



## **CD40L, Soluble (human) ELISA Kit (highsensitivity)**

*Manufactured by Bender MedSystems.*

### **ALX-850-311-KI01**

96 wells (~80 tests)

(Version 20: October 31, 2007)

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**For laboratory use only. Not for human or diagnostic use.**

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## 1 Intended Use

The human sCD40L high sensitive ELISA is an enzyme-linked immunosorbent assay for the quantitative detection of human sCD40L. **The human sCD40L high sensitive ELISA is for research use only. Not for diagnostic or therapeutic procedures.**

## 2 Summary

CD40 belongs to the TNF receptor superfamily. While the biological role of some of the ligand-receptor pairs in this family still remains obscure, CD40 has proven its importance (3).

A key role of CD40/CD40ligand interactions in immune activation, particularly in T-cell dependent B cell responses is anticipated. This molecule as well as the other ligands of the family share the property of co-stimulation of T-cell proliferation and are all expressed by activated T-cells.

The programmed cell death has been suggested to be involved in clonal elimination of self-reactive lymphocytes for the normal function of the immune system. Interaction with membrane bound self antigens may eliminate self-reactive nature B cells by apoptosis. Antigen-receptor mediated B cell apoptosis is blocked when a signal is transduced via the CD40 molecule on the B cell surface (10).

Because the ligand of CD40 (CD40L) is expressed on activated T helper cells, B cells may escape from apoptosis and are activated when the immune system interacts with foreign antigens, which are normally able to activate T-helper cells. Thus the CD40/CD40L interaction plays a central role in the various phases of the B cell response to T-dependent antigens (8).

Taken together, B cells can participate in regulating their own destruction. Protection against Fas-dependent apoptosis afforded by immunoglobulin-receptor engagement may constitute a fail-safe mechanism that eliminates bystander B cells activated by CD40L-expressing T cells, but ensures survival of antigen-specific B cells (9).

CD40 Ligand is expressed on the surface of activated CD4+ T cells, basophils, and mast cells. Binding of CD40L to its receptor, CD40, on

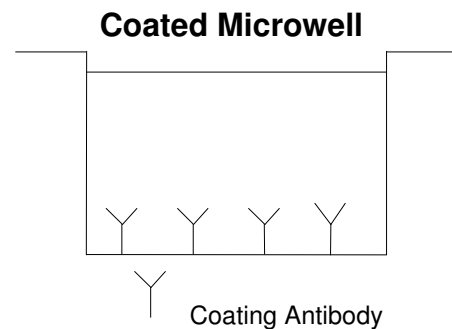
the surface of B cells stimulates B-cell proliferation, adhesion and differentiation. A soluble isoform of CD40L has been shown to exist in the circulation. This soluble molecule is a homotrimer of a 18kDa protein exhibiting full activity in B cell proliferation and differentiation assays, is able to rescue B cells from apoptosis and binds soluble CD40 (4, 6).

CD40L is discussed in relation to a potential role in supporting B cell tumors and it has been discovered that the molecular defect in the X-linked Hyper-IgM-Syndrome (1) is targeted to the CD40L gene, it is functional involved in B cell hybridomas (5) and chronic lymphocytic leukemia (2) as well as several autoimmune diseases (7).

### 3 Principles of the Test

An anti-human sCD40L coating antibody is adsorbed onto microwells.

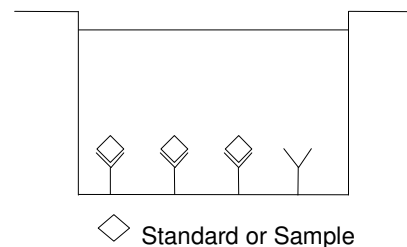
Figure 1



Human sCD40L present in the sample or standard binds to antibodies adsorbed to the microwells.

Figure 2

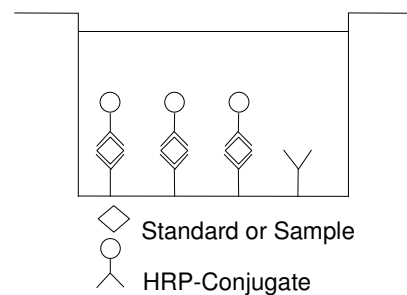
**First Incubation**



Following incubation unbound biological components are removed during a wash step and a HRP-conjugated anti-human sCD40L antibody is added and binds to human sCD40L captured by the first antibody.

Figure 3

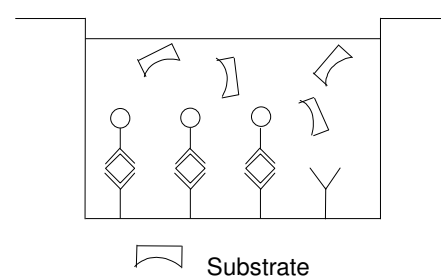
**Second Incubation**



Following incubation unbound HRP-conjugated anti-human sCD40L antibody is removed during a wash step, and substrate solution reactive with HRP is added to the wells.

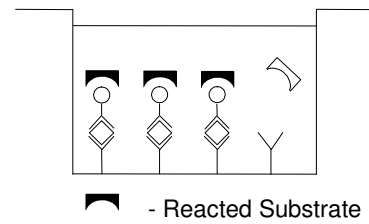
Figure 4

**Third Incubation**



A coloured product is formed in proportion to the amount of human sCD40L present in the sample or standard. The reaction is terminated by addition of acid and absorbance is measured at 450 nm. A standard curve is prepared from 7 human sCD40L standard dilutions and human sCD40L concentration determined.

Figure 5



## 4 Reagents Provided

### 4.1 Reagents for human sCD40L high sensitive ELISA BMS293 (96 tests)

- 1 aluminium pouch with a **Microwell Plate coated** with monoclonal antibody to human sCD40L
- 1 vial (150 µl) **HRP-Conjugate** anti-human sCD40L monoclonal antibody
- 2 vials human sCD40L **Standard** lyophilized, 20 ng/ml upon reconstitution
- 1 vial **Control high**, lyophilized
- 1 vial **Control low**, lyophilized
- 1 vial (12 ml) **Sample Diluent**

(Please note: In some cases the Sample Diluent contains an insoluble precipitate which does not interfere in any way with the test performance. Use according to protocol.)

- 1 vial (5 ml) **Assay Buffer Concentrate** 20x (PBS with 1% Tween 20 and 10% BSA)
- 1 bottle (50 ml) **Wash Buffer Concentrate** 20x (PBS with 1% Tween 20)
- 1 vial (15 ml) **Substrate Solution** (tetramethyl-benzidine)
- 1 vial (12 ml) **Stop Solution** (1M Phosphoric acid)
- 1 vial (0.4 ml) **Blue-Dye**
- 1 vial (0.4 ml) **Green-Dye**

### 4 Adhesive Films

## 4.2 Reagents for human sCD40L high sensitive ELISA ALX-850-311 (10x96 tests)

10 aluminium pouches with a **Microwell Plate coated** with monoclonal antibody to human sCD40L

10 vials (150 µl) **HRP-Conjugate** anti-human sCD40L monoclonal antibody

10 vials human sCD40L **Standard** lyophilized, 20 ng/ml upon reconstitution

10 vials **Control high**, lyophilized

10 vials **Control low**, lyophilized

10 vials (12 ml) **Sample Diluent**

(Please note: In some cases the Sample Diluent contains an insoluble precipitate which does not interfere in any way with the test performance. Use according to protocol.)

2 vials (5 ml) **Assay Buffer Concentrate** 20x (PBS with 1% Tween 20 and 10% BSA)

4 bottles (50 ml) **Wash Buffer Concentrate** 20x (PBS with 1% Tween 20)

10 vials (15 ml) **Substrate Solution** (tetramethyl-benzidine)

10 vials (12 ml) **Stop Solution** (1M Phosphoric acid)

6 vials (0.4 ml) **Blue-Dye**

6 vials (0.4 ml) **Green-Dye**

20 **Adhesive Films**

## **5 Storage Instructions – ELISA Kit**

Store kit reagents between 2° and 8°C except controls. Store lyophilized controls at -20°C.

Immediately after use remaining reagents should be returned to cold storage (2° to 8°C), controls to -20°C, respectively. Expiry of the kit and reagents is stated on labels.

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, this reagent is not contaminated by the first handling.

The standard has to be used immediately after reconstitution and cannot be stored.

## **6 Specimen Collection and Storage Instructions**

Cell culture supernatant, serum and plasma (EDTA, citrate, heparinized) were tested with this assay. Other body fluids might be suitable for use in the assay. Remove serum or plasma from the clot or 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 should be aliquoted and must be stored frozen at -20°C to avoid loss of bioactive human sCD40L. If samples are to be run within 24 hours, they may be stored at 2° to 8°C (for sample stability refer to 13.5).

Avoid repeated freeze-thaw cycles. Prior to assay, the frozen sample 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 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 statement(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 the conjugate and substrate reagent.

- Exposure to acid inactivates the conjugate.
- 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

**Buffer concentrates** should be brought to room temperature and should be diluted before starting the test procedure.

### 9.1 Wash Buffer

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

Pour entire contents (50 ml) of the Wash Buffer Concentrate into a clean 1000 ml graduated cylinder. Bring to final volume of 1000 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.

Wash Buffer may also be prepared as needed according to the following table:

Number of Strips	Wash Buffer Concentrate (ml)	Distilled Water (ml)
1 - 6	25	475
1 - 12	50	950

### 9.2 Assay Buffer (1x)

Pour the entire contents (5 ml) of the **Assay Buffer Concentrate** (20x) into a clean 100 ml graduated cylinder. Bring to final volume of 100 ml with distilled water. Mix gently to avoid foaming.

Store at 2° to 8°C. Please note that the Assay Buffer (1x) is stable for 30 days.

Assay Buffer (1x) may also be prepared as needed according to the following table:

Number of Strips	Assay Buffer Concentrate (ml)	Distilled Water (ml)
1 - 6	2.5	47.5
1 - 12	5.0	95.0

### 9.3 HRP-Conjugate

**Please note that the HRP-Conjugate should be used within 30 minutes after dilution.**

Make a 1:100 dilution of the concentrated **HRP-Conjugate** solution with Assay Buffer (1x) in a clean plastic tube as needed according to the following table:

Number of Strips	HRP-Conjugate (ml)	Assay Buffer (1x) (ml)
1 - 6	0.06	5.94
1 - 12	0.12	11.88

### 9.4 Human sCD40L Standard

Reconstitute **human sCD40L standard** by addition of distilled water. Reconstitution volume is stated on the label of the standard vial. Swirl or mix gently to insure complete and homogeneous solubilization (concentration of reconstituted standard = 20 ng/ml).

Further dilute standard 1:2 by adding the same volume Sample Diluent as the reconstitution volume to the reconstituted standard (concentration of prepared standard = 10 ng/ml).

The standard has to be used immediately after reconstitution and cannot be stored.

**Standard dilutions** can be prepared directly on the microwell plate (see 10.c) or alternatively in tubes (see 9.4.1).

### 9.4.1 External Standard Dilution

Label 7 tubes, one for each standard point.

S1, S2, S3, S4, S5, S6, S7

Then prepare 1:2 serial dilutions for the standard curve as follows:

Pipette 225  $\mu$ l of Sample Diluent into each tube.

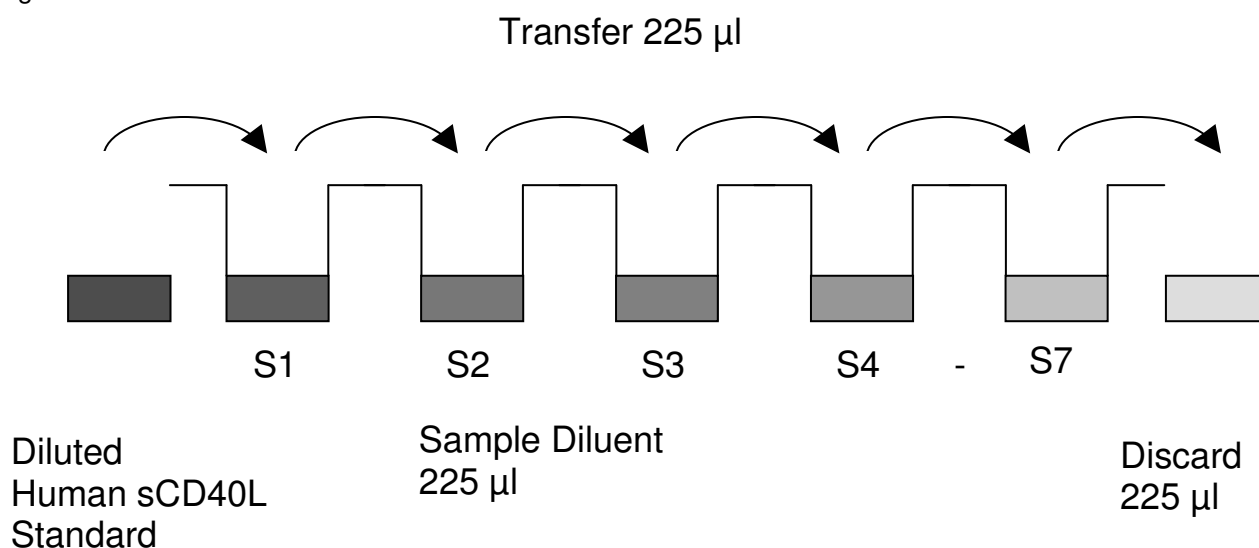
Pipette 225  $\mu$ l of diluted standard (concentration = 10 ng/ml) into the first tube, labelled S1, and mix (concentration of Standard 1 = 5 ng/ml).

Pipette 225  $\mu$ l of this dilution into the second tube, labelled S2, and mix thoroughly before the next transfer.

Repeat serial dilutions 5 more times thus creating the points of the standard curve (see Figure 6).

Sample Diluent serves as blank.

Figure 6



### 9.5 Control

Reconstitute by adding 200  $\mu$ l distilled water to lyophilized control. Swirl or mix gently to ensure complete and homogeneous solubilization. Further treat the control like your samples in the assay. For control range please refer to certificate of analysis or vial label. Store reconstituted control aliquoted at -20  $^{\circ}$ C. Avoid repeated freeze and thaw cycles.

## 9.6 Addition of Colour-giving Reagents: Blue-Dye, Green-Dye

In order to help our customers to avoid any mistakes in pipetting the Bender MedSystems ELISAs, Bender MedSystems offers a tool that helps to monitor the addition of even very small volumes of a solution to the reaction well by giving distinctive colours to each step of the ELISA procedure.

**This procedure is optional**, does not in any way interfere with the test results, and is designed to help the customer with the performance of the test, but can also be omitted, just following the instruction booklet.

Alternatively, the dye solutions from the stocks provided (**Blue-Dye**, **Green-Dye**) can be added to the reagents according to the following guidelines:

- 1. Diluent:** Before standard and sample dilution add the **Blue-Dye** at a dilution of 1:250 (see table below) to the appropriate diluent (1x) according to the test protocol. After addition of **Blue-Dye**, proceed according to the instruction booklet.

5 ml Sample Diluent	20 µl <b>Blue-Dye</b>
12 ml Sample Diluent	48 µl <b>Blue-Dye</b>
50 ml Sample Diluent	200 µl <b>Blue-Dye</b>

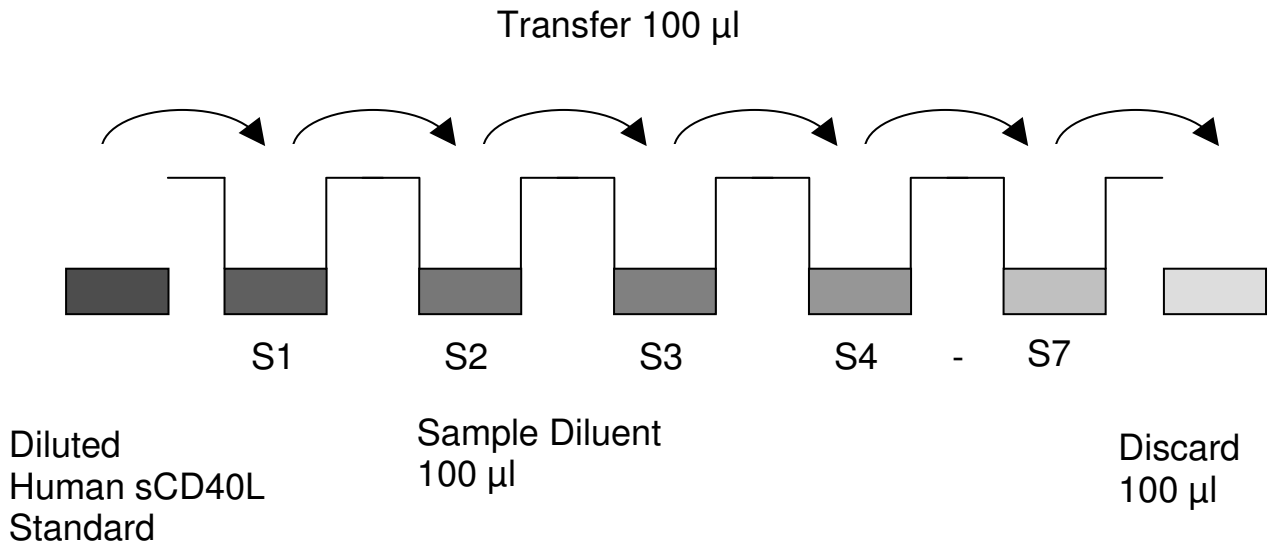
- 2. HRP-Conjugate:** Before dilution of the concentrated HRP-Conjugate add the **Green-Dye** at a dilution of 1:100 (see table below) to the Assay Buffer (1x) used for the final conjugate dilution. Proceed after addition of **Green-Dye** according to the instruction booklet: Preparation of HRP-Conjugate.

6 ml Assay Buffer (1x)	60 µl <b>Green-Dye</b>
12 ml Assay Buffer (1x)	120 µl <b>Green-Dye</b>

## 10 Test Protocol

- a. Determine the number of microwell strips required to test the desired number of samples plus appropriate number of wells needed for running blanks and standards. 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 2°-8°C sealed tightly.
- b. Wash the microwell strips twice with approximately 400 µl Wash Buffer per well with thorough aspiration of microwell contents between washes. Allow the Wash Buffer to sit in the wells for about **10 – 15 seconds** before aspiration. Take care not to scratch the surface of the microwells.  
After the last wash step, empty wells and tap microwell strips on absorbent pad or paper towel to remove excess Wash Buffer. Use the microwell strips immediately after washing. Alternatively microwell strips can be placed upside down on a wet absorbent paper for not longer than 15 minutes. **Do not allow wells to dry.**
- c. **Standard dilution on the microwell plate** (Alternatively the standard dilution can be prepared in tubes - see 9.4.1):  
Add 100 µl of Sample Diluent in duplicate to all **standard wells**.  
Pipette 100 µl of prepared **standard** (see Preparation of Standard 9.4.1, concentration = 10 ng/ml), in duplicate, into well A1 and A2 (see Table 1). Mix the contents of wells A1 and A2 by repeated aspiration and ejection (concentration of standard 1 S1 = 5 ng/ml), and transfer 100 µl to wells B1 and B2, respectively (see Figure 7). Take care not to scratch the inner surface of the microwells.  
Continue this procedure 5 times, creating two rows of human sCD40L standard dilutions, ranging from 5.00 to 0.08 ng/ml. Discard 100 µl of the contents from the last microwells (G1, G2) used.

Figure 7



In case of an **external standard dilution** (see 9.4.1), pipette 100 µl of these standard dilutions (S1 - S7) in the standard wells according to Table 1.

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 (5.00 ng/ml)	Standard 1 (5.00 ng/ml)	Sample 1	Sample 1
<b>B</b>	Standard 2 (2.50 ng/ml)	Standard 2 (2.50 ng/ml)	Sample 2	Sample 2
<b>C</b>	Standard 3 (1.25 ng/ml)	Standard 3 (1.25 ng/ml)	Sample 3	Sample 3
<b>D</b>	Standard 4 (0.63 ng/ml)	Standard 4 (0.63 ng/ml)	Sample 4	Sample 4
<b>E</b>	Standard 5 (0.31 ng/ml)	Standard 5 (0.31 ng/ml)	Sample 5	Sample 5
<b>F</b>	Standard 6 (0.16 ng/ml)	Standard 6 (0.16 ng/ml)	Sample 6	Sample 6
<b>G</b>	Standard 7 (0.08 ng/ml)	Standard 7 (0.08 ng/ml)	Sample 7	Sample 7
<b>H</b>	Blank	Blank	Sample 8	Sample 8

- d. Add 100 µl of **Sample Diluent** in duplicate to the **blank wells**.
- e. Add 80 µl of **Sample Diluent** to the **sample wells** designated for **serum samples**.  
Add 50 µl of **Sample Diluent** to the **sample wells** designated for **plasma samples**.
- f. Add 20 µl of each **serum sample** in duplicate to the **designated sample wells**.  
Add 50 µl of each **plasma sample** in duplicate to the **designated sample wells**.
- g. Cover with an adhesive film and incubate at room temperature (18 to 25°C) for 2 hours, if available on a microplate shaker set at 100 rpm.
- h. Prepare **HRP-Conjugate** (see Preparation of HRP-Conjugate 9.3).
- i. Remove adhesive film and empty wells. Wash microwell strips 3 times according to point b. of the test protocol. Proceed immediately to the next step.
- j. Add 100 µl of **HRP-Conjugate** to all wells.
- k. Cover with an adhesive film and incubate at room temperature (18 to 25°C) for 1 hours, if available on a microplate shaker set at 100 rpm.
- l. Remove adhesive film and empty wells. Wash microwell strips 3 times according to point b. of the test protocol. Proceed immediately to the next step.
- m. Pipette 100 µl of **TMB Substrate Solution** to all wells.
- n. Incubate the microwell strips at room temperature (18° to 25°C) for about 10 min. Avoid direct exposure to intense light.

**The colour development on the plate should be monitored and the substrate reaction stopped (see next point 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.

- o. Stop the enzyme reaction by quickly pipetting 100  $\mu$ l of **Stop Solution** into each well. 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.
- p. 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 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 value.
- Create a standard curve by plotting the mean absorbance for each standard concentration on the ordinate against the human sCD40L concentration on the abscissa. Draw a best fit curve through the points of the graph (a 5-parameter curve fit is recommended).
- To determine the concentration of circulating human sCD40L 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 sCD40L concentration.
- **If instructions in this protocol have been followed serum samples have been diluted 1:5 (20 µl sample + 80 µl Sample Diluent), the concentration read from the standard curve must be multiplied by the dilution factor (x 5). Plasma samples have been diluted 1:2 (50 µl sample + 50 µl Sample Diluent), the concentration read from the standard curve must be multiplied by the dilution factor (x 2).**
- **Calculation of samples with a concentration exceeding standard 1 may result in incorrect human sCD40L levels. Such samples require further external predilution according to expected human sCD40L values with Sample Diluent in order to precisely quantitate the actual human sCD40L level.**
- It is suggested that each testing facility establishes a control sample of known human sCD40L 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 8. This curve cannot be used to derive test results. Each laboratory must prepare a standard curve for each group of microwell strips assayed.

Figure 8

Representative standard curve for human sCD40L high sensitive ELISA. Human sCD40L was diluted in serial 2-fold steps in Sample Diluent. Do not use this standard curve to derive test results. A standard curve must be run for each group of microwell strips assayed.

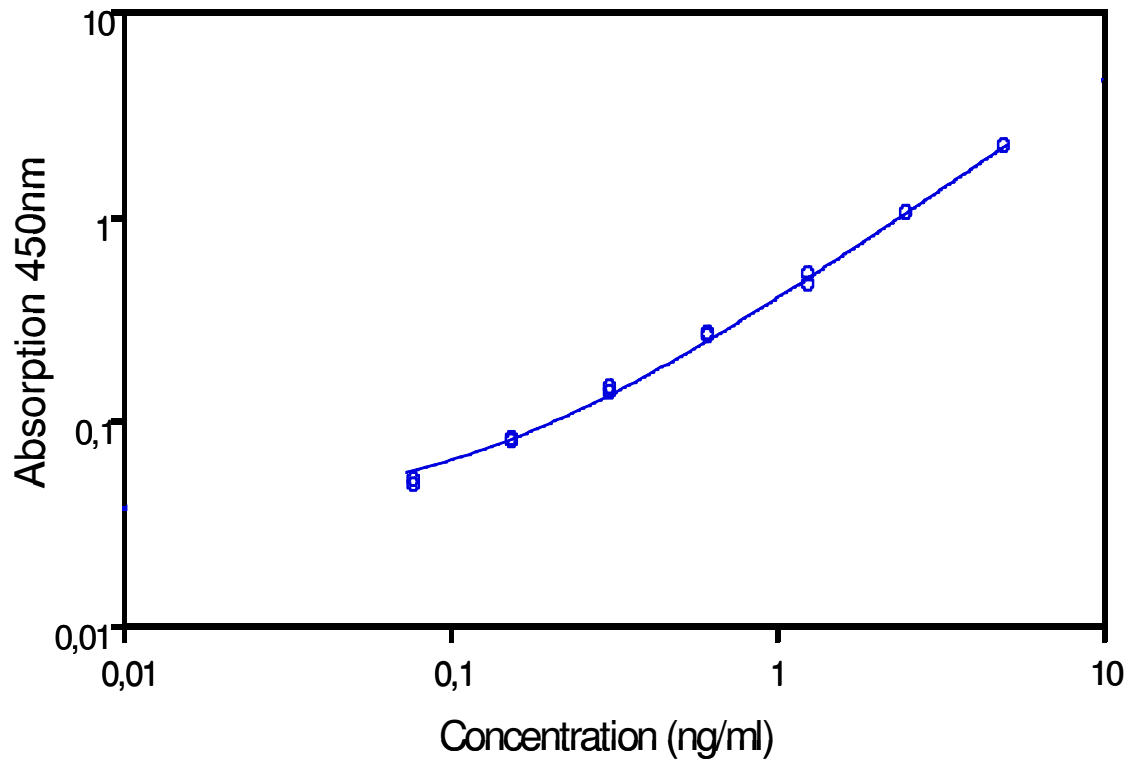


Table 2

Typical data using the human sCD40L high sensitive ELISA

Measuring wavelength: 450 nm

Reference wavelength: 620 nm

Standard	Human sCD40L Concentration (ng/ml)	O.D. at 450 nm	Mean O.D. at 450 nm	C.V. (%)
1	5.00	2.189	2.163	1.2%
	5.00	2.136		
2	2.50	1.013	1.017	0.4%
	2.50	1.021		
3	1.25	0.508	0.483	5.2%
	1.25	0.458		
4	0.63	0.260	0.257	1.2%
	0.63	0.254		
5	0.31	0.141	0.138	2.5%
	0.31	0.134		
6	0.16	0.080	0.079	1.3%
	0.16	0.078		
7	0.08	0.050	0.049	2.0%
	0.08	0.048		
Blank	0	0.022	0.019	
	0	0.016		

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 sCD40L 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 less than 0.01 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 sCD40L. 2 standard curves were run on each plate. Data below show the mean human sCD40L concentration and the coefficient of variation for each sample (see Table 3). The calculated overall intra-assay coefficient of variation was 5.5%.

Table 3

The mean human sCD40L concentration and the coefficient of variation for each sample

Sample	Experiment	Mean Human sCD40L Concentration (ng/ml)	Coefficient of Variation (%)
1	1	28.4	9.5
	2	25.8	9.3
	3	23.3	5.2
2	1	22.8	4.8
	2	20.7	5.4
	3	21.5	3.0
3	1	15.7	6.9
	2	12.2	8.7
	3	13.1	6.1
4	1	10.1	4.7
	2	8.8	4.9
	3	8.8	4.0
5	1	5.1	5.1
	2	4.2	8.4
	3	4.5	8.9
6	1	12.9	3.1
	2	12.6	5.1
	3	10.5	2.2
7	1	9.9	1.3
	2	9.5	5.1
	3	10.1	6.3
8	1	6.2	5.2
	2	6.5	7.0
	3	6.7	1.5

### 13.2.2 Inter-assay

Assay to assay reproducibility within one laboratory was evaluated in 3 independent experiments. Each assay was carried out with 6 replicates of 8 serum samples containing different concentrations of human sCD40L. 2 standard curves were run on each plate. Data below show the mean human sCD40L concentration and the coefficient of variation calculated on 18 determinations of each sample (see Table 4). The calculated overall inter-assay coefficient of variation was 6.6%.

Table 4

The mean human sCD40L concentration and the coefficient of variation of each sample

Sample	Mean Human sCD40L Concentration (ng/ml)	Coefficient of Variation (%)
1	25.8	8.1
2	21.7	3.8
3	13.7	10.5
4	9.2	6.8
5	4.6	8.7
6	12.0	8.8
7	9.8	2.7
8	6.5	3.3

### 13.3 Spike Recovery

The spike recovery was evaluated by spiking 4 levels of human sCD40L into serum and plasma. Recoveries were determined in 3 independent experiments with 6 replicates each.

The unspiked serum and plasma was used as blank in these experiments.

The recovery ranged from 87% to 112% with an overall mean recovery of 99%.

### 13.4 Dilution Parallelism

Serum samples with different levels of human sCD40L were analysed at serial 2 fold dilutions with 4 replicates each.

The recovery ranged from 84% to 114% with an overall recovery of 97% (see Table 5).

Table 5

Sample	Dilution	Expected Human sCD40L Concentration (ng/ml)	Observed Human sCD40L Concentration (ng/ml)	Recovery of Expected Concentration (%)
1	1:5	--	25.2	--
	1:10	12.6	14.3	114
	1:20	7.2	6.7	94
	1:40	3.4	3.5	104
2	1:5	--	23.5	--
	1:10	11.7	12.0	103
	1:20	6.0	5.1	85
	1:40	2.5	2.3	92
3	1:5	--	27.5	--
	1:10	13.7	13.5	98
	1:20	6.7	7.3	109
	1:40	3.7	3.6	97
4	1:5	--	28.1	--
	1:10	14.1	11.7	84
	1:20	5.9	5.5	94
	1:40	2.8	2.6	93

## **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 sCD40L levels determined. There was no significant loss of human sCD40L immunoreactivity detected by freezing and thawing.

### **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 sCD40L level determined after 24 h. A significant loss of human sCD40L immunoreactivity was detected during storage at RT (57% immunoreactivity) and at 37 °C (4% immunoreactivity) after 24 h.

## **13.6 Comparison of Serum and Plasma**

From two individuals, serum as well as EDTA and citrate plasma samples, obtained at the same time point, were evaluated. Human sCD40L concentrations were significantly different, but if the uniformity of blood preparations is assured, all these body fluids are suitable for the assay.

## **13.7 Specificity**

The interference of circulating factors of the immune system was evaluated by spiking these proteins at physiologically relevant concentrations into a human sCD40L positive serum. There was no crossreactivity detected.

### **13.8 Expected Values**

A panel of 40 sera samples from randomly selected apparently healthy donors (males and females) was tested for human sCD40L.

The detected human sCD40L levels ranged between 0.03 and 3.98 ng/ml with a mean level of 2.13 ng/ml and a standard deviation of 1.00 ng/ml.

A panel of 65 plasma samples was tested for human sCD40L.

The detected human sCD40L levels ranged between 0.14 and 2.94 ng/ml with a mean level of 1.00 ng/ml and a standard deviation of 0.57 ng/ml.

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## 15. Ordering Information

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## 16 Reagent Preparation Summary

### 16.1 Wash Buffer

Add **Wash Buffer Concentrate** 20x (50 ml) to 950 ml distilled water.

Number of Strips	Wash Buffer Concentrate (ml)	Distilled Water (ml)
1 - 6	25	475
1 - 12	50	950

### 16.2 Assay Buffer (1x)

Add **Assay Buffer Concentrate** 20x (5 ml) to 95 ml distilled water.

Number of Strips	Assay Buffer Concentrate (ml)	Distilled Water (ml)
1 - 6	2.5	47.5
1 - 12	5.0	95.0

### 16.3 HRP-Conjugate

Make a:100 dilution of **HRP-Conjugate** in Assay Buffer (1x):

Number of Strips	HRP-Conjugate (ml)	Assay Buffer (1x) (ml)
1 - 6	0.06	5.94
1 - 12	0.12	11.88

### 16.4 Human sCD40L Standard

Reconstitute lyophilized **human sCD40L standard** with distilled water. (Reconstitution volume is stated on the label of the standard vial.)

Dilute reconstituted standard 1:2 by adding the same volume as the reconstitution volume of Sample Diluent to the reconstituted standard.

### 16.5 Controls

Add 200 µl distilled water to lyophilized **controls**.

## 17 Test Protocol Summary

1. Determine the number of microwell strips required.
2. Wash microwell strips twice with Wash Buffer.
3. Standard dilution on the microwell plate: Add 100 µl Sample Diluent, in duplicate, to all standard wells. Pipette 100 µl prepared standard into the first wells and create standard dilutions by transferring 100 µl from well to well. Discard 100 µl from the last wells.  
Alternatively external standard dilution in tubes (see 9.4.1): Pipette 100 µl of these standard dilutions in the microwells strips.
4. Add 100 µl Sample Diluent, in duplicate, to the blank wells.
5. Add 80 µl Sample Diluent to all wells designated for **serum** samples.  
Add 50 µl Sample Diluent to all wells designated for **plasma** samples.
6. Add 20 µl of each **serum** sample in duplicate to designated sample wells.  
Add 50 µl of each **plasma** sample in duplicate to designated sample wells.
7. Cover microwell strips and incubate 2 hours at room temperature (18° to 25°C).
8. Prepare HRP-Conjugate.
9. Empty and wash microwell strips 3 times with Wash Buffer.
10. Add 100 µl HRP-Conjugate to all wells.
11. Cover microwell strips and incubate 1 hour at room temperature (18° to 25°C).
12. Empty and wash microwell strips 3 times with Wash Buffer.
13. Add 100 µl of TMB Substrate Solution to all wells.
14. Incubate the microwell strips for about 10 minutes at room temperature (18° to 25°C).
15. Add 100 µl Stop Solution to all wells.
16. Blank microwell reader and measure colour intensity at 450 nm.

**Note: If instructions in this protocol have been followed serum samples have been diluted 1:5 (20 µl sample + 80 µl Sample Diluent), the concentration read from the standard curve must be multiplied by the dilution factor (x 5).**

**Plasma samples have been diluted 1:2 (50 µl sample + 50 µl Sample Diluent), the concentration read from the standard curve must be multiplied by the dilution factor (x 2).**