

# Mouse IL-4 High Sensitivity ELISA Kit

Enzyme-linked Immunosorbent Assay for quantitative detection of mouse IL-4

Catalog Number BMS613HS

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**WARNING!** Read the Safety Data Sheets (SDSs) and follow the handling instructions. Wear appropriate protective eyewear, clothing, and gloves. Safety Data Sheets (SDSs) are available from [thermofisher.com/support](http://thermofisher.com/support).

## Product description

The Mouse IL-4 High Sensitivity ELISA Kit is an enzyme-linked immunosorbent assay for the quantitative detection of mouse IL-4.

## Summary

IL-4 mediates its function by binding to receptors expressed on target cells. The IL-4 receptors exhibit an affinity of approximately  $10^{-10}$  M. Receptors exist on freshly prepared B and T lymphocytes and macrophages, as well as on various cell lines including lymphoid cells, mast cell lines, a variety of other hematopoietic cell lines, fibroblasts and stromal cell lines. On T and B cells, receptors are present in low numbers (appr. 400), which are reported to be upregulated by IL-2 and IL-4.

IL-4 is produced by a particular subset of T helper cells, the  $T_{H2}$  cells. These cells tend to make a specific set of lymphokines including IL-4, IL-5, IL-6, IL-10, IL-13 and GM-CSF and fail to produce IL-2,  $IFN\gamma$ , and lymphotoxin ( $TNF\alpha$ ). Apart from T cells, it has been shown that mast cells can produce IL-4.

IL-4 exerts numerous effects on various hematopoietic cell types. On B cells, IL-4 promotes immunological class switching to IgE and  $IgG_1$  isotypes and upregulates MHC class II and CD23 expression. It can promote survival, growth, and differentiation of both T and B lymphocytes, mast cells, and endothelial cells.

In addition, IL-4 can inhibit the production of TNF, IL-1, and IL-6 by macrophages.

For literature update refer to our website.

## Principles of the test

An anti-mouse IL-4 coating antibody is adsorbed onto microwells.

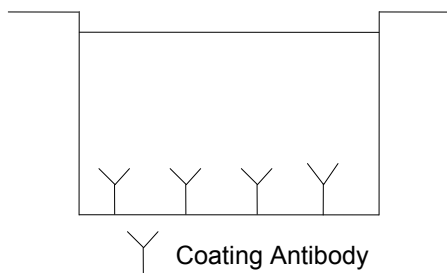


Fig. 1 Coated microwell

Mouse IL-4 present in the sample or standard binds to antibodies adsorbed to the microwells. A biotin-conjugated anti-mouse IL-4 antibody is added and binds to mouse IL-4 captured by the first antibody.

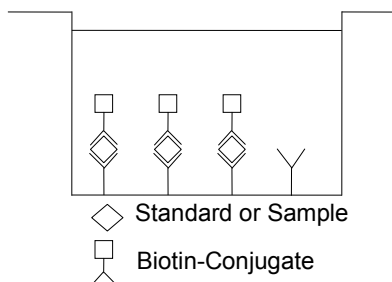


Fig. 2 First incubation

Following incubation unbound biotin-conjugated anti-mouse IL-4 antibody is removed during a wash step. Streptavidin-HRP is added and binds to the biotin-conjugated anti-mouse IL-4 antibody.

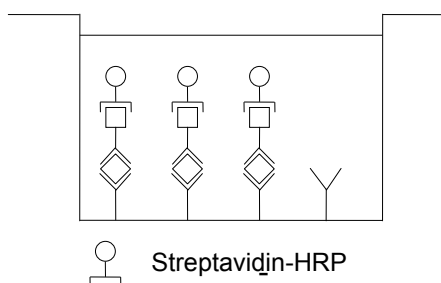


Fig. 3 Second incubation

Following incubation unbound Streptavidin-HRP is removed during a wash step, and amplification reagent I (Biotinyl-Tyramide) is added to the wells.

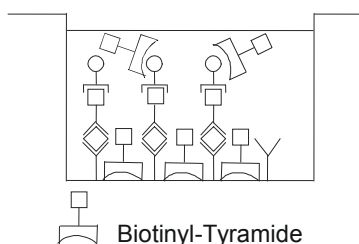


Fig. 4 Third incubation

Following incubation unbound amplification reagent I is removed during a wash step and amplification reagent II (Streptavidin-HRP) is added.

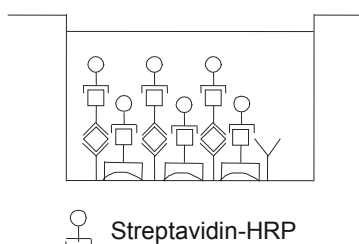
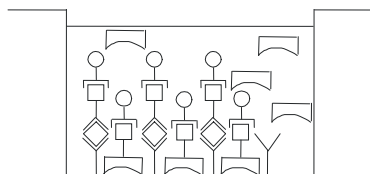


Fig. 5 Fourth incubation

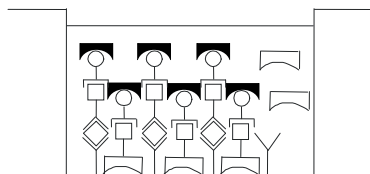
Following incubation unbound amplification reagent II is removed during a wash step and substrate solution reactive with HRP is added.



Substrate

Fig. 6 Fifth incubation

A colored product is formed in proportion to the amount of mouse IL-4 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 mouse IL-4 standard dilutions and mouse IL-4 sample concentration determined.



Reacted Substrate

Fig. 7 Stop reaction

## Principle of amplification reaction

The amplification reaction is based upon PerkinElmer Life Sciences TSA™ technology.

Amplification reagent I contains biotinyl-tyramide. HRP converts multiple biotinyl-tyramide molecules into highly reactive derivatives (free radicals). These free radicals bind covalently to any protein in the well.

Thus, the amount of reacted biotinyl-tyramide is proportional to the amount of HRP in the well.

Following incubation unbound biotinyl-tyramide is removed during a wash step. Amplification reagent II contains Streptavidin-HRP, which binds to the biotin sites created during the biotinyl-tyramide reaction, thus multiplying the HRP molecules available at the surface for the substrate reaction.

## Reagents provided

1 aluminum pouch with a Microwell Plate (12 strips of 8 wells each) coated with monoclonal antibody to mouse IL-4

1 vial (70 µL) Biotin-Conjugate anti-mouse IL-4 monoclonal antibody

1 vial (150 µL) Streptavidin-HRP

2 vials mouse IL-4 Standard lyophilized, 500 pg/mL upon reconstitution

1 vial (5 mL) Sample Diluent

1 vial (25 mL) Assay Diluent

1 vial (5 mL) Conjugate Diluent Concentrate 20x (PBS with 1% Tween 20 and 10% BSA)

2 bottles (50 mL) Wash Buffer Concentrate 20x (PBS with 1% Tween 20)

1 vial (7 mL) Amplification Diluent Concentrate (2x)

1 vial (75 µL) Amplification Reagent I

**Note:** reagent contains ethyl alcohol

1 vial (15 µL) Amplification Reagent II

1 vial (15 mL) Substrate Solution

1 vial (15 mL) Stop Solution (1M Phosphoric acid)

8 Adhesive Films

## 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.

## Sample collection and storage instructions

Cell culture supernatant, serum and plasma (citrate) 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 mouse IL-4. If samples are to be run within 24 hours, they may be stored at 2° to 8°C (refer to "Sample stability" on page 6).

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

## Materials required but not provided

- 5 mL and 10 mL graduated pipettes
- 5 µL to 1000 µL adjustable single channel micropipettes with disposable tips
- 50 µL to 300 µL 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)
- Microplate shaker
- 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

## 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 pipet 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 samples.
- Rubber or disposable latex gloves should be worn while handling kit reagents or samples.
- Avoid contact of substrate solution with oxidizing agents and metal.
- Avoid splashing or generation of aerosols.

- To avoid microbial contamination or cross-contamination of reagents or samples that 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 samples and all potentially contaminated materials as if 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.

## 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.

### 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.
- 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

### Conjugate diluent (1x)

- Pour the entire contents (5 mL) of the Conjugate Diluent (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 Conjugate Diluent (1x) is stable for 30 days.
- Conjugate Diluent (1x) may also be prepared as needed according to the following table:

Number of Strips	Conjugate Diluent Concentrate (20x) (mL)	Distilled Water (mL)
1 - 6	2.5	47.5
1 - 12	5.0	95.0

### Biotin-Conjugate

**Note:** The Biotin-Conjugate should be used within 30 minutes after dilution.

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

Number of Strips	Biotin-Conjugate (mL)	Conjugate Diluent (1x) (mL)
1 - 6	0.03	2.97
1 - 12	0.06	5.94

### Streptavidin-HRP

**Note:** The Streptavidin-HRP should be used within 30 minutes after dilution.

Make a 1:200 dilution of the concentrated Streptavidin-HRP solution with Assay Diluent in a clean plastic tube as needed according to the following table:

Number of Strips	Streptavidin-HRP (mL)	Assay Diluent (mL)
1 - 6	0.03	5.97
1 - 12	0.06	11.94

### Mouse IL-4 standard

- Reconstitute mouse IL-4 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 = 500 pg/mL).
- Allow the standard to reconstitute for 10-30 minutes. Mix well prior to making dilutions.  
**Note:** After usage remaining standard cannot be stored and has to be discarded.
- Dilute the reconstituted mouse IL-4 standard just prior to use in a clean plastic test tube according to following dilution scheme:
  - For testing serum and plasma samples, dilute 60 µL of the reconstituted mouse IL-4 standard in 690 µL of Sample Diluent. Shake gently to mix (concentration of standard = 40 pg/mL).
  - For testing cell culture samples, dilute 60 µL of the reconstituted mouse IL-4 standard in 690 µL of Assay Diluent. Shake gently to mix (concentration of standard = 40 pg/mL).

### External standard dilution

For testing serum and plasma samples

For testing serum and plasma samples, mouse IL-4 standard has to be diluted externally with Sample Diluent.

- Label 6 tubes, one for each standard point: S2, S3, S4, S5, S6, S7. The diluted standard (concentration of standard = 40 pg/mL) serves as S1.
- Prepare 1:2 serial dilutions for the standard curve as follows: Pipette 150 µL of Sample Diluent into tubes S2-S7.
- Pipette 150 µL of the diluted standard (concentration = 40 pg/mL) into the second tube, labeled S2, and mix thoroughly before the next transfer. Repeat serial dilutions 5 more times thus creating the points of the standard curve (see Figure 8). Sample Diluent serves as blank.

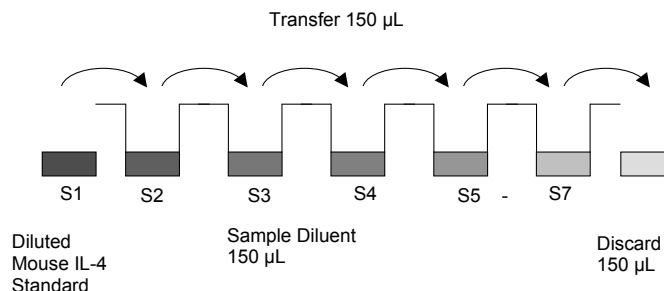


Fig. 8 External standard dilution

For testing cell culture samples

For testing cell culture samples, mouse IL-4 standard has to be diluted externally with Assay Diluent.

1. Label 6 tubes, one for each standard point: S2, S3, S4, S5, S6, S7. The diluted standard (concentration of standard = 40 pg/mL) serves as S1.
2. Prepare 1:2 serial dilutions for the standard curve as follows: Pipette 150 µL of Assay Diluent into tubes S2-S7.
3. Pipette 150 µL of the diluted standard (concentration = 40 pg/mL) into the second tube, labeled S2, and mix thoroughly before the next transfer. Repeat serial dilutions 5 more times thus creating the points of the standard curve (see Figure 9).

Assay Diluent serves as blank.

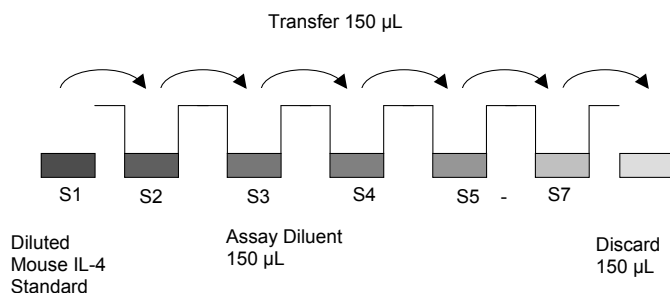


Fig. 9 External standard dilution

### Amplification diluent (1x)

Preparation of Amplification Diluent (1x) has to be done immediately prior to use. Make a 1:2 dilution of the concentrated Amplification Diluent (2x) as needed according to the following table:

Number of Strips	Amplification Diluent (2x) (mL)	Distilled Water (mL)
1 - 6	3	3
1 - 12	6	6

### Amplification Solution I

1. Prepare Amplification Solution I immediately prior to application on the plate.
2. Dilute Amplification Reagent I in Amplification Diluent (1x) as indicated in the Certificate of Analysis.
3. Discard immediately any prediluted Amplification Solution I after usage.

### Amplification Solution II

1. Prepare Amplification Solution II immediately prior to application on the plate.
2. Centrifuge vial for a few seconds in a microcentrifuge before opening to collect liquid trapped in the lid.
3. Dilute Amplification Reagent II in Conjugate Diluent as indicated in the Certificate of Analysis.
4. Discard immediately any prediluted Amplification Solution II after usage.

## Test protocol

### IMPORTANT!

- Because this ELISA is a high sensitivity system, it is extremely important to stick exactly to the manual (washing procedure, chronology of and preparation of solutions, incubation time) to obtain optimal test performance.
- Amplification Solutions must be prepared immediately prior to application on the plate! It is extremely important to wash the wells properly to obtain a good test performance.
- Shaking is absolutely necessary for an optimal test performance. Protect microwell plate from light during incubation steps

1. 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.
2. Wash the microwell strips twice with exactly 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. Soaking is highly recommended between the washes to obtain a good test performance! 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. Do not allow wells to dry.

3. Add 50 µL of Assay Diluent to all wells.
4. Add 50 µL of externally diluted standard to standard wells (according to Table 1)

**Table 1** Example of the arrangement of blanks, standards and samples in the microwell strips.

	1	2	3	4
A	Standard 1 40.00 pg/mL	Standard 1 40.00 pg/mL	Sample 1	Sample 1
B	Standard 2 20.00 pg/mL	Standard 2 20.00 pg/mL	Sample 2	Sample 2
C	Standard 3 10.00 pg/mL	Standard 3 10.00 pg/mL	Sample 3	Sample 3
D	Standard 4 5.00 pg/mL	Standard 4 5.00 pg/mL	Sample 4	Sample 4
E	Standard 5 2.50 pg/mL	Standard 5 2.50 pg/mL	Sample 5	Sample 5
F	Standard 6 1.25 pg/mL	Standard 6 1.25 pg/mL	Sample 6	Sample 6
G	Standard 7 0.63 pg/mL	Standard 7 0.63 pg/mL	Sample 7	Sample 7
H	Blank	Blank	Sample 8	Sample 8

5. For serum and plasma samples, add 50 µL Sample Diluent to blank wells. For cell culture samples, add 50 µL Assay Diluent to blank wells.
6. Add 50 µL of each sample in duplicate to the sample wells.
7. Prepare Biotin-Conjugate (see “Biotin-Conjugate” on page 3).
8. Add 50 µL of Biotin-Conjugate to all wells.
9. Cover with an adhesive film and incubate at 4°C over night, in the dark.
10. Prepare Streptavidin-HRP (refer to “Streptavidin-HRP” on page 3).
11. Remove adhesive film and empty wells. Wash microwell strips 6 times according to point b. of the test protocol. Proceed immediately to the next step.
12. Add 100 µL of diluted Streptavidin-HRP to all wells, including the blank wells.
13. Cover with an adhesive film and incubate at room temperature (18° to 25°C) for 1 hour on a microplate shaker, in the dark.
14. Prepare Amplification Solution I diluted in Amplification Diluent (1x) (see “Amplification Solution I” on page 4) immediately prior to use.
15. Remove adhesive film and empty wells. Wash microwell strips 6 times according to point b. of the test protocol. Proceed immediately to the next step.
16. Add 100 µL of Amplification Solution I to all wells, including the blank wells.
17. Cover with an adhesive film and incubate at room temperature (18° to 25°C) for exactly 15 minutes on a microplate shaker, in the dark.
18. Prepare Amplification Solution II diluted in Conjugate Diluent (see “Amplification Solution II” on page 4) immediately prior to use.

19. Remove adhesive film and empty wells. Wash microwell strips 6 times according to point b. of the test protocol. Proceed immediately to the next step.
20. Add 100  $\mu$ L of Amplification Solution II to all wells, including the blank wells.
21. Cover with an adhesive film and incubate at room temperature (18° to 25°C) for exactly 30 minutes on a microplate shaker, in the dark.
22. Remove adhesive film and empty wells. Wash microwell strips 6 times according to point b. of the test protocol. Proceed immediately to the next step.
23. Pipette 100  $\mu$ L of TMB Substrate Solution to all wells.
24. Incubate the microwell strips at room temperature (18° to 25°C) for about 10-20 minutes. Avoid direct exposure to intense light.

The color 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 color 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 color. Alternatively the color 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 0.9 – 0.95.

25. 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.
26. 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.

## Calculation of results

- Calculate the average absorbance values for each set of duplicate standards and samples. Duplicates should be within 20 percent of the mean value.
- Create a standard curve by plotting the mean absorbance for each standard concentration on the ordinate against the mouse IL-4 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 mouse IL-4 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 mouse IL-4 concentration.
- If instructions in this protocol have been followed samples have not been diluted. Concentrations read from the standard curve must not be multiplied by a dilution factor.
- Calculation of samples with a concentration exceeding standard 1 may result in incorrect, low mouse IL-4 levels. Such samples require further external predilution according to expected mouse IL-4 values with Sample Diluent for serum and plasma samples and with Assay Diluent for cell culture samples in order to precisely quantitate the actual mouse IL-4 level.
- It is suggested that each testing facility establishes a control sample of known mouse IL-4 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 10. This curve cannot be used to derive test results. Each laboratory must prepare a standard curve for each group of microwell strips assayed.

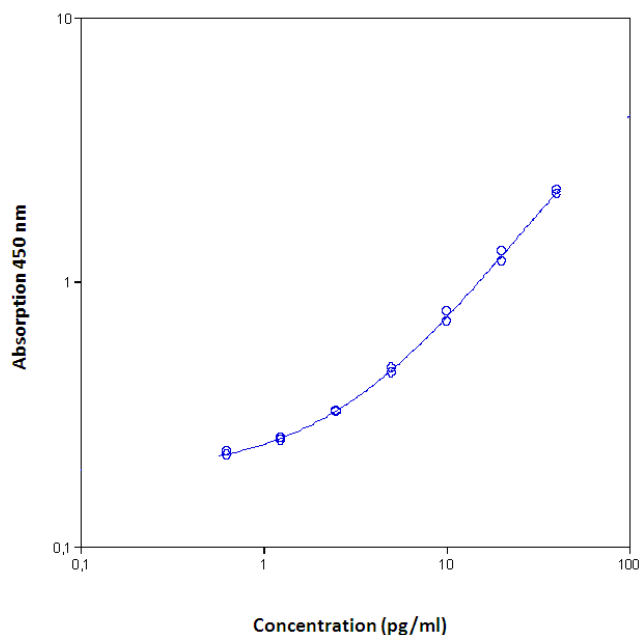


Fig. 10 Representative standard curve for mouse IL-4 ELISA. Mouse IL-4 was diluted in serial 2-fold steps in appropriate diluent. Do not use this standard curve to derive test results. A standard curve must be run for each group of microwell strips assayed.

**Table 2** Typical data using the mouse IL-4 ELISA

Measuring wavelength: 450 nm

Reference wavelength: 620 nm

Standard	Mouse IL-4 Concentration (pg/mL)	O.D. at 450 nm	Mean O.D. at 450 nm	C.V. (%)
1	40.00	2.161 2.232	2.197	1.6
2	20.00	1.315 1.211	1.263	4.1
3	10.00	0.778 0.713	0.746	4.4
4	5.00	0.477 0.457	0.467	2.2
5	2.50	0.326 0.324	0.325	0.3
6	1.25	0.254 0.260	0.257	1.1
7	0.63	0.231 0.222	0.226	2.0
Blank	0.00	0.165 0.151	0.158	4.6

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 color intensity. Values measured are still valid.

## 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.

## Performance characteristics

### Sensitivity

The limit of detection of mouse IL-4 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 0.32 pg/mL (mean of 6 independent assays).

### Reproducibility

#### Intra-assay

Reproducibility within the assay was evaluated in 3 independent experiments. Each assay was carried out with 6 replicates of 7 serum samples containing different concentrations of mouse IL-4. 2 standard curves were run on each plate. Data below show the mean mouse IL-4 concentration and the coefficient of variation for each sample (see Table 3). The calculated overall intra-assay coefficient of variation was 7.1%.

**Table 3** The mean mouse IL-4 concentration and the coefficient of variation for each sample:

Sample	Experiment	Mean Mouse IL-4 Concentration (pg/mL)	Coefficient of Variation (%)
1	1	41.3	2.9
	2	38.5	2.8
	3	41.1	5.7
2	1	31.3	2.4
	2	28.6	5.2
	3	35.7	4.5
3	1	23.5	3.7
	2	18.9	3.2
	3	24.0	4.8
4	1	12.9	11.5
	2	12.2	8.6
	3	12.5	6.7
5	1	8.9	9.1
	2	8.2	4.0
	3	7.9	6.2
6	1	3.5	7.2
	2	3.4	11.2
	3	3.7	7.0
7	1	2.1	16.0
	2	2.2	13.8
	3	2.7	12.6

#### Inter-assay

Assay to assay reproducibility within one laboratory was evaluated in 3 independent experiments. Each assay was carried out with 6 replicates of 7 serum samples containing different concentrations of mouse IL-4. 2 standard curves were run on each plate. Data below show the mean mouse IL-4 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 7.9%.

**Table 4** The mean mouse IL-4 concentration and the coefficient of variation of each sample

Sample	Mean Mouse IL-4 Concentration (pg/mL)	Coefficient of Variation (%)
1	40.3	3.9
2	31.9	11.3
3	22.1	12.7
4	12.6	2.9
5	8.3	6.3
6	3.5	4.8
7	2.3	13.2

### Spike recovery

The spike recovery was evaluated by spiking 3 levels of mouse IL-4 into serum, plasma (citrate) and cell culture supernatant. Recoveries were determined with 4 replicates each. The amount of endogenous mouse IL-4 in unspiked samples was subtracted from the spike values.

Sample matrix	Spike high Mean (%)	Spike medium Mean (%)	Spike low Mean (%)
Serum	81	81	70
Plasma (citrate)	107	94	73
Cell culture supernatant	88	98	95

### Dilution parallelism

Serum, plasma (citrate) and cell culture supernatant samples with different levels of mouse IL-4 were analyzed at serial 2 fold dilutions with 4 replicates each.

Sample matrix	Recovery of Exp. Val.	
	Dilution	Mean (%)
Serum	1:2	88
	1:4	109
	1:8	119
Plasma (citrate)	1:2	116
	1:4	103
	1:8	97
Cell culture supernatant	1:2	89
	1:4	86
	1:8	82

### Sample stability

#### Freeze-Thaw stability

Aliquots of spiked serum samples were stored at -20°C and thawed 5 times, and the mouse IL-4 levels determined. There was no significant loss of mouse IL-4 immunoreactivity detected by freezing and thawing.

#### Storage stability

Aliquots of spiked serum samples were stored at -20°C, 2-8°C, room temperature, and at 37°C, and the mouse IL-4 level determined after 24 hours. There was no significant loss of mouse IL-4 immunoreactivity detected during storage at -20°C, 2-8°C and RT. A significant loss of mouse IL-4 immunoreactivity (50%) was detected during storage at 37°C after 24 hours.

### Specificity

The interference of circulating factors of the immune system was evaluated by spiking these proteins at physiologically relevant concentrations into a mouse IL-4 positive serum.

There was no crossreactivity detected.

## Calibration

The immunoassay is calibrated with highly purified recombinant mouse IL-4 which has been evaluated against the international Reference Standard NIBSC 91/656 and has been shown to be equivalent.

NIBSC 91/656 is quantitated in International Units (IU), 1IU corresponding to 100 pg mouse IL-4.

## Reagent preparation summary

### Wash buffer (1x)

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

Number of Strips	Wash Buffer Concentrate (20x) (mL)	Distilled Water (mL)
1 - 6	25	475
1 - 12	50	950

### Conjugate diluent (1x)

Add Conjugate Diluent Concentrate 20x (5 mL) to 95 mL distilled water.

Number of Strips	Conjugate Diluent Concentrate (20x) (mL)	Distilled Water (mL)
1 - 6	2.5	47.5
1 - 12	5.0	95.0

### Biotin-Conjugate

Make a 1:100 dilution of Biotin-Conjugate in Conjugate Diluent (1x):

Number of Strips	Biotin-Conjugate (mL)	Conjugate Diluent (1x) (mL)
1 - 6	0.03	2.97
1 - 12	0.06	5.94

### Streptavidin-HRP

Make a 1:200 dilution of Streptavidin-HRP in Assay Diluent:

Number of Strips	Streptavidin-HRP (mL)	Assay Diluent (mL)
1 - 6	0.03	5.97
1 - 12	0.06	11.94

### Mouse IL-4 standard

1. Reconstitute lyophilized mouse IL-4 standard with distilled water. (Reconstitution volume is stated on the label of the standard vial.)
2. The concentrated mouse IL-4 standard must be diluted 1:12.5 with Sample Diluent when using serum and plasma samples.
3. The concentrated mouse IL-4 standard must be diluted 1:12.5 with Assay Diluent when using cell culture samples.

### Amplification diluent (1x)

Prepare Amplification Diluent (1x) immediately prior to use.

Number of Strips	Amplification Diluent (2x) (mL)	Distilled Water (mL)
1 - 6	3	3
1 - 12	6	6

### Amplification Solution I

Dilute Amplification Reagent I in Amplification Diluent (1x) immediately prior to application on the plate as indicated in the Certificate of Analysis.

### Amplification Solution II

Centrifuge vial for a few seconds in a micro-centrifuge before opening to collect liquid trapped in the lid. Dilute Amplification Solution II in Conjugate Diluent immediately prior to application on the plate as indicated in the Certificate of Analysis.

## Test protocol summary

**Note:** Prepare Amplification Solutions immediately prior to application on the plate. It is extremely important to wash the wells properly to obtain a good test performance.

1. Determine the number of microwell strips required.
2. Wash microwell strips twice with Wash Buffer.
3. Add 50 µL Assay Diluent to all wells.
4. Add 50 µL externally diluted standard to all standard wells.
5. For serum and plasma samples add 50 µL Sample Diluent to all blank wells.

For cell culture samples add 50 µL Assay Diluent to all blank wells.

6. Add 50 µL sample in duplicate to all sample wells.
7. Prepare Biotin-Conjugate.
8. Add 50 µL Biotin-Conjugate to all wells.
9. Cover microwell strips and incubate over night at 4°C, in the dark.
10. Prepare Streptavidin-HRP.
11. Empty and wash microwell strips 6 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), in the dark.
14. Prepare Amplification Solution I diluted in Amplification Diluent (1x) immediately prior to application on the plate.
15. Empty and wash microwell strips 6 times with Wash Buffer.
16. Add 100 µL Amplification Solution I to all wells.
17. Cover microwell strips and incubate for exactly 15 minutes at room temperature (18° to 25°C), in the dark.
18. Prepare Amplification Solution II diluted in Conjugate Diluent (1x) immediately prior to application on the plate.
19. Empty and wash microwell strips 6 times with Wash Buffer.
20. Add 100 µL Amplification Solution II to all wells.
21. Cover microwell strips and incubate for exactly 30 minutes at room temperature (18° to 25°C), in the dark.
22. Empty and wash microwell strips 6 times with Wash Buffer.
23. Add 100 µL of TMB Substrate Solution to all wells.
24. Incubate the microwell strips for about 10-20 minutes at room temperature (18° to 25°C).
25. Add 100 µL Stop Solution to all wells.
26. Blank microwell reader and measure color intensity at 450 nm.

**Note:** If instructions in this protocol have been followed samples have not been diluted. Concentrations read from the standard curve must not be multiplied by a dilution factor.

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