



## Anti-VlsE ELISA Dog (IgG)



- Highly specific marker for early diagnosis of *Borrelia* infections
- High specificity due to the use of a recombinant antigen
- Efficient automation solutions available



### Technical data

<b>Antigen</b>	Recombinantly produced and highly purified VlsE (variable major protein-like sequence, expressed) antigen of <i>Borrelia</i>
<b>Calibration</b>	Semiquantitative: Calculation of a ratio from the extinction of the sample and the extinction of the calibrator
<b>Result interpretation</b>	EUROIMMUN recommends interpreting results as follows: Ratio < 0.8: negative Ratio ≥ 0.8 to < 1.1: borderline Ratio ≥ 1.1: positive
<b>Sample dilution</b>	Canine serum or plasma, 1 : 101 in sample buffer
<b>Reagents</b>	Ready for use, with the exception of the wash buffer (10x), colour-coded solutions
<b>Test procedure</b>	30 min (37°C) / 30 min (37°C) / 15 min (room temperature), fully automatable
<b>Measurement</b>	450 nm, reference wavelength between 620 nm and 650 nm
<b>Test kit format</b>	96 break-off wells; kit includes all necessary reagents
<b>Order no.</b>	<b>EI 2132-9601-1 GC</b>



### Clinical significance

In 1982 W. Burgdorfer found that ticks transmit "*Treponema*-like spirochaetes", which were later identified as the causative agent of Lyme borreliosis. In 1984, the disease was also described in dogs. The gram-negative bacteria causing Lyme borreliosis are collectively referred to as *Borrelia* (*B.*) *burgdorferi* sensu lato. In this group, the genospecies *Borrelia burgdorferi* sensu stricto, *Borrelia garinii* and *Borrelia afzelii* are pathogenic for dogs. Whereas in the U.S. only *B. burgdorferi* sensu stricto is relevant, more than 80% of the pathogenic genospecies in European ticks are *B. garinii* or *B. afzelii*.

The bacteria are transmitted to humans and animals by ticks of the *Ixodes* species. Due to frequent contact with ticks, dogs have a higher risk of infection. The majority of infections, however, proceed asymptotically and less than 5% of bites from infected ticks lead to clinical symptoms. The first symptoms of Lyme borreliosis in dogs are rather unspecific and include lethargy, loss of appetite and fever. Erythema migrans, a characteristic sign of borreliosis in humans, is not relevant in either dogs or horses since it cannot be seen through the fur or because of dark skin. The first more or less specific symptom in dogs is lameness due to myositis or arthritis, which generally occurs weeks or months after infection. Neurological impairments and damage to the kidneys (glomerulonephritis) or heart (myocarditis) are rarely described. Infection does not confer strong long-term immunity. Reinfection is therefore possible. Various vaccines are available for dogs. Antibodies against *Borrelia burgdorferi* can be found in the serum of specifically infected or vaccinated dogs.



## Diagnostic application

Direct detection of *Borrelia* using PCR or cultivation is reliable only in tissue samples, but not in blood samples. Therefore, serological detection of antibodies is the method of choice for laboratory diagnosis of Lyme borreliosis in dogs. IgG antibodies are first detectable 4 to 6 weeks after infection and persist for months or years. One of the most important antigens in diagnostics is VlsE (variable major protein-like sequence, expressed). It is a surface lipoprotein that is only expressed *in vivo* and is not contained in vaccines. VlsE is a highly specific marker for field infections, and infected dogs show a relatively early and strong IgG response to VlsE. It contains preserved, highly immunogenic epitopes which make the Anti-VlsE ELISA Dog (IgG) both highly sensitive and highly specific.

## Reproducibility

The reproducibility of the test was investigated by determining the intra- and inter-assay coefficients of variation using three samples. The intra-assay CVs are based on 20 determinations and the inter-assay CVs on three determinations performed in six different test runs.

Serum	Intra-assay variation, n=20		Inter-assay variation, n=3x6	
	Mean value (ratio)	CV (%)	Mean value (ratio)	CV (%)
1	1.1	3.8	1.1	3.6
2	2.3	1.4	2.3	3.6
3	3.5	4.3	3.3	4.6

## Cross reactions

No cross reactivities are known. Nonetheless, 27 sera from dogs vaccinated against leptospirosis were tested using the Anti-VlsE ELISA Dog (IgG). Furthermore, sera from 7 dogs, which were positive for antibodies against *Leptospira interrogans* when tested by microagglutination test (MAT), were analysed. All sera yielded a negative result in the Anti-VlsE ELISA Dog (IgG).

## Sensitivity and specificity

For investigation of sensitivity, 64 sera from dogs experimentally infected with *Borrelia burgdorferi* (withdrawn 5–15 weeks p.i.) were analysed using the EUROIMMUN Anti-VlsE ELISA Dog (IgG). For investigation of specificity, sera from 17 experimental dogs, sera from 6 dogs vaccinated against Lyme borreliosis (withdrawn 4–8 weeks p.v.) and sera from 7 dogs with confirmed antibodies against *Leptospira interrogans* were analysed. In these investigations, both the sensitivity and the specificity amounted to 100%.

n=94		Precharacterisation	
		positive	negative
EUROIMMUN Anti-VlsE ELISA Dog (IgG)	positive	63	0
	borderline	1	0
	negative	0	30

## Literature

1. Appel MJ, et al. **Experimental Lyme disease in dogs produces arthritis and persistent infection.** J Infect Dis 167(3):651-664 (1993).
2. Barthold SW, et al. **Serologic responses of dogs naturally exposed to or vaccinated against *Borrelia burgdorferi* infection.** J Am Vet Med Assoc 207(11):1435-1440 (1995).
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4. Embers ME, et al. **Dominant epitopes of the C6 diagnostic peptide of *Borrelia burgdorferi* are largely inaccessible to antibody on the parent VlsE molecule.** Clin Vaccine Immunol 14(8):931-936 (2007).
5. Krupka I, et al. **Lyme borreliosis in dogs and cats: background, diagnosis, treatment and prevention of infections with *Borrelia burgdorferi sensu stricto*.** Vet Clin North Am Small Anim Pract 40(6):1103-1119 (2010).
6. Liang FT, et al. **Characterization of a *Borrelia burgdorferi* VlsE invariable region useful in canine Lyme disease serodiagnosis by enzyme-linked immunosorbent assay.** J Clin Microbiol 38(11):4160-4166 (2000).
7. Rauter C, et al. **Prevalence of *Borrelia burgdorferi sensu lato* genospecies in *Ixodes ricinus* ticks in Europe: a metaanalysis.** Appl Environ Microbiol 71(11):7203-7216 (2005).