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Datasheet for 000-001-C33

VlsE Control Protein

Overview

Description:	VlsE Control Protein - 000-001-C33
Item No.:	000-001-C33
Size:	100 µg
Applications:	SDS-PAGE, WB, Biochemical Assay
Origin:	Borrelia burgdorferi
Expressed in:	E. coli

Product Details

Background:	Variable Lipoprotein Surface-Exposed protein, or VlsE, is a lipoprotein on the surface of the Lyme Disease spirochete Borrelia burgdorferi, detectable during all its life stages. It can exist as many different isoforms. VlsE has variable regions (VRs) and invariable regions (IRs). Some IRs are anchored in the outer membrane of the bacteria and some are antigens exposed on the membrane surface. Replacement of the VR by Borrelia within days of being transferred to a mammalian host presents new surface antigens to the host immune system, and helps Borrelia avoid a strong reaction by host immune systems. The VlsE is apparently not modified as much in the tick or in the rodent vector, when compared to in the mammal host. Several putative envelope proteins of B. burgdorferi appear to be expressed only in the infected mammalian host. The VRs are antigenic, irregularly shaped loops on the bacterial surface which may help to hide both membrane-incorporated and surface portions of adjacent proteins from immune cells. These VR loops are coded by antigenic cassettes. The protein loops can therefore be switched in or out of the protein, or different type loops traded. In B. burgdorferi there seem to be at least fifteen different VlsE cassettes that can insert into any of the variable regions of VlsE, allowing it to appear as millions of different antigens. Similar, but smaller, systems also operate for OSP-A, OSP-B, OSP-C, and other proteins. Some current research involves determination of control of cassette activation. One IR region, C6, of the VlsE protein, consistently stimulates a strong immune response. Its presentation may be a decoy that misdirects the immune system from less protected sites by causing competition for binding antibodies. The bound antibodies are thus not available for binding important therapeutic proteins. This may help Borrelia to enter T-cells, leading to their destruction. Because IR6 is invariable and found in all life stages of B. burgdorferi, it has been used in an ELISA diagnostic test for early IgM of Lyme Disease. Lyme disease proteins are ideal for researchers interested in immunology, neurology, rheumatology, coinfections, autoimmune, and neurodegenerative diseases.
Synonyms:	Outer surface protein VlsE, Borrelia burgdorferi VlsE, vlsE protein, control protein

Species of Origin:	Borrelia burgdorferi
Expressed in:	E. coli
Type:	Recombinant Protein

Target Details

Gene Name:	vlsE
Purity/Specificity:	VlsE is a fusion protein with an MBP tag and was expressed in E. coli. Analysis by SDS-PAGE resulted in a pattern consistent with purified VlsE and was estimated to be greater than 90% pure.
Relevant Links:	• UniProtKB - Q5DVG3 • NCBI - CAH61549.1 • GeneID - 1194357

Application Details

Tested Applications:	SDS-PAGE, WB
Suggested Applications:	Biochemical Assay (Based on references)
Application Note:	VlsE is suitable as a control in immunological assays. Specific conditions for reactivity should be optimized by the end user. Expect a band at 78.7 kDa for VlsE-MBP, (36.3 kDa for VlsE and 42.4 kDa for MBP) in size corresponding to VlsE by Western blotting in the appropriate cell lysate or extract. Variable Lipoprotein Surface-Exposed protein was tested in SDS-page and western blot.
Assay Dilutions:	All assays should be optimized by the user. Recommended dilutions (if any) may be listed below.
ELISA:	User Optimized
WB:	User Optimized

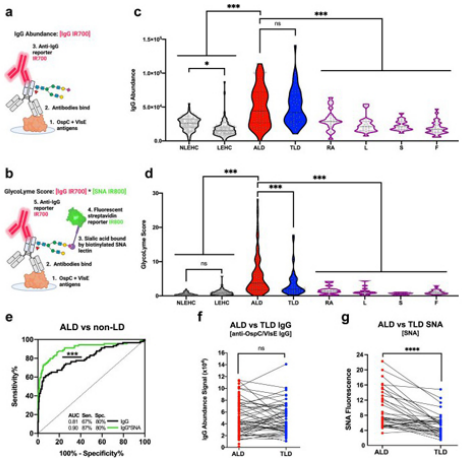
Formulation

Physical State:	Liquid (sterile filtered)
Concentration:	1.0 mg/mL by BCA assay
Buffer:	0.02 M Potassium Phosphate, 0.15 M Sodium Chloride, pH 7.2
Preservative:	0.01% (w/v) Sodium Azide
Stabilizer:	None

Shipping & Handling

Shipping Condition:	Dry Ice
Storage Condition:	Store vial at -20 °C prior to opening. Aliquot contents and freeze at -20 °C or below for extended storage. Avoid cycles of freezing and thawing. Centrifuge product if not completely clear after standing at room temperature. Dilute only prior to immediate use.
Expiration:	Expiration date is six (6) months from date of receipt.

Images



ELISA

Borrelia OspC- and VlsE- specific IgG combined with sialic acid abundance identifies acute Lyme disease patients.
(a) Example of traditional detection of Borrelia burgdorferi (Bb) antigen-specific antibodies using a fluorescent reporter created with BioRender. (b) Example of GlycoLyme method detects a multiplexed sialic acid content and anti-IgG signal in a Bb antigen-specific antibody population created with BioRender. (c) Comparison of IgG abundance from non-Lyme-endemic healthy controls (NLEHC) n = 96, Lyme-endemic healthy controls (LEHC) n = 111, acute Lyme disease (ALD) n = 89, treated Lyme disease (TLD) n = 50, rheumatoid arthritis (RA) n = 20, lupus (L) n = 20, syphilis (S) n = 20, and fibromyalgia (F) n = 20. (d) Comparison of GlycoLyme [anti-OspC/VlsE IgG⍰SNA] scores from non-Lyme-endemic healthy controls (NLEHC) n = 96, Lyme-endemic healthy controls (LEHC) n = 111, acute Lyme disease (ALD) n = 89, treated Lyme disease (TLD) n = 50, rheumatoid arthritis (RA) n = 20, lupus (L) n = 20, syphilis (S) n = 20, and fibromyalgia (F) n = 20. (e) Receiver operating characteristic (ROC) curve compares ALD to non-ALD (NLEHC, LEHC, RA, L, S, F) with and without accounting for sialic acid abundance using the GlycoLyme method was analyzed with DeLong's test to determine statical significance with ⍰⍰⍰p < 0.001. (f) Comparison of n = 35 GlycoLyme score positive ALD with matching TLD timepoint Bb-specific IgG abundance. (g) Comparison of n = 35 GlycoLyme score positive ALD with TLD time point Bb-specific immunoglobulin SNA fluorescence. Error bars present the mean ± standard deviation (SD). Borrelia OspC (p/n 000-001-C11) and VlsE (p/n 000-001-C33).
Statistical significance was determined using an ordinary one-way ANOVA with Tukey's multiple comparisons test with ⍰⍰⍰p < 0.001 for figures (a and b), while paired two-tailed student's t-test determined significance for figures (f and g) with ⍰⍰⍰⍰p < 0.0001 and ns = not significant.
Fig2. PMID: 38266555

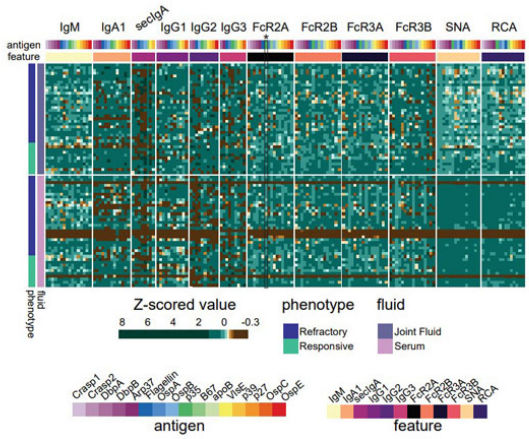


Figure
Systems serology profiling with Borrelia-specific antigens reveals patient heterogeneity. The heatmap shows the Z-scored measurements for 12 features, across 16 antigens for both refractory and responsive patients, visualized with joint fluid measurements in the upper half of the heatmap and serum measurements in the lower half of the heatmap. Only antigens detected above background for at least 30% of samples were included for each measurement. Statistical significance was assessed using the Mann-Whitney nonparametric test, with p values then corrected for multiple hypothesis testing via Benjamini-Hochburg, *p < 0.05, **p < 0.01, ***p < 0.001, else not significant. CRASP1 (p/n 000-001-C18), CRASP2 (p/n 000-001-C19), DbpA (p/n 000-001-B98), DbpB (p/n 000-001-C16), Arp37 (p/n 000-001-C09), flagellin (p/n 000-001-C14), OspA (p/n 000-001-C13), OspB (p/n 000-001-C15), OspC (p/n 000-001-C11), OspE (p/n 000-001-C10), p27 (p/n 000-001-C30), p35 (p/n 000-001-C12), p39 (p/n 000-001-C17), VlsE (p/n 000-001-C33). Fig 1. PMID: 38303696.

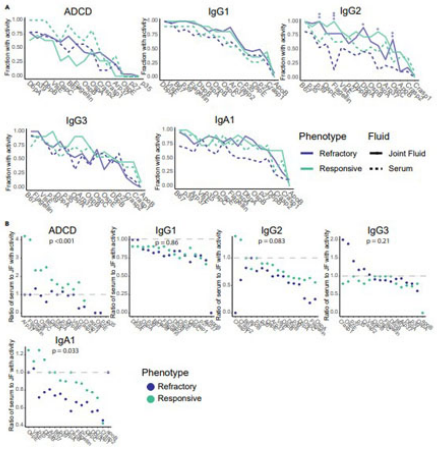
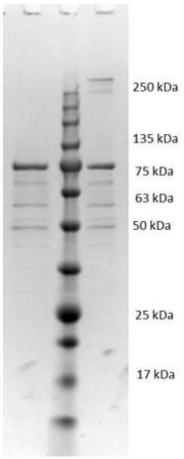


Figure
Antigen-specific IgG2, IgA1, and ADCD partitioning between compartments differs significantly across disease phenotypes. (A) Fraction of samples with non-zero measurements for ADCD, IgG1, IgG2, IgG3, and IgA1 for refractory (dark blue) and responsive (green) patients in the serum (dashed line) and joint fluid (solid line) for each antigen. Significant differences in distribution of non-zero measurements between fluids as assessed by a Fisher's exact test are denoted as *p < 0.05, **p < 0.01, ***p < 0.001 for refractory (dark blue) and responsive (green) samples after correction for multiple hypothesis testing via Benjamini-Hochburg. (B) Ratio of fraction of serum samples with non-zero measurements to fraction of joint fluid samples with non-zero measurements for ADCD, IgG1, IgG2, IgG3, and IgA1 for refractory (dark blue) and responsive (green) patients for each antigen. Significant differences in distributions of ratios between phenotypes are assessed by a Mann-Whitney nonparametric test, then corrected for multiple hypothesis testing via Benjamini-Hochburg. CRASP1, CRASP2, DbpA, DbpB, Arp37, flagellin, OspA, OspB, OspC, OspE, p27, p35, p39, VlsE: Rockland antigens. Fig 6. PMID: 38303696.



SDS-PAGE
SDS-Page of VlsE Control Protein. Lane 1: VlsE-MBP reduced. Lane 2: Opal Prestained Molecular Weight Marker (p/n MB-210-0500). Lane 3: VlsE-MBP non-reduced. 4-20% Gel, Coomassie Stained. Expect a band at ~78 kDa for VlsE-MBP, (~36 kDa for VlsE and ~42 kDa for MBP).

References

- Bowman KA. et al. Borrelia-specific antibody profiles and complement deposition in joint fluid distinguish antibiotic-refractory from -responsive Lyme arthritis. *iScience.* (2024)
- Haslund-Gourley BS. et al. Host glycosylation of immunoglobulins impairs the immune response to acute Lyme disease. *eBioMedicine.* (2024)
- Lone A et al. The Borrelia burgdorferi VlsE Lipoprotein Prevents Antibody Binding to an Arthritis-Related Surface Antigen. *Cell Rep.* (2020)

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