Cymax™ Mouse GM-CSF ELISA

Catalog # LF-EK0283 (1 kit)

Sandwich Enzyme-Linked Immunosorbent Assay for Quantitative Detection of mouse GM-CSF

For research use only
Not for diagnostic or therapeutic procedures

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1. Introduction

Granulocyte-macrophage colony-stimulating factor (GM-CSF) is also symbolized CSF2. Human GM-CSF is a glycoprotein that is essential for the in vitro proliferation and differentiation of precursor cells into mature granulocytes and macrophages. The human cDNA clones contain a single open-reading frame encoding a protein of 144 amino acids with a predicted molecular mass of 16,293 daltons and show 69% nucleotide homology and 54% amino acid homology to mouse GM-CSF. The gene for human GM-CSF appears to exist as a single-copy gene.[1] Human GM-CSF is a 22,000-dalton glycoprotein that stimulates the growth of myeloid progenitor cells and acts directly on mature neutrophils. The GM-CSF gene is localized by somatic cell hybrid analysis and in situ hybridization to human chromosome region 5q21-5q32, which is involved in interstitial deletions in the 5q- syndrome and acute myelogenous leukemia.[2] A complementary DNA for the T lymphocyte-derived lymphokine, GM-CSF has been cloned, and recombinant GM-CSF protein has been expressed in yeast and purified to homogeneity. This purified human recombinant GM-CSF stimulates peripheral blood monocytes in vitro to become cytotoxic for the malignant melanoma cell line A375.3 The standard product used in this kit is recombinant mouse GM-CSF, consisting of 125 amino acids with the molecular mass of 14.8KDa.

2. Principles of Method

The design of this assay is based on a sandwich Enzyme-Linked Immunosorbent Assay (ELISA). The microtiter plate provided in this kit has been pre-coated with a monoclonal antibody specific to mouse GM-CSF. Samples are pipetted into these wells. Nonbound mouse GM-CSF and other components of the sample should be removed by washing, then monoclonal antibody specific to mouse GM-CSF added. In order to quantitatively determine the amount of mouse GM-CSF present in the sample, Streptavidin Horseradish Peroxidase (HRP) should be added to each microplate well. The final step, a TMB-substrate solution added to each well. Finally, a sulfuric acid solution is added and the resulting yellow colored product is measured at 450nm. Since the increases in absorbency is directly proportional to the amount of captured mouse GM-CSF.

3. Intended Use

The AbFrontier mouse GM-CSF ELISA kit is to be used for the in vitro quantitative determination of mouse GM-CSF in mouse serum, mouse plasma, cell lysate, culture supernatants and buffered solution. The assay will recognize native and recombinant mouse GM-CSF.

This kit has been configured for research use only and is not to be used in diagnostic procedures.

4. Storage and Stability

All kit components of this kit are stable at 2 to 8℃. Any unused reconstituted standard should be discarded or frozen at -70℃. Standard can be frozen and thawed one time only without loss of immunoreactivity.

5. Chemical Hazard

- Stop solution: This reagent is an irritant to eyes, skin and mucous membranes. Avoid contact with eyes, skin and clothing. Wear suitable protective clothing, gloves and eye protection. In the event of contact with eyes or skin, wash immediately with plenty of water.
- Standard protein and 2nd Antibody containing Sodium Azide as a preservative.

6. Kit Contents

Contents	Number	Volume
96 Well Plate	1 (in aluminum foil bag with desiccant)	
Washing Buffer	2	(20X) 25 ml
Standard Protein	1 Glass vial (lyophilized)	
Standard/Sample Dilution Buffer	1	25 ml
Secondary Antibody	1 Glass vial (lyophilized)	
Streptavidin HRP(X100)	1	150 μl
Secondary antibody/ Streptavidin HRP Dilution Buffer	1	25 ml
Substrate (TMB)	1	15 ml
Stop Solution	1	15 ml
Protocol booklet	1	
Plate sealers	2	

① 96 Well Plate

: Mouse GM-CSF microtiter plate, one plate of 96 wells (8 well strips x 12).

A plate using break-apart strips coated with a monoclonal antibody specific to mouse GM-CSF.

② Standard Protein

: Recombinant mouse GM-CSF.

③ Secondary Antibody

: Biotinylated anti GM-CSF antibody.

④ Streptavidin HRP

: Streptavidin Horseradish Peroxidase (HRP, enzyme)

⑤ Substrate (Stabilized chromogen)

: Tetramethylbenzidine (TMB) solution

⑥ Stop Solution

: 1N solution of sulfuric acid (H_2SO_4).

⑦ Plate sealer

: Adhesive sheet.

- Do not mix or interchange different reagents from various kit lots.

7. Materials Required But Not Provided

① Microtiter plate reader capable of measurement at or near 450nm.
② Calibrated, adjustable precision pipettes, preferably with disposable plastic tips (A manifold multi-channel pipette is desirable for large assays.)
③ Distilled or deionized water
④ Data analysis and graphing software
⑤ Vortex mixer
⑥ Polypropylene tubes for diluting and aliquoting standard
⑦ Absorbent paper towels
⑧ Calibrated beakers and graduated cylinders of various sizes

8. Reagent Preparation

1) Mouse GM-CSF standard

1. Reconstitute the lyophilized mouse GM-CSF standard by adding 1 ml of *Standard/Sample Dilution Buffer* to make the 10 ng/ml standard stock solution. Allow solution to sit at RT for 5 minutes, then gently vortex to mix completely. Use within one hour of reconstituting.

2. Prepare 1 ml of 250 pg/ml top standard by adding 25 µl of the above stock solution in 975 µl of *Standard/Sample Dilution Buffer*. Perform 2-fold serial dilutions of the top standards to make the standard curve within the range of this assay (3.91 pg/ml ~ 250 pg/ml) as below. *Standard/Sample Dilution Buffer* serves as the zero standard (0 pg/ml).

Standard	Add	Into
250 pg/ml	*25.0 µl of the std.(10 ng/ml)*	975.0 µl of the *Standard/Sample Dilution Buffer*
125 pg/ml	*500 µl of the std.(250 pg/ml)*	500.0 µl of the *Standard/Sample Dilution Buffer*
62.5 pg/ml	*500 µl of the std.(125 pg/ml)*	500.0 µl of the *Standard/Sample Dilution Buffer*
31.25 pg/ml	*500 µl of the std.(62.5 pg/ml)*	500.0 µl of the *Standard/Sample Dilution Buffer*
15.63 pg/ml	*500 µl of the std.(31.3 pg/ml)*	500.0 µl of the *Standard/Sample Dilution Buffer*
7.81 pg/ml	*500 µl of the std.(15.6 pg/ml)*	500.0 µl of the *Standard/Sample Dilution Buffer*
3.91 pg/ml	*500 µl of the std.(7.81 pg/ml)*	500.0 µl of the *Standard/Sample Dilution Buffer*
0 pg/ml	1.0 ml of the *Standard/Sample Dilution Buffer*	

2) Secondary Antibody

100X secondary antibody solution can be made by adding 150 µl *Secondary antibody/Streptavidin HRP dilution buffer* in the vial.

1. Equilibrate to room temperature, mix gently.

2. Mix 20 μl *Secondary Antibody concentrated solution* (100X) + 1.98 ml *Secondary antibody/Streptavidin HRP dilution buffer*. (Sufficient for one 16-well strip, prepare more if necessary)

   Label as "Working Secondary antibody Solution".
3. Return the unused *Secondary Antibody concentrated solution* to the refrigerator.

3) Streptavidin HRP(X100)

1. Equilibrate to room temperature, mix gently.
2. Mix 20 μl *Streptavidin HRP concentrated solution* (100X) + 1.98 ml *Secondary antibody/Streptavidin HRP dilution buffer*. (Sufficient for one 16-well strip, prepare more if needed)

   Label as "Working Streptavidin HRP Solution".
3. Return the unused *Streptavidin HRP concentrated solution* to the refrigerator.

4) Washing buffer

1. Equilibrate to room temperature, mix to re-dissolve any precipitated salt.
2. Mix 0.5 volume *Wash buffer concentrate solution* (20X) + 9.5 volumes of deionized water. Label as "Working Washing Solution".
3. Store both the concentrated and the Working Washing Solution in the refrigerator.

*** Directions for washing**

1. Fill the wells with 300 μl of "Working Washing Buffer".

   Let soak for 1 to 3 minutes and then all residual wash-liquid must be drained from the wells by aspiration (taking care not to scratch the inside of the well) or decantation, followed by forceful tapping of the plate on absorbent paper. Never insert absorbent paper directly into the wells.

   If using an automated washer, the operating instructions for washing equipment should be carefully followed.
2. Incomplete washing will adversary affects the assay and renders false results.
3. It is recommended to use laboratory tape to hold plate strips to the plate frame while performing the plate washing to avoid strips coming free of the frame.

5) Sample preparation

Blood should be collected by venipuncture. For plasma samples, blood may be drawn into tubes containing sodium citrate or heparin, EDTA. The serum or plasma should be separated from the coagulated or packed cells by centrifugation. Specimens may be shipped at room temperature and then stored refrigerated at 2-8℃ if testing is to take place within one week after collection. If testing is to take place later than one week, specimens should be stored at -20℃. Avoid repeated freeze/thawing.

9. Assay Procedure

- Allow all reagents to reach room temperature before use. Gently mix all liquid reagents prior to use.
- All standards, controls and samples should be run in duplicate for confirmation of reproducibility.
- A standard curve must be run with each assay.
- If particulate matter is present in the analyte, centrifuge or filter prior to analysis.
- Maintain a consistent order of components and reagents addition from well to well. This ensures equal incubation times for all wells.

1) Determine the number of 16-well strips needed for assay. Insert these in the flame(s) for current use (Re-bag extra strips and frame. Refrigerate for further use).
2) For the standard curve, add 100 μl of the standard to the appropriate microtiter wells. Add 100 μl of the *Standard/Sample/secondary antibody Dilution Buffer* to zero wells.
3) Serum and plasma require **at least 5 fold dilution** in the *Standard/Sample Dilution Buffer*. And add 100 μl of samples to each well.
4) Cover the plate with the plate cover and incubate for 2 hours at 37℃.
5) Thoroughly aspirate or decant the solution from the wells. Wash the wells 3 times (See "Directions for washing").
6) Pipette 100 μl of "Working Secondary Antibody Solution" into each well.
7) Cover the plate with the plate cover and incubate for 1 hour at 37℃.
8) Thoroughly aspirate or decant the solution from the wells. Wash the wells 3 times (See "Directions for washing").
9) Add 100 μl "Working Streptavidin HRP Solution" to each well.
10) Cover the plate with the plate cover and incubate for 30 minutes at 37℃.
11) Thoroughly aspirate or decant the solution from the wells. Wash the wells 3 times (See "Directions for washing").
12) Add 100 μl of *Substrate* to each well. The liquid in the wells should begin to turn blue.
13) Incubate the plate at room temperature.

- Do not cover the plate with aluminum foil, or color may develop.
  The incubation time for chromogen substrate is often determined by the microtiter plate reader used. O.D. values should be monitored and the substrate reaction stopped before O.D. of the positive wells exceeds the limits of the instrument. O.D. values at 450nm can only be read after the Stop Solution has been added to each well.
- Because the *Substrate* is light sensitive, avoid the remained *Substrate* solution prolonged exposure to light.

- Typically, reaction is stopped 5~10 minutes after treatment of Substrate, but this time can be adjusted as the user desires.

14) Add 100 µl of *Stop Solution* to each well. The solution in the wells should change from blue to yellow.
15) Read the absorbance of each well at 450nm. Read the plate within 20 minutes of adding the *Stop Solution*.
16) Plot on graph paper the absorbance of the standard against the standard concentration (Optimally, the background absorbance can be subtracted from all data points, including standards, unknowns and controls, prior to plotting.). Draw a smooth curve through these points to construct the standard curve.
17) Read the mouse GM-CSF concentrations for the unknown samples and controls from the standard curve plotted in step 18. Multiply value(s) obtained for the unknown sample by the dilution factor (Samples producing signals greater than that of the highest standard should be further diluted in the S*tandard/Sample Dilution Buffer*).

10. Characteristics

1) Typical result

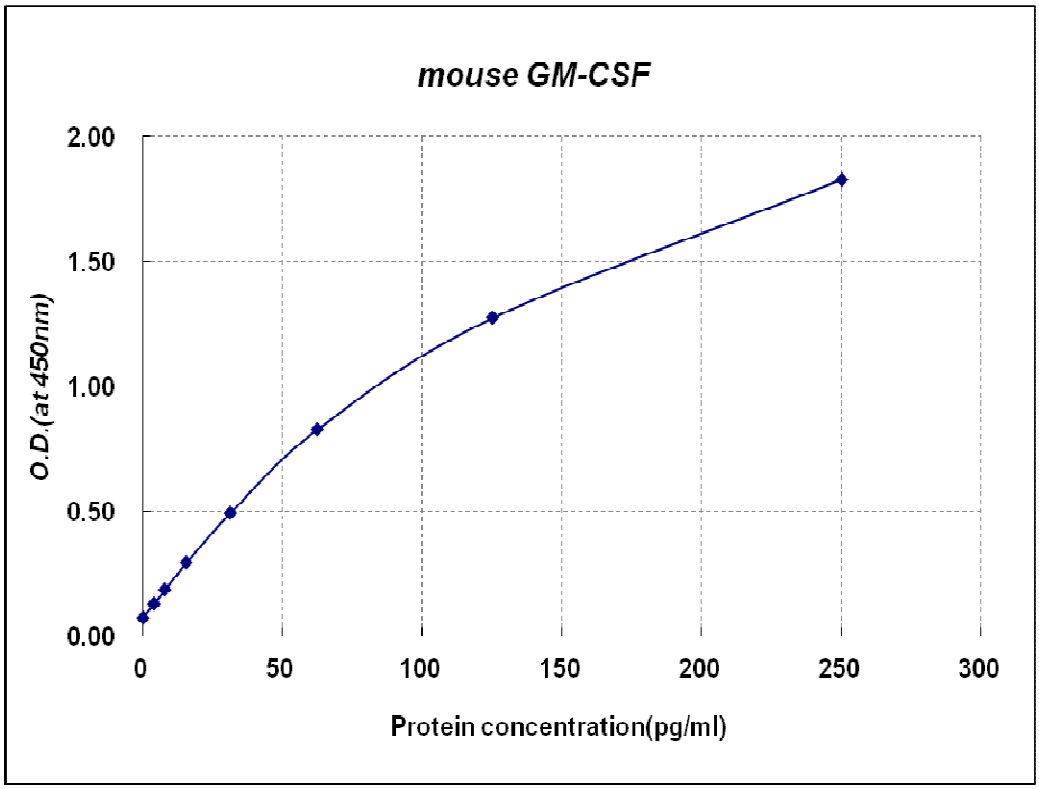
The standard curve below is for illustration only and **should not be used** to calculate results in your assay.

A standard curve must be run with each assay.

Standard mouse GM-CSF (pg/ml)	Optical Density (at 450nm)
0	0.0724
3.90625	0.1273
7.8125	0.1841
15.625	0.2942
31.25	0.4918
62.5	0.8287
125	1.2753
250	1.8315

< Limitations >

- Do not extrapolate the standard curve beyond the 250 pg/ml standard point.
- Other buffers and matrices have not been investigated.
- The rate of degradation of native mouse GM-CSF in various matrices has not been investigated.



(TMB reaction incubate at room temperature for 5 min)

2) Sensitivity

The minimal detectable dose of mouse GM-CSF was calculated to be 1.53 pg/ml, by subtracting three standard deviations from the mean of 12 zero standard replicates (ELISA buffer, S0) and intersecting this value with the standard curve obtained in the same calculation.

N	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
ZERO	**0.0715**	**0.0692**	**0.0678**	**0.0715**	**0.0685**	**0.0715**	**0.0656**	**0.0721**	**0.0788**	**0.0756**	**0.0769**	**0.0801**

Average	**SD**	**LLD**	**LLD mean(pg/ml)**
0.0724	**0.0045**	**0.086**	**1.53**

3) Specificity

The following substances were tested and found to have no cross-reactivity: human GM-CSF, rat GM-CSF, human M-CSF, mouse IL-4, human IL-5.

4) Precision

① Within-Run (Intra-Assay)

(n=12)

Mean (pg/ml)	SD (pg/ml)	CV (%)
30.929	1.453	4.697
63.980	3.041	4.754
124.123	5.965	4.805
250.814	11.390	4.541

② Between-Run (Inter-Assay)

(n=12)

Mean (pg/ml)	SD (pg/ml)	CV (%)
31.037	1.466	4.724
62.845	2.408	3.832
125.646	5.221	4.155
251.326	8.890	3.537

5) Recovery

Recovery on addition is 99.04~103.46% (mean 101.41%)

Added Analyte (pg/ml)	Serum(1/20)+added analyte (450nm)	Serum(1/20)(450nm) +added analyte(450nm)	Recovery (%)
31.664	35.294	34.953	99.036
65.247	68.877	71.261	103.462
127.661	131.291	132.035	100.567
247.741	251.371	251.482	100.044

11.Troubleshooting

Problem	Possible Cause	Solution
High signal and background in all wells	• Insufficient washing	• Increase number of washes • Increase time of soaking between in wash
	• Too much Streptavidin-HRP	• Check dilution, titration
	• Incubation time too long	• Reduce incubation time
	• Development time too long	• Decrease the incubation time before the stop solution is added
No signal	• Reagent added in incorrect order, or incorrectly prepared	• Review protocol
	• Standard has gone bad (If there is a signal in the sample wells)	• Check the condition of stored standard
	• Assay was conducted from an incorrect starting point	• Reagents allows to come to 20~30℃ before performing assay
Too much signal – whole plate turned uniformly blue	• Insufficient washing – unbound SAV-HRP remaining	• Increase number of washes carefully
	• Too much Streptavidin -HRP	• Check dilution
	• Plate sealer or reservoir reused, resulting in presence of residual Streptavidin -HRP	• Use fresh plate sealer and reagent reservoir for each step
Standard curve achieved but poor discrimination between point	• Plate not developed long enough	• Increase substrate solution incubation time
	• Improper calculation of standard curve dilution	• Check dilution, make new standard curve
No signal when a signal is expected, but standard curve looks fine	• Sample matrix is masking detection	• More diluted sample recommended
Samples are reading too high, but standard curve is fine	• Samples contain protein levels above assay range	• Dilute samples and run again
Edge effect	• Uneven temperature around work surface	• Avoid incubating plate in areas where environmental conditions vary • Use plate sealer

12.Reference

1) *Cantrell, M. A.; Anderson, D.; Cerretti, D. P.; Price, V.; McKereghan, K.; Tushinski, R. J.; Mochizuki, D. Y.; Larsen, A.; Grabstein, K.; Gillis, S.; Cosman, D. Cloning, sequence, and expression of a human granulocyte/macrophage colony-stimulating factor. Proc. Nat. Acad. Sci.82: 6250-6254, 1985.*

2) *Huebner, K.; Isobe, M.; Croce, C. M.; Golde, D. W.; Kaufman, S. E.; Gasson, J. C. The human gene encoding GM-CSF is at 5q21-q32, the chromosome region deleted in the 5q-anomaly. Science230: 12821285, 1985.*

3) *Grabstein, K. H.; Urdal, D. L.; Tushinski, R. J.; Mochizuki, D. Y.; Price, V. L.; Cantrell, M. A.; Gillis, S.; Conlon, P. J. Induction of macrophage tumoricidal activity by granulocyte-macrophage colonystimulating factor. Science 232: 506-508, 1986.*

◈ Ordering Information

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