



AlphaLISA[®] BMP-7 (Human) Detection Kit

Product number: AL369 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 Bone Morphogenetic Protein 7 (BMP-7) in immunoassay buffer, human serum, plasma, and cell culture supernatants using a homogeneous AlphaLISA assay (no wash steps). The assay shows negligible cross-reactivity with Human BMP-5 and Human BMP-6, but 100% cross-reactivity with Mouse BMP-7. Other species have not been tested.
- Sensitivity:** Lower Detection Limit (LDL): 4.3 pg/mL
Lower Limit of Quantification (LLOQ): 14.8 pg/mL
EC₅₀: 43.3 ng/mL
- Dynamic range:** 4 – 300 000 pg/mL (Figure 1).

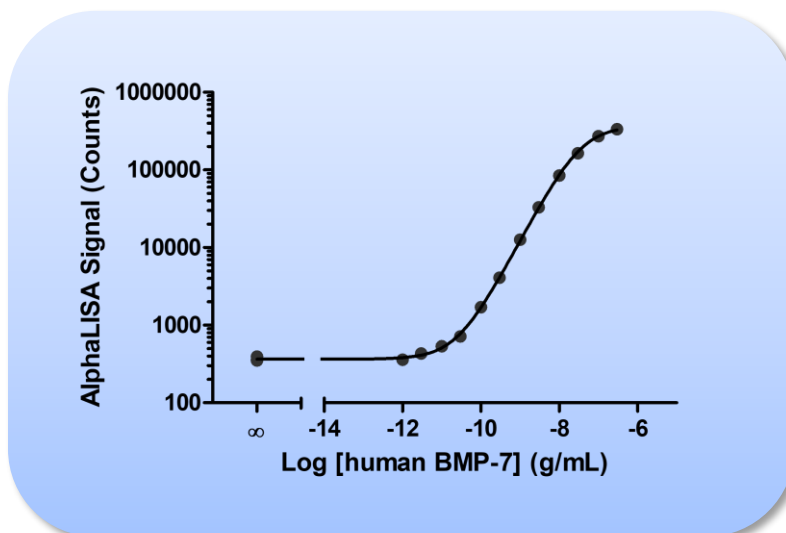


Figure 1. Typical sensitivity curve in AlphaLISA Immunoassay Buffer. The data was generated using a white Optiplate[™]-384 microplate and the EnVision[®] Multilabel Plate Reader 2103 with Alpha option.

- Storage:** Store kit in the dark at +4°C. Store reconstituted analyte at -20°C.
- 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

Bone morphogenetic protein 7 (BMP-7), also known as osteogenic protein 1 (OP-1), belongs to the TGF- β superfamily and is expressed in the brain, kidneys and bladder. BMP-7 is involved in bone homeostasis and plays a key role in the transformation of mesenchymal cells into bone and cartilage. The expression of BMP-7 causes ventral phenotypes while its complete inhibition creates a dorsal phenotype. Human recombinant BMP-7 protein can be used to aid in the fusion of vertebral bodies to prevent neurologic trauma. It also functions in the treatment of tibial non-union fracture, frequently in cases where a bone graft has failed. It is also found that BMP-7 has the potential for treatment of chronic kidney disease.

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).

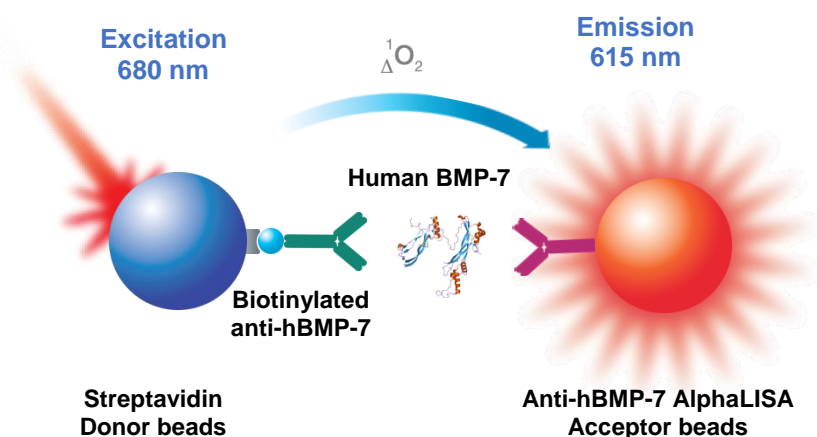


Figure 2. AlphaLISA Assay Principle.

Precautions

- The AlphaScreen® 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.
- All blood components and biological materials should be handled as potentially hazardous. The analyte included in this kit is from a human source.
- Some analytes are present in saliva. 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	AL369HV (100 assay points)***	AL369C (500 assay points)***	AL369F (5000 assay points)***
AlphaLISA Anti-hBMP-7 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 (brown tube, <u>black</u> cap)
Lyophilized anti-human BMP-7 Biotinylated Antibody	5 µg (1 clear tube, <u>black</u> cap)	5 µg (1 clear tube, <u>black</u> cap)	5 µg (8 clear tubes, <u>black</u> caps)
Lyophilized Human BMP-7*	0.3 µg (1 tube, <u>clear</u> cap)	0.3 µg (1 tube, <u>clear</u> cap)	0.3 µg (1 tube, <u>clear</u> cap)
AlphaLISA Immunoassay Buffer (10X)**	2 mL, 1 small bottle	10 mL, 1 small bottle	100 mL, 1 large bottle

* Reconstitute hBMP-7 in 100 µL Milli-Q® grade H₂O. The reconstituted analyte should be used within 60 minutes or aliquoted into screw-capped polypropylene vials and stored at -20°C for further experiments. Avoid multiple freeze-thaw cycles. One vial contains an amount of hBMP-7 sufficient for performing 10 standard curves. Additional vials can be ordered separately (cat # AL369S).

** 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 H₂O (18 MΩ•cm) to dilute 10X AlphaLISA Immunoassay Buffer and to reconstitute the lyophilized analyte and biotinylated antibody.
- 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. The standard curve should be performed in the AlphaLISA Immunoassay Buffer for serum and/or plasma samples.

Assay Procedure

IMPORTANT: PLEASE READ THE RECOMMENDATIONS BELOW BEFORE USE

- The manual described below is an **example** for generating one standard curve in a 50 µL final assay volume (48 wells, triplicate determinations). The manuals 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 manual 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	Volume					Plate recommendation
		Final	Sample	AlphaLISA beads	Biotin Antibody	SA-Donor beads	
AL369HV	100	100 µL	10 µL	20 µL	20 µL	50 µL	White OptiPlate-96 (cat # 6005290) White ½ AreaPlate-96 (cat # 6005560)
AL369C	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)
AL369F	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 Manual (3 incubation steps) – Dilution of standards can be done in 1X AlphaLISA Immunoassay Buffer. The manual described below is for one standard curve (48 wells) and 452 sample 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 3 mL of 10X AlphaLISA Immunoassay Buffer to 27 mL H₂O.

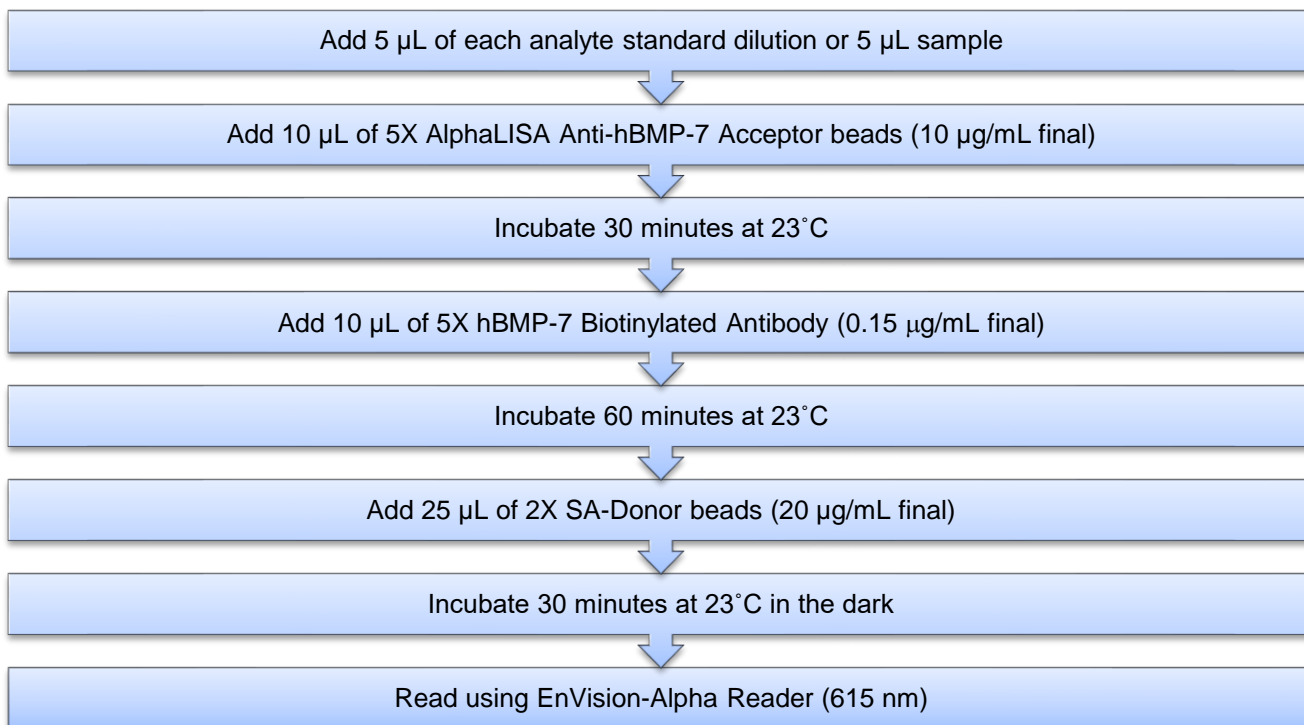
- 2) Preparation of human BMP-7 analyte standard dilutions:
- Reconstitute lyophilized hBMP-7 (0.3 µg) in 100 µL H₂O.
 - Store unused analyte at 4°C or aliquot and place at -20°C for long term storage.
 - Prepare standard dilutions as follows in 1X AlphaLISA Immunoassay Buffer (change tip between each standard dilution):

Tube	Vol. of hBMP-7 (µL)	Vol. of diluent (µL) *	[hBMP-7] in standard curve	
			(g/mL in 5 µL)	(pg/mL in 5 µL)
A	10 µL of provided hBMP-7	90	3.00E-07	300 000
B	60 µL of tube A	120	1.00E-07	100 000
C	60 µL of tube B	140	3.00E-08	30 000
D	60 µL of tube C	120	1.00E-08	10 000
E	60 µL of tube D	140	3.00E-09	3 000
F	60 µL of tube E	120	1.00E-09	1 000
G	60 µL of tube F	140	3.00E-10	300
H	60 µL of tube G	120	1.00E-10	100
I	60 µL of tube H	140	3.00E-11	30
J	60 µL of tube I	120	1.00E-11	10
K	60 µL of tube J	140	3.00E-12	3
L	60 µL of tube K	120	1.00E-12	1
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-hBMP-7 Antibody Acceptor beads (50 µg/mL)
- Add 50 µL of 5 mg/mL AlphaLISA Anti-hBMP-7 antibody Acceptor beads to 4950 µL of 1X AlphaLISA Immunoassay Buffer.
 - Prepare just before use.
- 4) Preparation of 5X Human BMP-7 Biotinylated Antibody (0.75 µg/mL)
- Reconstitute lyophilized hBMP-7 biotinylated antibody (5 µg) in 100 µL H₂O to make 50 µg/mL solution.
 - Add 75 µL of 50 µg/mL hBMP-7 biotinylated antibody to 4925 µL of 1X AlphaLISA Immunoassay Buffer.
 - Prepare just before use.
- 5) Preparation of 2X Streptavidin (SA) Donor beads (40 µg/mL):
- Keep the beads under subdued laboratory lighting.
 - Add 100 µL of 5 mg/mL SA-Donor beads to 12 400 µL of 1X AlphaLISA Immunoassay Buffer.
 - Prepare just before use.

6) In a white Optiplate (384 wells):



Read Settings: AlphaLISA signal is detected using an EnVision Multilabel Reader equipped with the Alpha option using the following settings: Total Measurement Time: 550 ms, Laser: 680 nm, Excitation Time: 180 ms, Mirror: 640as (Barcode# 444), Emission Filter: Wavelength 570nm, bandwidth: 100nm, Transmittance 75%, (Barcode# 244).

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 manual using AlphaLISA Immunoassay Buffer.

Assay Sensitivity

The LDL and LLOQ were calculated as described above. The values correspond to the lowest concentration of analyte that can be detected in a volume of 5 µL using the recommended assay conditions.

LDL (pg/mL)	Buffer/Serum/Medium*	# of experiments
4	IAB	6
16	DMEM+ 10% FBS	6
30	RPMI + 10% FBS**	6

* Note that LDL/ LLOQ can be decreased (i.e. sensitivity increased) by preparing standards in different matrixes. Only the analytes were prepared in cell culture media. All of other components were prepared in AlphaLISA immunoassay buffer.

** The biotin-containing medium significantly reduced assay sensitivity. We suggest using biotin free medium to perform this assay.

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, or RPMI. 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 using AlphaLISA immunoassay buffer.

- Intra-assay precision:

The intra-assay precision was determined using 3 independent experiments for a total of 6 independent determinations in triplicate. CV% were calculated for each individual experiment then averaged. Shown is the average intra-experimental CV%.

hBMP-7	IAB	DMEM	RPMI
CV(%)	7.0	6.3	6.2

- Inter-assay precision:

The inter-assay precision was determined using a total of 4 independent determinations with 12 measurements for 3 ng/mL sample. Shown as CV%.

hBMP-7 (3 ng/ml)	IAB	DMEM	RPMI
CV (%)	7.6	4.6	4.2

- Spike Recovery:

Three known concentrations of analyte were spiked in IAB, or in cell culture media containing 10% FBS. All samples, including non-spiked buffer or media were measured in the assay. The average recovery from three independent measurements is reported. Note that the standard curves were prepared in IAB, DMEM, and RPMI.

Spiked hBMP-7 (ng/mL)	% Recovery		
	IAB	DMEM	RPMI
100	92	109	108
10	102	99	99
1	101	99	99

Human Serum Experiments

To validate the assay kit, commercially available human serum sample with unknown concentration of hBMP-7 was used to examine dilution linearity and spike recovery.

BMP-7 was not detected in the serum tested. Therefore, the dilution linearity and spike recovery were determined in human serum spiked with hBMP-7 (100 ng/mL). The spiked serum was then further diluted and recovery of BMP-7 is shown in the table below. 75% recovery is observed when a sample is diluted 32 fold or greater.

Dilution Factor	% Recovery
1	7
2	17
4	29
8	45
16	65
32	74
64	77
128	77
256	80
512	75
1024	89
2048	79

Specificity

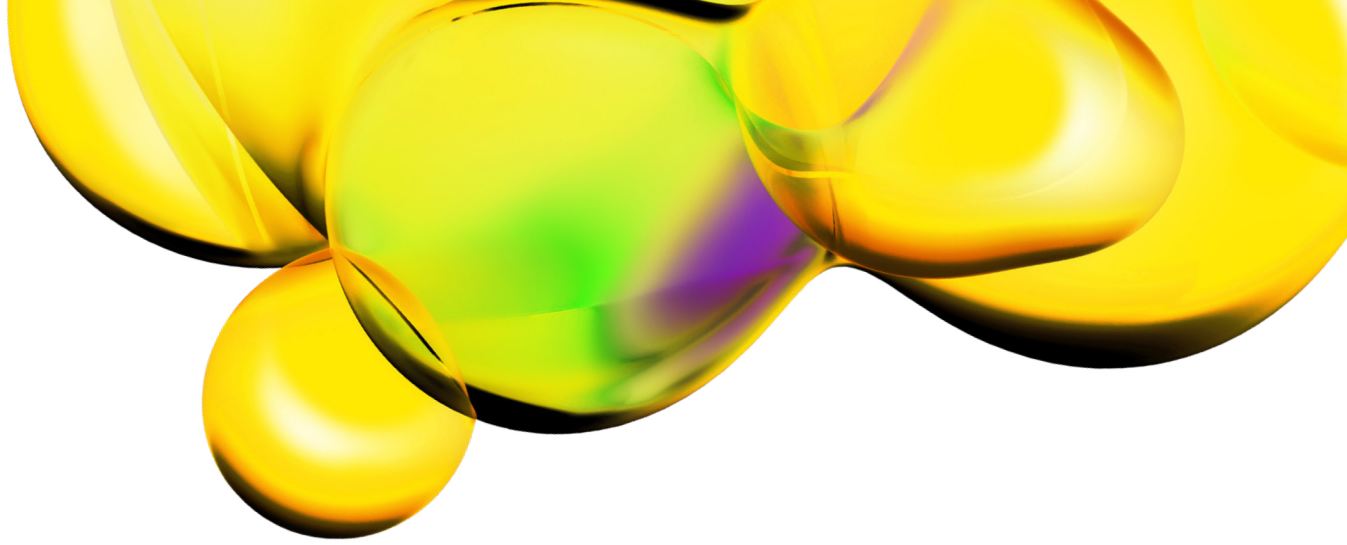
Cross-reactivity to other similar proteins was assessed for the AlphaLISA BMP-7 Kit by performing full 12 point curves in triplicate using the following proteins at 100 ng/mL in IAB.

Protein	% Cross-reactivity
Human BMP-5	0
Human BMP-6	0
Mouse BMP-7	100

Troubleshooting Guide

You will find detailed recommendations for common situations you might encounter with your AlphaLISA Assay kit at: www.revivity.com

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