MAYO CLINIC LABORATORIES

# Test Definition: BMIYC

Borrelia miyamotoi Detection PCR, Spinal Fluid

## Overview

### Useful For

Aids in the diagnosis of *Borrelia miyamotoi* infection in conjunction with clinical findings

This test is **not useful for** detecting the *Borrelia* species that cause Lyme disease.

### Testing Algorithm

For more information see Acute Tick-Borne Disease Testing Algorithm

### Special Instructions

- Acute Tick-borne Disease Testing Algorithm

### Highlights

This test is intended as an aid in the diagnosis of *Borrelia miyamotoi* infection in conjunction with clinical findings.

The preferred method for detecting *B miyamotoi* is polymerase chain reaction.

### Method Name

Real-Time Polymerase Chain Reaction (PCR)

### NY State Available

Yes

## Specimen

### Specimen Type

CSF

### Ordering Guidance

This assay does not detect the *Borrelia* species that cause Lyme disease.

### Specimen Required

**Container/Tube:** Sterile vial

**Specimen Volume:** 1 mL

**Collection Instructions**: Submit aliquot from collection vial 2.

### Forms

If not ordering electronically, complete, print, and send Microbiology Test Request (T244) with the specimen.

### Specimen Minimum Volume

0.3 mL

### Reject Due To

All specimens will be evaluated at Mayo Clinic Laboratories for test suitability.

### Specimen Stability Information

| Specimen Type | Temperature | Time | Special Container |
|---|---|---|---|
| CSF | Refrigerated (preferred) | 7 days | |
| | Frozen | 7 days | |

## Clinical & Interpretive

### Clinical Information

*Borrelia miyamotoi* is a spirochetal bacterium. It is a member of the tick-borne relapsing fever borreliae and is more distantly related to the *Borrelia* species that cause Lyme disease. This organism causes a febrile illness with body and joint pain, fatigue, and, rarely, rash, and has been detected in *Ixodes scapularis* and *Ixodes pacificus* ticks. These ticks are also the vectors for Lyme disease, anaplasmosis, and babesiosis.

The preferred method for detecting *B miyamotoi* is real-time polymerase chain reaction. Less commonly, *B miyamotoi* spirochetes can be detected in cerebrospinal fluid preparations in patients with invasive neurologic disease. This assay does not detect the *Borrelia* species that cause Lyme disease.

### Reference Values

Negative

### Interpretation

A positive result indicates the presence of *Borrelia miyamotoi* DNA and is consistent with active or recent infection. While positive results are highly specific indicators of disease, they should be correlated with symptoms and clinical findings of tick-borne relapsing fever. Less commonly, this test may also detect the nucleic acid of other relapsing fever borreliae; when detected, the report indicates the presence of relapsing fever *Borrelia* species, not *B miyamotoi.*

### Cautions

Inadequate specimen collection or improper storage may invalidate test results.

*Borrelia miyamotoi* DNA may be detectable for an unknown period of time after adequate treatment.

### Supportive Data

The following assay verification data supports the use of this assay for clinical testing.

Accuracy/Diagnostic Sensitivity and Specificity:
The sensitivity and specificity of the polymerase chain reaction (PCR) assay using clinical and spiked specimens are 100%.

Analytical Sensitivity/Limit of Detection:
The limit of detection is 2800 target copies/mL (5.6 target copies/mcL) of whole blood or spinal fluid.

Analytical Specificity:
No PCR signal was obtained from the extracts of 31 bacterial, viral, parasitic, and fungal isolates from similar organisms or from organisms commonly found in the specimens tested.

Precision:
Interassay and intra-assay precisions are 100%.

Reference Range:
The reference range of this assay is negative. This assay is designed to detect only species of clinical significance and is to be used for patients with a clinical history and symptoms consistent with tick-borne relapsing fever. It should not be used to screen healthy patients.

Reportable Range:
This is a qualitative assay, and the results are reported as negative or positive for *Borrelia miyamotoi* DNA.

### Clinical Reference

1. Centers for Disease Control and Prevention. About Hard Tick Relapsing Fever. CDC; 2024. Accessed December 30, 2025. Available at www.cdc.gov/relapsing-fever/about/about-htrf.html
2. Hoornstra D, Azagi T, van Eck JA, et al. Prevalence and clinical manifestation of Borrelia miyamotoi in Ixodes ticks and humans in the northern hemisphere: a systematic review and meta-analysis. Lancet Microbe. 2022;3(10):e772-e786. doi:10.1016/S2666-5247(22)00157-4
3. Miller JM, Binnicker MJ, Campbell S, et al. Guide to Utilization of the Microbiology Laboratory for Diagnosis of Infectious Diseases: 2024 Update by the Infectious Diseases Society of America (IDSA) and the American Society for Microbiology (ASM). Clin Infect Dis. Published online March 5, 2024. doi:10.1093/cid/ciae104
4. Kubiak JM, Klevay M, Hilt EE, Ferrieri P. Acute meningoencephalitis associated with Borrelia miyamotoi, Minnesota, USA. Emerg Infect Dis. 2024;30(7):1472-1474. doi:10.3201/eid3007.231611
5. Rodino KG, Pritt BS. When to think about other borreliae:: Hard tick relapsing fever (Borrelia miyamotoi), Borrelia mayonii, and beyond. Infect Dis Clin North Am. 2022;36(3):689-701. doi:10.1016/j.idc.2022.04.002

## Performance

### Method Description

The assay is performed on the Roche LightCycler (LC) 480 instrument, following DNA extraction on the Roche MagNA Pure. The LC 480 instrument amplifies and monitors the development of target nucleic acid (amplicon) after each polymerase chain reaction (PCR) cycle.

The DNA target for this PCR assay is a gene encoding the glycerophosphodiester phosphodiesterase (*glpQ*) gene specific to *Borrelia* species in the relapsing fever group. This gene is not found in *Borrelia* species that cause Lyme disease.

The specific base pair DNA target sequence is amplified by PCR. The detection of amplicon is based on fluorescence resonance energy transfer (FRET), which utilizes 1 hybridization probe with a donor fluorophore, fluorescein, at the 3' end, and a second hybridization probe with an acceptor fluorophore, LC-Red 640, at the 5' end. When the target

amplicon is present, the LC-Red 640 emits a measurable and quantifiable light signal at a specific wavelength. Presence of the specific organism nucleic acid is confirmed by performing a melting temperature analysis of the amplicon; the presence or absence of a melting peak in the appropriate temperature range is used to determine if a specimen is positive or negative.(Unpublished Mayo method)

### PDF Report
No

### Day(s) Performed
Monday through Sunday

### Report Available
1 to 4 days

### Specimen Retention Time
1 week

### Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Main Campus

## Fees & Codes

### Fees
- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

### Test Classification
This test was developed and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA requirements. It has not been cleared or approved by the US Food and Drug Administration.

### CPT Code Information
87478

### LOINC® Information

| Test ID | Test Order Name | Order LOINC® Value |
|---|---|---|
| BMIYC | Borrelia miyamotoi Detection PCR, C | 82476-3 |

| Result ID | Test Result Name | Result LOINC® Value |
|---|---|---|
| 64969 | B. miyamotoi PCR, C | 82476-3 |