**EBV-VCA IgM Test System**

**IVD**

 **9Z9201M**

**Rx Only**

**REF**

** 9Z9201MB**

|  |  |
| --- | --- |
| Institute Name | Date |
|  |  |

**PRINCIPLE OF THE ASSAY**

The ZEUS ELISA EBV-VCA IgM Test System is designed to detect IgM class antibodies to EBV IgM in human sera. Creation of the sensitized wells of the plastic microwell strips occurred using passive adsorption with EBV antigen. The test procedure involves three incubation steps:

1. Test sera are diluted with the Sample Diluent provided. The Sample Diluent contains antihuman IgG that precipitates and removes IgG and rheumatoid factor from the sample leaving IgM free to react with the immobilized antigen. During sample incubation any antigen specific IgM antibody in the sample will bind to the immobilized antigen. The plate is washed to remove unbound antibody and other serum components.
2. Peroxidase Conjugated goat anti-human IgM is added to the wells and the plate is incubated. The Conjugate will react with IgM antibody immobilized on the solid phase in step 1. The wells are washed to remove unbound Conjugate.
3. The microwells containing immobilized peroxidase Conjugate are incubated with peroxidase Substrate Solution. Hydrolysis of the Substrate by peroxidase produces a color change. After a period of time the reaction is stopped and the color intensity of the solution is measured photometrically. The color intensity of the solution depends upon the antibody concentration in the original test sample.

**TEST SYSTEM COMPONENTS**

**Materials Provided:**

Each Test System contains the following components in sufficient quantities to perform the number of tests indicated on the packaging label. **NOTE: The following components contain Sodium Azide as a preservative at a concentration of <0.1% (w/v): Controls, Calibrator, and Sample Diluent.**

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| **Component** |  | **96 Tests.bmp** | **480 Tests.bmp** | **Description** |
|  |  |  |  |  |  |
| **PLATE** |  |  1 |  5 | Plate: 96 wells configured in twelve, 1x8-well, strips coated with 125kD capsid peptide purified from induced P3-HR1 cells. The strips are packaged in a strip holder and sealed in an envelope with desiccant. |
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| **CONJ** |  |  1 |  5 | Conjugate: Conjugated (horseradish peroxidase) goat anti-human IgM (μ chain specific) in 15mL, white-capped bottle(s). Ready to use. |
|  |  |  |  |  |  |
| **CONTROL** | **+** |  | 1 | 2 | Positive Control (Human Serum): 0.35mL, red-capped vial(s). |
|  |  |  |  |  |  |
| **CAL** |  | 1 | 4 | Calibrator (Human Serum): 0.5mL, blue-capped vial(s). |
|  |  |  |  |  |  |
| **CONTROL** |  **-** |  | 1 | 2 | Negative Control (Human Serum): 0.35mL, green-capped vial(s). |
|  |  |  |  |  |  |
| **DIL** |  **SPE** |  | 1 | 4 | Sample Diluent: 30mL, green-capped, bottle(s) containing Tween-20, bovine serum albumin and phosphate-buffered-saline. Purple Solution. Ready to use. |
|  |  |  |  |  |  |
| **SOLN** | **TMB** |  | 1 | 5 | TMB: 15mL, amber-capped, amber bottle(s) containing 3, 3’, 5, 5’ - tetramethylbenzidine (TMB). Ready to use. |
|  |  |  |  |  |  |
| **SOLN** |  **STOP** |  | 1 | 3 | Stop Solution: 15mL, red-capped, bottle(s) containing 1M H2SO4, 0.7M HCl. Ready to use. |
|  |  |  |  |  |  |
| **WASHBUF** |  **10X** |  | 1 | 5 | Wash Buffer Concentrate (10X): Dilute 1 part concentrate + 9 parts deionized or distilled water. 100mL, clear-capped, bottle(s) containing a 10X concentrated phosphate-buffered-saline and Tween-20 solution (blue solution). **NOTE: 1X solution will have a pH of 7.2 ± 0.2.** |

**NOTES:**

1. **The following components are not Test System Lot Number dependent and may be used interchangeably within the ZEUS ELISA Test Systems: TMB, Stop Solution, and Wash Buffer.**
2. **Test System also contains a Component Label containing lot specific information inside the Test System box.**

**PRECAUTIONS**

1. For *In Vitro* diagnostic use.
2. Follow normal precautions exercised in handling laboratory reagents. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves, and eye/face protection. Do not breathe vapor. Dispose of waste observing all local, state, and federal laws.
3. The wells of the ELISA Plate do not contain viable organisms. However, consider the strips **potentially biohazardous materials** and handle accordingly.
4. The Controls are **potentially biohazardous materials**. ource materials from which these products were derived were found negative for HIV-1 antigen, HBsAg and for antibodies against HCV and HIV by approved test methods. However, since no test method can offer complete assurance that infectious agents are absent, handle these products at the Biosafety Level 2 as recommended for any potentially infectious human serum or blood specimen in the Centers for Disease Control/National Institutes of Health manual “Biosafety in Microbiological and Biomedical Laboratories”: Current Edition; and OSHA’s Standard for Bloodborne Pathogens (33).
5. Adherence to the specified time and temperature of incubations is essential for accurate results. **All reagents must be allowed to reach room temperature (20 - 25°C) before starting the assay**. Return unused reagents to refrigerated temperature immediately after use.
6. Improper washing could cause false positive or false negative results. Be sure to minimize the amount of any residual wash solution; (e.g., by blotting or aspiration) before adding Conjugate or Substrate. Do not allow the wells to dry out between incubations.
7. The Sample Diluent, Controls, and Calibrator contain Sodium Azide at a concentration of <0.1% (w/v). Sodium Azide has been reported to form lead or copper azides in laboratory plumbing which may cause explosions upon hammering. To prevent, rinse sink thoroughly with water after disposing of solution containing Sodium Azide.
8. The Stop Solution is TOXIC if inhaled, has contact with skin or if swallowed. It can cause burns. In case of accident or ill feelings, seek medical advice immediately.
9. The TMB Solution is HARMFUL. It is irritating to eyes, respiratory system and skin.
10. The Wash Buffer concentrate is an IRRITANT. It is irritating to eyes, respiratory system and skin.
11. Wipe the bottom of the plate free of residual liquid and/or fingerprints that can alter optical density (OD) readings.
12. Dilution or adulteration of these reagents may generate erroneous results.
13. Do not use reagents from other sources or manufacturers.
14. TMB Solution should be colorless, very pale yellow, very pale green, or very pale blue when used. Contamination of the TMB with Conjugate or other oxidants will cause the solution to change color prematurely. Do not use the TMB if it is noticeably blue in color.
15. Never pipette by mouth. Avoid contact of reagents and patient specimens with skin and mucous membranes.
16. Avoid microbial contamination of reagents. Incorrect results may occur.
17. Cross contamination of reagents and/or samples could cause erroneous results.
18. Reusable glassware must be washed and thoroughly rinsed free of all detergents.
19. Avoid splashing or generation of aerosols.
20. Do not expose reagents to strong light during storage or incubation.
21. Allowing the microwell strips and holder to equilibrate to room temperature prior to opening the protective envelope will protect the wells from condensation.
22. Collect the wash solution in a disposal basin. Treat the waste solution with disinfectant (i.e.: 10% household bleach - 0.5% Sodium Hypochlorite). Avoid exposure of reagents to bleach fumes.
23. Caution: Neutralize any liquid waste at an acidic pH before adding to a bleach solution.
24. Do not use ELISA Plate if the indicator strip on the desiccant pouch has turned from blue to pink.
25. Do not allow the Conjugate to come in contact with containers or instruments that may have previously contained a solution utilizing Sodium Azide as a preservative. Residual amounts of Sodium Azide may destroy the Conjugate’s enzymatic activity.
26. Do not expose any of the reactive reagents to bleach-containing solutions or to any strong odors from bleach-containing solutions. Trace amounts of bleach (sodium hypochlorite) may destroy the biological activity of many of the reactive reagents within this Test System.

**MATERIALS REQUIRED BUT NOT PROVIDED**

1. ELISA microwell reader capable of reading at a wavelength of 450nm. **NOTE: Use of a single (450nm), or dual (450/620 - 650nm), wavelength reader is acceptable. Dual wavelength is preferred, as the additional reference filter has been determined to reduce potential interference from anomalies that may absorb light.**
2. Pipettes capable of accurately delivering 10 - 200µL.
3. Multichannel pipette capable of accurately delivering 50 - 200µL.
4. Reagent reservoirs for multichannel pipettes.
5. Wash bottle or microwell washing system.
6. Distilled or deionized water.
7. One liter graduated cylinder.
8. Serological pipettes.
9. Disposable pipette tips.
10. Paper towels.
11. Laboratory timer to monitor incubation steps.
12. Disposal basin and disinfectant (i.e.: 10% household bleach - 0.5% Sodium Hypochlorite).

**STORAGE CONDITIONS**

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| storage2-8.bmp | Coated Microwell Strips: Immediately reseal extra strips with desiccant and return to proper storage. After opening - strips are stable for 60 days, as long as the indicator strips on the desiccant pouch remains blue. |
| Conjugate – DO NOT FREEZE. |
| Unopened Test System, Calibrator, Positive Control, Negative Control, TMB, Sample Diluent |
| storage2-25.bmp | Stop Solution: 2 - 25°C Wash Buffer (1X): 20 - 25°C for up to 7 days, 2 - 8°C for 30 days.Wash Buffer (10X): 2 - 25°C |

**SPECIMEN COLLECTION**

1. ZEUS Scientific recommends that the user carry out specimen collection in accordance with CLSI document M29: Protection of Laboratory Workers from Infectious Disease (Current Edition).
2. No known test method can offer complete assurance that human blood samples will not transmit infection. Therefore, consider all blood derivatives potentially infectious.
3. Use only freshly drawn and properly refrigerated sera obtained by approved aseptic venipuncture procedures in this assay (28, 29). Do not use if there are any added anticoagulants or preservatives. Avoid using hemolyzed, lipemic, or bacterially contaminated sera and samples that contain high levels of IgG. High levels of IgG have been shown to reduce reactivity to VZV IgM antibody.
4. Store sample at room temperature for no longer than 8 hours. If testing is not performed within 8 hours, sera may be stored between 2 - 8°C, for no longer than 48 hours. If a delay in testing is anticipated, store test sera at –20°C or lower. Avoid multiple freeze/thaw cycles which may cause loss of antibody activity and give erroneous results. It is the responsibility of the individual laboratory to use all available references and/or its own studies to determine stability criteria for its laboratory (34).

**ASSAY PROCEDURE**

1. Remove the individual components from storage and allow them to warm to room temperature (20 - 25°C).
2. Determine the number of microwells needed. Allow for six Control/Calibrator determinations (one Reagent Blank, one Negative Control, three Calibrators and one Positive Control) per run. Run a Reagent Blank on each assay. Check software and reader requirements for the correct Controls/Calibrator configurations. Return unused strips to the resealable pouch with desiccant, seal, and return to storage between 2 - 8°C.

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| **EXAMPLE PLATE SET-UP** |
|  | 1 | 2 |
| A | Blank | Patient 3 |
| B | Negative Control | Patient 4 |
| C | Calibrator | Etc. |
| D | Calibrator |  |
| E | Calibrator |  |
| F | Positive Control |  |
| G | Patient 1 |  |
| H | Patient 2 |  |

1. Prepare a 1:21 dilution (e.g.: 10µL of serum + 200µL of Sample Diluent) of the Negative Control, Calibrator, Positive Control, and each patient serum.
2. To individual wells, add 100μL of each diluted Control, Calibrator and patient specimen. Ensure that the samples are properly mixed. Use a different pipette tip for each sample.
3. Add 100µL of Sample Diluent to well A1 as a Reagent Blank. Check software and reader requirements for the correct Reagent Blank well configuration.
4. Incubate the plate at room temperature (20 - 25°C) for 25 ± 5 minutes.
5. Wash the microwell strips 5 times.
	1. **Manual Wash Procedure**:
6. Vigorously shake out the liquid from the wells.
7. Fill each microwell with Wash Buffer. Make sure no air bubbles are trapped in the wells.
8. Repeat steps 1. and 2. for a total of 5 washes.
9. Shake out the wash solution from all the wells. Invert the plate over a paper towel and tap firmly to remove any residual wash solution from the wells. Visually inspect the plate to ensure that no residual wash solution remains. Collect wash solution in a disposable basin and treat with disinfectant at the end of the day’s run.
	1. **Automated Wash Procedure**:

If using an automated microwell wash system, set the dispensing volume to 300 - 350µL/well. Set the wash cycle for 5 washes with no delay between washes. If necessary, the microwell plate may be removed from the washer, inverted over a paper towel and tapped firmly to remove any residual wash solution from the microwells.

1. Add 100µL of the Conjugate to each well, including the Reagent Blank well, at the same rate and in the same order as the specimens.
2. Incubate the plate at room temperature (20 - 25°C) for 25 ± 5 minutes.
3. Wash the microwells by following the procedure as described in step 7.
4. Add 100µL of TMB to each well, including the Reagent Blank well, at the same rate and in the same order as the specimens.
5. Incubate the plate at room temperature (20 - 25°C) for 10 - 15 minutes.
6. Stop the reaction by adding 50µL of Stop Solution to each well, including the Reagent Blank well, at the same rate and in the same order as the TMB. Positive samples will turn from blue to yellow. After adding the Stop Solution, tap the plate several times to ensure that the samples are thoroughly mixed.
7. Set the microwell reader to read at a wavelength of 450nm and measure the optical density (OD) of each well against the Reagent Blank. Read the plate within 30 minutes of the addition of the Stop Solution.

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|  **ABBREVIATED TEST PROCEDURE** |
|  1. Dilute Serum 1:21. |
|  2. Add diluted sample to microwell - 100µL/well. |
|  3. *Incubate 25 ± 5 minutes.* |
|  4. Wash. |
|  5. Add Conjugate - 100µL/well. |
|  6.  *Incubate 25 ± 5 minutes.* |
|  7. Wash. |
|  8. Add TMB - 100µL/well. |
|  9. *Incubate 10 - 15 minutes.* |
| 10. Add Stop Solution - 50µL/well - Mix. |
| 11. READ within 30 minutes. |

**QUALITY CONTROL**

1. Each time the assay is performed, the Calibrator must be run in triplicate. A Reagent Blank, Negative Control, and Positive Control must also be included.
2. Calculate the mean of the three Calibrator wells. If any of the three values differ by more than 15% from the mean, discard that value and calculate the mean using the remaining two wells.
3. The mean OD value for the Calibrator, Positive Control, and Negative Control should fall within the following ranges:

OD Range

Negative Control ≤0.250

Calibrator ≥0.300

Positive Control ≥0.500

1. The OD of the Negative Control divided by the mean OD of the Calibrator should be ≤0.9.
2. The OD of the Positive Control divided by the mean OD of the Calibrator should be ≥1.25.
3. If the above conditions are not met the test should be considered invalid and should be repeated.
4. The Positive Control and Negative Control are intended to monitor for substantial reagent failure, but will not ensure precision at the assay Cutoff.
5. Additional Controls may be tested according to guidelines or requirements of local, state, and/or federal regulations or accrediting organizations.
6. Refer to CLSI document C24: Statistical Quality Control for Quantitative Measurement Procedures for guidance on appropriate QC practices.

**INTERPRETATION OF RESULTS**

1. **Calculations:**
2. *Correction Factor:* The manufacturer determined a Cutoff OD Value for positive samples and correlated it to the Calibrator. The Correction Factor (CF) allows for the determination of the Cutoff Value for positive samples. It will also correct for slight day-to-day variations in test results. The Correction Factor is determined for each lot of components and is printed on the Component Label located in the Test System box.
3. *Cutoff OD Value:* To obtain the Cutoff OD Value, multiply the CF by the mean OD of the Calibrator determined above.

*(CF x Mean OD of Calibrator = Cutoff OD Value)*

1. *Index Values/OD Ratios:* Calculate the Index Value/OD Ratio for each specimen by dividing its OD Value by the Cutoff OD from step b.

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| --- | --- | --- | --- |
| Example: | Mean OD of Calibrator | = | 0.793 |
|  | Correction Factor (CF) | = | 0.25 |
|  | Cutoff OD | = | 0.793 x 0.25 = 0.198 |
|  | Unknown Specimen OD | = | 0.432 |
|  | Specimen Index Value/OD Ratio | = | 0.432/0.198 = 2.18 |

* 1. **Interpretations:** Index Values/OD Ratios are interpreted as follows.

|  |  |
| --- | --- |
|  | Index Value/OD Ratio |
| Negative Specimens | ≤0.90 |
| Equivocal Specimens | 0.91 to 1.09 |
| Positive Specimens | ≥1.10 |

1. An OD ratio <0.90 indicates no significant amount of IgM antibodies to EBV-VCA detected. A negative result indicates no active infection with EBV and should be reported as non-reactive for EBV-VCA IgM antibody.
2. An OD ratio >1.10 indicates that IgM antibodies specific to EBV-VCA were detected. A positive test result indicates a current or reactivated infection with EBV-VCA, and should be reported as reactive for EBV-VCA IgM antibody.
3. Specimens with OD ratio values in the equivocal range (0.91 - 1.09) should be retested in duplicate. Report any two of the three results which agree. valuate repeatedly equivocal specimen by an alternate serologic procedure and/or re-evaluate by drawing another sample one to three weeks later. If the second specimen is positive, consider the patient to have an active infection.
4. The numeric value of the final result above the cutoff is not indicative of the amount of anti-EBV-VCA IgM antibody present.

**LIMITATIONS OF THE ASSAY**

1. Most (80%) of IM individuals have peak anti-VCA IgM titers before they consult a physician (4). Therefore, testing paired acute and convalescent sera for significant changes in antibody levels is not useful in most patients with IM (4).
2. Do not use the antibody titer of a single serum specimen to determine recent infection. Interpret test results for anti-VCA in conjunction with the clinical evaluation and results of antibody tests for other EBV antigens, i.e., EBNA, EA, and IgG-VCA.
3. The lack of detectable IgM antibodies does not exclude current EBV infection. The sample may have been collected before development of demonstrable antibody or after the antibody level is no longer detectable.
4. Test results of specimens from immunosuppressed patients may be difficult to interpret.
5. Specific IgM antibodies are usually detected in patients with recent primary infection, but may be found in patients with reactivated or secondary infections, and sometimes found in patients with no other detectable evidence of recent infection.
6. The anti-IgG absorbent has been shown to functionally remove >13.9 mg/mL IgG from human serum. Normal adult IgG levels may range from eight to 16 mg/mL (32). Patients with an IgG level exceeding 14 mg/mL may require additional treatment to neutralize all IgG.
7. Performance characteristics have not been established with EBV-associated disease other than infectious mononucleosis.
8. Evaluate test results in relation to patient symptoms, clinical history, and other laboratory findings to establish a diagnosis.

**REFERENCES**

1. Rapp CE and Heweston JF: Infectious mononucleosis and the Epstein - Barr virus. Am. J. Dis. Child. 132:78, 1978.
2. Biggar RJ, Henle W, Fleisher G, Bocker J, Lennette ET, and Henle G: Primary Epstein-Barr virus infections in African infants. I: Decline of maternal antibodies and time of infection. Int. J. Cancer. 22:239, 1978.
3. Fry J: Infectious mononucleosis: Some new observations from a 15 year study. J. Fam. Prac. 10:1087, 1980.
4. Lennette ET: Epstein-Barr virus. In: Manual of Clinical Microbiology, 4th edition. Lennette ET, Balows A, Hausler WJ, Shadomy HJ, eds. Washington DC, American Society for Microbiology, p. 326, 1987.
5. Fleisher G, Henle W, Henle G, Lennette ET, and Biggar RJ: Primary infection with Epstein-Barr virus in infants in the United States: Clinical and Serological Observations. J. Infect. Dis. 139:553, 1979.
6. Merlin TL: Chronic mononucleosis: Pitfalls in the laboratory diagnosis. Hum. Path. 17:2, 1986.
7. Sixbey JW, Nedrud JG, Raab-Traub N, Hanes RA, Pagano JS: Epstein-Barr virus replication in oropharyngeal epithelial cells. New Eng. J. Med. 310:1225, 1984.
8. Chang RS, Lewis JP, Reynolds RD, Sullivan MJ, Neuman J: Oropharyngeal excretion of Epstein-Barr virus by patients with lymphoproliferative disorders and by recipients of renal homografts. Ann. Intern. Med. 88:34, 1978.
9. Jones JF, Ray G, Minnich LL, Hicks MJ, Kibler R, Lucus DO: Evidence of active Epstein-Barr virus infection in patients with persistent, unexplained illness. Elevated anti-early antigen antibodies. Ann. Intern. Med. 102:1, 1985.
10. Evans AS, Neiderman JC, Cenabre LC, West B, and Richards VA: A prospective evaluation of heterophile and Epstein-Barr virus-specific IgM antibody tests in clinical and subclinical infectious mononucleosis: Specificity and sensitivity of the tests and persistence of antibody. J. Infect. Dis. 132:546, 1975.
11. Henle W, Henle GE, and Horowitz CA: Epstein-Barr virus specific diagnostic tests in infectious mononucleosis. Hum. Path. 5:551, 1974.
12. Lennette ET, and Henle W: Epstein-Barr virus infections: Clinical and serological features. Lab Management. p. 23, June, 1987.
13. Reedman BM, and Klein G: Cellular localization of an Epstein-Barr virus (EBV) associated complement-fixing antigen in producer and non-producer lymphoblastoid cell lines. Int. J. Cancer 11:499, 1973.
14. Henle G, Henle W, and Horowitz CA: Antibodies to Epstein-Barr virus-associated nuclear antigen in infectious mononucleosis. J. Infect. Dis. 130:231, 1974.
15. Horowtiz CA, Henle W, Henle G, Rudnick H, and Lutts E: Long-term serological follow-up of patients for Epstein-Barr virus after recovery from infectious mononucleosis. J. Infect. Dis. 151:1150, 1985.
16. Horowitz CA, Henle W, Henle G, and Schmitz H: Clinical evaluation of patients with infectious mononucleosis and development of antibodies to the R component of the Epstein-Barr virus-induced early antigen complex. Am. J. Med. 58:330, 1975.
17. Sumaya CV: Endogenous reactivation of Epstein-Barr virus infections. J. Infect. Dis. 135:374, 1977.
18. Joncas J, Lapointe N, Gervais F, Leyritz M, and Wills A: Unusual prevalence of antibodies to Epstein-Barr virus early antigen in ataxia telangiectasia. Lancet 1: 1160, 1977.
19. Akaboshi I, Jamamoto J, Katsuki T, and Matsuda I: Unique pattern of Epstein-Barr virus specific antibodies in recurrent parotitis. Lancet 2:1049, 1983.
20. Larson PD, Bloomer LC, and Brag PF: Epstein-Barr nuclear antigen and viral capsid antigen antibody titers in multiple sclerosis. Neurology 35: 435, 1985.
21. Henle W, Ho H-C, Henle G, and Kwan HC: Antibodies to Epstein-Barr virus related antigens in nasopharyngeal carcinoma. Comparison of active cases with long-term survivors, J. Natl. Cancer Inst. 51:361, 1973.
22. Henle W and Henle G: Epstein - Barr virus-specific serology in immunologically compromised individuals. Cancer Res. 41:4222, 1981.
23. Fleisher G, and Bolognese R: Persistent Epstein-Barr virus infection and pregnancy. J. Infect. Dis. 147:982, 1983.
24. Engvall E and Perlman P: Enzyme-linked immunosorbent assay (ELISA). Quantitative assay of immunoglobulin G. Immunochem. 8:871-874, 1971.
25. Engvall E and Perlman P: Enzyme-linked immunosorbent assay, ELISA. III. Quantitation of specific antibodies by enzyme-labeled anti-immunoglobulin in antigen coated tubes. J. Immunol. 109:129-135, 1972.
26. Voller A, Bartlett A, and Bidwell DE: Enzyme immunoassays with special reference to ELISA technique. J. Clin. Pathol. 31:507-520, 1978.
27. Hopkins RF, Witmer TJ, Neubauer RH, and Rabin H: Detection of antibodies to Epstein-Barr virus antigens by enzyme-linked immunosorbent assay. J. Infect. Dis. 146:734-740, 1982.
28. Procedures for the collection of diagnostic blood specimens by venipuncture. Second Edition; Approved Standard (1984). Published by National Committee for Clinical Laboratory Standards.
29. Procedures for the Handling and Processing of Blood Specimens. NCCLS Document H18-A, Vol. 10, No. 12, Approved Guideline, 1990.
30. Hallee TJ, Evans AS, Neiderman JC, Brooks CM and Boegtly: Infectious mononucleosis at the United States Military Academy, a prospective study of a single class over four years. Yale J. Biol. Med. 47:182-192, 1974.
31. Nickoskelainer J and Hanninen P: Antibody response to Epstein - Barr virus in Infectious Mononucleosis. Infec. & Immun. 11:42-51, 1975.
32. Roitt I: The immunoglobulin. In: Roitt I, Essential Immunology. 7th ed. Blackwell Scientific Publications, Oxford, 1991.
33. U.S. Department of Labor, Occupational Safety and Health Administration: Occupational Exposure to Bloodborne Pathogens. Final Rule. Fed. Register 56:64175-64182, 1991.
34. Procedures for the Handling and Processing of Blood Specimens for Common Laboratory Tests; Approved Guidelines – 4th Edition (2010). CLSI Document GP44-A4 (ISBN 1-56238-724-3). Clinical and Laboratory Standards Institute, 950 West Valley Road, Suite 2500, Wayne, PA 19087.

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