

## Rapid Response®

### Lyme IgG/IgM Test Cassette (Whole Blood/Serum/Plasma)

REF LYM-13C20  
LYM-13C40

Product Insert

#### A rapid test for the qualitative detection of IgG and IgM antibodies to Borrelia in human whole blood, serum or plasma specimens.

For professional laboratory *in vitro* diagnostic use only.

### Intended Use

The Rapid Response® Lyme IgG/IgM Test Cassette is a lateral flow chromatographic immunoassay for the qualitative detection of IgG and IgM antibodies to Borrelia in human whole blood, serum or plasma specimen.

### Summary

Lyme disease, also known as Lyme borreliosis, is an infectious disease caused by bacteria of the Borrelia sp. which is spread by ticks.<sup>2</sup> The most common sign of infection is an expanding area of redness on the skin, known as erythema migrans, that begins at the site of a tick bite about a week after it has occurred.<sup>1</sup> The rash is typically neither itchy nor painful. Approximately 25–50% of infected people do not develop a rash.<sup>1</sup> Other early symptoms may include fever, headache and feeling tired.<sup>1</sup> If untreated, symptoms may include loss of the ability to move one or both sides of the face, joint pains, severe headaches with neck stiffness, or heart palpitations, among others.<sup>1</sup> Months to years later, repeated episodes of joint pain and swelling may occur.<sup>1</sup> Occasionally, people develop shooting pains or tingling in their arms and legs.<sup>1</sup> Despite appropriate treatment, about 10 to 20% of people develop joint pains, memory problems, and feel tired for at least six months.<sup>1,4</sup>

Lyme disease is transmitted to humans by the bite of infected ticks of the genus Ixodes.<sup>5</sup> Usually, the tick must be attached for 36 to 48 hours before the bacteria can spread.<sup>6</sup> In North America, Borrelia burgdorferi and Borrelia mayonii are the causes.<sup>2,7</sup> In Europe and Asia, the bacteria Borrelia afzelii and Borrelia garinii are also causes of the disease.<sup>2</sup> The disease does not appear to be transmissible between people, by other animals, or through food.<sup>6</sup> Diagnosis is based upon a combination of symptoms, history of tick exposure, and possibly testing for specific antibodies in the blood.<sup>3,8</sup> Blood tests are often negative in the early stages of the disease.<sup>2</sup> Testing of individual ticks is not typically useful.<sup>9</sup>

### Principle

The Rapid Response® Lyme IgG/IgM Test Cassette is a qualitative membrane-based immunoassay for the detection of

IgG and IgM antibodies to Borrelia in whole blood, serum or plasma specimens. This test consists of two components, an IgG component and an IgM component. In the IgG component, anti-human IgG is coated on the IgG test line region. During testing, the specimen reacts with Borrelia antigen-coated particles in the test cassette. The mixture then migrates upward on the membrane chromatographically by capillary action and reacts with the anti-human IgG on the IgG test line region. If the specimen contains IgG antibodies to Borrelia a colored line will appear in the IgG test line region. Similarly, anti-human IgM is coated on IgM test line region. If the specimen contains IgM antibodies to Borrelia, the conjugate-specimen complex reacts with anti-human IgM and a colored line will appear in IgM test line region. Therefore, if the specimen contains anti-Borrelia IgG antibodies, a colored line will appear in IgG test line region and if the specimen contains anti-Borrelia IgM antibodies, a colored line will appear in IgM test line region. If the specimen does not contain anti-Borrelia antibodies, no colored line will appear in either of the test line regions, indicating a negative result. To serve as a procedural control, a colored line will always appear in the control line region, indicating that the proper volume of specimen has been added and membrane wicking has occurred.

### Reagents

The test contains anti-human IgM and anti-human IgG as the capture reagent, and Borrelia antigen as the detection reagent. Goat anti-human IgG is employed in the control line system.

### Precautions

1. For professional laboratory *in vitro* diagnostic use only. Do not use after expiration date.
2. Do not eat, drink or smoke in the area where the specimens or kits are handled.
3. Do not use test if pouch is damaged.
4. Handle all specimens as if they contain infectious agents. Observe established precautions against microbiological hazards throughout all procedures and follow the standard procedures for proper disposal of specimens.
5. Wear protective clothing such as laboratory coats, disposable gloves and eye protection when specimens are assayed.
6. The used test should be discarded according to local regulations.
7. Humidity and temperature can adversely affect results.

### Materials

#### Materials provided

- Test cassettes
- Droppers
- Buffer solution
- Product insert

#### Materials required but not provided

- Specimen collection containers
- Pipette and disposable tips (optional)

- Lancets (for fingerstick whole blood only)
- Centrifuge
- Timer

### Storage and Stability

Store as packaged in the sealed pouch at room temperature or refrigerated 35.6-86°F (2-30°C). The test is stable through the expiration date printed on the sealed pouch. The test must remain in the sealed pouch until use. **DO NOT FREEZE.** Do not use beyond the expiration date.

### Specimen Collection and Preparation

- The Rapid Response® Lyme IgG/IgM Test Cassette can be performed using whole blood (from venipuncture or fingerstick), serum or plasma.
- To collect **Fingerstick Whole Blood Specimens:**
  - Wash the patient's hand with soap and warm water or clean with an alcohol swab. Allow to dry.
  - Massage the hand without touching the puncture site by rubbing down the hand towards the fingertip of the middle or ring finger.
  - Puncture the skin with a sterile lancet. Wipe away the first sign of blood.
  - Gently rub the hand from wrist to palm to finger to form a rounded drop of blood over the puncture site.
- Add the Fingerstick Whole Blood specimen to the test by using **a capillary tube:**
  - Touch the end of the capillary tube to the blood until filled to approximately 10µL. Avoid air bubbles.
  - Place the bulb onto the top end of the capillary tube, then squeeze the bulb to dispense the whole blood to the specimen area of the test cassette.
- Separate serum or plasma from blood as soon as possible to avoid hemolysis. Use only clear non-hemolyzed specimens.
- Testing should be performed immediately after the specimens have been collected. Do not leave the specimens at room temperature for prolonged periods. Serum and plasma specimens may be stored at 35.6-46.4°F (2-8°C) for up to 3 days, for long term storage, specimens should be kept below -4°F (-20°C). Whole blood collected by venipuncture should be stored at 35.6-46.4°F (2-8°C) if the test is to be run within 2 days of collection. Do not freeze whole blood specimens. Whole blood collected by fingerstick should be tested immediately.
- 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 etiological agents.

- EDTA K2, Heparin sodium, Citrate sodium and Potassium Oxalate can be used as the anticoagulant for collecting the specimen.

### Test Procedure

**Allow the test, specimen, buffer and/or controls to reach room temperature (59-86°F; 15-30°C) prior to testing.**

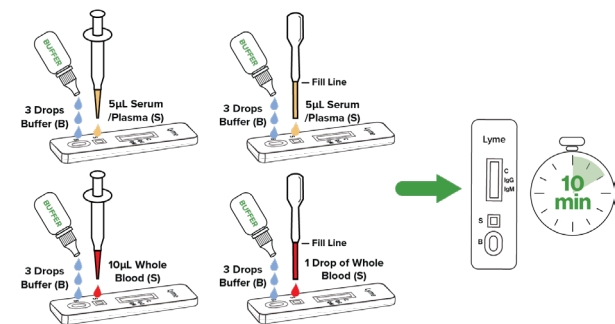
1. Bring the pouch to room temperature before opening it. Remove the test cassette from the sealed pouch and use it as soon as possible.
  2. Place the cassette on a clean and level surface.
 

For **Serum/Plasma** specimen:

    - Use a **pipette:** To transfer **5 µL of Serum/Plasma** to the specimen well (S), then add **3 drops of buffer (approximately 120 µL) to the buffer well (B).**
    - Use a **dropper:** Hold the dropper vertically, draw the specimen up to the **upper end of the nozzle** as shown in illustration below (**approximately 5 µL**). Transfer the specimen to the specimen well (S), then add **3 drops of buffer (approximately 120 µL) to the buffer well (B)** and start the timer.

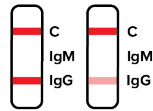
For **Whole Blood** specimen:

    - Use a **pipette:** To transfer **10 µL of whole blood** to the specimen well (S), then add **3 drops of buffer (approximately 120 µL) to the buffer well (B).**
    - Use a **dropper:** Hold the dropper vertically, draw the specimen about **1 cm above the upper end of the nozzle.** Transfer **1 full drop (approx. 10 µL)** of specimen to the sample well (S), then add 3 drops of buffer (approximately 120 µL) to the buffer well (B) and start the timer.
  3. Wait for the colored line(s) to appear. Read results at **10 minutes.** Do not interpret the result after **20 minutes.**
- NOTE:** It is suggested not to use the buffer beyond 3 months after opening the vial.

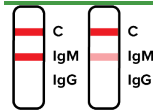


## Results Interpretation

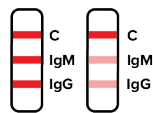
### Positive



**IgG POSITIVE:\* Two colored lines appear.** One colored line should always appear in the control line region (C) and another line should be in the IgG line region.



**IgM POSITIVE:\* Two colored lines appear.** One colored line should always appear in the control line region (C) and another line should be in the IgM line region.



**IgG and IgM POSITIVE:\* Three colored lines appear.** One colored line should always appear in the control line region (C) and two test lines should be in the IgG line region and IgM line region.

**\*NOTE:** The intensity of the color in the test line regions may vary depending on the concentration of anti-Lyme antibodies present in the specimen. Therefore, any shade of color in the test line region should be considered positive.

### Negative



**One colored line appears in the control line region (C).** No line appears in the IgG region or the IgM region.

### Invalid



**Control line fails to appear.** Insufficient specimen volume or incorrect procedural techniques are the most likely reasons for control line failure. Review the procedure and repeat the test with a new test. If the problem persists, discontinue using the test kit immediately and contact your local distributor.

## Quality Control

Internal procedural controls are included in the test. A colored line appearing in the control region (C) is an internal procedural control. It confirms sufficient specimen volume and correct procedural technique.

Control standards are not supplied with this kit; however, it is recommended that positive and negative controls be tested as good laboratory testing practice to confirm the test procedure and to verify proper test performance.

## Limitations

- The Rapid Response<sup>®</sup> Lyme IgG/IgM Test Cassette is for *in vitro* diagnostic use only. This test should be used for detection of IgG and IgM antibodies to Borrelia in whole blood, serum or plasma specimens. Neither the quantitative value nor the rate of increase in the concentration of IgG or IgM antibodies to Borrelia can be determined by this qualitative test.
- The Rapid Response<sup>®</sup> Lyme IgG/IgM Test Cassette will only indicate the presence of IgG and IgM antibodies to Borrelia in the specimen and should not be used as the sole criteria for the diagnosis of Lyme infections.
- As with all diagnostic tests, all results must be considered with other clinical information available to the physician.
- If the test result is negative and clinical symptoms persist, additional follow-up testing using other clinical methods is suggested. A negative result at any time does not preclude the possibility of Borrelia infection.
- The hematocrit level of the whole blood can affect the test results.
- Hematocrit level needs to be between 25% and 65% for accurate results.

## Performance Characteristics

### Sensitivity and Specificity

The Rapid Response<sup>®</sup> Lyme IgG/IgM Test Cassette was compared with a leading commercial ELISA Lyme IgG test and ELISA Lyme IgM test. The results show that the Rapid Response<sup>®</sup> Lyme IgG/IgM Test Cassette has a high sensitivity and specificity.

#### IgG Results

Method	Results	ELISA		Total Result
		Positive	Negative	
Rapid Response <sup>®</sup> Lyme IgG/IgM Test Cassette for IgG	Positive	21	1	22
	Negative	1	89	90
Total Result		22	90	112

Relative Sensitivity: 95.5% (95%CI\*: 87.3%-100%)  
 Relative Specificity: 98.9% (95%CI\*: 97.1%-99.8%)  
 Accuracy: 98.2% (95%CI\*: 93.7%-99.8%)  
 \*Confidence Interval

#### IgM Results

Method	Results	ELISA		Total Result
		Positive	Negative	
Rapid Response <sup>®</sup> Lyme IgG/IgM Test Cassette for IgM	Positive	17	1	18
	Negative	1	89	90
Total Result		18	90	108

Relative Sensitivity: 94.4% (95%CI\*: 72.7%-99.9%)  
 Relative Specificity: 98.9% (95%CI\*: 96.7%-100%)  
 Accuracy: 98.1% (95%CI\*: 93.5%-99.8%)

\*Confidence Interval

### Precision

#### Intra-Assay

Within-run precision has been determined by using 3 replicates of five specimens: negative, IgG low positive, IgG high positive, IgM low positive, IgM high positive. The negative, low positive, and high positive values were correctly identified >99% of the time.

#### Inter-Assay

Between-run precision has been determined by 3 independent assays on the same specimens: negative, IgG low positive, IgG high positive, IgM low positive, IgM high. Three different lots of the Rapid Response<sup>®</sup> Lyme IgG/IgM Test Cassette have been tested over a 3-days period using negative, low positive, and high positive specimens. The specimens were correctly identified >99% of the time.

### Cross-reactivity

The Rapid Response<sup>®</sup> Lyme IgG/IgM Test Cassette has been tested for anti-HAV IgM, HBsAg, anti-HCV IgG, anti-HIV IgG, anti-RF IgG, anti-Syphilis IgG, anti-H. Pylori IgG, anti-Rubella IgG, anti-Toxo IgG, anti-HSV 1 IgG, anti-HSV 2 IgG, anti-CMV IgG, anti-Rubella IgM, anti-Toxo IgM, anti-HSV 1 IgM, anti-HSV 2 IgM and anti-CMV IgM positive specimens. The results showed no cross-reactivity.

### Interfering Substances

The following compounds have been tested using the Rapid Response<sup>®</sup> Lyme IgG/IgM Test Cassette and no interference was observed.

Acetaminophen: 20 mg/dL	Caffeine: 20 mg/dL
Acetylsalicylic Acid: 20 mg/dL	Gentisic Acid: 20 mg/dL
Ascorbic Acid: 2g/dL	Albumin: 2 g/dL
Creatin: 200 mg/dL	Hemoglobin 1000mg/dL
Bilirubin: 1g/dL	Oxalic Acid: 60mg/dL

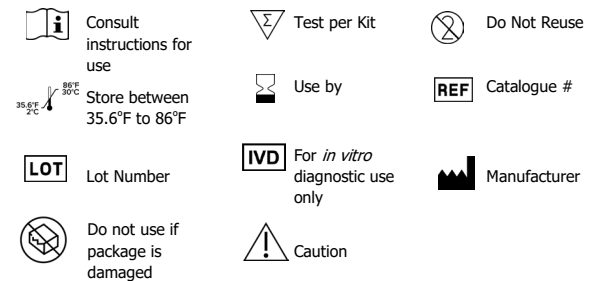
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## Glossary of Symbols



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