



## AlphaLISA® HVEM/TNFRSF14/CD270 (Human) Detection Kit

**Product number:** AL3054 HV/C/F

Research Use Only. Not for use in diagnostic procedures.

### Product Information

- Application:** This kit is designed for the quantitative determination of human HVEM in serum and cell culture supernatants using a homogeneous AlphaLISA assay (no wash steps).
- Sensitivity:** Lower Detection Limit (LDL): 3 pg/mL  
Lower Limit of Quantification (LLOQ): 11 pg/mL  
EC<sub>50</sub>: 22 ng/mL
- Dynamic range:** 3 – 300 000 pg/mL

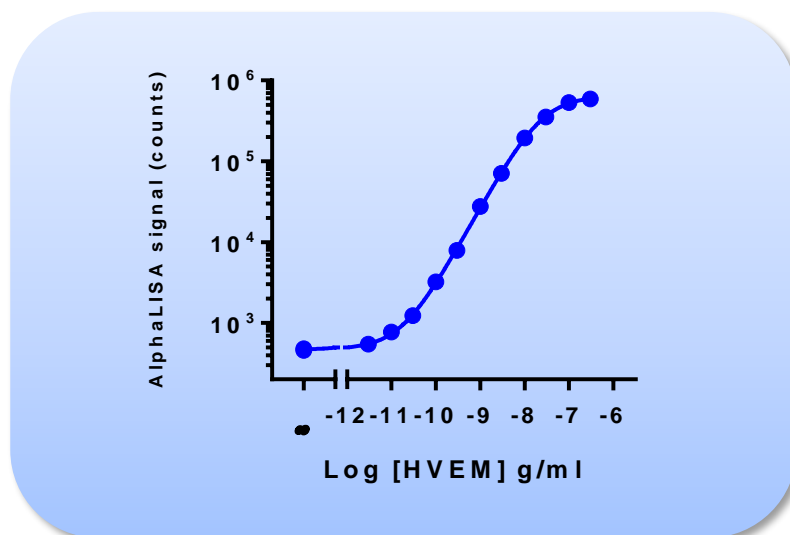


Figure 1. Typical sensitivity curve in AlphaLISA Immunoassay Buffer. The data was generated using a white Optiplate™-384 microplate and the EnVision® Multilabel Plate Reader 2103 with Alpha option.

- Storage:** Store kit in the dark at +4°C. For reconstituted analyte aliquot and store at -20 °C. Avoid freeze-thaw cycles.
- Stability:** This kit is stable for at least 12 months from the manufacturing date when stored in its original packaging and the recommended storage conditions.

## Analyte of Interest

Herpesvirus entry mediator (HVEM), also known as tumor necrosis factor receptor (TNFR) superfamily 14 and CD270, is a cell surface membrane protein that regulates T-cell immune responses by activating both inhibitory and inflammatory signaling pathways. HVEM is widely expressed on the plasma membranes of hematopoietic lineage cells, such as natural killer cells, monocytes, dendritic cells, neutrophils, T-cells and B cells. This membrane protein functions as a receptor and or ligand for BTLA, CD160, LIGHT and lymphotoxin-alpha. Although little is known of the correlation of HVEM and cancer, it has been proven that elevated levels of HVEM have been associated in patients with autoimmune and allergic diseases such as atopic dermatitis, rheumatoid arthritis, and allergic asthma. This kit is designated to detect and quantify the levels of HVEM in cell culture supernatant and serum.

## Description of the AlphaLISA Assay

AlphaLISA technology allows the detection of molecules of interest in buffer, cell culture media, serum and plasma in a highly sensitive, quantitative, reproducible and user-friendly mode. In an AlphaLISA assay, a Biotinylated Anti-Analyte Antibody binds to the Streptavidin-coated Alpha Donor beads, while another Anti-Analyte Antibody is conjugated to AlphaLISA Acceptor beads. In the presence of the analyte, the beads come into close proximity. The excitation of the Donor beads provokes the release of singlet oxygen molecules that triggers a cascade of energy transfer in the Acceptor beads, resulting in a sharp peak of light emission at 615 nm (Figure 2).

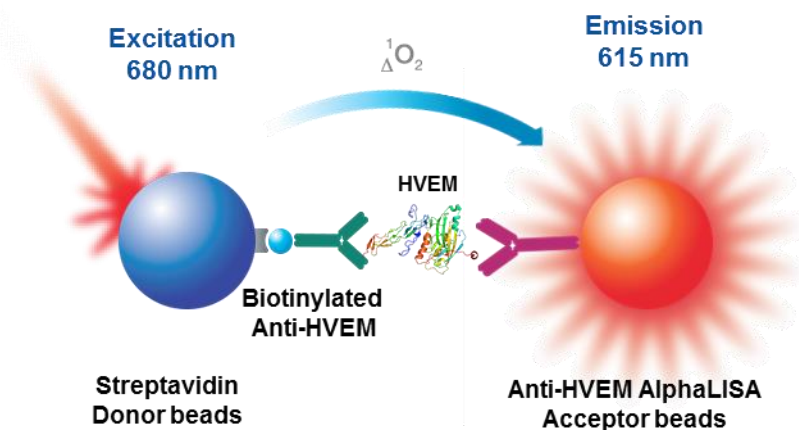


Figure 2. AlphaLISA Assay Principle.

## Precautions

- The Alpha Donor beads are light-sensitive. All the other assay reagents can be used under normal light conditions. All Alpha assays using the Donor beads should be performed under subdued laboratory lighting (< 100 lux). Green filters (LEE 090 filters (preferred) or Roscolux filters #389 from Rosco) can be applied to light fixtures.
- Take precautionary measures to avoid contamination of the reagent solutions.
- The Biotinylated Anti-Analyte Antibody contains sodium azide. Contact with skin or inhalation should be avoided.

## Kit Content: Reagents and Materials

Kit components	AL3054HV (100 assay points <sup>***</sup> )	AL3054C (500 assay points <sup>***</sup> )	AL3054F (5000 assay points <sup>***</sup> )
AlphaLISA Anti-HVEM Acceptor beads stored in PBS, 0.05% Kathon, pH 7.2	20 µL @ 5 mg/mL (1 brown tube, <u>white</u> cap)	50 µL @ 5 mg/mL (1 brown tube, <u>white</u> cap)	500 µL @ 5 mg/mL (1 brown tube, <u>white</u> cap)
Streptavidin (SA)-coated Donor beads stored in 25 mM HEPES, 100 mM NaCl, 0.05% Kathon, pH 7.4	40 µL @ 5 mg/mL (1 brown tube, <u>black</u> cap)	100 µL @ 5 mg/mL (1 brown tube, <u>black</u> cap)	1 mL @ 5 mg/mL (1 brown tube, <u>black</u> cap)
Biotinylated Anti-HVEM Antibody stored in PBS, 0.1% Tween-20, 0.05% NaN <sub>3</sub> , pH 7.4	20 µL @ 500 nM (1 tube, <u>black</u> cap)	50 µL @ 500 nM (1 tube, <u>black</u> cap)	500 µL @ 500 nM (1 tube, <u>black</u> cap)
Lyophilized HVEM*	1 µg (1 tube, <u>clear</u> cap)	1 µg (1 tube, <u>clear</u> cap)	1 µg (1 tube, <u>clear</u> cap)
AlphaLISA Immunoassay Buffer (10X)**	2 mL, 1 small bottle	10 mL, 1 medium bottle	100 mL, 1 large bottle

\* Reconstitute lyophilized analyte in 100 µL Milli-Q® grade H<sub>2</sub>O. The reconstituted analyte should be used within 60 minutes or aliquoted into screw-capped polypropylene vials and stored at -20°C for future experiments. Avoid freeze-thaw cycles. One vial contains an amount of analyte sufficient for performing 10 standard curves. Additional vials can be ordered separately (cat # AL3054S).

\*\* Extra buffer can be ordered separately (cat # AL000C: 10 mL, cat # AL000F: 100 mL).

\*\*\* The number of assay points is based on an assay volume of 100 µL in 96-well plates or 50 µL in 96- or 384-well assay plates using the kit components at the recommended concentrations.

Sodium azide should **not** be added to the stock reagents. High concentrations of sodium azide (> 0.001 % final in the assay) might decrease the AlphaLISA signal. Note that sodium azide from the Biotinylated Antibody stock solution will not interfere with the AlphaLISA signal (0.0001% final in the assay).

### Specific additional required reagents and materials:

The following materials are recommended:

Item	Suggested source	Catalog #
TopSeal™-A Plus Adhesive Sealing Film	Revvity Inc.	6050185
EnVision®-Alpha Reader	Revvity Inc.	-

## Recommendations

- The volume indicated on each tube is guaranteed for single pipetting. Multiple pipetting of the reagents may reduce the theoretical amount left in the tube. To minimize loss when pipetting beads, it is preferable not to pre-wet the tip.
- Centrifuge all tubes (including lyophilized analyte) before use to improve recovery of content (2000g, 10-15 sec).  
Re-suspend all reagents by vortexing before use.
- Use Milli-Q® grade H<sub>2</sub>O (18 MΩ·cm) to dilute 10X AlphaLISA Immunoassay Buffer and to reconstitute the lyophilized analyte.
- When diluting the standard or samples, change tips between each standard or sample dilution. When loading reagents in the assay microplate, change tips between each standard or sample addition and after each set of reagents.
- When reagents are added to the microplate, make sure the liquids are at the bottom of the well.
- Small volumes may be prone to evaporation. It is recommended to cover microplates with TopSeal-A Adhesive Sealing Films to reduce evaporation during incubation. Microplates can be read with the TopSeal-A Film.
- The AlphaLISA signal is detected with an EnVision Multilabel Reader equipped with the Alpha option using the AlphaScreen standard settings (e.g. Total Measurement Time: 550 ms, Laser 680 nm Excitation Time: 180 ms, Mirror: D640as, Emission Filter: M570w, Center Wavelength 570 nm, Bandwidth 100 nm, Transmittance 75%).
- AlphaLISA signal will vary with temperature and incubation time. For consistent results, identical incubation times and temperature should be used for each plate.
- The standard curves shown in this technical data sheet are provided for information only. A standard curve must be generated for each experiment.

## Assay Procedure

IMPORTANT: PLEASE READ THE RECOMMENDATIONS BELOW BEFORE USE

- The protocol described below is an example for generating one standard curve in a 50 µL final assay volume (48 wells, triplicate determinations). The protocols also include testing samples in 452 wells. If a different amount of samples are tested, the volumes of all reagents have to be adjusted accordingly, as shown in the table below. These calculations do not include excess reagent to account for losses during transfer of solutions or dead volumes.
- The standard dilution protocol is provided for information only. As needed, the number of replicates or the range of concentrations covered can be modified.
- Use of four background points in triplicate (12 wells) is recommended when LDL/LLOQ is calculated. One background point in triplicate (3 wells) can be used when LDL/LLOQ is not calculated.

Format	# of data points	Final	Volume				Plate recommendation
			Sample	AlphaLISA Acceptor beads	Biotinylated Antibody	SA-Donor beads	
AL3054HV	100	100 µL	10 µL	20 µL	20 µL	50 µL	White OptiPlate-96 (cat # 6005290) White ½ AreaPlate-96 (cat # 6005560)
AL3054C	250	100 µL	10 µL	20 µL	20 µL	50 µL	White OptiPlate-96 (cat # 6005290) White ½ AreaPlate-96 (cat # 6005560)
	500	50 µL	5 µL	10 µL	10 µL	25 µL	White ½ AreaPlate-96 (cat # 6005560) White OptiPlate-384 (cat # 6007290) Light gray AlphaPlate™-384 (cat # 6005350)
	1 250	20 µL	2 µL	4 µL	4 µL	10 µL	Light gray AlphaPlate-384 (cat # 6005350) ProxiPlate™-384 Plus (cat # 6008280) White OptiPlate-384 (cat # 6007290)
	2 500	10 µL	1 µL	2 µL	2 µL	5 µL	Light gray AlphaPlate-1536 (cat # 6004350)
AL3054F	5 000	50 µL	5 µL	10 µL	10 µL	25 µL	White ½ AreaPlate-96 (cat # 6005560) White OptiPlate-384 (cat # 6007290) Light gray AlphaPlate-384 (cat # 6005350)
	12 500	20 µL	2 µL	4 µL	4 µL	10 µL	Light gray AlphaPlate-384 (cat # 6005350) ProxiPlate-384 Plus (cat # 6008280) White OptiPlate-384 (cat # 6007290)
	25 000	10 µL	1 µL	2 µL	2 µL	5 µL	Light gray AlphaPlate-1536 (cat # 6004350)

**3 Step Protocol described below is for 500 assay points including one standard curve (48 wells) and samples (452 wells). If a different amount of samples are tested, the volumes of all reagents have to be adjusted accordingly.**

- 1) Preparation of 1X AlphaLISA Immunoassay Buffer:  
Add 5 mL of 10X AlphaLISA Immunoassay Buffer to 45 mL Milli-Q® grade H<sub>2</sub>O.
- 2) Preparation of HVEM analyte standard dilutions:
  - a. Reconstitute lyophilized HVEM (1 µg) in 100 µL Milli-Q® grade H<sub>2</sub>O.
  - b. Prepare standard dilutions as follows in 1X AlphaLISA Immunoassay Buffer (change tip between each standard dilution):

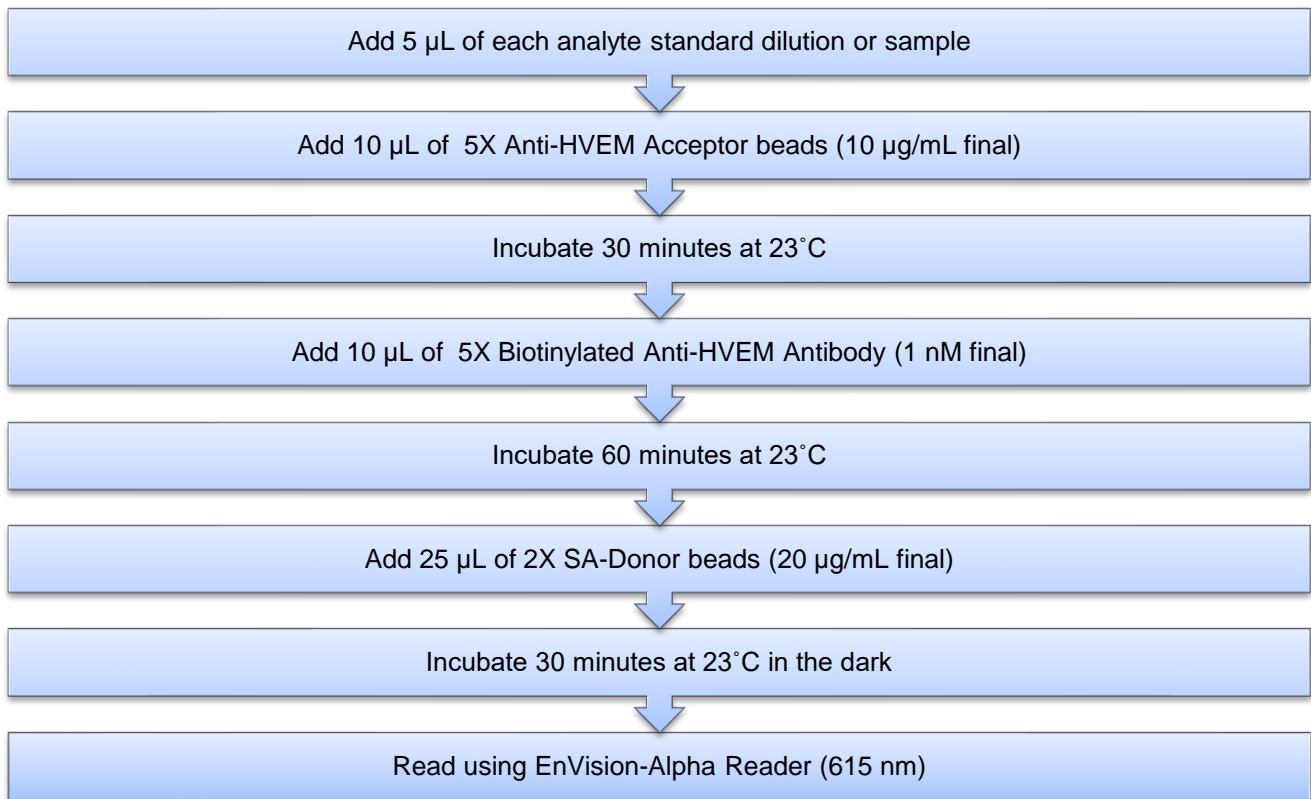
Tube	Vol. of HVEM (µL)	Vol. of diluent (µL) *	[HVEM] in standard curve	
			(g/mL in 5 µL)	(pg/mL in 5 µL)
A	10 µL of reconstituted HVEM	90	1.0E-06	1 000 000
B	60 µL of tube A	140	3.0E-07	300 000
C	60 µL of tube B	120	1.0E-07	100 000
D	60 µL of tube C	140	3.0E-08	30 000
E	60 µL of tube D	120	1.0E-08	10 000
F	60 µL of tube E	140	3.0E-09	3 000
G	60 µL of tube F	120	1.0E-09	1 000
H	60 µL of tube G	140	3.0E-10	300
I	60 µL of tube H	120	1.0E-10	100
J	60 µL of tube I	140	3.0E-11	30
K	60 µL of tube J	120	1.0E-11	10
L	60 µL of tube K	140	3.0E-12	3
M ** (background)	0	100	0	0
N ** (background)	0	100	0	0
O ** (background)	0	100	0	0
P ** (background)	0	100	0	0

\* Dilute standards in diluent (e.g. 1X AlphaLISA Immunoassay Buffer).  
At low concentrations of analyte, a significant amount of analyte can bind to the vial. Therefore, load the analyte standard dilutions in the assay microplate within 60 minutes of preparation.

\*\* Four background points in triplicate (12 wells) are used when LDL is calculated. If LDL does not need to be calculated, one background point in triplicate can be used (3 wells).

- 3) Preparation of 5X AlphaLISA Anti-HVEM Acceptor beads (50 µg/mL):
  - a. Prepare just before use.
  - b. Add 50 µL of 5 mg/mL AlphaLISA Anti-HVEM Acceptor to 4950 µL of 1X AlphaLISA Immunoassay Buffer.
- 4) Preparation of 5X Biotinylated Anti-HVEM Antibody (5 nM):
  - a. Prepare just before use.
  - b. Add 50 µL of 500 nM Biotinylated Anti-HVEM Antibody to 4950 µL of 1X AlphaLISA Immunoassay Buffer.
- 5) Preparation of 2X Streptavidin (SA) Donor beads (40 µg/mL):
  - a. Prepare just before use.
  - b. Keep the beads under subdued laboratory lighting.
  - c. Add 100 µL of 5 mg/mL SA-Donor beads to 12400 µL of 1X AlphaLISA Immunoassay Buffer.

6) In a white Optiplate (384 wells):



## Data Analysis

- Calculate the average count value for the background wells.
- Generate a standard curve by plotting the AlphaLISA counts versus the concentration of analyte. A log scale can be used for either or both axes. No additional data transformation is required.
- Analyze data according to a nonlinear regression using the 4-parameter logistic equation (sigmoidal dose-response curve with variable slope) and a  $1/Y^2$  data weighting (the values at maximal concentrations of analyte after the hook point should be removed for correct analysis).
- The LDL is calculated by interpolating the average background counts (12 wells without analyte) + 3 x standard deviation value (average background counts + (3xSD)) on the standard curve.
- The LLOQ as measured here is calculated by interpolating the average background counts (12 wells without analyte) + 10 x standard deviation value (average background counts + (10xSD)) on the standard curve. Alternatively, the true LLOQ can be determined by spiking known concentrations of analyte in the matrix and measuring the percent recovery, and then determining the minimal amount of spiked analyte that can be quantified within a given limit (usually +/- 20% or 30% of the real concentration).
- Read from the standard curve the concentration of analyte contained in the samples.
- If samples have been diluted, the concentration read from the standard curve must be multiplied by the dilution factor.

## Assay Performance Characteristics

*AlphaLISA assay performance described below was determined using the 3 step protocol using AlphaLISA Immunoassay Buffer (IAB), cell culture medium containing 10% FBS, and 100%FBS. The analytes (standards) were prepared in IAB, DMEM, RPMI, or 100%FBS and all other components were prepared in IAB.*

- Assay Sensitivity:

The LDL was calculated as described above. The values correspond to the lowest concentration of analyte that can be detected in a volume of 5  $\mu$ L using the recommended assay conditions.

LDL (pg/mL)	Analyte Diluent *	# of experiments
4	IAB	6
5	DMEM + 10% FBS	6
239	RPMI + 10% FBS **	6
5	FBS	6

\* The standard was prepared in these diluents and all other components were diluted in IAB. Note that LDL can be decreased (i.e. sensitivity increased) by increasing the volume of analyte in the assay (e.g. use 10  $\mu$ L of analyte in a final assay volume of 50  $\mu$ L).

\*\* When the analyte was prepared in RPMI the sensitivity (pg/mL) increased drastically. The overall counts and signal to background also decreased drastically.

- Assay Precision:

The following assay precision data were calculated from the three independent assays using two different kit lots. In each lot, the analytes were prepared in IAB, DMEM +10% FBS, RPMI +10% FBS, or 100% FBS. All other components were prepared in IAB. Each assay consisted of one standard curve comprising 12 data points (each in triplicate) and 12 background wells (no analytes). The assays were performed in 384-well format.

- Intra-assay precision:

The intra-assay precision was determined by averaging 6 experiments each with 12 independent determinations in triplicate. Shown as CV%.

HVEM	IAB	DMEM + 10%FBS	FBS
CV (%)	3	5	6

- Inter-assay precision:

The inter-assay precision was determined comparing 6 experiments each with 12 independent determinations in triplicate. Shown as CV%.

HVEM	IAB	DMEM + 10%FBS	FBS
CV (%)	8	9	9

- Spike Recovery:

Known concentrations of analyte were spiked into IAB, DMEM + 10% FBS, and 100% FBS. All samples, including non-spiked buffer were measured in the assay. Note that the standard curves were prepared in IAB, DMEM + 10% FBS, 100% FBS. All other components were diluted in IAB.

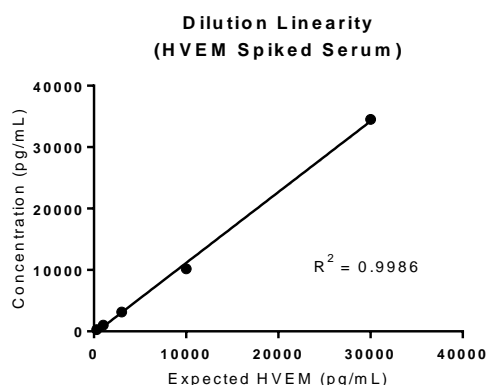


Spiked HVEM (ng/mL)	% Recovery		
	IAB	DMEM + 10% FBS	FBS
1	96	94	104
0.3	103	102	108
0.1	97	99	107

## Serum Experiments

Neat Normal Pooled Human Serum, and Normal Human Serum spiked with 100 ng/mL HVEM were diluted into 100% FBS, and interpolated against a standard curve of the analyte in 100% FBS. Calculated amounts in neat serum were subtracted from the spiked serum and showed dilutional linearity after 2x dilution. HVEM was detected in non-spiked normal human serum and good dilution linearity ( $R^2 = 0.9998$ ) was obtained when the serum was diluted  $\geq 3$ fold

Dilution Factor (DF)	HVEM in Spiked samples (Expected, pg/mL)	HVEM Spiked samples (Observed, pg/mL)
3	30000	34513
10	10000	10182
30	3000	3149
100	1000	1009
300	300	281



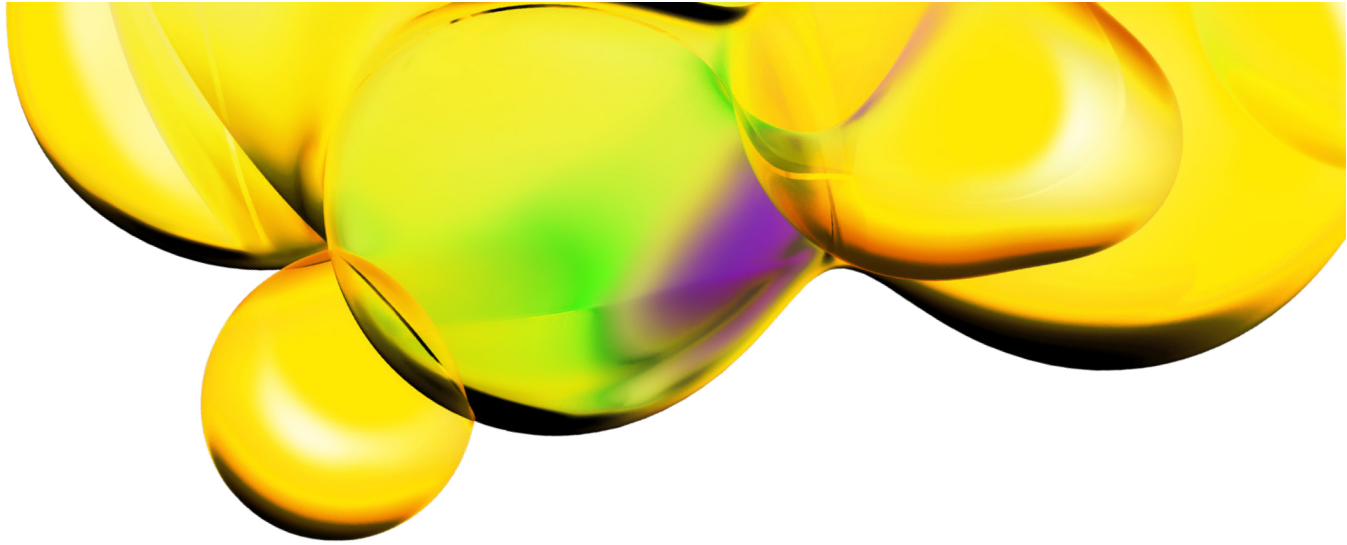
Known amounts of HVEM were spiked into Normal Human Serum and then the sample was diluted 8-fold into FBS. \*Concentration for 30-300 ng/mL spikes is equal to the measured concentration minus the no spike value (in this case, 9.6 ng/mL). Excellent recovery was achieved for all three spikes tested.

Diluent: FBS		
Spiked sample (Normal Human Serum)		
Spike (ng/mL)	Concentration (ng/mL)*	Recovery (%)
No spike	9.6	n/a
300	346.1	115
100	105.4	105
30	31.3	104

## Troubleshooting Guide

You will find detailed recommendations for common situations you might encounter with your AlphaLISA Assay kit at: [www.revivity.com/](http://www.revivity.com/)

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