

*PRODUCT
INFORMATION*



***Human sCD40
ELISA***

***IB49656
and
IB49656-10***

Enzyme-linked immunosorbent assay for
detection of human sCD40.

For research use only - not for use in diagnostic procedures.

**Human sCD40
IB49656
IB49656-10**

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1 Intended Use

The human sCD40 ELISA is an enzyme-linked immunosorbent assay for the detection of human sCD40. **The human sCD40 ELISA is for research use only. Not for use in diagnostic procedures.**

2 Summary

CD40 is a 50 kDa membrane-bound type I glycoprotein expressed by numerous cells, most notably B lymphocytes and monocytes and antigen presenting cells (APC) such as macrophages, dendritic cells and fibroblasts. It is furthermore highly expressed on various malignant cells. The expression of CD40 regulates T-cell - APC interaction and has been shown to be centrally involved in a wide array of inflammatory events. The function of CD40 is very broad.

CD40 belongs to the TNF-receptor family. The ligand for CD40 (CD154) is a 33 kDa type II transmembrane protein mainly expressed by activated T-cells, and is a member of the TNF superfamily. CD40/CD40L interactions are essential for T-cell-dependent B cell proliferation and differentiation, for activation of antigen presenting cells and for cytokine production on numerous other cells.

It is presently accepted that CD40 plays a critical role in the regulation of immune responses (21, 22).

CD40 expression has also been found on non lymphoid cells such as fibroblasts, endothelia, and epithelial cells.

Its critical role in T-cell-dependent humoral immune responses was demonstrated by patients with the hyper-IgM-Syndrome.

CD40 is also involved in the apoptotic pathway of cells (20). While it has been shown that the programmed cell death can be inhibited by the survival signals mediated from the binding of the CD40 receptor to the CD40 Ligand (9, 6), very recently a novel proapoptotic mechanism induced by CD40 in carcinoma cells has been described (4). This mechanism is dependent on the endogenous production of cytotoxic cytokines.

The interaction of CD40 and its ligand, CD154 (CD40L) was found to play a crucial role in many aspects of immune response and the development and progress of various diseases.

It was found to be centrally involved in transplant rejection (3, 8, 19). The interaction of CD40 on synovial fibroblasts and CD40L expressed on activated T lymphocytes is directly involved in the neovascularization in rheumatoid synovitis (2). CD40 expression in thyroid tissue suggests a new pathway of pathogenesis of thyroid diseases (16). Functional expression of CD40 on human melanoma cells mediates T-cell-co-stimulation and tumor cell growth (11).

The interaction of CD40 and CD154 is centrally involved in a wide array of inflammatory events such as multiple sclerosis (5), atherosclerosis (7, 10) and asthma-associated airway inflammation (14).

The expression of CD40 on various B cell malignancies such as leukemias, non Hodgkins lymphoma and multiple myeloma has been described (1, 12). CD40 was found to regulate cell growth in squamous cell cancer of the head and neck (13). Its expression in hepatocellular carcinomas plays an important role in tumor biology (17).

The expression of CD40 on human lung cancer correlates with metastatic spread and may serve as a prognostic marker and an indicator of advanced disease (15).

An increased CD40 expression on muscle cells of polymyositis and dermatomyositis has been described (18).

3 Principles of the Test

An anti-human sCD40 coating antibody is adsorbed onto microwells.

Human sCD40 present in the sample or standard binds to antibodies adsorbed to the microwells. A biotin-conjugated anti-human sCD40 antibody is added and binds to human sCD40 captured by the first antibody.

Following incubation unbound biotin-conjugated anti-human sCD40 antibody is removed during a wash step. Streptavidin-HRP is added and binds to the biotin-conjugated anti-human sCD40 antibody.

Following incubation unbound Streptavidin-HRP is removed during a wash step, and substrate solution reactive with HRP is added to the wells.

Figure 1

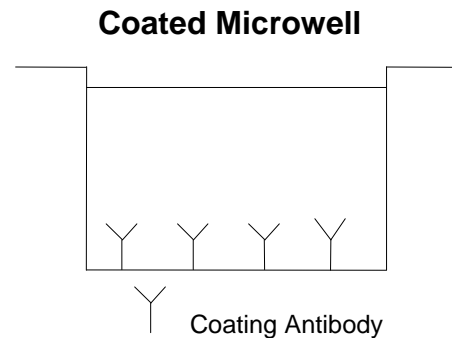


Figure 2

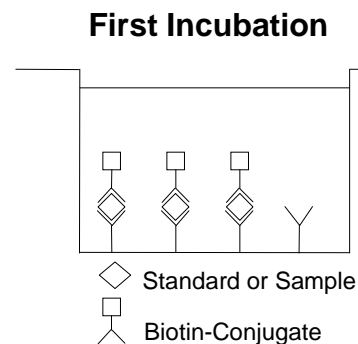


Figure 3

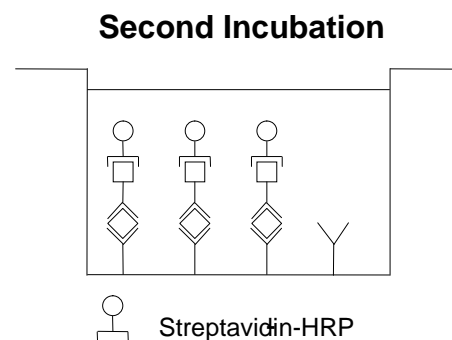
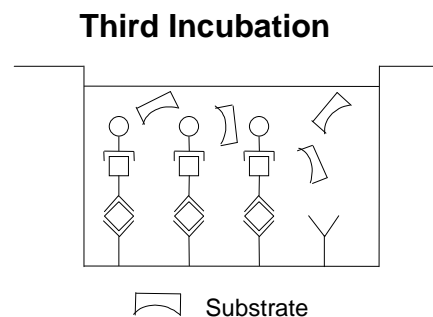
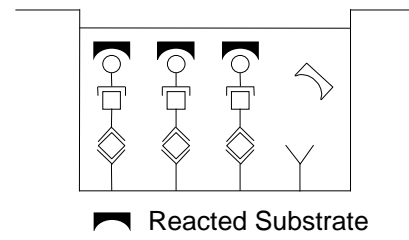


Figure 4



A coloured product is formed in proportion to the amount of human sCD40 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 sCD40 standard dilutions and human sCD40 sample concentration determined.

Figure 5



4 Reagents Provided

4.1 Reagents for human sCD40 ELISA IB49656 (96 tests)

- 1 aluminium pouch with a **Microwell Plate coated** with monoclonal antibody to human sCD40
- 1 vial (100 µl) **Biotin-Conjugate** anti-human sCD40 monoclonal antibody
- 1 vial (150 µl) **Streptavidin-HRP**
- 2 vials human sCD40 **Standard** lyophilized, 1000 pg/ml upon reconstitution
- 1 vial (12 ml) **Sample Diluent**
- 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**
- 1 vial (0.4 ml) **Red-Dye**
- 4 **Adhesive Films**

4.2 Reagents for human sCD40 ELISA IB49656-10 (10x96 tests)

- 10 aluminium pouches with a **Microwell Plate coated** with monoclonal antibody to human sCD40
- 10 vials (100 µl) **Biotin-Conjugate** anti-human sCD40 monoclonal antibody
- 10 vials (150 µl) **Streptavidin-HRP**
- 10 vials human sCD40 **Standard** lyophilized, 1000 pg/ml upon reconstitution
- 10 vials (12 ml) **Sample Diluent**
- 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**
- 6 vials (0.4 ml) **Red-Dye**
- 20 **Adhesive Films**

5 Storage Instructions – ELISA Kit

Store kit reagents between 2° and 8°C. Immediately after use remaining reagents should be returned to cold storage (2° to 8°C). 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.

6 Specimen Collection and Storage Instructions

Cell culture supernatant, serum, plasma (EDTA, heparin) and amniotic fluid were tested with this assay. Other biological samples 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 sCD40. 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 μ l to 1000 μ l adjustable single channel micropipettes with disposable tips
- 50 μ l to 300 μ 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.

If crystals have formed in the **Buffer Concentrates**, warm them gently until they have completely dissolved.

9.1 Wash Buffer (1x)

Pour entire contents (50 ml) of the **Wash Buffer Concentrate** (20x) 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 (1x) is stable for 30 days.

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

Number of Strips	Wash Buffer Concentrate (20x) (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 (20x) (ml)	Distilled Water (ml)
1 - 6	2.5	47.5
1 - 12	5.0	95.0

9.3 Biotin-Conjugate

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

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

Number of Strips	Biotin-Conjugate (ml)	Assay Buffer (1x) (ml)
1 - 6	0.03	2.97
1 - 12	0.06	5.94

9.4 Streptavidin-HRP

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

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

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

9.5 Human sCD40 Standard

Reconstitute **human sCD40 standard** by addition 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 = 1000 pg/ml). Allow the reconstituted standard to sit for exactly 10 minutes. Mix well prior to making dilutions.

After usage remaining standard cannot be stored and has to be discarded.

Standard dilutions can be prepared directly on the microwell plate (see 10.c) or alternatively in tubes (see 9.5.1).

9.5.1 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 µl of Sample Diluent into each tube.

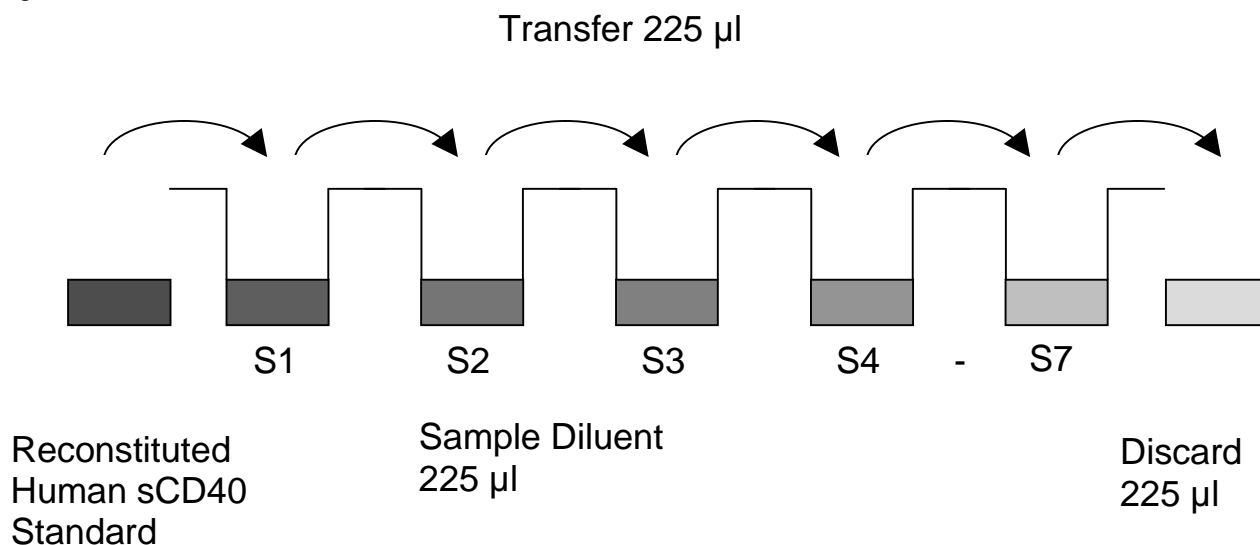
Pipette 225 µl of reconstituted standard (concentration = 1000 pg/ml) into the first tube, labelled S1, and mix (concentration of standard 1 = 500 pg/ml).

Pipette 225 µl 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



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

In order to help our customers to avoid any mistakes in pipetting the IBL-America ELISAs, IBL-America 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, Red-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 μ l Blue-Dye
12 ml Sample Diluent	48 μ l Blue-Dye
50 ml Sample Diluent	200 μ l Blue-Dye

2. Biotin-Conjugate: Before dilution of the concentrated Biotin-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 Biotin-Conjugate.

3 ml Assay Buffer (1x)	30 μ l Green-Dye
6 ml Assay Buffer (1x)	60 μ l Green-Dye

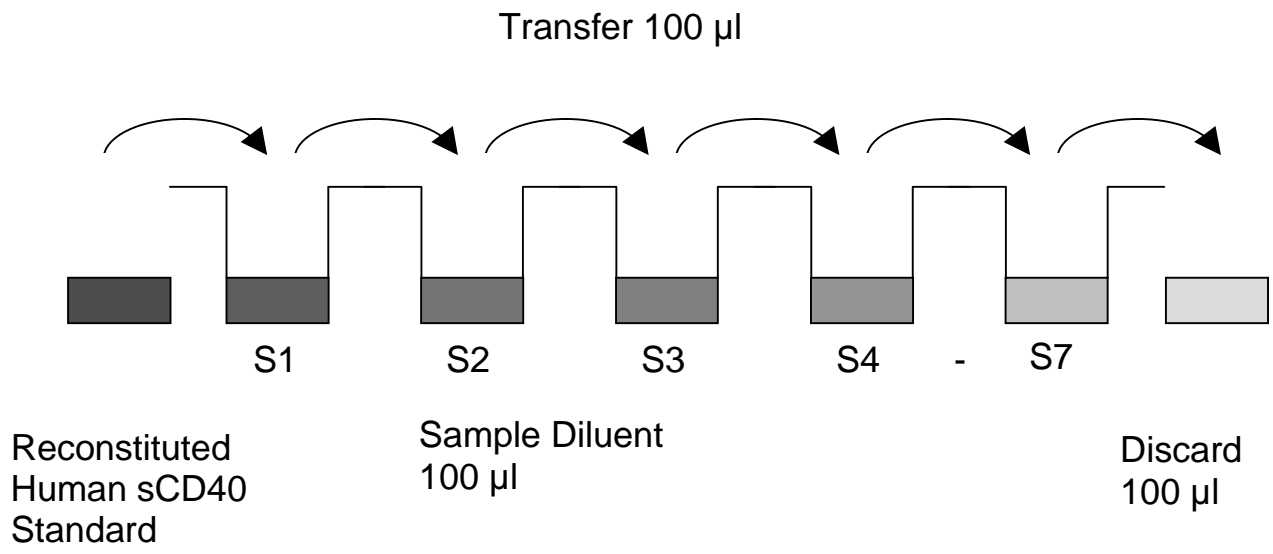
3. Streptavidin-HRP: Before dilution of the concentrated Streptavidin-HRP, add the **Red-Dye** at a dilution of 1:250 (see table below) to the Assay Buffer (1x) used for the final Streptavidin-HRP dilution. Proceed after addition of **Red-Dye** according to the instruction booklet: Preparation of Streptavidin-HRP.

6 ml Assay Buffer (1x)	24 μ l Red-Dye
12 ml Assay Buffer (1x)	48 μ l Red-Dye

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 9.5.1):
Add 100 µl of Sample Diluent in duplicate to all **standard wells**.
Pipette 100 µl of prepared **standard** (see Preparation of Standard 9.5, concentration = 1000 pg/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 = 500 pg/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 sCD40 standard dilutions ranging from 500.0 to 7.8 pg/ml. Discard 100 µl of the contents from the last microwells (G1, G2) used.

Figure 7



In case of an **external standard dilution** (see 9.5.1), 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:

	1	2	3	4
A	Standard 1 (500.0 pg/ml)	Standard 1 (500.0 pg/ml)	Sample 1	Sample 1
B	Standard 2 (250.0 pg/ml)	Standard 2 (250.0 pg/ml)	Sample 2	Sample 2
C	Standard 3 (125.0 pg/ml)	Standard 3 (125.0 pg/ml)	Sample 3	Sample 3
D	Standard 4 (62.5 pg/ml)	Standard 4 (62.5 pg/ml)	Sample 4	Sample 4
E	Standard 5 (31.3 pg/ml)	Standard 5 (31.3 pg/ml)	Sample 5	Sample 5
F	Standard 6 (15.6 pg/ml)	Standard 6 (15.6 pg/ml)	Sample 6	Sample 6
G	Standard 7 (7.8 pg/ml)	Standard 7 (7.8 pg/ml)	Sample 7	Sample 7
H	Blank	Blank	Sample 8	Sample 8

- d. Add 100 µl of **Sample Diluent** in duplicate to the **blank wells**.
- e. Add 50 µl of **Sample Diluent** to the **sample wells**.
- f. Add 50 µl of each **sample** in duplicate to the **sample wells**.
- g. Prepare **Biotin-Conjugate** (see Preparation of Biotin-Conjugate 9.3).
- h. Add 50 µl of **Biotin-Conjugate** to all wells.
- i. 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.
- j. Prepare **Streptavidin-HRP** (refer to Preparation of Streptavidin-HRP 9.4).
- k. 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.
- l. Add 100 µl of diluted **Streptavidin-HRP** to all wells, including the blank wells.
- m. Cover with an adhesive film and incubate at room temperature (18° to 25°C) for 1 hour, if available on a microplate shaker set at 100 rpm.
- n. 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.
- o. Pipette 100 µl of **TMB Substrate Solution** to all wells.
- p. 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.

- q. Stop the enzyme reaction by quickly pipetting 100 μ 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.
- r. 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 sCD40 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 sCD40 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 sCD40 concentration.
- **If instructions in this protocol have been followed 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, low human sCD40 levels. Such samples require further external predilution according to expected human sCD40 values with Sample Diluent in order to precisely quantitate the actual human sCD40 level.**
- It is suggested that each testing facility establishes a control sample of known human sCD40 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 sCD40 ELISA. Human sCD40 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.

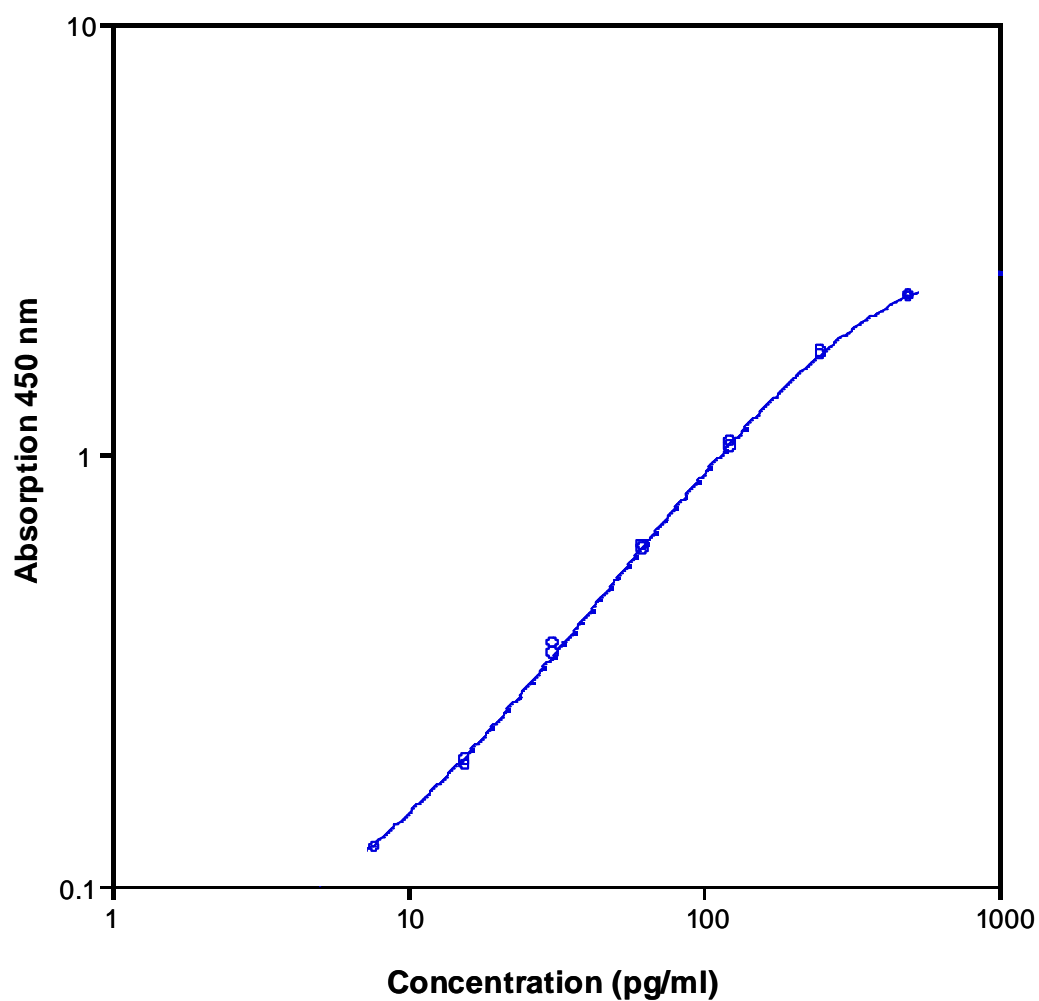


Table 2

Typical data using the human sCD40 ELISA

Measuring wavelength: 450 nm

Reference wavelength: 620 nm

Standard	Human sCD40 Concentration (pg/ml)	O.D. at 450 nm	Mean O.D. at 450 nm	C.V. (%)
1	500.0	2.325	2.330	0.3
	500.0	2.334		
2	250.0	1.727	1.711	1.4
	250.0	1.694		
3	125.0	1.069	1.052	2.4
	125.0	1.034		
4	62.5	0.604	0.610	1.4
	62.5	0.616		
5	31.3	0.345	0.354	3.6
	31.3	0.363		
6	15.6	0.197	0.193	2.9
	15.6	0.189		
7	7.8	0.122	0.122	0.0
	7.8	0.122		
Blank	0	0.024	0.028	
	0	0.032		

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 sCD40 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 1.3 pg/ml (mean of 6 independent assays).

13.2 Reproducibility

13.2.1 Intra-assay

Reproducibility within the assay was evaluated in 2 independent experiments. Each assay was carried out with 4 replicates of 8 serum samples containing different concentrations of human sCD40. 2 standard curves were run on each plate. Data below show the mean human sCD40 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 sCD40 concentration and the coefficient of variation for each sample

Sample	Experiment	Mean Human sCD40 Concentration (pg/ml)	Coefficient of Variation (%)
1	1	221.2	8.7
	2	224.9	2.0
2	1	105.2	3.0
	2	133.8	8.7
3	1	272.8	4.6
	2	269.6	0.7
4	1	223.2	0.5
	2	222.8	7.9
5	1	51.6	11.1
	2	58.3	12.5
6	1	153.3	13.0
	2	138.8	8.3
7	1	1630.1	3.3
	2	1308.8	0.4
8	1	742.3	0.4
	2	682.5	2.9

13.2.2 Inter-assay

Assay to assay reproducibility within one laboratory was evaluated in 2 independent experiments. Each assay was carried out with 4 replicates of 8 serum samples containing different concentrations of human sCD40. 2 standard curves were run on each plate. Data below show the mean human sCD40 concentration and the coefficient of variation calculated on 8 determinations of each sample (see Table 4). The calculated overall inter-assay coefficient of variation was 7.0%.

Table 4

The mean human sCD40 concentration and the coefficient of variation of each sample

Sample	Mean Human sCD40 Concentration (pg/ml)	Coefficient of Variation (%)
1	223.0	1.2
2	119.5	16.9
3	271.2	0.8
4	223.0	0.1
5	54.9	8.7
6	149.1	7.0
7	1469.4	15.5
8	712.4	5.9

13.3 Spike Recovery

The spike recovery was evaluated by spiking 4 levels of human sCD40 into pooled normal serum samples. Recoveries were determined in 3 independent experiments with 6 replicates each.

The amount of endogenous human sCD40 in unspiked serum was subtracted from the spike values.

The recovery ranged from 81% to 110% with an overall mean recovery of 94%.

13.4 Dilution Parallelism

4 serum samples with different levels of human sCD40 were analysed at serial 2 fold dilutions with 4 replicates each.

The recovery ranged from 82% to 104% with an overall recovery of 94% (see Table 5).

Table 5

Sample	Dilution	Expected Human sCD40 Concentration (pg/ml)	Observed Human sCD40 Concentration (pg/ml)	Recovery of Expected Human sCD40 Concentration (%)
1	1:2	--	121.4	--
	1:4	60.7	62.9	104
	1:8	30.3	31.4	104
2	1:2	--	88.0	--
	1:4	44.0	43.2	98
	1:8	22.0	21.4	97
3	1:2	--	419.9	--
	1:4	209.9	197.2	94
	1:8	105.0	85.7	82
4	1:2	--	282.0	--
	1:4	141.0	130.7	93
	1:8	70.5	58.8	83

13.5 Sample Stability

13.5.1 Freeze-Thaw Stability

Aliquots of serum samples (spiked or unspiked) were stored at -20°C and thawed 5 times, and the human sCD40 levels determined. There was no significant loss of human sCD40 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 sCD40 level determined after 24 h. There was no significant loss of human sCD40 immunoreactivity detected during storage under above conditions.

13.6 Comparison of Serum and Plasma

From 8 individuals, serum as well as EDTA, citrate and heparin plasma obtained at the same time point were evaluated. Human sCD40 concentrations were not significantly different and therefore all these body fluids are suitable for the assay. It is nevertheless highly recommended to assure the uniformity of blood preparations.

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 sCD40 positive serum. There was no crossreactivity detected.

13.8 Expected Values

A panel of 8 serum samples from randomly selected apparently healthy donors was tested for human sCD40.

The detected human sCD40 levels ranged between 53.3 and 156.9 pg/ml with a mean level of 102.1 pg/ml and a standard deviation of 37.1 pg/ml.

14 Bibliography

- 1) Biancone L, Cantaluppi V, Camussi G. CD40-CD154 interaction in experimental and human disease (review). *Int J Mol Med* 1999 Apr;3(4):343-53.
- 2) Cho CS, Cho ML, Min SY, Kim WU, Min DJ, Lee SS, Park SH, Choe J, Kim HY. CD40 engagement on synovial fibroblast up-regulates production of vascular endothelial growth factor. *J Immunol* 2000 May 15;164(10):5055-61.
- 3) Denton MD, Reul RM, Dharnidharka VR, Fang JC, Ganz P, Briscoe DM. Central role for CD40/CD40 ligand (CD154) interactions in transplant rejection. *Pediatr Transplant* 1998 Feb;2(1):6-15.
- 4) Eliopoulos AG, Davies C, Knox PG, Gallagher NJ, Afford SC, Adams DH, Young LS. CD40 induces apoptosis in carcinoma cells through activation of cytotoxic ligands of the tumor necrosis factor superfamily. *Mol Cell Biol* 2000 Aug;20(15):5503-15.
- 5) Huang WX, Huang P, Hillert J. Systemic upregulation of CD40 and CD40 ligand mRNA expression in multiple sclerosis. *Mult Scler* 2000 Apr;6(2):61-5.
- 6) Klaus GG, Choi MS, Lam EW, Johnson-Leger C, Cliff J. CD40: a pivotal receptor in the determination of life/death decisions in B lymphocytes. *Int Rev Immunol* 1997;15(1-2):5-31.
- 7) Laman JD, De Boer M, Hart BA. CD40 in clinical inflammation: from multiple sclerosis to atherosclerosis. *Dev Immunol* 1998;6(3-4):215-22.
- 8) Larsen CP, Pearson TC. The CD40 pathway in allograft rejection, acceptance, and tolerance. *Curr Opin Immunol* 1997 Oct;9(5): 641-7.
- 9) Laytragoon-Lewin N. Programmed cell death: the influence of CD40, CD95 (Fas or Apo-I) and their ligands. *Med Oncol* 1998 Apr;15(1):15-9.
- 10) Mach F, Schonbeck U, Libby P. CD40 signaling in vascular cells: a key role in atherosclerosis? *Atherosclerosis* 1998 Apr;137 Suppl:S89-95.

- 11) Pirozzi G, Lombardi V, Zanzi D, Ionna F, Lombardi ML, Errico S, Ruggiero G, Manzo C. CD40 expressed on human melanoma cells mediates T cell co-stimulation and tumor cell growth. *Int Immunol* 2000 Jun;12(6):787-95
- 12) Planken EV, Willemze R, Kluin-Nelemans JC. The role of the CD40 antigen on malignant B cells. *Leuk Lymphoma* 1996 Jul;22(3-4):229-35.
- 13) Posner MR, Cavacini LA, Upton MP, Tillmann KC, Gornstein ER, Norris CM Jr. Surface membrane – expressed CD40 is present on tumor cells from squamous cell cancer of the head and neck in vitro and in vivo and regulates cell growth in tumor cell lines. *Clin Cancer Res* 1999 Aug;5(8):2261-70.
- 14) Propst SM, Denson R, Rothstein E, Estell K, Schwiebert LM. Proinflammatory and Th2-derived cytokines modulate CD40-mediated expression of inflammatory mediators in airway epithelia: implications for the role of epithelial CD40 in airway inflammation. *J. Immunol* 2000 Aug 15;165(4):2214-21.
- 15) Sabel MS, Yamada M, Kawaguchi Y, Chen FA, Takita H, Bankert RB. CD40 expression on human lung cancer correlates with metastatic spread. *Cancer Immunol Immunother* 2000 May;49(2):101-8.
- 16) Smith TJ, Sciaky D, Phipps RP, Jennings TA. CD40 expression in human thyroid tissue: evidence for involvement of multiple cell types in autoimmune and neoplastic diseases. *Thyroid* 1999 Aug;9(8):749-55.
- 17) Sugimoto K, Shiraki K, Ito T, Fujikawa K, Takase K, Tameda Y, Moriyama M, Nakano T. Expression of functional CD40 in human hepatocellular carcinoma. *Hepatology* 1999 Oct;30(4):920-6.
- 18) Sugiura T, Kawaguchi Y, Harigai M, Takagi K, Ohta S, Fukasawa C, Hara M, Kamatani N. Increased CD40 expression on muscle cells of polymyositis and dermatomyositis: role of CD40-CD40 ligand interaction in IL-6, IL-8, IL-15, and monocyte chemoattractant protein-1 production. *J. Immunol* 2000 Jun 15;164(12):6593-600.

- 19) Szabolcs MJ, Cannon PJ, Thienel U, Chen R, Michler RE, Chess L, Yellin MJ. Analysis of CD154 and CD40 expression in native coronary atherosclerosis and transport associated coronary artery disease. *Virchows Arch* 2000 Aug;437(2):149-59.
- 20) Van Kooten C, Banchereau J. CD40-CD40 ligand. *J. Leukoc Biol* 2000 Jan;67(1):2-17.
- 21) Van Kooten C, Banchereau J. Functional role of CD40 and its ligand. *Int Arch Allergy Immunol* 1997 Aug;113(4):393-9.
- 22) Van Kooten C, Banchereau J. Functions of CD40 on B cells, dendritic cells and other cells. *Curr Opin Immunol* 1997 Jun;9(3):330-7.

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16 Reagent Preparation Summary

16.1 Wash Buffer (1x)

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 Biotin-Conjugate

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

Number of Strips	Biotin-Conjugate (ml)	Assay Buffer (1x) (ml)
1 - 6	0.03	2.97
1 - 12	0.06	5.94

16.4 Streptavidin-HRP

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

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

16.5 Human sCD40 Standard

Reconstitute lyophilized **human sCD40 standard** with distilled water. (Reconstitution volume is stated on the label of the standard vial.)

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 9.5.1): Pipette 100 µl of these standard dilutions in the microwell strips.
4. Add 100 µl Sample Diluent, in duplicate, to the blank wells.
5. Add 50 µl Sample Diluent to sample wells.
6. Add 50 µl sample in duplicate, to designated sample wells.
7. Prepare Biotin-Conjugate.
8. Add 50 µl Biotin-Conjugate to all wells.
9. Cover microwell strips and incubate 2 hours at room temperature (18° to 25°C).
10. Prepare Streptavidin-HRP.
11. Empty and wash microwell strips 3 times with Wash Buffer.
12. Add 100 µl diluted Streptavidin-HRP to all wells.
13. Cover microwell strips and incubate 1 hour at room temperature (18° to 25°C).
14. Empty and wash microwell strips 3 times with Wash Buffer.
15. Add 100 µl of TMB Substrate Solution to all wells.
16. Incubate the microwell strips for about 10 minutes at room temperature (18° to 25°C).
17. Add 100 µl Stop Solution to all wells.
18. Blank microwell reader and measure colour intensity at 450 nm.

Note: If instructions in this protocol have been followed 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).