted serum or plasma specimens (1:100) are incubated for 20 minutes to allow specific antibodies to CMV to bind to the antigen-coated wells. After washing away unbound antibodies and other serum constituents, CMV specific IgG is detected using rabbit anti-human IgG conjugated to horseradish peroxidase. After 20 minutes incubation, unbound conjugate is removed by washing, and TMB enzyme substrate is added for 10 minutes. A blue colour develops if antibodies to CMV are present. Addition of stop solution gives a yellow colour and the optical densities of controls, the standard(s) and samples are measured using a microplate reader.

6. Safety Precautions

1. Only experienced laboratory personnel should use this test. The test protocol must be followed strictly.
2. CAUTION: the device contains material of human and animal origin and should be handled as a potential transmitter of diseases. All human source material used in the preparation of standards and control for this product have been tested and found negative by ELISA 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.
3. Reagents of this kit contain antimicrobial agents and the 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.
4. The Stop Solution contains 0.25M sulphuric acid. Avoid contact with skin and eyes. Rinse immediately with plenty of water if contact occurs.
5. Any liquid that has been brought into contact with potentially infectious material has to be discarded in a container with a disinfectant. Dispose of plates and specimens as clinical waste. Any unused reagents should be flushed away with copious amounts of water. Disposal must be performed in accordance with local legislation.

7. 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. The sample diluent X15 concentrate contains 0.09% sodium azide as preservative. Prepare sufficient working strength diluent for the assay run. However, if the working strength diluent is to be stored for more than 1 week, add sodium azide (0.9g/L). Store unused sample diluent concentrate and dilute sample diluent at 2 - 8°C.
4. Include the Positive and Negative Control in every test run to monitor for reagent stability and correct assay performance.
5. Strictly observe the indicated incubation times and temperature.
6. When automating, consider excess volumes required for setting up the instrument and dead volume of robot pipette
7. Ensure that no cross-contamination occurs between wells. Keep all pipettes and other equipment used for Conjugate completely separate from the TMB Substrate reagent.
8. 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.
9. Do not allow microwells to dry between incubation steps.
10. Strictly follow the described wash procedure. Insufficient washing may cause high background signal.
11. Avoid direct sunlight and exposure to heat sources during all incubation steps.
12. Replace colour-coded caps on their correct vials to avoid cross-contamination
13. It is important to dispense all samples and controls into the wells without delay. Therefore ensure that all samples are ready to dispense.

8. 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.

9. Specimen Collection and Storage

Serum and plasma 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, icteric or lipaemic specimens should be avoided.

10. Preparation of Reagents

1. Dilute the Sample Diluent **(Reagent 1)** 1:14 in distilled water to make sufficient buffer for the assay run e.g. add 10ml sample diluent concentrate to 140 ml water.

2. Dilute the Wash Buffer **(Reagent 2)** 1:9 in distilled water to make sufficient buffer for the assay run e.g. add 50ml wash buffer concentrate to 450ml water.

11. Assay Procedure

1. Dilute patient samples 1:100 (e.g. 5µl serum plus 0.5 ml IgG-absorbent-containing sample diluent). It is important to dispense all samples, standards and controls into the wells without delay. Therefore ensure that all samples are ready to dispense.
2. Assemble the number of strips required for the assay.
3. For qualitative determinations, dispense 100 µl of the 3 U/ml standard, the positive control, the negative control and the diluted patient sample into the wells. For semi-quantitative determinations, use sample diluent as 0 IU/ml and additionally dispense the 10 U/ml and 30 U/ml standards.
4. Incubate for **20 minutes** at room temperature. During all incubations, avoid direct sunlight and close proximity to any heat sources.
5. After 20 minutes, decant or aspirate the well contents and wash the wells 3 times using an automatic plate washer or the manual wash procedure (see below). Careful washing is the key to good results. Blot the wells on absorbent paper before proceeding. **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.