

## The two tier serum test for Lyme antibodies

### Testing:

#### Issue Number:

- 1.1. The 2 Tier methodology widely recommended in Europe and the USA for testing serum samples for Lyme disease detects just over 50% of positive case, based on trials under strictly controlled research laboratory conditions.

#### Source:

Studies from 1996 to 2010 evaluated commercial ELISA and Western Blot test kits using the "2 Tier" test methodology. The results were produced by teams of researchers and assistants free from many of the factors that govern busy microbiology labs. Using well defined borrelia infected serum panels, sensitivities between 17% and 100% were achieved with a 58% average.

Test failures (false negative results) up to 83% were observed by Steere et al with serum panels selected based on clinical diagnosis and prior positive serology as defined by the US Center for Disease Control.

### Summary of Serology Test data using 2 Tier Testing Methodology

Author	Symptoms	Test	Sensitivity	Range
(Johnson et al., 1996)	Culture	2 Tier	75%	56% - 100%
(Trevejo et al., 1999)	EM	2 Tier	31%	29% - 32%
(Nowakowski et al., 2008)	Clinical	2 Tier	53%	40% - 66%
(Steere et al., 2008)	CDC	2 Tier	67%	17% - 100%
(Branda et al., 2010)	CDC	2 Tier	64%	64% - 100%
Average and Range of studies			58%	17% - 100%

Culture = Patients selected based on positive culture of Borrelia spirochaetes

EM = Erythema migrans rash

Clinical = Patients with clinical diagnosis of Lyme disease

CDC = Patient meeting Center for Disease Control definition which requires clinical symptoms and positive serology.

### References:

- Branda, J. a, Aguero-Rosenfeld, M. E., Ferraro, M. J., Johnson, B. J. B., Wormser, G. P., & Steere, A. C. (2010). 2-tiered antibody testing for early and late Lyme disease using only an immunoglobulin G blot with the addition of a VlsE band as the second-tier test. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America*, 50(1), 20-6. doi:10.1086/648674
- Johnson, B. J. B., Robbins, K. E., Bailey, R. E., Cao, B.-liang, Sviat, S. L., Craven, R. B., Mayer, L. W., et al. (1996). Serodiagnosis of Lyme Disease : Accuracy of a Two-Step Approach Using a Flagella-Based ELISA and Immunoblotting. *Test*, 346-353.
- Nowakowski, J., Schwartz, I., Liveris, D., Wang, G., Aguero-Rosenfield, M. E., Girao, G., McKenna, D., et al. (2008). Laboratory Diagnostic Techniques for Patients with Early Lyme Disease Associated with Erythema Migrans: A Comparison of Different Techniques. University of Chicago Press. Retrieved from <http://www.jstor.org/pss/4482944>
- Steere, A. C., McHugh, G., Damle, N., & Sikand, V. K. (2008). Prospective study of serologic tests for lyme disease. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America*, 47(2), 188-95. doi:10.1086/589242
- Trevejo, R. T., Krause, P. J., Sikand, V. K., Schriefer, M. E., Ryan, R., Lepore, T., Porter, W., et al. (1999). Evaluation of two-test serodiagnostic method for early Lyme disease in clinical practice. *The Journal of infectious diseases*, 179(4), 931-8. doi:10.1086/314663

