

# AlphaLISA® BMP-9 (Human) Detection Kit

**Product number:** AL3013HV/C/F

Research Use Only. Not for use in diagnostic procedures.

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## Product Information

**Application:** This kit is designed for the quantitative determination of human BMP-9 in serum, buffered solution and cell culture supernatants using a homogeneous AlphaLISA assay (no wash steps).

**Sensitivity:** Lower Detection Limit (LDL): 1 pg/mL  
Lower Limit of Quantification (LLOQ): 3 pg/mL  
EC<sub>50</sub>: 10 ng/mL

**Dynamic range:** 1 – 100 000 pg/mL (Figure 1).

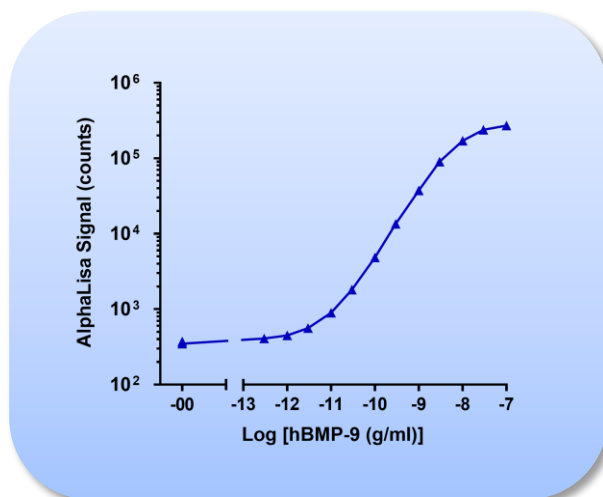


Figure1. Typical sensitivity curve in AlphaLISA Immunoassay Buffer. The data was generated using a white Optiplate™ 384 microplate and the EnVision® Multilabel Plate Reader 2103 with Alpha option.

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

Bone Morphogenetic Protein 9 (BMP-9), also known as growth differentiation factor 2 (GDF2), is a protein of the transforming growth factor beta superfamily. It contains an N-terminal TGF-beta-like pro-peptide (prodomain) (residues 56–257) and a C-terminal transforming growth factor beta superfamily domain (325–428). BMP-9 is expressed by non-parenchymal cells in the liver and secreted as a homodimer. It is involved in a number of physiologic events, including induction of orthotopic bone formation, glucose homeostasis, iron homeostasis and the inhibition of angiogenesis. Mutations in BMP-9 have been identified in patients with a vascular disorder phenotypically overlapping with hereditary hemorrhagic telangiectasia.

## 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).

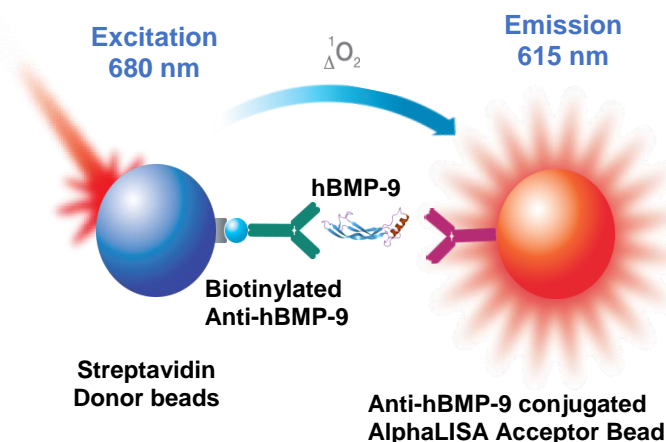


Figure 2. AlphaLISA Assay Principle.

## 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.
- All blood components and biological materials should be handled as potentially hazardous.
- Some analytes are present in blood. 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	AL3013HV (100 assay points)***	AL3013C (500 assay points)***	AL3013F (5000 assay points)***
AlphaLISA Anti-hBMP-9 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	80 µL @ 5 mg/mL (1 brown tube, <u>black</u> cap)	200 µL @ 5 mg/mL (1 brown tube, <u>black</u> cap)	2X1 mL @ 5 mg/mL (2 brown tubes, <u>black</u> caps)
Biotinylated Anti-hBMP-9 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)
Human BMP-9 Analyte lyophilized	0.1 µg 1 tube, <u>clear</u> cap	0.1 µg 1 tube, <u>clear</u> cap	0.1 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 hBMP-9 in 100 µL Milli-Q® grade H<sub>2</sub>O. The reconstituted analyte should be used within 60 minutes, or can be aliquoted into screw-capped polypropylene vials and stored at -20°C for further experiments. Avoid repeated freezing and thawing. One vial contains an amount of hBMP-9 sufficient for performing 10 standard curves. Additional vials can be ordered separately (cat # AL3013S).

\*\* Contains 250 mM HEPES, pH 7.4, 1% Casein, 10 mg/mL Dextran-500, 5% Triton X-100 and 0.5% Kathon. 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 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.

### 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 Plus Adhesive Sealing Films to reduce evaporation during incubation. Microplates can be read with the TopSeal-A Plus 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 Immunoassay buffer for serum and/or plasma samples.

## 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.

		Volume					
Format	# of data points	Final	Sample	AlphaLISA beads	Biotin Antibody	Donor beads	Plate recommendation
<b>AL3013HV</b>	100	100 µL	10 µL	20 µL	20 µL	50 µL	White OptiPlate-96 (cat # 6005290) White ½ AreaPlate-96 (cat # 6005560)
<b>AL3013C</b>	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)
<b>AL3013F</b>	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	4µL	4µL	10 µL	Light gray AlphaPlate-384 (cat # 6005350) ProxiPlate-384 Plus (cat # 6008280) White OptiPlate-384 (cat # 6007290)
	25 000	10 µL	1 µL	2µL	2µL	5 µL	Light gray AlphaPlate-1536 (cat # 6004350)

## The protocol for hBMP-9 AlphaLISA Assay:

### 3-Step Protocol — Dilution of standards in 1X AlphaLISA Immunoassay Buffer or cell culture medium.

The 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 10 mL of 10X AlphaLISA Immunoassay Buffer to 90 mL H<sub>2</sub>O.

#### 2) Preparation of hBMP-9 analyte standard dilutions:

- a. Reconstitute lyophilized hBMP-9 (0.1 µg) in 100 µL 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 hBMP-9 (µL)	Vol. of diluent (µL) *	[hBMP-9] in standard curve	
			(g/mL in 5 µL)	(pg/mL in 5 µL)
A	10 µL of reconstituted hBMP-9	90	1.00E-07	100 000
B	60 µL of tube A	140	3.00E-08	30 000
C	60 µL of tube B	120	1.00E-08	10 000
D	60 µL of tube C	140	3.00E-09	3 000
E	60 µL of tube D	120	1.00E-09	1 000
F	60 µL of tube E	140	3.00E-10	300
G	60 µL of tube F	120	1.00E-10	100
H	60 µL of tube G	140	3.00E-11	30
I	60 µL of tube H	120	1.00E-11	10
J	60 µL of tube I	140	3.00E-12	3
K	60 µL of tube J	120	1.00E-12	1
L	60 µL of tube K	140	3.00E-13	0.3
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-hBMP-9 Acceptor beads (50 µg/mL)

- a. Add 50 µL of 5 mg/mL AlphaLISA Anti-hBMP-9 Acceptor beads to 4950 µL of 1X AlphaLISA Immunoassay Buffer.
- b. Prepare just before use.

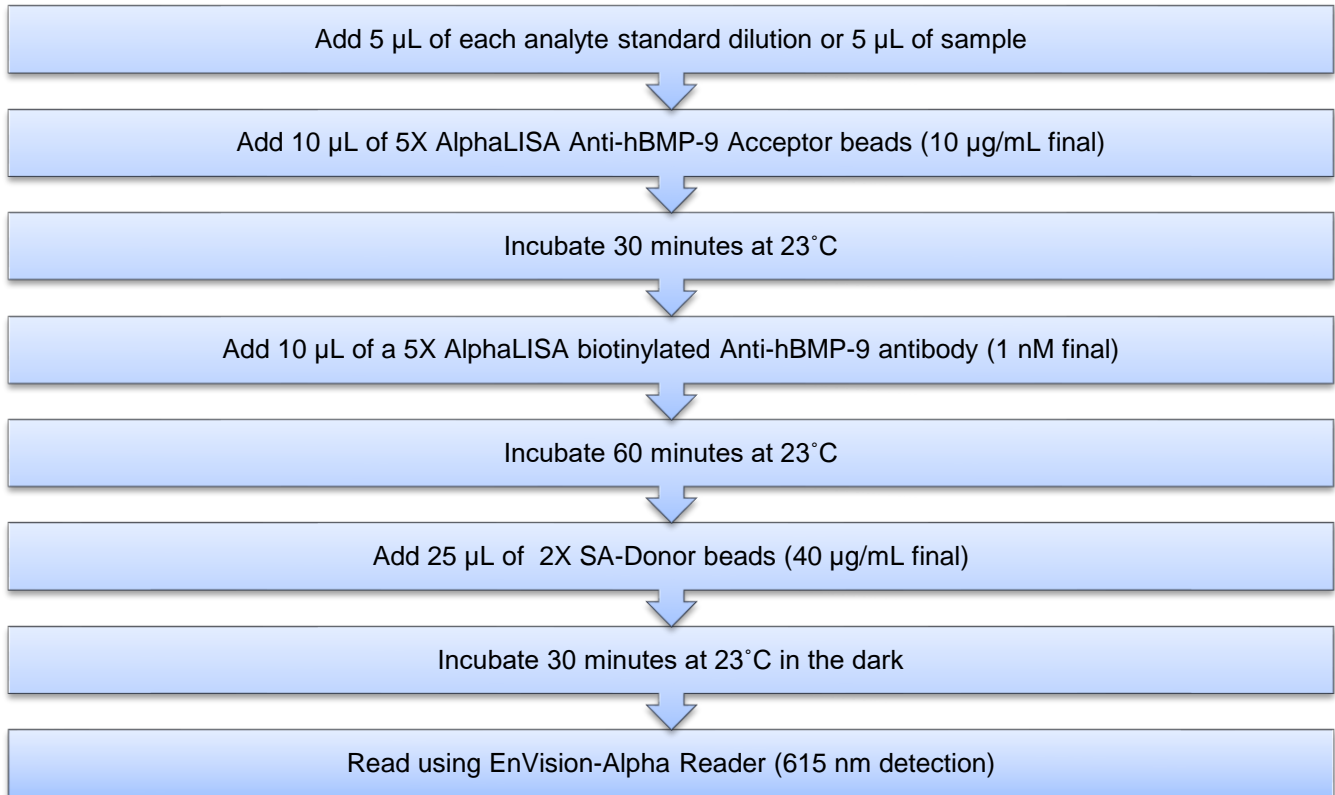
#### 4) Preparation of 5X AlphaLISA Biotinylated Anti-hBMP-9 (5 nM)

- a. Add 50 µL of 500 nM Biotinylated Anti-hBMP-9 antibody to 4950 µL of 1X AlphaLISA Immunoassay Buffer.
- b. Prepare just before use.

5) Preparation of 2X Streptavidin (SA) Donor beads (80 µg/mL):

- a. Prepare just before use and keep the beads under subdued laboratory lighting.
- b. Add 200 µL of 5 mg/mL SA-Donor beads to 12300 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 performed in AlphaLISA Immunoassay Buffer (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. The assay performs well in cell culture medium supplemented with 10% FBS.

LDL (pg/mL)	Buffer/Media	# of experiments
1.0	IAB	8
1.3	DMEM +10% FBS	6
2.0	RPMI +10% FBS	6

\* The standard was prepared in these diluents. 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).

- 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 supplemented with 10% FBS. 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 IAB.

- Intra-assay precision:

The intra-assay precision was determined using a total of 6 independent determinations in triplicate, shown as CV%.

hBMP-9	IAB	DMEM with 10% FBS	RPMI with 10% FBS
CV%	3.6	5.7	8.1

- Inter-assay precision:

The inter-assay precision was determined using a total of 3 independent determinations with 9 measurements at 10 ng/mL. Shown as CV%.

hBMP-9 (10 ng/mL)	IAB	DMEM with 10% FBS	RPMI with 10% FBS
CV%	4.9	5.6	10.1



- Spike Recovery:

Three known concentrations of analyte were spiked into IAB. All samples, including non-spiked Immunoassay Buffer were measured in the assay. The average recovery from three independent measurements is reported.

Spiked hBMP-9 (ng/mL)	% of Recovery		
	IAB	DMEM with 10% FBS	RPMI with 10% FBS
30	102	92	81
3	106	83	85
0.3	101	80	79

- Specificity:

Cross-reactivity of the hBMP-9 AlphaLISA Kit was tested using the following protein at 10 ng/mL in IAB.

Protein	% Cross-reactivity
Human BMP-5	1.2
Human BMP-6	0.5
Human BMP-7	0.3
Human BMP-10	0.2

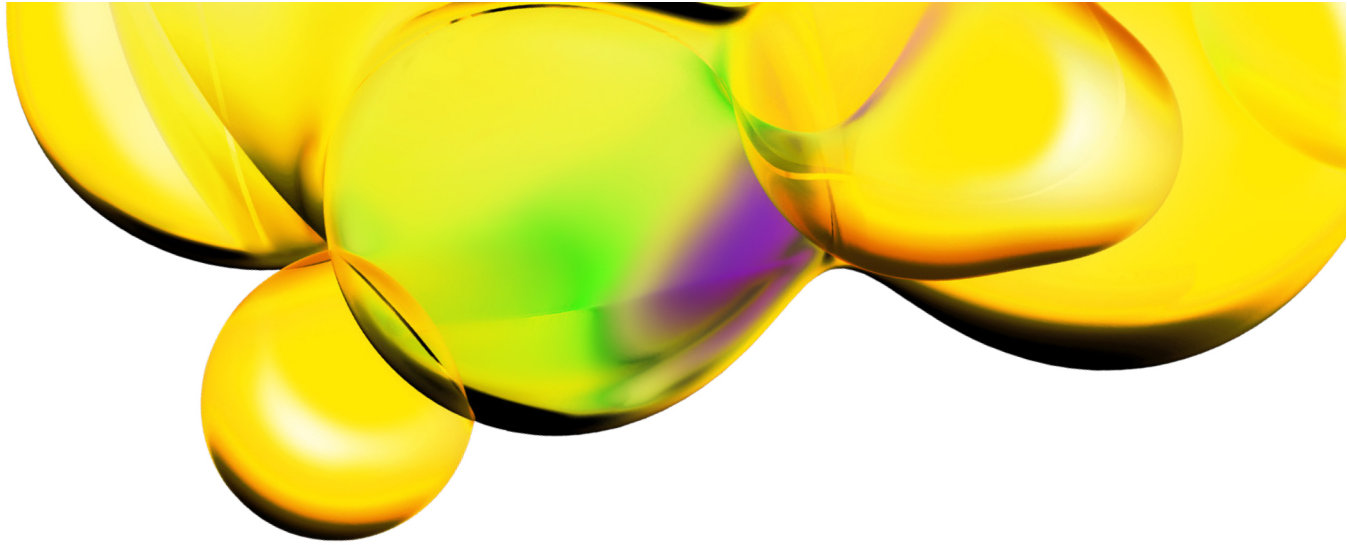
## Human Serum Experiments

To validate the assay kit, hBMP-9 is detected in normal human pooled serum. hBMP-9 serum levels of 150 pg/ml were detected and are consistent with the literature.

## 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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