

*PRODUCT INFORMATION AND MANUAL*

***human sCD44std  
Instant ELISA***

***BMS209INST***

Enzyme-linked immunosorbent assay for quantitative  
detection of human sCD44std.

For research use only.

Not for diagnostic or therapeutic procedures.

128 Tests

**human sCD44std  
BMS209INST**



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## 1 Intended Use

The human sCD44std Instant ELISA is an enzyme-linked immunosorbent assay for the quantitative detection of soluble CD44std levels in cell culture supernatants, human serum, EDTA, heparinized plasma, urine or other body fluids. The human sCD44std Instant ELISA is **for research use only. Not for diagnostic or therapeutic procedures.**

## 2 Summary

CD44 (Pgp-1; Ly-24; ECMR III; F10-44-2; H-CAM; HUTCH-I; In(Lu)-related p80; Hermes antigen; hyaluronan receptor) is a polymorphic glycoprotein with apparent molecular weights ranging from 85 kDa to 250 kDa. This cell membrane associated molecule has a cytoplasmic tail (mediates the interaction with the cytoskeleton), a short hydrophobic transmembrane region and an NH<sub>2</sub>-terminal extracellular (binds to hyaluronate) domain (2,14).

CD44 isoforms participate in a wide variety of cell-cell or cell-matrix interactions including lymphocyte homing, establishment of B and T cell immune responses, tumor metastases formation and inflammation.

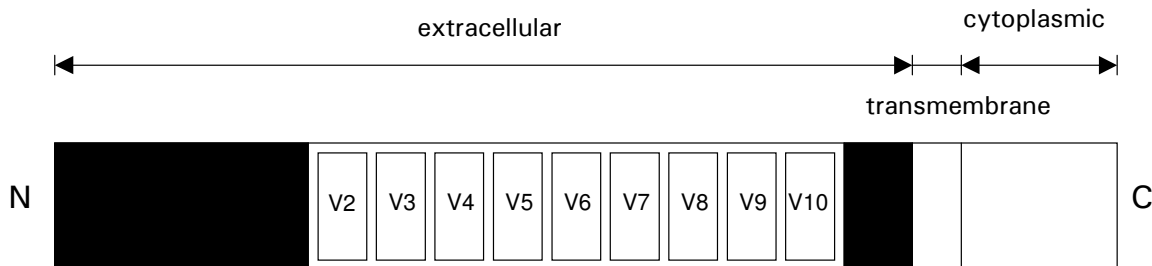
Three isoform categories of the CD44 molecule have been identified:

- 1) an 80-90 kDa isoform, the so-called standard form named CD44std, which is widely distributed on several hematopoietic and nonhematopoietic cells including all subsets of leukocytes, monocytes, erythrocytes, many types of epithelium, mesenchymal elements like fibroblasts, smooth muscle cells and glial cells of the central nervous system,
- 2) a medium size category of 110-160 kDa which is weakly expressed on epithelial cells and highly expressed in some carcinomas, and
- 3) a category which includes very large isoforms of 250 kDa covalently modified by the addition of chondroitin sulfate (12).

These bigger isoforms of CD44 arise by alternative splicing of one or more "variant" exons (v2-v10) into the extracellular part of the 90kDa constant form molecule. Compared to the standard CD44, all larger isoforms are expressed in a much more restricted fashion, only in a few normal tissues or on the surface of certain tumor cells. Some splice

variants of CD44 play important and distinct roles in tumor metastasis (15).

The sCD44std ELISA detects all circulating CD44 isoforms comprising the standard protein sequences (black area).



CD44 protein:      - standard protein sequences (black area)  
                          - variant exons (open boxes numbered v2 - v10)

Determination of sCD44std will provide more detailed insight into different pathological modifications during cancer and other diseases.

- **brain tumors:** CD44 is strongly expressed in high-grade gliomas and weakly expressed in meningiomas, medulloblastomas and normal brain (8).
- **colorectal carcinomas:** in human colorectal neoplasia CD44 variant proteins are found on all invasive carcinomas and during carcinoma metastasis. Variants are already expressed at a relatively early stage of colorectal carcinogenesis and tumor progression (4).
- **gastric cancer:** tumors from patients suffering from stomach adenocarcinomas express CD44 variants. Adenocarcinomas of the intestinal type are strongly positive for exon v5 and v6, whereas diffuse type adenocarcinomas predominantly express exon v5 (3).
- **lung, breast cancer:** in malignant tissues there is gross overproduction of alternatively-spliced large molecular variants in all samples, whereas in the control samples only the standard product was routinely detected with occasional minimal quantities of one or two small variants (10).
- **lymphoma:** in gastrointestinal lymphoma overexpression of CD44 has been correlated with poor survival and more disseminated disease (6,3).

Overexpression of CD44 is also found in several aggressive, but not low-grade, non-Hodgkin's lymphomas (7) as well as in Hodgkin's and nodal diffuse lymphomas (1).

- **tonsil, skin cancer:** variant CD44 isoform expression can be demonstrated in the plasma membrane of squamous cells of skin and tonsil epithelial and is greatly diminished in malignant squamous epithelial tumors (11,13).

- **HIV:** CD44 is almost completely depleted from the surface of HIV-infected cells (9).

- **inflammatory joint diseases:** CD44 expression was decreased in synovial fluid neutrophils from most patients (5).

### 3 Principles of the Test

An anti-human sCD44std monoclonal coating antibody is adsorbed onto microwells. Human sCD44std present in the sample or standard binds to antibodies adsorbed to the microwells; an HRP-conjugated monoclonal anti-human sCD44std antibody binds to human sCD44std captured by the first antibody. Following incubation unbound enzyme conjugated anti-human sCD44std is removed during a wash step and substrate solution reactive with HRP is added to the wells.

A coloured product is formed in proportion to the amount of human sCD44std present in the sample. The reaction is terminated by addition of acid and absorbance is measured at 450 nm. A standard curve is prepared from seven human sCD44std standard dilutions and human sCD44std sample concentration determined.

Figure 1

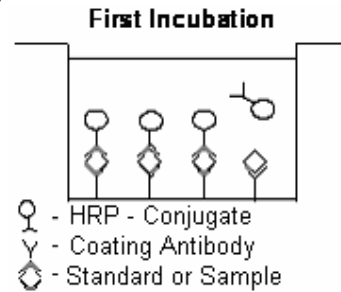


Figure 2

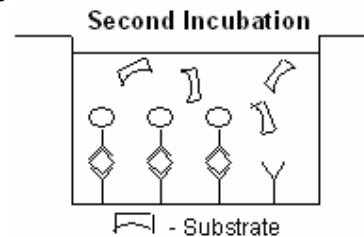
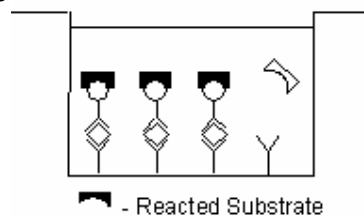


Figure 3



#### 4 Reagents Provided

- 1 aluminium pouch with a **Microwell Plate coated with Monoclonal Antibody** (murine) to human sCD44std, Sample Diluent and **HRP-Conjugate** (anti-sCD44std monoclonal (murine) antibody), lyophilized
- 2 aluminium pouches with a **human sCD44std Standard curve (coloured)**
- 1 bottle (25 ml) **Wash Buffer Concentrate** 20x (phosphate-buffered saline with 1% Tween 20)
- 1 vial (15 ml) **Substrate Solution** (tetramethyl-benzidine)
- 1 vial (60 ml) **Sample Diluent** (Use when an external predilution of the samples is needed)
- 1 vial (15 ml) **Stop Solution** (1M Phosphoric acid)
- 2 adhesive **Plate Covers**

#### 5 Storage Instructions

Store ELISA plate and Standard curves or whole kit at -20°C. The plate and the standard curves can also be removed, stored at -20°C, remaining kit reagents can be stored between 2° and 8°C. Expiry of the kit and reagents is stated on labels.

The expiry of the kit components can only be guaranteed if the components are stored properly, and if, in case of repeated use of one component, the reagent is not contaminated by the first handling.

## 6 Specimen Collection

Cell culture supernatants, human serum, EDTA, heparinized plasma, urine or other body fluids are suitable for use in the assay. Remove the serum or plasma from the clot or red cells as soon as possible after clotting and separation.

Samples containing a visible precipitate must be clarified prior to use in the assay. Do not use grossly hemolyzed or lipemic specimens.

Samples must be stored frozen at  $-20^{\circ}\text{C}$  to avoid loss of bioactive human sCD44std. If samples are to be run within 24 hours, they may be stored at  $2^{\circ}$  to  $8^{\circ}\text{C}$  (for sample stability refer to 13).

Avoid repeated freeze-thaw cycles. Prior to assay, frozen serum or plasma should be brought to room temperature slowly and mixed gently.

## **7 Materials Required But Not Provided**

- 5 ml and 10 ml graduated pipettes
- 5  $\mu$ l to 1000  $\mu$ l adjustable single channel micropipettes with disposable tips
- 50  $\mu$ l to 300  $\mu$ l adjustable multichannel micropipette with disposable tips
- Multichannel micropipette reservoir
- Beakers, flasks, cylinders necessary for preparation of reagents
- Device for delivery of wash solution (multichannel wash bottle or automatic wash system)
- Microwell strip reader capable of reading at 450 nm (620 nm as optional reference wave length)
- Glass-distilled or deionized water
- Statistical calculator with program to perform linear regression analysis

## 8 Precautions for Use

- All chemicals should be considered as potentially hazardous. We therefore recommend that this product is handled only by those persons who have been trained in laboratory techniques and that it is used in accordance with the principles of good laboratory practice. Wear suitable protective clothing such as laboratory overalls, safety glasses and gloves. Care should be taken to avoid contact with skin or eyes. In the case of contact with skin or eyes wash immediately with water. See material safety data sheet(s) and/or safety statements(s) for specific advice.
- Reagents are intended for research use only and are not for use in diagnostic or therapeutic procedures.
- Do not mix or substitute reagents with those from other lots or other sources.
- Do not use kit reagents beyond expiration date on label.
- Do not expose kit reagents to strong light during storage or incubation.
- Do not pipette by mouth.
- Do not eat or smoke in areas where kit reagents or samples are handled.
- Avoid contact of skin or mucous membranes with kit reagents or specimens.
- Rubber or disposable latex gloves should be worn while handling kit reagents or specimens.
- Avoid contact of substrate solution with oxidizing agents and metal.
- Avoid splashing or generation of aerosols.
- In order to avoid microbial contamination or cross-contamination of reagents or specimens which may invalidate the test use disposable pipette tips and/or pipettes.
- Use clean, dedicated reagent trays for dispensing substrate reagent.

- Glass-distilled water or deionized water must be used for reagent preparation.
- Substrate solution must be at room temperature prior to use.
- Decontaminate and dispose specimens and all potentially contaminated materials as they could contain infectious agents. The preferred method of decontamination is autoclaving for a minimum of 1 hour at 121.5 °C.
- Liquid wastes not containing acid and neutralized waste may be mixed with sodium hypochlorite in volumes such that the final mixture contains 1.0% sodium hypochlorite. Allow 30 minutes for effective decontamination. Liquid waste containing acid must be neutralized prior to the addition of sodium hypochlorite.

## **9 Preparation of Reagents and Samples**

### **9.1 Wash Buffer**

If crystals have formed in the Wash Buffer Concentrate, warm it gently until they have completely dissolved.

Pour entire contents (25 ml) of the Wash Buffer Concentrate into a clean 500 ml graduated cylinder. Bring to final volume to 500 ml with glass-distilled or deionized water. Mix gently to avoid foaming. The pH of the final solution should adjust to 7.4.

Transfer to a clean wash bottle and store at 2° to 25°C. Please note that Wash Buffer is stable for 30 days.

## 10 Test Protocol

- **Use plate immediately after removal from -20°C!**
- **Do not wait until pellets have completely dissolved before applying samples - the binding reaction in the standard strips starts immediately after addition of water!**
- **Do not try to dissolve pellets by pipetting up and down in the wells - some parts of the pellet could stick to the tip creating high variation of results**
- **Perform the washing step with at least 400 µl of washing buffer as stated in the manual or fill the wells completely - otherwise any pellet residues sticking to the rim of the well will not be removed and create high variation of results**
- **Allow the washing buffer to sit in the wells for a few seconds before aspiration**
- **Remove covers of the standard strips carefully in order that all the lyophilised pellets remain in the wells**

- a. Predilute serum, plasma or urine samples 1:60 with Sample Diluent according to the following dilution scheme:

10 µl Sample + 590 µl Sample Diluent

- b. Determine the number of Microwell Strips required to test the desired number of samples plus Microwell Strips for blanks and standards (coloured). Each sample, standard, blank, and optional control sample should be assayed in duplicate. Remove extra Microwell Strips from holder and store in foil bag with the desiccant provided at -20°C sealed tightly. Place microwell strips containing the standard curve in position A1/A2 to H1/H2 (see Table 1).
- c. Add 130 µl of distilled water to the sample wells.
- d. Add distilled water to all standard and blank wells as indicated on the label of the standard strips (A1, A2 to H1, H2).

Table 1

Table depicting an example of the arrangement of blanks, standards and samples in the microwell strips:

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>A</b>	Standard 1 (4.000 ng/ml)	Standard 1 (4.000 ng/ml)	Sample 1	Sample 1
<b>B</b>	Standard 2 (2.000 ng/ml)	Standard 2 (2.000 ng/ml)	Sample 2	Sample 2
<b>C</b>	Standard 3 (1.000 ng/ml)	Standard 3 (1.000 ng/ml)	Sample 3	Sample 3
<b>D</b>	Standard 4 (0.500 ng/ml)	Standard 4 (0.500 ng/ml)	Sample 4	Sample 4
<b>E</b>	Standard 5 (0.250 ng/ml)	Standard 5 (0.250 ng/ml)	Sample 5	Sample 5
<b>F</b>	Standard 6 (0.125 ng/ml)	Standard 6 (0.125 ng/ml)	Sample 6	Sample 6
<b>G</b>	Standard 7 (0.063 ng/ml)	Standard 7 (0.063 ng/ml)	Sample 7	Sample 7
<b>H</b>	Blank	Blank	Sample 8	Sample 8

- e. Add 20 µl of each 1:60 prediluted **Sample**, in duplicate, to the designated wells and mix the contents.
- f. Cover with a **Plate Cover** and incubate at room temperature (18°C to 25°C) for 3 hours, if available on a microplate shaker at 100 rpm.
- g. Remove **Plate Cover** and empty wells. Wash the microwell strips 3 times with approximately 400 µl Wash Buffer per well with thorough aspiration of microwell contents between washes. Take care not to scratch the surface of the microwells.

After the last wash, tap microwell strips on absorbent pad or paper towel to remove excess Wash Buffer. Use the microwell strips immediately after washing or place upside down on a wet absorbent paper for no longer than 15 minutes. Do not allow wells to dry.

- h. Pipette 100 µl of **TMB Substrate Solution** to all wells, including the blank wells.
- i. Incubate the microwell strips at room temperature (18° to 25°C) for about 10 minutes. Avoid direct exposure to intense light.

**The colour development on the plate should be monitored and the substrate reaction stopped (see point j. of this protocol) before positive wells are no longer properly recordable. Determination of the ideal time period for colour development has to be done individually for each assay.**

It is recommended to add the stop solution when the highest standard has developed a dark blue colour.

Alternatively the colour development can be monitored by the ELISA reader at 620 nm. The substrate reaction should be stopped as soon as Standard 1 has reached an OD of 0.6 – 0.65.

- j. Stop the enzyme reaction by quickly pipetting 100 µl of **Stop Solution** into each well, including the blank wells. It is important that the Stop Solution is spread quickly and uniformly throughout the microwells to completely inactivate the enzyme. Results must be read immediately after the Stop Solution is added or within one hour if the microwell strips are stored at 2 - 8°C in the dark.
- k. Read absorbance of each microwell on a spectro-photometer using 450 nm as the primary wave length (optionally 620 nm as the

reference wave length; 610 nm to 650 nm is acceptable). Blank the plate reader according to the manufacturer's instructions by using the blank wells. Determine the absorbance of both the samples and the human sCD44std standards.

**Note: In case of incubation without shaking the obtained O.D. values may be lower than indicated below. Nevertheless the results are still valid.**

## 11 Calculation of Results

- Calculate the average absorbance values for each set of duplicate standards and samples. Duplicates should be within 20 per cent of the mean.
- Create a standard curve by plotting the mean absorbance for each standard concentration on the ordinate against the human sCD44std concentration on the abscissa. Draw a best fit curve through the points of the graph.
- To determine the concentration of circulating human sCD44std for each sample, first find the mean absorbance value on the ordinate and extend a horizontal line to the standard curve. At the point of intersection, extend a vertical line to the abscissa and read the corresponding human sCD44std concentration.
- **\*Samples have been diluted 1:300, thus the concentration read from the standard curve must be multiplied by the dilution factor (x 300).**
- It is suggested that each testing facility establishes a control sample of known human sCD44std concentration and runs this additional control with each assay. If the values obtained are not within the expected range of the control, the assay results may be invalid.
- A representative standard curve is shown in Figure 4. This curve cannot be used to derive test results. Every laboratory must prepare a standard curve for each group of microwell strips assayed.

\* N.B: There is a common dilution factor for samples due to the conjugate which must then be included in the calculation. The samples contribute 100 µl to the final volume per well. These 100 µl are composed of 80 µl of sample diluent plus 20 µl of the 1:60 prediluted sample. This is a 1:300 dilution.

The remaining 50 µl to give 150 µl are due to the addition of 50 µl conjugate to all wells.

80 µl sample diluent and 50 µl conjugate results in 130 µl reconstitution volume, addition of 20 µl 1:60 prediluted sample (80 µl + 20 µl 1:60 prediluted sample = 1:300 dilution)

Figure 4

Representative standard curve for human sCD44std Instant ELISA. Human sCD44std was diluted in serial 2-fold steps in Sample Diluent, each symbol represents the mean of 3 parallel titrations. Do not use this standard curve to derive test results. A standard curve must be run for each group of microwell strips assayed.

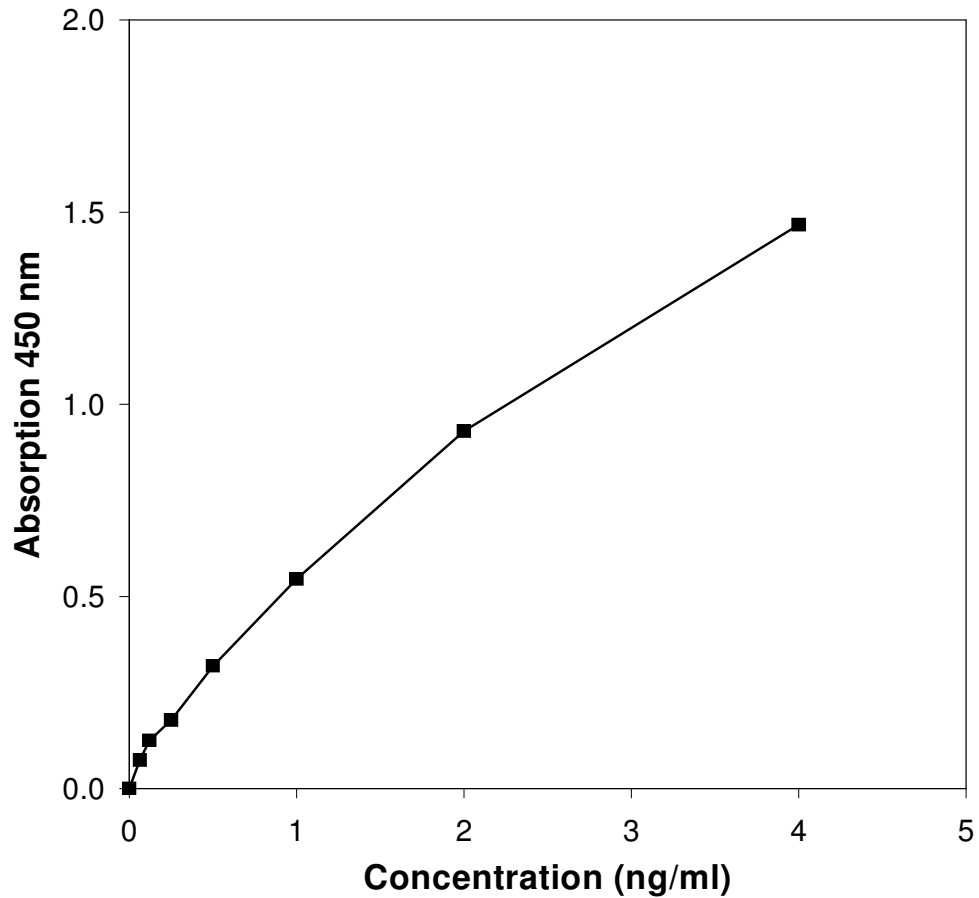


Table 2

Typical data using the human sCD44std INSTANT ELISA

Measuring wavelength: 450 nm

Reference wavelength: 620 nm

Standard	human sCD44std Concentration (ng/ml)	O.D. (450 nm)	O.D. Mean	C.V. (%)
1	4.000	1.486	1.467	1.3
	4.000	1.449		
2	2.000	0.949	0.930	3.5
	2.000	0.910		
3	1.000	0.538	0.545	4.8
	1.000	0.551		
4	0.500	0.321	0.319	2.8
	0.500	0.316		
5	0.250	0.180	0.178	4.0
	0.250	0.177		
6	0.125	0.128	0.125	2.5
	0.125	0.122		
7	0.063	0.072	0.074	4.1
	0.063	0.076		
Blank	0	0.041		
	0	0.036		

The OD values of the standard curve may vary according to the conditions of assay performance (e.g. operator, pipetting technique, washing technique or temperature effects). Furthermore shelf life of the kit may affect enzymatic activity and thus colour intensity. Values measured are still valid.

## 12 Limitations

- Since exact conditions may vary from assay to assay, a standard curve must be established for every run.
- Bacterial or fungal contamination of either screen samples or reagents or cross-contamination between reagents may cause erroneous results.
- Disposable pipette tips, flasks or glassware are preferred, reusable glassware must be washed and thoroughly rinsed of all detergents before use.
- Improper or insufficient washing at any stage of the procedure will result in either false positive or false negative results. Empty wells completely before dispensing fresh wash solution, fill with Wash Buffer as indicated for each wash cycle and do not allow wells to sit uncovered or dry for extended periods.
- The use of radioimmunotherapy has significantly increased the number of patients with human anti-mouse IgG antibodies (HAMA). HAMA may interfere with assays utilizing murine monoclonal antibodies leading to both false positive and false negative results. Serum samples containing antibodies to murine immunoglobulins can still be analysed in such assays when murine immunoglobulins (serum, ascitic fluid, or monoclonal antibodies of irrelevant specificity) are added to the Sample.

## **13 Performance Characteristics**

### **13.1 Sensitivity**

The limit of detection of human sCD44std defined as the analyte concentration resulting in an absorbance significantly higher than that of the dilution medium (mean plus 2 standard deviations) was determined to be 0.016 ng/ml (mean of 6 independent assays).

### **13.2 Reproducibility**

#### **13.2.1 Intra-assay**

Reproducibility within the assay was evaluated in 3 independent experiments. Each assay was carried out with 6 replicates of 8 serum samples containing different concentrations of human sCD44std. 2 standard curves were run on each plate. Data below show the mean human sCD44std concentration and the coefficient of variation for each sample (see Table 3). The calculated overall intra-assay coefficient of variation was 9.5%.

Table 3

The Mean human sCD44std concentration and the coefficient of variation for each sample.

Positive Sample	Experiment	human sCD44std Concentration (ng/ml)	Coefficient of Variation (%)
1	1	611.4	16
	2	811.9	19
	3	796.2	12
2	1	511.3	5
	2	563.5	11
	3	544.1	10
3	1	487.7	6
	2	583.9	17
	3	514.4	11
4	1	131.6	4
	2	143.7	13
	3	136.7	2
5	1	579.3	7
	2	644.3	12
	3	583.1	7
6	1	279.1	3
	2	356.0	11
	3	284.3	12
7	1	374.4	6
	2	473.7	16
	3	434.8	6
8	1	317.8	7
	2	388.4	8
	3	339.2	8

### 13.2.2 Inter-assay

Assay to assay reproducibility within one laboratory was evaluated in 3 independent experiments by 3 technicians. Each assay was carried out with 6 replicates of 8 serum samples containing different concentrations of human sCD44std. 2 standard curves were run on each plate. Data below (see Table 4) show the mean human sCD44std concentration and the coefficient of variation calculated on 18 determinations of each sample. The calculated overall coefficient of variation was 4.1%.

Table 4

The mean human sCD44std concentration and the coefficient of variation calculated on 18 determinations of each sample.

Sample	human sCD44std Concentration (ng/ml)	Coefficient of Variation (%)
1	739.9	15
2	539.6	5
3	528.7	9
4	137.3	4
5	602.2	6
6	306.5	14
7	427.6	12
8	348.5	10

### 13.3 Spike Recovery

The spike recovery was evaluated by spiking 4 levels of human sCD44std into human serum. Recoveries were determined in 3 independent experiments with 6 replicates each. The unspiked serum was used as blank in these experiments. Average recovery ranged from 67% to 98% with an overall mean recovery of 73%.

### 13.4 Dilution Parallelism

4 serum samples with different levels of human sCD44std were analysed at serial 2 fold dilutions with 4 replicates each. The recovery ranged between 83% to 101% with an overall mean recovery of 92% (see Table 5).

Table 5

Sample	Dilution	Human sCD44std Concentration (ng/ml)		% Recovery of Exp. Val.
		Expected Value	Observed Value	
1	1:300	--	1027	--
	1:600	514	477	93
	1:1200	238	229	96
2	1:300	--	1244	--
	1:600	622	567	91
	1:1200	284	266	94
3	1:300	--	363	--
	1:600	182	182	101
	1:1200	91	83	91
4	1:300	--	1247	--
	1:600	624	563	90
	1:1200	281	232	83

### 13.5 Sample Stability

#### 13.5.1 Freeze-Thaw Stability

Aliquots of serum samples (unspiked or spiked) were stored at -20 °C and thawed 5 times, and the human sCD44std levels determined. There was no significant loss of human sCD44std concentrations between 0 and 5 freeze-thaw cycles.

#### 13.5.2 Storage Stability

Aliquots of serum samples (spiked or unspiked) were stored at -20 °C, 2-8 °C, room temperature (RT) and at 37 °C, and the human sCD44std level determined after 24 h. There was no significant loss of human sCD44std immunoreactivity caused by storage under above conditions.

### 13.6 Comparison of Serum and Plasma

Sera, as well as EDTA, citrate and heparin plasmas from 22 individuals were obtained at the same time point. All these blood preparations were

found suitable for human sCD44std determinations, although human sCD44std levels in citrate and EDTA plasmas were slightly lower than serum levels. It is, therefore, highly recommended to assure the uniformity of sample preparations!

### **13.7 Specificity**

To define the specificity of this ELISA several proteins were tested for cross reactivity. There was no cross reactivity observed.

### **13.8 Expected Values**

22 randomly selected sera from healthy blood donors (male and female) was tested for human sCD44std. The detected human sCD44std levels ranged between 251 and 925 ng/ml with a mean level of 443 ng/ml and a standard deviation of 125 ng/ml. Normal human sCD44std levels may vary depending on the serum collective used.

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For literature update refer to [www.bendermedsystems.com/44.html](http://www.bendermedsystems.com/44.html)

## 15 Ordering Information

For orders please contact:

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**Cat.No. BMS209INST human sCD44std INSTANT ELISA**

## **16 Reagent Preparation Summary**

### **16.1 Wash Buffer**

Add **Wash Buffer Concentrate** 20 x (25 ml) to 475 ml distilled water

## 17 Test Protocol Summary

- Predilute sample with Sample Diluent 1:60
- Place standard strips in position A1/A2 to H1/H2.
- Add 130  $\mu\text{l}$  **distilled water** to sample wells.
- Add **distilled water**, in duplicate, to all standard and blank wells as indicated on the label of the standard strips.
- Add 20  $\mu\text{l}$  1:60 prediluted **Sample** to designated wells.
- Cover microwell strips and incubate 3 hours at room temperature (18° to 25°C) on a microplate shaker at 100 rpm.
- Empty and wash microwell strips 3 times with 400  $\mu\text{l}$  **Wash Buffer**.
- Add 100  $\mu\text{l}$  of **TMB Substrate Solution** to all wells including blank wells.
- Incubate the microwell strips for about 10 minutes at room temperature (18° to 25°C).
- Add 100  $\mu\text{l}$  **Stop Solution** to all wells including blank wells.
- Blank microwell reader and measure colour intensity at 450 nm.

**Note: Samples have been diluted 1:300, thus the concentration read from the standard curve must be multiplied by the dilution factor (x 300).**