Foresight®

HBeAg EIA Test Kit
Package Insert

REF	I231-1061	English

An enzyme immunoassay (EIA) for the qualitative detection of Hepatitis B Envelope Antigen (HBeAg) in human serum or plasma.

For professional in vitro diagnostic use only.

INTENDED USE

The HBeAg EIA Test Kit is a one step enzyme immunoassay for the qualitative detection of Hepatitis B Envelope Antigen (HBeAg) in human serum or plasma. It is intended as a screening tool for exposure to the Hepatitis B virus (HBV), and as an aid in the evaluation of infectivity, the disease state, and management of patients.

SUMMARY

Hepatitis B virus is a spherical enveloped, partially double-stranded DNA virus of the Hepadnaviridae family.[1] The Hepatitis B infection of the liver is transmitted through sexual contact, blood borne exposure, transmission from mother to child during delivery, sharing of objects that pierce the skin, child-to-child and household contact.[2,3,4,5] HBV infection has been linked to a variety of mild to chronic liver diseases, including cirrhosis, and hepatocellular carcinoma.[4] In some cases, the virus may persist for a lifetime. Annually, 1 million people die from chronic active hepatitis, cirrhosis or primary liver cancer. Hepatitis B affects millions of people worldwide and is considered a global public health problem.[4,5]

Hepatitis B envelope antigen (HBeAg) is produced by hepatocytes infected with the Hepatitis B virus (HBV) and is one of the serological markers of Hepatitis B infection. It appears during the viral replication period, at the most infectious phase of the disease, and is regarded as an indicator of infectivity. HBeAg appears 3-6 weeks after exposure and remains detectable up to several weeks. The presence of HBeAg indicates that the patient is infectious and its long term presence is a sign of chronic liver disease.[5] In the chronic carrier state, HBeAg may persist in the blood for years. Upon recovery, HBeAg declines and its specific antibody (HBeAb) appears. In cases of infection with mutant strains of HBV, pre-core mutants, HBeAg is not synthesized and viral replication may be ongoing in the absence of HBeAg.[3,5] In these cases it is recommended that the test is combined with other HBV serological marker tests for the evaluation of the disease state.

The HBeAg EIA Test Kit is an immunoassay for the qualitative detection of the presence of Hepatitis B Envelope Antigen in serum or plasma specimen. The test utilizes monoclonal antibodies to selectively detect various subtypes of HBeAg in serum or plasma.

PRINCIPLE

The HBeAg EIA Test Kit is a solid phase qualitative enzyme immunoassay based on a sandwich principle for the detection of HBeAg in human serum or plasma. The microwell plate is coated with monoclonal antibodies specific to HBeAg. During testing, the specimen and the enzyme-conjugated HBeAg antibodies are added to the antibody coated microwell plate and then incubated. If the specimen contains HBeAg, it will bind to the antibodies coated on the microwell plate and simultaneously bind to the conjugate to form immobilized antibody-HBeAg-conjugate complexes. If the specimen does not contain HBeAg, the complexes will not be formed. After initial incubation, the microwell plate is washed to remove unbound materials. Substrate A and substrate B are added and then incubated to produce a blue color, indicating the amount of HBeAg present in the specimen. Sulfuric acid solution is added to the microwell plate to stop the reaction which produces a color change from blue to yellow. The color intensity, which corresponds to the amount of HBeAg present in the specimen, is measured with a microplate reader at 450/630-700 nm or 450 nm.

PRECAUTIONS

- For professional *in vitro* diagnostic use only. Do not use after expiration date.
- Do not mix reagents from other kits with different lot numbers.
- Avoid cross contamination between reagents to ensure valid test results.
- Follow the wash procedure to ensure optimum assay performance.
- Use plate sealer to cover microwell plate during incubation to minimize evaporation.
- Use a new pipet tip for each specimen assayed.
- Ensure that the bottom of the plate is clean and dry and that no bubbles are present on the surface of the liquid before reading the plate. Do not allow wells to dry out during the assay procedure.
- Do not touch the bottom of the wells with pipette tips. Do not touch the bottom of the microwell plate with fingertips.
- Do not allow sodium hypochlorite fumes from chlorine bleach or other sources to contact the microwell plate during the assay as the color reaction may be inhibited.
- All equipment should be used with care, calibrated regularly and maintained following the equipment manufacturer's instructions.

HEALTH AND SAFETY INFORMATION

- Some components of this kit contain human blood derivatives. No known test method can offer complete assurance that products derived from human blood will not transmit infectious agents. Therefore, all blood derivatives should be considered potentially infectious. It is recommended that these reagents and human specimens be handled using established good laboratory working practices.
- Wear disposable gloves and other protective clothing such as laboratory coats and eye protection while handling kit reagents and specimens. Wash hands thoroughly when finished.
- ProClin™ 300 is included as a preservative in the Conjugate, Concentrated Wash Buffer, Substrate and Controls. Avoid any contact with skin or eyes.
- Do not eat, drink or smoke in the area where the specimens or kits are handled. Do not pipette by mouth.
- Avoid any contact of the Substrate A, Substrate B, and Stop Solution with skin or mucosa. The Stop Solution contains 0.5M sulfuric acid which is a strong acid. If spills occur, wipe immediately with large amounts of water. If the acid contacts the skin or eyes, flush with large amounts of water and seek medical attention.
- Non-disposable apparatus should be sterilized after use. The preferred method is to autoclave for one hour at 121°C. Disposables should be autoclaved or incinerated. Do not autoclave materials containing sodium hypochlorite.
- Handle and dispose all specimens and materials used to perform the test as if they contained infectious agents. Observe established precautions against microbiological hazards throughout all the procedures and follow the standard procedures for proper disposal of specimens.
- Observe Good Laboratory Practices when handling chemicals and potentially infectious material. Discard all contaminated material, specimens and reagents of human origin after proper decontamination and by following local, state and federal regulations.
- Neutralized acids and other liquids should be decontaminated by adding sufficient volume of sodium hypochlorite to obtain a final concentration of at least 1.0%. A 30 minute exposure to a 1.0% sodium hypochlorite may be necessary to ensure effective decontamination.

STORAGE AND STABILITY

- Unopened test kits should be stored at 2-8°C upon receipt. All unopened reagents are stable through the expiration date printed on the box if stored between 2-8°C. Once opened, all reagents are stable for up to 3 months after the first opening date if stored between 2-8°C. Return reagents to 2-8°C immediately after use.
- Allow the sealed pouch to reach room temperature before opening the pouch and remove the required number of strips to prevent condensation of the microwell plate. The remaining unused strips should be stored in the original resealable pouch with desiccant supplied at 2-8°C and can be used within 3 months of the opening date. Return the remaining unused strips and supplied desiccant to the original resealable pouch, firmly press the seal closure to seal the pouch completely and immediately store at 2-8°C.
- Concentrated Wash Buffer may be stored at room temperature to avoid crystallization. If crystals are present, warm up the solution at 37°C. Working Wash Buffer is stable for 2 weeks at room temperature.
- Do not expose reagents especially the Substrate to strong light or hypochlorite fumes during storage or incubation steps.
- Do not store Stop Solution in a shallow dish or return it to the original bottle after use.

SPECIMEN COLLECTION AND PREPARATION

- The HBeAg EIA Test Kit can be performed using only human serum or plasma collected from venipuncture whole blood.
- EDTA, sodium heparin, and ACD collection tubes may be used to collect venipuncture whole blood and plasma specimens. The preservative sodium azide inactivates horseradish peroxide and may lead to erroneous results.
- Separate serum or plasma from blood as soon as possible to avoid hemolysis. Grossly hemolytic, lipidic or turbid samples should not be used. Specimen with extensive particulate should be clarified by centrifugation prior to use. Do not use specimens with fibrin particles or contaminated with microbial growth.
- Serum and plasma specimens may be stored at 2-8°C for up to 7 days prior to assaying. For long term storage, specimens should be kept frozen below -20°C.
- Bring specimens to room temperature prior to testing. Frozen specimens must be completely thawed and mixed well prior to testing. Specimens should not be frozen and thawed repeatedly.
- If specimens are to be shipped, they should be packed in compliance with local regulations covering the transportation of etiologic agents.

REAGENTS AND COMPONENTS

Materials Provided

No.	Reagent	Component Description	Quantity	
			96 wells/kit	480 wells/kit
	HBeAg Microwell Plate	Microwell plate coated with Anti-HBeAg	1 plate (96 wells/plate)	5 plates (96 wells/plate)
1	HBeAg Conjugate	Anti-HBeAg bound to peroxidase; Preservative: 0.1% ProClin™ 300	1 x 8 mL	5 x 8 mL
2	Concentrated Wash Buffer (25x)	Tris-HCl buffer containing 0.1% Tween 20; Preservative: 0.1% ProClin™ 300	1 x 40 mL	5 x 40 mL
3	Substrate A	Citrate-phosphate buffer containing hydrogen peroxide; Preservative: 0.1% ProClin™ 300	1 x 8 mL	5 x 8 mL
4	Substrate B	Buffer containing tetramethylbenzidine (TMB); Preservative: 0.1% ProClin™ 300	1 x 8 mL	5 x 8 mL
5	Stop Solution	0.5M Sulfuric acid	1 x 8 mL	5 x 8 mL
6	HBeAg Negative Control	Normal serum non-reactive for HBeAg, HCV, HIV-1, and HIV-2; Preservative: 0.1% ProClin™ 300	1 x 1 mL	5 x 1 mL
7	HBeAg Positive Control	Inactivated serum containing HBeAg and negative for HCV, HIV-1, and HIV-2; Preservative: 0.1% ProClin™ 300	1 x 1 mL	5 x 1 mL
	Plate Sealers		2	10
	Package Insert		1	1

Materials Required But Not Provided

- Freshly distilled or deionized water
- Sodium hypochlorite solution for decontamination
- Absorbent paper or paper towel
- Water bath or incubator capable of maintaining 37°C ± 2°C
- Calibrated automatic or manual microwell plate washer capable of aspirating and dispensing 350 µL/well
- Disposable gloves
- Calibrated micropipettes with disposable tips capable of dispensing 50 µL
- Graduated cylinders for wash buffer dilution
- Vortex mixer for specimen mixing (optional)
- Timer
- Disposable reagent reservoirs
- Calibrated microplate reader capable of reading at 450 nm with a 630-700 nm reference filter, or reading at 450 nm without a reference filter
- Automated processor (optional)

DIRECTIONS FOR USE

Allow reagents and specimens to reach room temperature (15-30°C) prior to testing. The procedure must be strictly followed. Assay must proceed to completion within time limits. Arrange the controls so that well A1 is the Blank well. From well A1, arrange the controls in a horizontal or vertical configuration. The procedure below assigns specific wells arranged in a vertical configuration. Configuration may depend upon software.

Step	Detailed Procedure	Simplified Procedure
	• Prepare Working Wash Buffer by diluting the Concentrated Wash Buffer 1:25. Pour the contents of the bottle containing the concentrated wash buffer in a graduated cylinder and fill it with freshly distilled or deionized water to 1000 mL for 96 wells/plate testing. The Working Wash Buffer is stable for 2 weeks at 15-30°C. **Note:** If crystals are present in the Concentrated Wash Buffer, warm it up at 37°C until all crystals dissolve. • Remove unused strips from the microwell plate, and store in the original resealable pouch at 2-8°C.	• Prepare Working Wash Buffer by diluting the Concentrated Wash Buffer 1:25 • Remove and store unused strips at 2-8°C
0	• Leave A1 as Blank well.	• Leave A1 as Blank well
1	• Add 50 µL of Negative Control in wells B1 and C1. (Blue Reagent) • Add 50 µL of Positive Control in wells D1 and E1. (Red Reagent) • Add 50 µL of specimen to assigned wells starting at F1.	• B1 and C1: Add 50 µL Negative Control • D1 and E1: Add 50 µL Positive Control • Starting F1: Add 50 µL specimen
2	• Add 50 µL of Conjugate to each well except for the Blank well. (Red Reagent)	• Add 50 µL of Conjugate to each well except for the Blank well
3	• Mix gently by swirling the microwell plate on a flat bench for 30 seconds. • Cover the microwell plate with the Plate Sealer and incubate in a water bath or an incubator at 37°C ± 2°C for 30 minutes ± 2 minutes.	• Mix gently • Cover the microwell plate with the Plate Sealer and incubate at 37°C for 30 min
4	• Remove the Plate Sealer. • Wash each well 5 times with 350 µL of Working Wash Buffer per well, then remove the liquid. • Turn the microwell plate upside down on absorbent tissue for a few seconds. Ensure that all wells have been completely washed and dried. • Note: Improper washing may cause false positive results	• Remove the Plate Sealer • Wash each well 5 times with 350 µL of Working Wash Buffer • Turn the microwell plate upside down on absorbent tissue

5	• Add 50 µL of Substrate A to each well. (Clear Reagent) • Add 50 µL of Substrate B to each well. (Clear Reagent) Then a blue color should develop in wells containing Positive specimens.	• Add 50 µL of Substrate A to each well • Add 50 µL of Substrate B to each well
6	• Mix gently then cover microwell plate with Plate Sealer and incubate in a water bath or incubator at 37°C ± 2°C for 15 minutes ± 1 minute.	• Mix then cover microwell plate with Plate Sealer and incubate at 37°C for 15 min
7	• Remove the Plate Sealer. • Add 50 µL of Stop Solution to each well. (Clear Reagent) Then a yellow color should develop in wells containing Positive specimens.	• Remove the Plate Sealer • Add 50 µL of Stop Solution to each well
8	• Read at 450/630-700 nm within 30 minutes. Note: Microwell plate can also be read at 450 nm, but it is strongly recommended to read it at 450/630-700 nm for better results.	• Read at 450/630-700 nm within 30 min

AUTOMATED PROCESSING

Automatic EIA microplate processors may be used to perform the assay after validating the results to ensure they are equivalent to those obtained using the manual method for the same specimens. Incubation times may vary depending on the processors used but do not program less incubation times than the procedure listed above. When automatic EIA microplate processors are used, periodic validation is recommended to ensure proper results.

VALIDATION REQUIREMENTS AND QUALITY CONTROL

1. Calculate the Mean Absorbance of Negative Control and Positive Control by referring to the table below.

Example of Negative Control Calculation

Item	Absorbance
Negative Control: Well B1	0.023
Negative Control: Well C1	0.021
Total Absorbance of Negative Control	0.023 + 0.021 = 0.044
Mean Absorbance of Negative Control	0.044/2 = 0.022
Blank Absorbance: Well A1	0.002
NCx: Mean Absorbance of Negative Control – Blank Absorbance	0.022 - 0.002 = 0.020

2. Check the validation requirements below to determine if the test results are valid.

Item	Validation Requirements
Blank Well	Blank Absorbance should be < 0.050 if read at 450/630-700 nm Note: It should be < 0.100 if read at 450 nm
Negative Control	Mean Absorbance after subtraction of Blank Absorbance should be < 0.080
Positive Control	Mean Absorbance after subtraction of Blank Absorbance should be ≥ 1.000

NOTE: The test results are considered invalid if the above validation requirements are not met. Repeat the test or contact your local distributor.

3. Calculate the Cut-Off Value using the following formula if the test results are valid.

Example of Cut-Off Value Calculation

NCx Range	Item	NCx	Absorbance
If NCx < 0.050	Cut-Off Value: 0.050 * 2.1 = 0.105	0.020	0.105
If NCx ≥ 0.050	Cut-Off Value: NCx * 2.1	0.052	0.052 * 2.1 = 0.109

INTERPRETATION OF RESULTS

NON-REACTIVE: Specimens with absorbance less than the Cut-Off Value are non-reactive for HBeAg and may be considered negative.

REACTIVE:* Specimens with absorbance greater than or equal to the Cut-Off Value are considered initially reactive for HBeAg. The specimen should be retested in duplicate before final interpretation. Specimens that are reactive in at least one of the re-test are presumed to be repeatedly reactive and should be confirmed using other HBV markers or confirmatory testing. Specimens that are non-reactive on both retests should be considered non-reactive.

***NOTE**: Specimens with values within ±10% of the Cut-Off Value should be retested in duplicates for final interpretation.

LIMITATIONS

1. The HBeAg EIA Test Kit is used for the detection of HBeAg in human serum or plasma. Diagnosis of an infectious disease should not be established based on a single test result. Further testing, including confirmatory testing, should be performed before a specimen is considered positive. A non-reactive test result does not exclude the possibility of exposure. Specimens containing precipitate may give inconsistent test results. Mutated HBeAg may not be detected by the test.
2. As with all diagnostic tests, all results must be interpreted together with other clinical information available to the physician.
3. As with other sensitive immunoassays, there is the possibility that non-repeatable reactive results may occur due to inadequate washing. The results may be affected due to procedural or instrument error.
4. False positive results may occur due to high titers of Heterophilic Anti Mouse Antibodies (HAMA). Erroneous result may also be due to fibrin particles and microbial contamination.
5. The Positive Control in the test kit is not to be used to quantify assay sensitivity. The Positive Control is used to verify that the test kit components are capable of detecting a reactive specimen provided the procedure is followed as defined in the kit and the storage conditions have been strictly adhered to.

PERFORMANCE CHARACTERISTICS

Clinical Sensitivity and Specificity

The HBeAg EIA Test Kit has correctly identified specimens of a seroconversion panel and has been compared with a leading commercial HBeAg EIA test using clinical specimens. The results show that the clinical sensitivity of the HBeAg EIA Test Kit is 99.7% and the clinical specificity is 99.8%.

HBeAg EIA vs. Other EIA

Method		Other EIA		Total Results
HBeAg EIA	Results	Positive	Negative	
	Positive	377	4	381
	Negative	1	1,801	1,802
Total Results		378	1,805	2,183

Clinical Sensitivity: 99.7% (98.5-100.0%)* Clinical Specificity: 99.8% (99.4-99.9%)*
Overall Agreement: 99.8% (99.5-99.9%)* *95% Confidence Interval

Reproducibility

Intra-Assay: Within-run precision has been determined by using 10 replicates of three specimens: a low positive, a medium positive, and a high positive.

Inter-Assay: Between-run precision has been determined by 3 independent assays on the same three specimens: a low positive, a medium positive, and a high positive. Three different lots of the HBeAg EIA Test Kit have been tested using these specimens over a 5-day period.

Specimen	Intra-Assay			Inter-Assay		
	Mean Absorbance/ Cut-Off	Standard Deviation	Coefficient of Variation (%)	Mean Absorbance /Cut-Off	Standard Deviation	Coefficient of Variation (%)
1	1.819	0.119	6.546	1.781	0.151	8.497
2	8.371	0.470	5.638	8.038	0.638	7.937
3	17.962	1.006	5.599	17.657	1.345	7.616

BIBLIOGRAPHY

1. Frank Fenner and David O. White, *Medical Virology*, 4th Edition, Academic Press, 1994.
2. Centers for Disease Control. Viral Hepatitis B Fact Sheet.
3. Richman, D., R. Whitley, F. Hayden.*Clinical Virology*. New York: Churchill Livingstone Inc., 1997.
4. World Health Organization. World Health Organization Hepatitis B Fact Sheet. N°204. Revised October 2000.
5. World Health Organization. Hepatitis B. 2002.

Index of Symbols

	Consult instructions for use		Tests per kit		Manufacturer
IVD	For *in vitro* diagnostic use only		Use by	REF	Catalog #
2°C 8°C	Store between 2-8°C	LOT	Lot Number	Substrate B	Substrate B
HBeAg	HBeAg	Substrate A	Substrate A	Control +	Positive Control
Wash Buffer 25x	Wash Buffer (25x)	Conjugate	Conjugate	Package Insert	Package Insert
Control –	Negative Control	Stop Solution	Stop Solution		
Microwell Plate	Microwell Plate	Plate Sealer	Plate Sealer		

***ACON* Laboratories, Inc.**
10125 Mesa Rim Road,
San Diego, CA 92121, USA

Number: 1150403408
Effective date:2015-07-31