ab108711

Borrelia burgdorferi IgM Human ELISA Kit

Instructions for Use

For the qualitative determination of IgM class antibodies against Borrelia burgdorferi in Human serum or plasma (citrate).

This product is for research use only and is not intended for *in vitro* diagnostic use.

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ab108711 Borrelia burgdorferi IgM Human ELISA Kit
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1. Introduction

ab108711 Borrelia burgdorferi IgM Human ELISA Kit is intended for the qualitative determination of IgM class antibodies against Borrelia burgdorferi in human serum or plasma (citrate) offering increased diagnostic specificity and sensitivity by employing immunodominant antigens.

Spirochetes are motile bacteria with a periplasmatic axial filament. All pathogenic species belong to the family Treponemataceae, which includes the three genera: Treponema, Borrelia, and Leptospira. The Treponemae are extremely long, flexible, filamentous cells that are usually held in a characteristic spiral, or coiled-spring shape. Borreliae are the largest Treponemataceae with very coarse and irregular spirals. Borrelia burgdorferi, the causative agent of Lyme disease, is transmitted mainly by ticks but probably also by other blood-sucking insects. Habitats are the wooded, humid and temperate regions of North America, Europe, North Africa, Australia and Japan. The degree of contamination of ticks amounts to 3-60% dependent on seasonal and regional differences; up to 30% of the population may be infected (about 1500 cases annually in USA, several hundred in Europe).
2. Assay Summary

The major constituent of B. burgdorferi flagella is flagellin (41 kDa, p41), whereas the lipoprotein OspC (22 kDa, p22) within the outer membrane of the spirochete induces an early antibody formation in the ECM-phase of Lyme disease. Recombinant p41i is included in the presented antigens to avoid crossreactivity with antibodies of syphilitic sera. ab108711 contains the recombinant epitope OspC of the phylum PKo (B. afzelii) and 20047 (B. garinii) and p41i of the phylum PBi (B. garinii).

Microtiter strip wells are precoated with recombinant B. burgdorferi antigens Diluted specimens and ready to use controls are added to these wells and antibodies recognizing the immobilized B. burgdorferi antigen bind during the first incubation.

After washing the wells to remove all unbound sample and control material horseradish peroxidase labeled anti-human IgM conjugate is added. This conjugate binds to the captured antibodies, and the excess unbound conjugate is removed by a further wash step.

The immune complex formed by the bound conjugate is visualized by adding Tetramethylbenzidine (TMB) substrate which gives a blue reaction product. The intensity of this product is proportional to the amount of B. burgdorferi specific IgM antibodies in the specimen.

Sulphuric acid is added to stop the reaction. This produces a yellow endpoint color. Absorption at 450 nm is read using an ELISA microwell plate reader.
3. Kit Contents

- **Borrelia burgdorferi Coated Wells (IgM):** 12 break apart 8-well snap-off strips coated with Borrelia burgdorferi antigen; in resealable aluminium foil.
- **IgM Sample Diluent ***:** 1 bottle containing 100 ml of buffer for sample dilution; pH 7.2 ± 0.2; colored green; white cap.
- **Stop Solution:** 1 bottle containing 15 ml sulphuric acid, 0.2 mol/l; ready to use; red cap.
- **Washing Solution (20x conc.)*:** 1 bottle containing 50 ml of a 20-fold concentrated buffer (pH 7.2 ± 0.2) for washing the wells; white cap.
- **Borrelia burgdorferi anti-IgM Conjugate**: 1 bottle containing 20 ml of peroxidase labelled rabbit antibody to human IgM; colored red, ready to use; black cap.
- **TMB Substrate Solution:** 1 bottle containing 15 ml 3,3′,5,5′-tetramethylbenzidine (TMB); ready to use; yellow cap.
- **Borrelia burgdorferi IgM Positive Control***: 1 bottle containing 2 ml; colored yellow; ready to use; red cap.
- **Borrelia burgdorferi IgM Cut-off Control***: 1 bottle containing 3 ml; colored yellow; ready to use; green cap.
- **Borrelia burgdorferi IgM Negative Control***: 1 bottle containing 2 ml; colored yellow; ready to use; blue cap.
- **Strip holder:** 1
• **Cover foil:** 1

* contains 0.1 % Bronidox L after dilution  
** contains 0.2 % Bronidox L  
*** contains 0.1 % Kathon

### 4. Storage and Handling

The reagents are stable up to the expiry date stated on the label when stored at 2-8°C.

### 5. Additional Materials Required

- ELISA microwell plate reader, equipped for the measurement of absorbance at 450/620 nm  
- Incubator 37°C  
- Manual or automatic equipment for rinsing wells  
- Pipettes to deliver volumes between 10 and 1000 µl  
- Vortex tube mixer  
- Deionised or (freshly) distilled water  
- Disposable tubes  
- Timer
6. Preparation of Reagents

It is very important to bring all reagents, samples and standards to room temperature (20-25 °C) before starting the test run.

1. **Coated snap-off Strips:** The ready to use break apart snap-off strips are coated with *Borrelia burgdorferi* antigen. Store at 2-8°C. Immediately after removal of strips, the remaining strips should be resealed in the aluminium foil along with the desiccant supplied and stored at 2-8 °C; stability until expiry date.

2. **Borrelia burgdorferi anti-IgM Conjugate:** The bottle contains 20 ml of a solution with anti-human-IgM horseradish peroxidase, buffer, stabilizers, preservatives and an inert red dye. The solution is ready to use. Store at 2-8°C. After first opening stability until expiry date when stored at 2-8 °C.

3. **Controls:** The bottles labelled with Positive, Cut-off and Negative Control contain a ready to use control solution. It contains 0.1% Kathon and has to be stored at 2-8 °C. After first opening stability until expiry date when stored at 2-8 °C.

4. **IgM Sample Diluent:** The bottle contains 100 ml phosphate buffer, anti-human-IgG, stabilizers, preservatives and an inert green dye. It is used for the dilution of the specimen. The solution contains anti-human IgG class antibodies to eliminate competitive inhibition from specific IgG class antibody to remove rheumatoid factor. This ready to use solution has to be
stored at 2-8°C. After first opening stability until expiry date when stored at 2-8°C.

5. **Washing Solution (20x conc.):** The bottle contains 50 ml of a concentrated buffer, detergents and preservatives. Dilute Washing Solution 1+19; e.g. 10 ml Washing Solution + 190 ml fresh and germ free redistilled water. The diluted buffer is stable for 5 days at room temperature. Crystals in the solution disappear by warming up to 37°C in a water bath. After first opening stability until expiry date when stored at 2-8°C.

6. **TMB Substrate Solution:** The bottle contains 15 ml of a tetramethylbenzidine/hydrogen peroxide system. The reagent is ready to use and has to be stored at 2-8°C away from the light. The solution should be colorless or could have a slight blue tinge. If the substrate turns into blue, it may have become contaminated and should be thrown away. After first opening stability until expiry date when stored at 2-8°C.

7. **Stop Solution:** The bottle contains 15 ml 0.2 M sulphuric acid solution (R 36/38, S 26). This ready to use solution has to be stored at 2-8°C. After first opening stability until expiry date.

7. **Preparation and Collection of Specimen**

Use human serum or plasma (citrate) samples with this assay. If the assay is performed within 5 days after sample collection, the
specimen should be kept at 2-8°C; otherwise they should be aliquoted and stored deep-frozen (-20 to -70°C). If samples are stored frozen, mix thawed samples well before testing. Avoid repeated freezing and thawing.

Heat inactivation of samples is not recommended.

**Sample Dilution:**

Before assaying, all samples should be diluted 1+100 with IgM Sample Diluent. Dispense 10μl sample and 1ml IgM Sample Diluent into tubes to obtain a 1+100 dilution and thoroughly mix with a Vortex.

8. **Assay Method**

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**Test Preparation**

Please read the test protocol carefully before performing the assay. Result reliability depends on strict adherence to the test protocol as described. If performing the test on ELISA automatic systems we recommend to increase the washing steps from three to five and the volume of washing solution from 300μl to 350μl to avoid washing effects. Prior to commencing the assay, the distribution and identification plan for all specimens and controls should be carefully
established. 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 blank
- 1 well (e.g. B1) for the negative control
- 2 wells (e.g. C1+D1) for the cut-off control and
- 1 well (e.g. E1) for the positive control

- It is recommended to determine controls and samples in duplicate, if necessary.
- Perform all assay steps in the order given and without any appreciable delays between the steps.
- A clean, disposable tip should be used for dispensing each standard and each sample.
- Adjust the incubator to 37° ± 1°C.

**Assay Procedure:**

1. Dispense 100 µl controls and diluted samples into their respective wells. Leave well A1 for substrate blank.
2. Cover wells with the foil supplied in the kit.
3. **Incubate for 1 hour ± 5 min at 37±1°C.**
4. When incubation has been completed, remove the foil, aspirate the content of the wells and wash each well three times with 300µl of Washing Solution. Avoid overflows from the reaction wells. The soak time between each wash cycle should be >5sec.
At the end carefully remove remaining fluid by tapping strips on tissue paper prior to the next step!

*Note: Washing is critical! Insufficient washing results in poor precision and falsely elevated absorbance values.*

5. Dispense 100μl Borrelia burgdorferi anti-IgM Conjugate into all wells except for the blank well (e.g. A1). Cover with foil.

6. **Incubate for 30 min at room temperature. Do not expose to direct sunlight.**

7. Repeat step 4.

8. Dispense 100μl TMB Substrate Solution into all wells.

9. **Incubate for exactly 15 min at room temperature in the dark.**

10. Dispense 100μl Stop Solution into all wells in the same order and at the same rate as for the TMB Substrate Solution.

   *Any blue colour developed during the incubation turns into yellow.*

   *Note: Highly positive samples can cause dark precipitates of the chromogen! These precipitates have an influence when reading the optical density. Predilution of the sample with physiological sodium chloride solution, for example 1+1, is recommended. Then dilute the sample 1+100 with dilution buffer and multiply the results in NTU by 2.*

11. Measure the absorbance of the specimen at 450/620 nm within 30 min after addition of the Stop Solution.
Measurement:

Adjust the ELISA Microwell Plate 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 standard and sample.

Dual wavelength reading using 620 nm as reference wavelength is recommended.

Where applicable calculate the mean absorbance values of all duplicates.

9. Data Analysis

A. Run Validation Criteria

In order for an assay to be considered valid, the following criteria must be met:
Substrate blank in A1: Absorbance value < 0.100.

Negative control in B1: Absorbance value < 0.200 and < cut-off.

Cut-off control in C1 and D1: Absorbance value 0.150 – 1.300.

Positive control in E1: Absorbance value > cut-off.

If these criteria are not met, the test is not valid and must be repeated.

B. Calculation of Results

The cut-off is the mean absorbance value of the Cut-off control determinations.

Example: Absorbance value Cut-off control 0.39 + absorbance value Cut-off control 0.37 =0.76 / 2 = 0.38

Cut-off = 0.38

C. Interpretation of Results

Samples are considered POSITIVE if the absorbance value is higher than 10% over the cut-off.
Samples with an absorbance value of 10% above or below the cut-off should not be considered as clearly positive or negative → grey zone

It is recommended to repeat the test again 2 - 4 weeks later with a fresh sample. If results in the second test are again in the grey zone the sample has to be considered **NEGATIVE**.

Samples are considered **NEGATIVE** if the absorbance value is lower than 10% below the cut-off.

**D. Results in Abcam Units**

\[
\frac{\text{Sample (mean) absorbance value} \times 10}{\text{Cut off}} = \text{[Abcam Units = NTU]}
\]

*Example: \( \frac{1.216 \times 10}{0.38} = 32 \text{ NTU [Abcam Units = NTU]} \)*

- Cut-off: 10 NTU
- Grey zone: 9-11 NTU
- Negative: <9 NTU
- Positive: >11 NTU

**E. Precision**

<table>
<thead>
<tr>
<th>Intra-assay</th>
<th>n</th>
<th>Mean</th>
<th>Cv (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pos. Serum</td>
<td>8</td>
<td>1.06</td>
<td>8.6</td>
</tr>
</tbody>
</table>
**Inter-assay**

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Mean</th>
<th>Cv (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pos. Serum</td>
<td>14</td>
<td>0.76</td>
<td>4.1</td>
</tr>
</tbody>
</table>

**F. Specificity**

The specificity is defined as the probability of the assay of scoring negative in the absence of the specific analyte. It is 98.8 %.

**G. Sensitivity**

The sensitivity is defined as the probability of the assay of scoring positive in the presence of the specific analyte. It is 93 %.

**H. Interferences**

Interferences with hemolytic, lipemic or icteric sera are not observed up to a concentration of 10 mg/ml hemoglobin, 5 mg/ml triglycerides and 0.2 mg/ml bilirubin.

**Note:** The results refer to the groups of samples investigated; these are not guaranteed specifications.
10. Limitations

- Bacterial contamination or repeated freeze-thaw cycles of the specimen may affect the absorbance values.
- A negative result (IgM or IgG) cannot exclude an infection with B. burgdorferi. Especially in the early phase of infection there is the possibility that none or no detection quantities of the antibodies do exist. In the case of infection or a grey zone result we recommend a further sample after 2-3 weeks. A positive result of IgM does not always mean that an acute infection exists because the antibodies of a previous infection can persist.
- The use of recombinant antigens avoid extensively cross reactions with the following antibodies: Treponema pallidum, Leptospira, Borrelia recurrentis. Antibodies of a lues-infection to p41i were occasionally determined. Therefore a lues-infection should be excluded.
## 11. Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low signal</td>
<td>Incubation time too short</td>
<td>Try overnight incubation at 4°C</td>
</tr>
<tr>
<td></td>
<td>Precipitate can form in wells upon substrate addition when concentration of target is too high</td>
<td>Increase dilution factor of sample</td>
</tr>
<tr>
<td></td>
<td>Using incompatible sample type (e.g. serum vs. cell extract)</td>
<td>Detection may be reduced or absent in untested sample types</td>
</tr>
<tr>
<td></td>
<td>Sample prepared incorrectly</td>
<td>Ensure proper sample preparation/dilution</td>
</tr>
<tr>
<td>Large CV</td>
<td>Bubbles in wells</td>
<td>Ensure no bubbles present prior to reading plate</td>
</tr>
<tr>
<td></td>
<td>All wells not washed equally/thoroughly</td>
<td>Check that all ports of plate washer are unobstructed/wash wells as recommended</td>
</tr>
<tr>
<td></td>
<td>Incomplete reagent mixing</td>
<td>Ensure all reagents/master mixes are mixed thoroughly</td>
</tr>
<tr>
<td></td>
<td>Inconsistent pipetting</td>
<td>Use calibrated pipettes &amp; ensure accurate pipetting</td>
</tr>
<tr>
<td></td>
<td>Inconsistent sample preparation or storage</td>
<td>Ensure consistent sample preparation and optimal sample storage conditions (e.g. minimize freeze/thaws cycles)</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>High background</th>
<th>Wells are insufficiently washed</th>
<th>Wash wells as per protocol recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Contaminated wash buffer</td>
<td>Make fresh wash buffer</td>
</tr>
<tr>
<td></td>
<td>Waiting too long to read plate after adding STOP solution</td>
<td>Read plate immediately after adding STOP solution</td>
</tr>
<tr>
<td>Low sensitivity</td>
<td>Improper storage of ELISA kit</td>
<td>Store all reagents as recommended. Please note all reagents may not have identical storage requirements.</td>
</tr>
<tr>
<td></td>
<td>Using incompatible sample type (e.g. Serum vs. cell extract)</td>
<td>Detection may be reduced or absent in untested sample types</td>
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For further technical questions please do not hesitate to contact us by email ([technical@abcam.com](mailto:technical@abcam.com)) or phone (select “contact us” on [www.abcam.com](http://www.abcam.com) for the phone number for your region).
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