

# Evaluation of two automated tests on the VIDAS® system to detect anti-Lyme disease antibodies IgG and IgM in human serum, plasma and CSF

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## INTRODUCTION

Lyme disease or Lyme *Borreliosis* is an infectious disease caused by at least three species of bacteria belonging to the genus *Borrelia*. *Borrelia burgdorferi sensu stricto* is the main cause of Lyme disease in the United States, whereas *B. afzelii* and *B. garinii* cause most European cases. VIDAS® Lyme IgG and VIDAS® Lyme IgM new generation (bioMérieux, France) are two automated ELISA tests for the qualitative detection of IgG or IgM antibodies against *B. burgdorferi sensu lato* (*B. afzelii*, *B. garinii*, *B. burgdorferi sensu stricto*) in human serum or plasma. VIDAS Lyme IgG can also detect IgG in cerebrospinal fluid. Preliminary analytical and clinical performance were assessed.

## MATERIAL AND METHODS

### A- MATERIAL:

#### 1. Instrument

All of the assay steps are performed automatically by the VIDAS system. The main characteristics of this system are its ease of use, robustness, cost effectiveness and large menu.

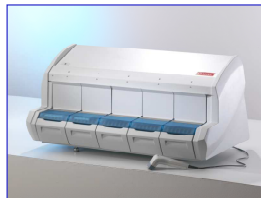


Figure 1: VIDAS System

#### 2. Assay

**2.1. Assay principle:** The assay principle combines a two-step enzyme immunoassay sandwich method with a final fluorescent detection (ELFA).

The two step sandwich method includes washes between steps. Specific recombinant proteins VlsE, DbpA and OspC are used on the ELISA solid phase to recognize and capture serum antibodies.

#### 2.2. Assay features:

- Time to result: 27 min,
- Sample type: serum, plasma, CSF,
- Sample volume: 100 µL,
- No equivocal range for IgG.

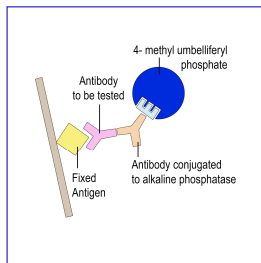


Figure 2: Sandwich method

### B- METHOD:

#### 1. Clinical sensitivity study:

About 300 human serum samples were evaluated with the VIDAS Lyme IgG and Lyme IgM assays. All sera were from patients with well-established clinical status of early Lyme borreliosis (EM including seroconversion) or early disseminated (neuroborreliosis) and late Lyme borreliosis (arthritis – ACA: Acrodermatitis chronica atropicans).

#### 2. Clinical specificity and cross-reactivity studies:

Specificity for both IgG and IgM assays was assessed using sera from endemic area healthy people (N= 200) and patients with EBV, HAV, syphilis (N=130).

Other cross-reactivities with Spirocheatae bacteria (*Leptospira*), HSV, CMV, Toxoplasma and non-specific antibodies such as: rheumatoid factor (RF), antinuclear antibody (ANA), human anti-mouse antibody (HAMA), systemic lupus erythematosus (SLE) were analyzed.

#### 3. Precision study:

The precision study was performed according to the CLSI document EP5-A2 with samples around the cut-off.

#### 4. IgG detection in Cerebro Spinal Fluid (CSF):

Preliminary assays for IgG detection in CSF were performed on 12 samples with intrathecal antibody production (IAP) and 16 without IAP.

#### 2. Clinical specificity and cross reactivity studies:

Specificity default and cross reactions observed with Spirocheatae bacteria, EBV, HAV, HSV, CMV infectious diseases and as well as autoimmune diseases (RF, ANA, SLE, HAMA) were evaluated < 5 % in VIDAS Lyme IgG test. With non specific interference neutralisation during the test, specificity default and cross- reactions observed are estimated < 8% in VIDAS Lyme IgM test.

#### 3. Precision study on Lyme IgM and IgG tests:

The total precision % CV observed was < 10% for a sample around the cut-off, was <12% in reproducible conditions with intermediate calibration.

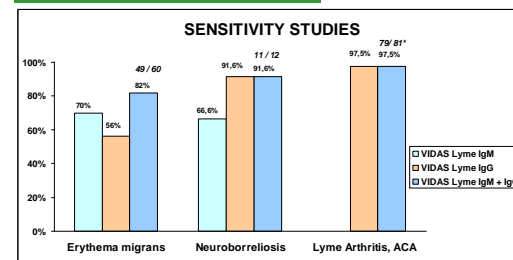
#### 4. IgG detection in CSF:

Using VIDAS Lyme IgG reagents, the CSF specific protocol (LYGS) requires 100 µL of CSF to indicate a CSF test value (TV).

The patient intrathecal synthesis index is established with the ratio of CSF and serum VIDAS Lyme IgG test results corrected as a ratio of their albumin concentrations. A patient index > 2 consolidates a neuroborreliosis diagnosis. The preliminary results for IgG detection in CSF on 12 samples with intrathecal antibodies production were conform to expectations, as well as the 16 cases without IAP.

## RESULTS

### 1. Clinical sensitivity studies including seroconversion situations and neuroborreliosis with IAP



\* 2 seronegative Lyme arthritis

## CONCLUSION

The VIDAS Lyme IgG new generation assay, without equivocal status results, showed good sensitivity and specificity and a rapid time to result (27'). Preliminary testing on CSF, performed in the same manner as serum samples, appears promising. The VIDAS Lyme IgM new generation assay, with equivocal status results, showed good sensitivity and specificity. Using specific recombinant proteins, the VIDAS Lyme IgG and IgM assays provide good specificity allowing precise and accurate assessment of disease status.