

GE Healthcare

Amersham  
Interleukin-4 [(m)IL-4]  
Mouse, Biotrak ELISA  
System

96 wells

Product Booklet

Code: RPN2712



# Page finder

1. Legal	3
2. Handling	4
2.1. Safety warnings and precautions	4
2.2. Storage	4
2.3. Expiry	4
3. Components of the assay system	5
4. Critical parameters	6
5. Description	7
6. Summary of the assay	8
7. Additional materials and equipment required	9
7.1. Optional equipment	9
8. Sample preparation	10
9. Assay procedure	11
9.1. Reagent preparation	11
9.2. Preparation of the standard curve	11
9.3. Running partial plates	12
9.4. Assay protocol	12
10. Data processing	16
10.1. Calculation of results	16
10.2. Typical assay data	16
11. Additional information	18
11.1. Specificity	18
11.2. Reproducibility	18
11.3. Sensitivity	18
11.4. Calibration	18
11.5. Recovery	18
12. Background references	20
13. Related products	22

# 1. Legal

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## 2. Handling

### 2.1. Safety warnings and precautions

**Warning: For research use only.**

Not recommended or intended for diagnosis of disease in humans or animals. Do not use internally or externally in humans or animals.

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.

### 2.2. Storage

Store at 2–8°C.

### 2.3. Expiry

The expiry date is stated on the package and will normally be at least 4 weeks from the date of despatch.

### 3. Components of the assay system

This pack contains the following assay components and provides sufficient material for 96 wells.

All reagents are stored refrigerated at 2–8°C. Refer to the expiry date on the kit box.

**(m)IL-4 microplate** - 96 well polystyrene microplate (12 strips of 8 wells) coated with an antibody against mouse IL-4.

**(m)IL-4 conjugate** - pre-diluted antibody against mouse IL-4 conjugated to horseradish peroxidase, with preservative, 12 ml.

**(m)IL-4 standard** - recombinant mouse IL-4, lyophilized, 2 vials.

**Plate reagent** - with 0.1% (w/v) sodium azide, 8 ml.

**Standard diluent** - with 0.1% (w/v) sodium azide, 12 ml.

**Wash buffer concentrate** - 30-fold concentrated solution, with preservative, 50 ml.

**Pre-mixed TMB substrate solution** - substrate solution, with preservative, 13 ml. Contains methanol.

**Stop solution** - 0.18 M sulphuric acid.

**Plate covers** - adhesive strips, 4.

## 4. Critical parameters

- Allow samples and all reagents to reach room temperature prior to performing the assays. Do not use water baths to thaw samples or reagents.
- Mix samples and all reagents thoroughly before use.
- Avoid excessive foaming of reagents. Also avoid exposure of reagents to excessive heat or light during storage and incubation.
- Avoid handling the tops of the wells both before and after filling.
- Standards and samples should be assayed in duplicate.
- Run a separate standard curve for each assay.
- The total dispensing time for each plate should not exceed 20 minutes.
- Use only coated wells from the same reagent batch for each assay. Also do not mix reagents from different kit lots.
- For sample and conjugate incubations a humidified incubator may be used to help prevent evaporation loss due to incomplete plate sealing.
- Some components of this kit contain sodium azide which may react with lead and copper plumbing to form explosive metallic azides. Flush with large volumes of water during disposal.

## 5. Description

The Biotrak™ mouse interleukin-4 ELISA system from GE Healthcare provides a simple, specific, reliable and precise quantitative determination of (m)IL-4 in cell culture supernatants and serum.

The assay system is based on a solid phase ELISA, which utilizes an antibody for (m)IL-4 bound to the wells of a microplate (12 x 8 well strip format) together with an antibody to (m)IL-4 conjugated to horseradish peroxidase. Although the Biotrak (m)IL-4 immunoassay contains recombinant (m)IL-4 and antibodies raised against recombinant (m)IL-4 it has been shown to quantitate accurately both natural (m)IL-4 and recombinant (m)IL-4.

(m)IL-4 can be measured in the range 15–375 pg/ml (0.75–18.75 pg/well) in less than 4 hours using the protocol provided with the kit. Each pack contains sufficient material for 96 wells. If one standard curve is constructed, 44 unknowns can be measured in duplicate.

- High sensitivity - 5 pg/ml (0.25 pg/well)
- Same day protocol
- Pre-coated microplate
- Specific for (m)IL-4

## 6. Summary of the assay

This assay employs the quantitative 'sandwich' enzyme immunoassay technique. An antibody specific for (m)IL-4 has been coated on to the microplate provided in the kit. Samples are pipetted into the wells, and the (m)IL-4, if present, is bound by the immobilized antibody. After washing away any unbound sample proteins, an enzyme-linked antibody specific for (m)IL-4 is added to the wells and allowed to bind to any (m)IL-4 which was bound during the first incubation. Following a wash to remove any unbound antibody-enzyme reagent, a substrate solution is added to the wells and colour develops in proportion to the amount of (m)IL-4 bound in the initial step.

In addition to the samples to be tested, a series of wells is prepared using known concentrations of the (m)IL-4 standard. A curve, plotting the optical density versus the concentration of (m)IL-4 in these standard wells, is prepared. By comparing the optical density of the samples to this standard curve, the concentration of the (m)IL-4 in the unknown samples is then determined.



## 7. Additional materials and equipment required

The following materials and equipment are required:

- Pipettes or pipetting equipment with disposable tips (50  $\mu$ l, 100  $\mu$ l and 1.00 ml)
- Disposable polypropylene test tubes - do not use polystyrene, polycarbonate or glass
- Measuring cylinder, 2 l
- Distilled or deionized water
- Plate reader capable of reading at 450 nm
- Reagent reservoirs for use with multi-channel pipettes

### 7.1. Optional equipment

Assays may be performed with commercially available microplate washers to aid convenience and assay throughput.

## 8. Sample preparation

### **Cell culture supernatants**

Centrifuge to remove any particulate material and store at -15°C to -30°C.

Avoid freeze-thaw cycles.

### **Serum**

Serum samples should be allowed to clot at room temperature. Immediately after clotting, spin down. Specimens should be clear and non-haemolysed whenever possible. If samples contain particulate matter, clarify by centrifugation before testing.

Serum and culture supernatant samples that are to be assayed within 24 hours should be stored at 2–8°C. Specimens to be stored for longer periods of time should be frozen at -70°C to avoid loss of biologically active cytokine. Avoid freezing and thawing samples more than once.

### **Dilution of test samples**

If it is suspected that the (m)IL-4 concentration of a sample exceeds the highest point of the standard curve, one or more five-fold dilutions of the test sample should be prepared. Mix thoroughly between dilutions and before assaying.

## 9. Assay procedure

### 9.1. Reagent preparation

#### **Wash buffer concentrate**

Any precipitate formed during storage will redissolve upon dilution. Dilute 30-fold with distilled or deionized water to prepare 1500 ml of wash buffer. Store at 2–8°C until the expiry date of the kit. Do not use wash buffer if it becomes visibly contaminated on storage.

#### **(m)IL-4 standard**

It is important that the diluent selected for reconstitution and dilution of the standard reflects the environment of the samples being measured. Standard diluent will be suitable for the serial dilution of standards for serum determinations. If the samples are cell culture supernatants, the culture media used will be suitable for preparation of the standard curve.

Reconstitute the (m)IL-4 standard with distilled or deionized water for serum samples, and culture media for cell culture supernatants. Reconstitution volume is stated on the standard vial label. This reconstitution produces a stock solution of 375 pg/ml. Mix by gently inverting the vial. Use this stock solution to produce a dilution series, as described below, within the range of this assay (15–375 pg/ml). Use standards within 15 minutes of dilution.

### 9.2. Preparation of the standard curve

The reconstituted 375 pg/ml (m)IL-4 is the first point of the standard curve. For the other points, prepare five-fold serial dilutions as follows: label two tubes, one tube for each of the additional dilutions: 75 pg/ml and 15 pg/ml. Pipette 400 µl of appropriate diluent into each tube. Pipette 100 µl of reconstituted (m)IL-4 standard into the first tube labelled 75 pg/ml and mix. Pipette 100 µl of this dilution into the second tube labelled 15 pg/ml and mix. These

concentrations, 375 pg/ml, 75 pg/ml and 15 pg/ml provide the standard curve points.

### 9.3. Running partial plates

This ELISA provides the flexibility to run two partial plates on separate occasions. Decide the number of strips you wish to run, leaving the strips to be used in the frame. Remove the unnecessary strips and store them in the foil pouch with the desiccant provided at 2–8°C, making sure the foil pouch is sealed tightly.

When adding the TMB substrate solution, pour out from the bottle **only** the amount needed to run a partial plate. Do not combine left over substrate with that reserved for the remainder of the plate. Care must be taken to ensure that the remaining TMB substrate solution is not contaminated. If the substrate solution is bright blue prior to use, it has been contaminated. **DO NOT USE.**

### 9.4. Assay protocol

1. Prepare assay reagents and working standards as described in the previous sections.
2. Set up the microplate with sufficient wells to enable the running of all standards and samples as required (see figure 1).
3. Remove excess microplate strips from the frame and store in the resealable foil bag with the desiccant provided.
4. Add 50 µl of plate reagent to each well that is to be used.
5. Add 50 µl of standard or sample per well in duplicate. Cover with adhesive strip provided and incubate for 2 hours at  $37^{\circ} \pm 2^{\circ}\text{C}$ .
6. Aspirate or decant each well and wash, repeating the process four times for a total of five washes. Wash vigorously by filling each well with wash buffer (400 µl) using a washbottle, pipette or manifold dispenser. Complete removal of liquid at each step is essential for good performance. After the last wash, remove

any remaining wash buffer by inverting the plate and blotting it against clean paper towelling. Squeeze the sides of the plate when decanting to ensure that all strips remain securely in the frame.

7. Add 100 µl of pre-diluted (m)IL-4 conjugate. Cover with a new adhesive strip and incubate for 1 hour at 37°C ±2°C.
8. Repeat the aspiration/wash step as in step 6.
9. Add 100 µl of TMB substrate solution into each well, incubate for 30 minutes at room temperature. If the substrate solution is bright blue prior to use, do not use. **THE PLATE SHOULD BE DEVELOPED IN THE DARK.** Do not cover the plate with aluminium foil.
10. Add 100 µl of stop solution to each well.
11. Determine the optical density of each well within 30 minutes, using a spectrophotometer set to 450 nm.

	1	2	3	4	5	6	7	8	9	10	11	12
A	0	0	S	S	S	S	S	S	S	S	S	S
B	15	15	S	S	S	S	S	S	S	S	S	S
C	75	75	S	S	S	S	S	S	S	S	S	S
D	375	375	S	S	S	S	S	S	S	S	S	S
E	S	S	S	S	S	S	S	S	S	S	S	S
F	S	S	S	S	S	S	S	S	S	S	S	S
G	S	S	S	S	S	S	S	S	S	S	S	S
H	S	S	S	S	S	S	S	S	S	S	S	S

**Figure 1.** Recommended positioning of standard (0–375 pg/ml) and sample wells (S).

**Table 1.** Assay protocol (all volumes are in microlitres)

	<b>Zero standard (B<sub>0</sub>)</b>	<b>Standards</b>	<b>Samples</b>
Plate reagent	50	50	50
Standard	–	50	–
Standard diluent or cell culture media	50	–	–
Sample	–	–	50
Cover plate, incubate at 37°C ±2°C for 2 hours.			
Aspirate/decant and vigorously wash all wells five times with 400 µl wash buffer.			
Conjugate	100	100	100
Cover plate, incubate at 37°C ±2°C for 1 hour.			
Aspirate/decant and vigorously wash all wells five times with 400 µl wash buffer.			
Substrate	100	100	100
Incubate at room temperature for 30 minutes in the dark.			
Stop solution	100	100	100
Determine optical density at 450 nm within 30 minutes.			

## 10. Data processing

### 10.1. Calculation of results

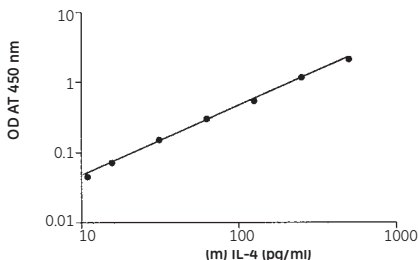
Average the duplicate readings for each standard, control and sample and subtract the zero standard optical density.

Plot these averaged absorbance values for each of the standard values versus the corresponding concentration of the standards. The data can be linearized by using a log/log plot and regression analysis may be applied to the log transformation.

Figure 2 shows such a plot of the data from table 2. The standard curve, with 7 points plotted, is provided for illustration purposes only. A standard curve should be generated for each set of samples to be assayed. The protocol describes the generation of a 4 point curve (zero included) by dilution of a stock standard. This allows for the measurement of 44 unknowns in duplicate.

If a test sample has been diluted prior to assay, account for the dilution factor in calculation of results.

### 10.2. Typical assay data



**Figure 2.** Standard curve



The following data (table 2) were obtained for a standard curve using the protocol provided, with an extended dilution series to demonstrate the linearity of the assay curve.

**Table 2.** Typical assay data

<b>Tube</b>	<b>Optical density</b>	<b>Zero standard subtracted</b>
Zero standard	0.028	–
10.94 pg/ml standard	0.073	0.045
15.63 pg/ml standard	0.099	0.072
31.25 pg/ml standard	0.181	0.153
62.5 pg/ml standard	0.328	0.301
125 pg/ml standard	0.567	0.539
250 pg/ml standard	1.191	1.163
500 pg/ml standard	2.134	2.106

## 11. Additional information

### 11.1. Specificity

This assay recognises both natural and recombinant (m)IL-4. It does not cross react with (m)IL-2, (m)IL-3, (m)IL-5, (m)IL-6, (m)IL-10, (m)GM-CSF, (m)IFN $\gamma$ , (m)TNF $\alpha$ , (h)IL-4, rat IL-4 or rabbit IL-4.

### 11.2. Reproducibility

#### **Within-assay precision**

The within-assay coefficient of variation of the ELISA has been determined to be <10%.

#### **Between-assay precision**

The between-assay coefficient of variation of the ELISA has been determined to be <10%.

### 11.3. Sensitivity

The minimum detectable dose of biologically active (m)IL-4 was determined to be 5 pg/ml (0.25 pg/well), by adding two standard deviations to the optical density value of zero and calculating the corresponding concentration from the standard curve.

### 11.4. Calibration

The standard in this ELISA is calibrated to the NIBSC reference lot 91/656.

One (1) pg of Biotrak standard = 1NIBSC pg

### 11.5. Recovery

Serum recovery in the ELISA has been determined by spiking recombinant cytokine into neat pooled mouse serum and comparing it with spiked standard diluent control. The values below are typical recoveries:

<b>Standard diluent spike</b>	<b>Serum value</b>	<b>Recovery</b>
256 pg/ml	169 pg/ml	66%
121 pg/ml	84 pg/ml	69%
65 pg/ml	44 pg/ml	68%

## 12. Background and references

Mouse IL-4 is a 120 amino acid (19 kDa) cytokine released primarily by activated T cells and mast cells that displays both stimulatory and inhibitory effects. Mouse and human IL-4 display approximately 50% homology at the amino acid level. IL-4 was first identified as a B cell growth factor capable of supporting the proliferation of B cells primed with antibodies to surface immunoglobulins. IL-4 has since been shown to play a pivotal role in regulating the immune response through its effects on B cells (upregulates CD23 and class II expression and Ig production, induces class-switching to IgE and IgG<sub>1</sub>), T cells (promotes proliferation and ADCC), monocytes (inhibits inflammatory cytokine synthesis), and endothelial cells (increases adhesiveness for lymphocytes by regulating adhesion molecule expression).

The biological effects of mouse IL-4 are mediated by the mouse IL-4R, a cell surface receptor complex believed to consist of a high affinity ligand-binding 130 kDa glycoprotein and a 64 kDa signalling chain; this 64 kDa protein is the common signal-transducing chain for a growing family of cytokine receptors that includes the IL-2R and IL-7R. IL-4R are expressed by both haematopoietic (lymphoid, myeloid and erythroid) and non-haematopoietic (brain, liver, muscle, and fibroblast) cell types. In the mouse, a truncated soluble form of IL-4R capable of binding IL-4 with high affinity has been detected in serum and other biological fluids.

Treatment of mice with IL-4 antagonists (anti-IL-4 or soluble IL-4) suggests an important role for IL-4 *in vivo*. Anti-IL-4 antibodies inhibited both primary and secondary IgE responses induced by injection of nematode larvae or TNP-KLH on alum. In a cardiac allograft model, soluble IL-4R prolonged graft survival, implicating IL-4 in CTL development. IL-4 produced *in situ* by tumour cell lines

transfected with IL-4 cDNA has been reported to inhibit solid tumour formation in mouse models.

The ability of IL-4 to inhibit solid tumour formation suggests that it may have applications as an anti-neoplastic agent. IL-4 may also have therapeutic value in the management of inflammatory disease states by inhibiting the synthesis of inflammatory cytokines.

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## 13. Related products

**Human cytokine ELISA systems from the Biotrak assay range**  
**Unlabelled and radiolabelled growth factors and cytokines**

### **Cell proliferation**

Cell proliferation kit (for immunocytochemical/  
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RPN 20

Cell proliferation ELISA

RPN 250

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RPN 202

Cell proliferation labelling reagent

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