



Why Early-Stage Lyme *Borrelia* Is Commonly Under-Detected

Description

Early Lyme disease is frequently missed not because it is rare, but because pathogen biology and host immune dynamics complicate detection.



Reasons for Under-Detection

1. Delayed Antibody Development

- IgM often rises weeks 3 to 6
- IgG may take longer or fail to mature
- Up to approximately 50% of patients may be seronegative early

2. Incomplete Class Switching

- Disrupted germinal center responses
- Weak immune memory
- Low antibody titers despite ongoing infection

3. Antigenic Variation

- Surface protein switching, such as VlsE
- Antibodies chase changing targets
- Serologic assays may miss active variants

4. Rapid Tissue Dissemination

- Bloodstream residency is brief
- Organisms preferentially localize to skin, joints, heart, and central nervous system
- Blood bacterial burden becomes negligible

Both serology and blood PCR may fail early

5. Variable Clinical Presentation

- Erythema migrans often absent
- Symptoms overlap with viral or inflammatory illness
- Tick exposure often unnoticed

Mosaic offers tests and combination panels to meet every patient's needs

Lyme + Co-infections



		Lyme Borrelia Direct Detect	Bartonella IgG Detect - IFA	Tickborne BBB Direct Detect (1 or 3 day)
Methodology		Nanotrap® Direct	Immunofluorescence (IFA) Indirect	Digital PCR (dPCR) Direct
Sample Type		Urine	Serum (yellow top)	Blood (lavender top)
Test ID	Description	Confirms current presence of OspA antigen in easy-to-collect urine samples.	Confirms antibodies against the four most common species of infection based on published research.	Confirms current presence of pathogens by detecting DNA for a broad range of Bartonella, Borrelia, and Babesia species in whole blood.
INDIVIDUAL PROFILES				
1	Lyme Borrelia Direct Detect	✓		
2	Bartonella IgG Detect - IFA		✓	
3	Tickborne BBB Direct Detect - 1 day			✓
7	Tickborne BBB Direct Detect - 3 day			✓
COMBINATION PROFILES				
4	Lyme + Bartonella IgG Detect	✓	✓	
5	Tickborne BBB Plus - 1 day		✓	✓
8	Tickborne BBB Plus - 3 day		✓	✓
6	Lyme + Co-infections Comprehensive - 1 day	✓	✓	✓
9	Lyme + Co-infections Comprehensive - 3 day	✓	✓	✓

Test (by clinical suspicion)

Lyme-only suspicion

- 1** Lyme Borrelia Direct Detect (Nanotrap)
Best matrix for Lyme; validated in acute (EM rash) and chronic/PTLDS populations.

Bartonella suspicion

- 5** **8** Tickborne BBB Plus
= Tickborne BBB Direct Detect + Bartonella IgG Detect
1 day 3 day

Babesia suspicion

- 3** **7** Tickborne BBB Direct Detect
Triple (3 day) vs single (1 day) blood draw
- When feasible, choose triple draw for Tickborne BBB Direct Detect—serial sampling increases the probability of detecting low-abundance pathogens.

Tick-borne illness, unsure which pathogen

- 6** **9** Lyme + Co-infections Comprehensive
= Lyme Borrelia Direct Detect + Bartonella IgG Detect + BBB Direct Detect
1 day 3 day