

Quantibody® Mouse Interleukin Array 1000

--- Quantitative measurement of 30 mouse cytokines

Patent Pending Technology

User Manual (Version Oct08)

Quantibody® Mouse Interleukin Array 1000

(Combination of Quantibody® mouse Interleukin Arrays 1 & 2
to quantitatively measure the concentration of 30 mouse cytokines)

Cat # QAM-INT-1000

Quantibody® Mouse Interleukin Array 1 (Cat# QAM-INT-1)

Quantibody® Mouse Interleukin Array 2 (Cat# QAM-INT-2)



RayBiotech, Inc.

**We Provide You With Excellent
Protein Array Systems and Service**

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OVERVIEW

Quantibody® Mouse Interleukin Array 1000

Cytokine Detected	30
Arrays Included	Quantibody® Mouse Interleukin Arrays 1 & 2
Quantibody® Mouse Interleukin Array 1 (20)	G-CSF, GM-CSF, IFN γ , IL-1 α , IL-1 β , IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-9, IL-10, IL-12p70, IL-13, IL-15, IL-17, IL-21, IL-23, TNF α
Quantibody® Mouse Interleukin Array 2 (10)	IL-1ra, IL-2R α , IL-6R, IL-11, IL-12p40, IL-17B, IL-17E, IL-17F, IL-20, IL-28
Format	One standard glass slide is spotted with 16 wells of identical cytokine antibody arrays. Each antibody is arrayed in quadruplicate.
Detection Method	Fluorescence with laser scanner: Cy3 equivalent dye
Sample Volume	50 – 100 μ l per array
Reproducibility	CV <20%
Assay duration	4 hrs



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I. Introduction

Cytokines play an important role in innate immunity, apoptosis, angiogenesis, cell growth and differentiation. They are involved in interactions between different cell types, cellular responses to environmental conditions, and maintenance of homeostasis. In addition, cytokines are also involved in most disease processes, including cancer and cardiac diseases.

The traditional method for cytokine detection and quantification is through the use of an enzyme-linked immunosorbent array (ELISA). In this method, target protein is first immobilized to a solid support. The immobilized protein is then complexed with an antibody that is linked to an enzyme. Detection of the enzyme-complex can then be visualized through the use of a substrate that produces a detectable signal. While the traditional method works well for a single protein, the overall procedure is time consuming and requires a lot of sample. With little sample to work with, conservation of precious small quantities becomes a risky task. Take the advantage of advancement of microarray technology over the last decade; more and more choices are available to the scientist today. A long-standing leader in the field, Raybiotech, has pioneered the development of semi-quantitative cytokine antibody array, in which multiple cytokine antibodies are arrayed on solid support (membrane or glass slide). Detection of multiple cytokines is achieved through a sandwich-like ELISA procedure. Our current RayBio[®] Human Cytokine Antibody Array C or G series 2000 enables scientists to detect 174 human cytokines in a single experiment rapidly and inexpensively. The array data can be further validated and quantified by using RayBiotech ELISA kits.

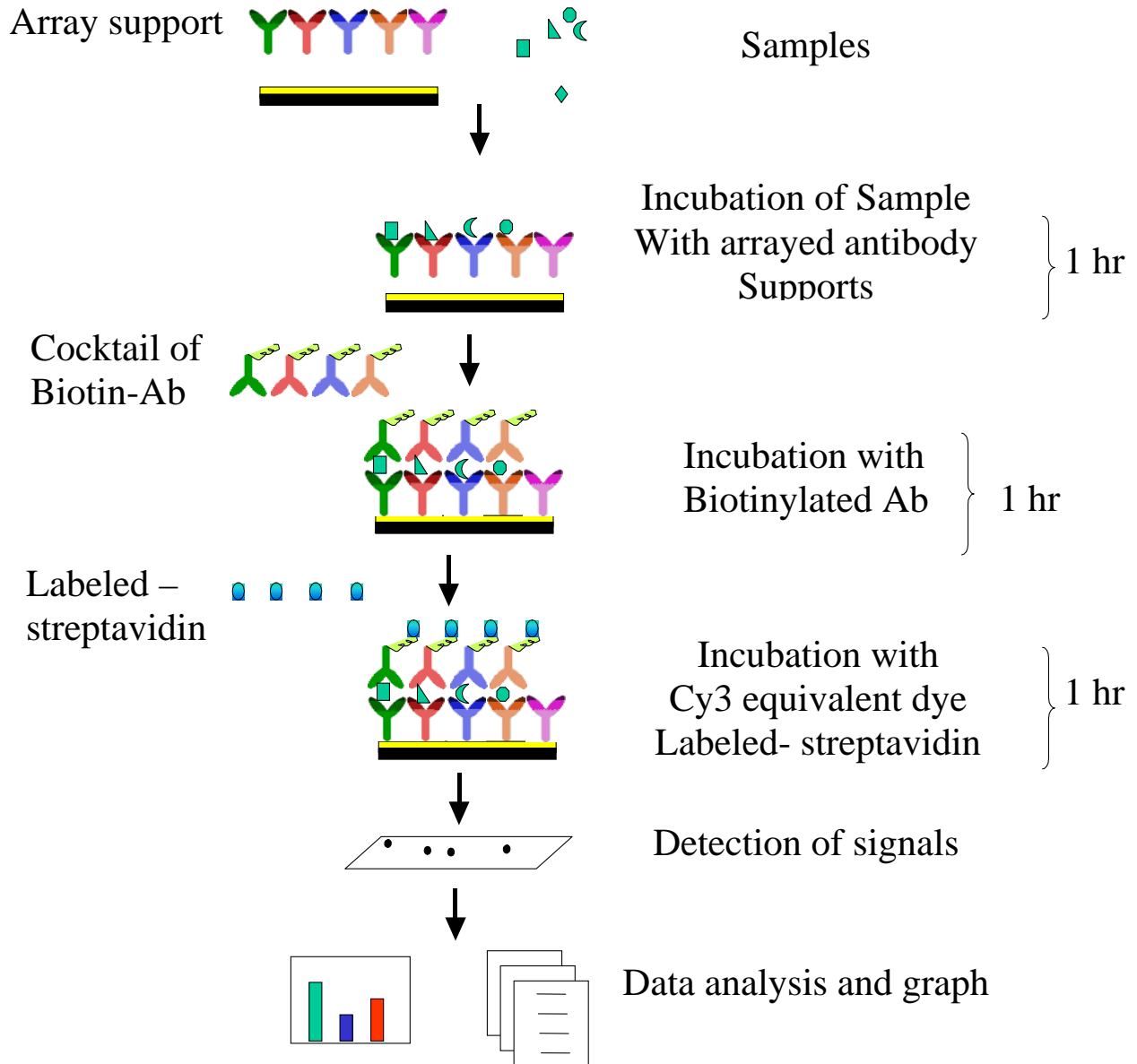
Our new multiplex Quantibody[®] Array is another quantum leap forward in protein microarray technology. This glass-chip-based multiplexed sandwich ELISA system enables researchers to accurately determine the concentration of multiple cytokines simultaneously. It combines the advantages of the high detection specificity / sensitivity of ELISA and the high throughput of the arrays. Like a traditional sandwich-based ELISA, it uses a pair of cytokine specific antibodies for detection. A capture antibody is first bound to the glass surface. After incubation with the sample, the target cytokine is trapped on the solid surface. A second biotin-labeled detection antibody is then

added, which can recognize a different isotope of the target cytokine. The cytokine-antibody-biotin complex can then be visualized through the addition of the streptavidin-labeled cy3 equivalent dye using a laser scanner. Unlike the traditional ELISA, Quantibody products use array format. By arraying multiple cytokine specific capture antibodies onto a glass support, multiplex detection of cytokines in one experiment is made possible.

In detail, one standard glass slide is spotted with 16 wells of identical cytokine antibody arrays. Each antibody, together with the positive and negative control is arrayed in quadruplicate. The slide comes with a 16-well removable gasket which allows for the process of 16 samples in one slide. Four slide chips can be nested into a tray, which matches a standard microplate and allows for automated robotic high throughput process of 64 arrays simultaneously. For cytokine quantification, the array specific cytokine standards, whose concentration has been predetermined, were provided to generate a five-point standard curve of each cytokine. In a real experiment, standard cytokines and samples will be assayed in each array simultaneously through a sandwich ELISA procedure. By comparing signals from unknown samples to the standard curve, the unknown cytokine concentration in the samples will be determined.

Quantibody® Mouse Interleukin Array 1000 is the combination of Quantibody® Mouse Interleukin Arrays 1 and 2 for quantitatively measure the concentration of 30 mouse cytokines. Quantibody® array kits have been confirmed to have similar detection sensitivity as traditional ELISA. Simultaneous detection of multiple cytokines undoubtedly provides a powerful tool for drug and biomarker discovery.

How it works



II. Materials Provided

Upon receipt, all the components of the Quantibody® Array kit should be stored at -20°C. At -20°C the kit will retain complete activity for up to 6 months. Once thawed, the glass chip, cytokine standard mix, detection antibody cocktail and Cy3 equivalent dye-conjugated Streptavidin should be kept at -20°C and all other components should be stored at 4°C. The entire kit should be used within 6 months of purchase.

Components*

Item	Description	Quantity
1	Quantibody® Array Glass Chip	1+1
2	Sample Diluent	1
3	20X Wash Buffer I	3
4	20X Wash Buffer II	1
5	Lyophilized cytokine standard mix	1+1
6	Detection antibody cocktail	1+1
7	Cy3 equivalent dye-conjugated Streptavidin	2
8	Slide Washer/Dryer	1
9	Adhesive device sealer	10
10	Manual	1

* There are two independent sets of reagents for Quantibody® mouse Interleukin Arrays 1, and 2. Among all the reagents, the glass chip, lyophilized cytokine standard mix, and detection antibody cocktail are array specific, while all the other reagents are suitable for both arrays.

Additional Materials Required

- Orbital shaker
- Laser scanner for fluorescence detection
- Aluminum foil
- Distilled water
- 1.5ml Polypropylene microcentrifuge tubes

III. General Considerations

A. Preparation of Samples

- Use serum-free conditioned media if possible.
- If serum-containing conditioned media is required, it is highly recommended that complete medium be used as a control since many types of sera contains cytokines.
- We recommend the following parameters for your samples:
50 to 100 µl of original or diluted serum, plasma or cell culture supernatant or 20-200 µg of protein for cell lysates and tissue lysates.

If you experience high background or the readings exceed the detection range, further dilution your sample is recommended.

B. Handling glass chips

- Do not touch the surface of the slides, as the microarray slides are very sensitive. Hold the slides by the edges only.
- Handle all buffers and slides with latex free gloves.
- Avoid breaking glass slide.
- Handle glass chip in clean environment.

C. Incubation

- Completely cover array area with sample or buffer during incubation.
- Avoid foaming during incubation steps.
- Perform all incubation and wash steps under gentle rotation.
- Cover the incubation chamber with adhesive film during incubation, particularly when incubation is more than 2 hours or <70 µl of sample or reagent is used.
- Avoid cross-contamination from overflowing solution to neighboring wells.
- Several incubation steps such as step 6 (blocking), step 7 (sample incubation), step 10 (Detection antibody incubation) or step 13 (Cy3 equivalent dye-streptavidin incubation) may be done at 4⁰C for overnight. Please make sure to cover the incubation chamber tightly to prevent evaporation.

IV. Protocol

*Note: There are two sets of reagents for **two different arrays**. Be careful to use the glass chip, lyophilized cytokine standard, and the detection antibody cocktail for the same array. Following is the procedure for processing any one of the arrays in the kit.*

A. Complete air dry the glass chip

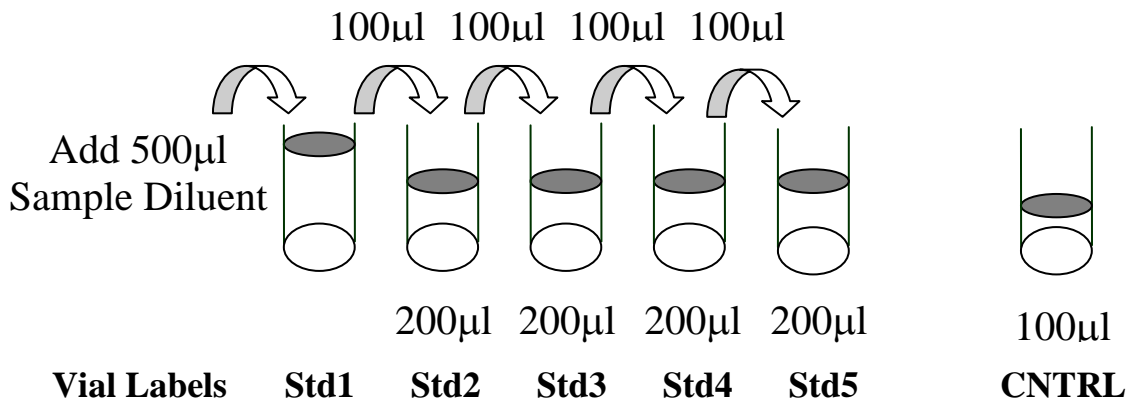
1. Take out the glass chip from the box, and let it equilibrate to room temperature inside the sealed plastic bag for 20-30 minutes. Remove it from the plastic bag; peel off the covering film, and let it air dry at room temperature for another 1-2 hours.

Note: Incomplete drying of slides before use may cause the formation of “comet tails”.

B. Prepare Cytokine Standard Dilutions

Note: Reconstitute the lyophilized standard within one hour of usage.

Prepare serial dilution of cytokine standards



2. Reconstitute the Cytokine Standard Mix (lyophilized) by adding 500µl Sample Diluent to the tube. Dissolve the powder thoroughly by a gentle mix. Labeled the tube as Std1.

3. Label 4 clean microcentrifuge tubes as Std 2 to Std 5. Add 200µl Sample Diluent to each of the tubes.
4. Pipette 100µl Std1 into tube Std2 and mix gently. Perform 3 more serial dilutions by adding 100ul Std2 to tube Std3 and so on.
5. Add 100µl Sample Diluent to another tube labeled as CNTRL. Do not add standard cytokines or sample to the CNTRL tube, which will be used as negative control.

C. Blocking and Incubation

6. Add 100µl Sample Diluent into each well and incubate at room temperature for 30 min to block slides.
7. Decant buffer from each well. Add 100µl standard cytokines or samples to each well. Incubate arrays at room temperature for 1 hour. (*Be careful to use the corresponding cytokine standard for the matching glass slide.*)

Note: The sample volume can be 50-100 µl. If sample volume is less than 70 µl, cover the gasket with adhesive sealer to prevent evaporation during incubation. Incubation may be done at 4⁰C for overnight.

*Note: We recommend using 50 to 100 µl of original or diluted serum, plasma or conditioned media or 20-200 µg of protein for cell lysates and tissue lysates. **In order to minimize the matrix effects and to lower the background of the assay, we recommended that the samples at least diluted 2 folds with Sample Diluent. Dilute the lysate at least 5 folds with Sample Diluent to make a total volume of 50 to 100 µl. Make sure there is no bubble in the wells.***

Note: The amount of sample used depends on the abundance of cytokines. More samples can be used if signals are too weak. If signals are too strong, the sample can be diluted further.

8. Decant the samples from each well, and wash 5 times with 200 µl of 1x Wash Buffer I and then 2 times with 200 µl of 1x Wash Buffer II at

room temperature with gentle shaking. Completely remove wash buffer in each wash step.

Note: avoid solution flowing into neighboring wells.

9. Reconstitute the Detection Antibody by adding 1.4 ml of Sample Diluent to the tube. Spin briefly. (Be careful to use the corresponding detection antibody for the matching glass slide.)

Note: the diluted Detection antibodies can be stored at 4⁰C for 2-3 days.

10. Add 80 µl of the detection antibody cocktail to each well. Incubate at room temperature for 1 hour.

Note: incubation may be done at 4⁰C for overnight.

11. Wash as directed in step 8.

12. After briefly spinning down, add 1.4 ml of Sample Diluent to Cy3 equivalent dye-conjugated streptavidin tube. Mix gently.

13. Add 80 µl of Cy3 equivalent dye-conjugated streptavidin to each well. Cover the device with aluminum foil to avoid exposure to light or incubate in dark room. Incubate at room temperature for 1 hour.

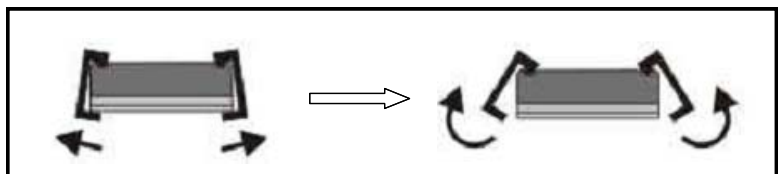
Note: incubation may be done at 4⁰C for overnight.

14. Wash four times with 1x Wash Buffer I.

D. Fluorescence Detection

15. Disassemble the device by pushing clips outward from the slide side. Carefully remove the slide from the gasket.

Note: Be careful not to touch the surface of the array side



16. Place the slide in the slide washer (50 ml centrifuge tube), add enough 1x Wash Buffer I (about 40 ml) to cover the whole slide, and then gently shake at room temperature for 15 minutes. Decant Wash Buffer I. Wash with 1x Wash Buffer II (about 40 ml) with gentle, and gently shake at room temperature for 5 minutes.

Note: This step can be done using slide chamber.

17. Decant Wash Buffer II and remove water droplets by centrifuging at 1,000 rpm for 3 minutes without cap.

Note: After the rinse step, proceed immediately for the drying step to prevent the deposit of the watermarks on the slide.

18. The signals can be visualized through use of a laser scanner equipped with a cy3 wavelength such as Axon GenePix. The settings should be: Excitation: 555 nm; Emission: 565 nm; Resolution: 10 um. Make sure that the signal from the standard well containing the highest concentration (Std1) receives the highest possible reading, yet remains unsaturated. Saved the image as a high resolution (16-bit) .tif file.

Note: In case the signal intensity for different cytokine varies greatly in the same array, we recommend using multiple scans for the low signal ones.

Note: we recommend scanning slide right after experiment. You can also store the slide at 4⁰C in a dry dark container for several days. If you do not have a laser scanner, RayBiotech can provide service for you. Just simply send your slide to us and we will take care of it.

E. Data Analysis

19. Data extraction can be done with most of the microarray analysis software (GenePix, ScanArray Express, ArrayVision, or MicroVigene). For quantitative data analysis, our RayBio[®] Q Analyzer software is available. It gives visual output as well as digital value. More information can be found in section VIII.

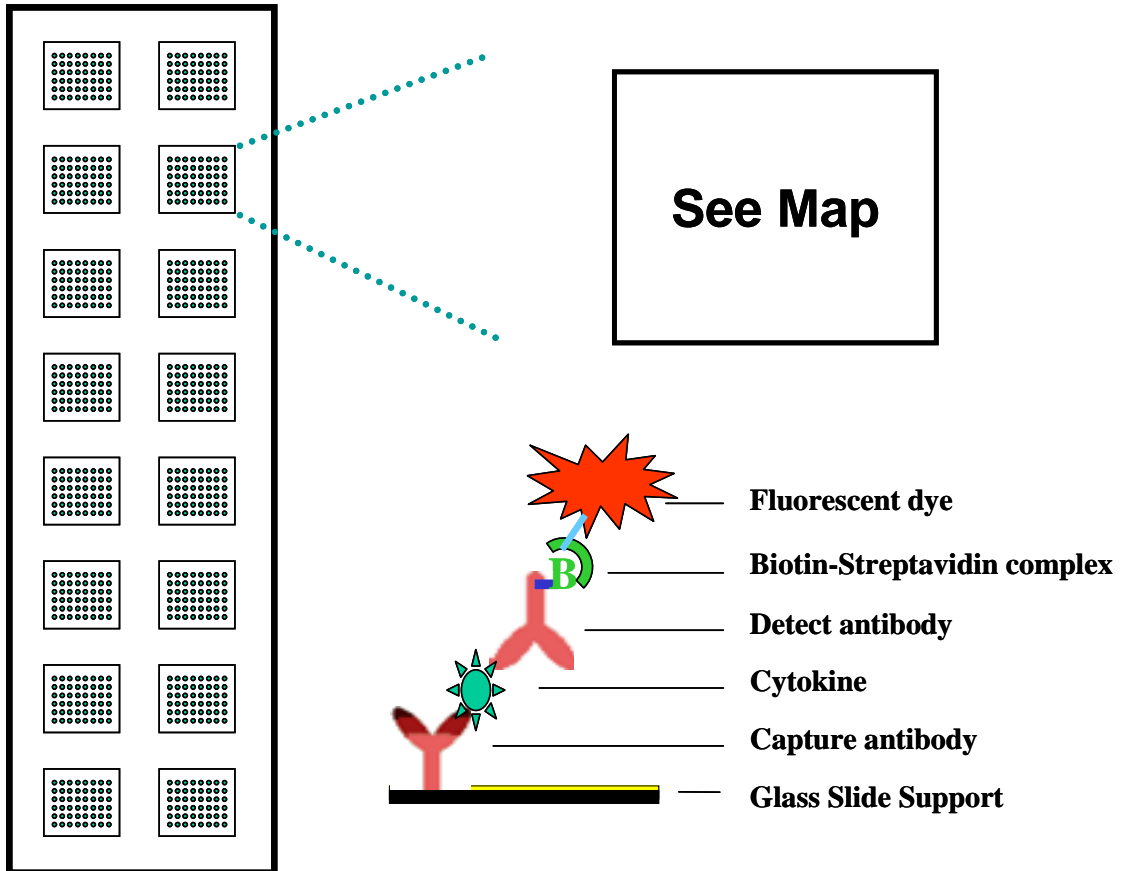
V. Cytokine array map

Mouse Interleukin Array 1

	1,2,3,4	5,6,7,8
a	POS	NEG
b	G-CSF	GM-CSF
c	IL-1a	IL-1b
d	IL-2	IL-3
e	IL-4	IL-5
f	IL-6	IL-7
g	IL-9	IL-10
h	IL-12p70	IL-13
i	IL-15	IL-17
j	IL-21	IL-23
k	IFN γ	TNF α

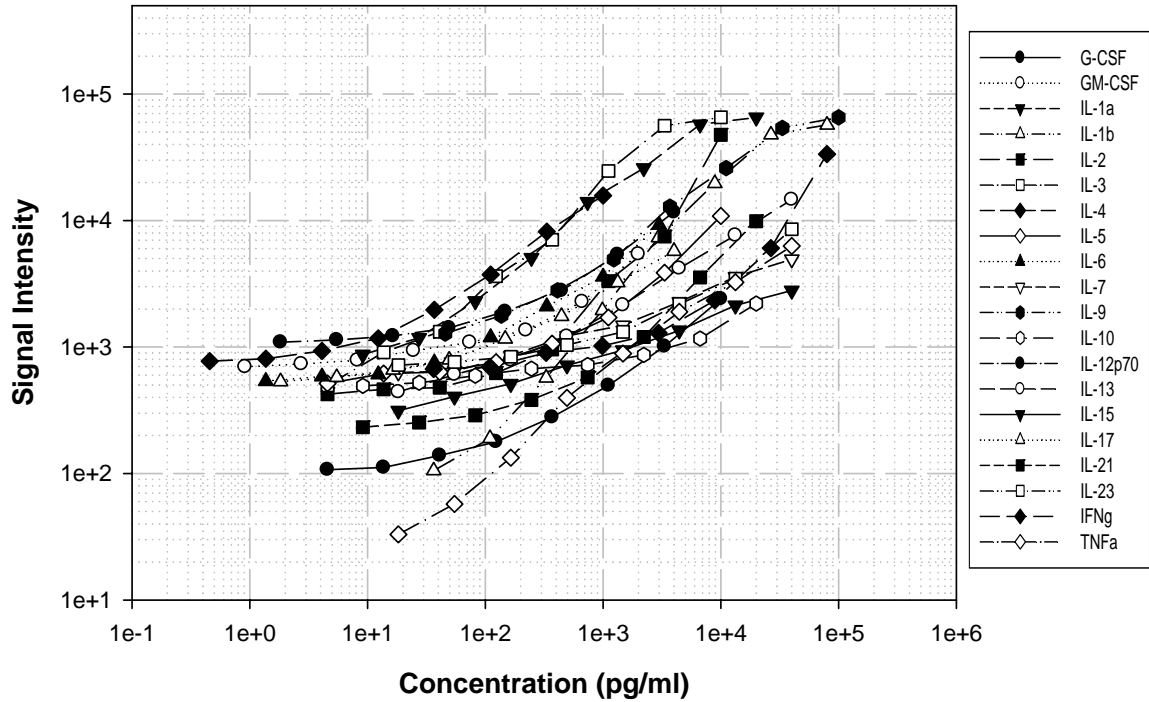
Mouse Interleukin Array 2

	1,2,3,4	5,6,7,8
a	POS	IL-12/23p40
b	NEG	IL-17B
c	IL-1ra	IL-17E
d	IL-2Ra	IL-17F
e	IL-6R	IL-20
f	IL-11	IL-28

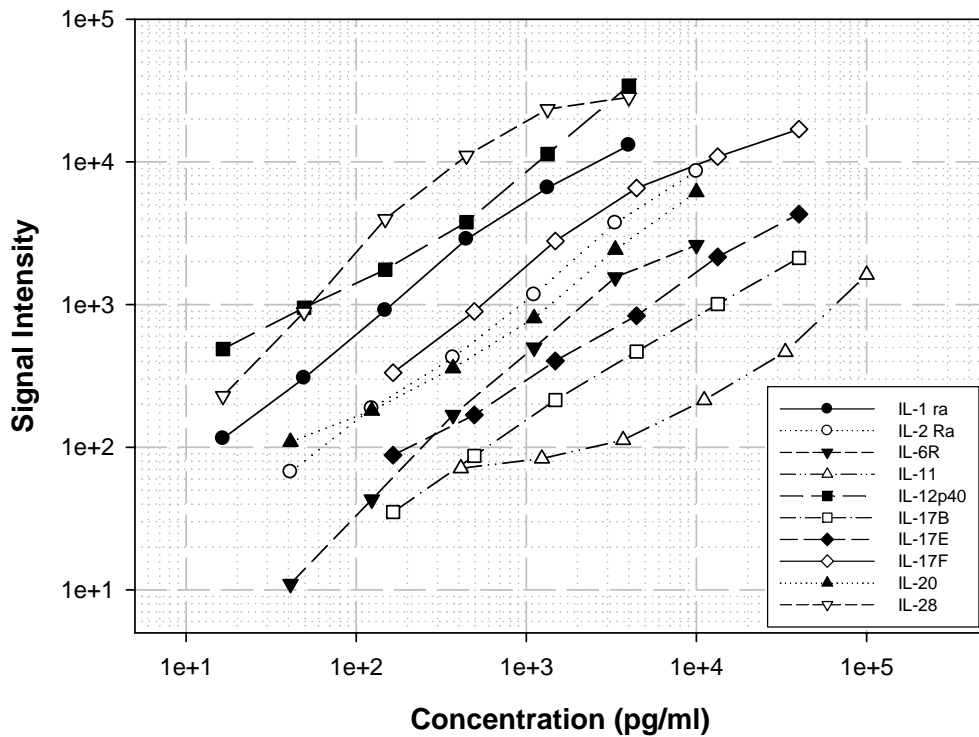


VI. Standard Curve for Individual Cytokines

Mouse Interleukin Array 1 Standard Curves



Mouse Interleukin Array 2 Standard Curves



VII. System Detection Sensitivity

The five-point cytokine concentration used for generating the standard curve of a given antigen was listed below. The sensitivity of each protein, which is defined as the corresponding concentration at two standard deviations above the median fluorescence of 20 replicates of the negative control (0 pg/ml), is listed at the following table.

Serial standard concentration (pg/ml) and assay sensitivity

Mouse Interleukin Array 1

(pg/ml)	Control	Std5	Std4	Std3	Std2	Std1	Median Fluorescence	Standard Deviation	Sensitivity (pg/ml)
G-CSF	0	123	370	1,111	3,333	10,000	155	5	41
GM-CSF	0	25	74	222	667	2,000	1001	45	28
IL-1 α	0	247	741	2,222	6,667	20,000	1036	85	19
IL-1 β	0	988	2,963	8,889	26,667	80,000	99	6	43
IL-2	0	123	370	1,111	3,333	10,000	615	58	26
IL-3	0	123	370	1,111	3,333	10,000	634	53	6
IL-4	0	12	37	111	333	1,000	921	52	7
IL-5	0	123	370	1,111	3,333	10,000	728	16	31
IL-6	0	37	111	333	1,000	3,000	596	28	19
IL-7	0	494	1,481	4,444	13,333	40,000	1480	29	474
IL-9	0	1,235	3,704	11,111	33,333	100,000	1409	34	41
IL-10	0	247	741	2,222	6,667	20,000	730	41	139
IL-12p70	0	49	148	444	1,333	4,000	1186	80	59
IL-13	0	494	1,481	4,444	13,333	40,000	467	51	269
IL-15	0	494	1,481	4,444	13,333	40,000	1348	52	447
IL-17	0	49	148	444	1,333	4,000	696	57	42
IL-21	0	247	741	2,222	6,667	20,000	472	48	199
IL-23	0	494	1,481	4,444	13,333	40,000	894	38	383
IFN γ	0	988	2,963	8,889	26,667	80,000	1043	78	402
TNF α	0	494	1,481	4,444	13,333	40,000	28	8	68

Mouse Interleukin Array 2

(pg/ml)	Control	Std5	Std4	Std3	Std2	Std1	Median Fluorescence	Standard Deviation	Sensitivity (pg/ml)
IL-1ra	0	49	148	444	1,333	4,000	22	7	11
IL-2R α	0	123	370	1,111	3,333	10,000	183	10	68
IL-6R	0	123	370	1,111	3,333	10,000	19	7	123
IL-11	0	1,235	3,704	11,111	33,333	100,000	172	11	884
IL-12p40	0	49	148	444	1,333	4,000	660	72	27
IL-17B	0	494	1,481	4,444	13,333	40,000	49	10	194
IL-17E	0	494	1,481	4,444	13,333	40,000	181	10	355
IL-17F	0	494	1,481	4,444	13,333	40,000	39	9	98
IL-20	0	123	370	1,111	3,333	10,000	122	8	102
IL-28	0	49	148	444	1,333	4,000	174	14	10

VIII. System Recovery

The recovery of the mouse antigens by the kit was tested through spiking different levels of the recombinant proteins in both the 2x diluted mouse serum (SA) and 2x diluted mouse cell culture media NIH 3T3 (CM). The non-spiked serum sample and cell culture media were used as negative control. The recovery rate for each antigen was then determined by subtracting the endogenous antigen level from the observed value and divided by the spiking antigen concentration.

(pg/ml)	Spiking	SA	SA+Ag	SA%	CM	CM+Ag	CM%
G-CSF	5,000	3856	10124	125.4%	0	5028	100.6%
GM-CSF	1,000	0	869	86.9%	0	1216	121.6%
IL-1	10,000	102	7028	69.3%	0	7214	72.1%
IL-1	40,000	291	29280	72.5%	0	31758	79.4%
IL-2	5,000	42	3109	61.3%	0	4193	83.9%
IL-3	5,000	0	4768	95.4%	0	4885	97.7%
IL-4	500	13	324	62.1%	19	539	104.1%
IL-5	5,000	200	6409	124.2%	175	6773	132.0%
IL-6	2,000	107	1914	90.3%	72	2103	101.5%
IL-7	20,000	24640	24772	-	11893	31769	99.4%
IL-9	50,000	693	38514	75.6%	0	38546	77.1%
IL-10	10,000	1971	12069	101.0%	0	12131	121.3%
IL-12p70	2,000	252	2421	108.5%	0	2478	123.9%
IL-13	30,000	0	31359	104.5%	0	36833	122.8%
IL-15	20,000	25247	19074	-	10925	15792	-
IL-17	3,000	0	3148	104.9%	0	3588	119.6%
IL-21	15,000	822	14536	91.4%	0	15384	102.6%
IL-23	20,000	1298	19298	90.0%	0	19971	99.9%
IFN	40,000	915	33918	82.5%	0	26214	65.5%
TNF	20,000	625	17083	82.3%	0	17802	89.0%

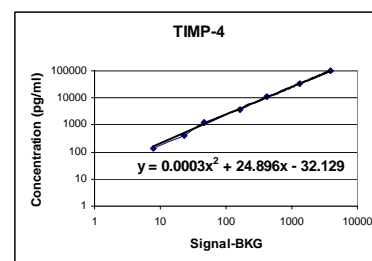
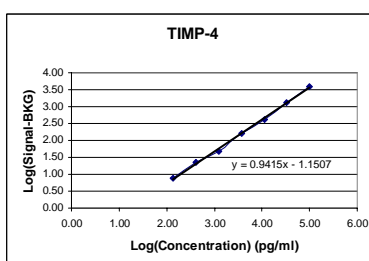
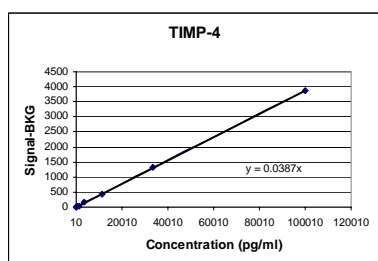
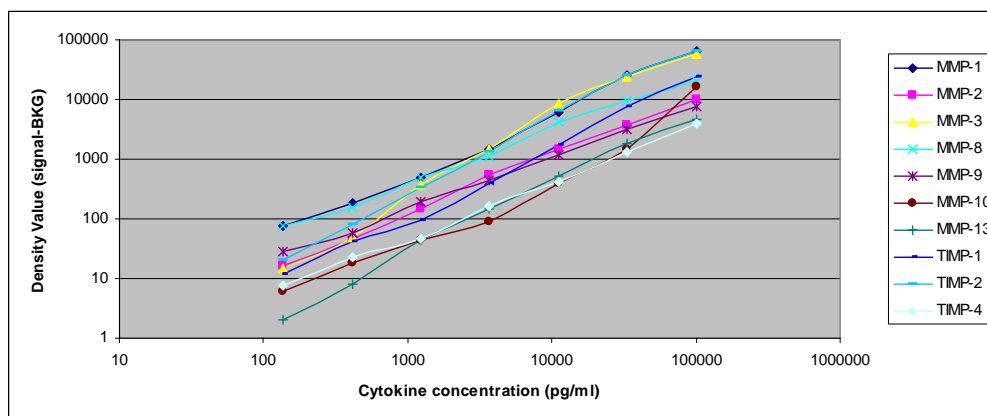
(pg/ml)	Spiking	SA	SA+Ag	SA%	CM	CM+Ag	CM%
IL-1ra	2,500	0.0	2605.2	104.2%	0.0	2918.7	116.7%
IL-2R α	6,000	660.2	7353.5	111.6%	0.0	6782.4	113.0%
IL-6R	5,000	5961.6	13935.5	159.5%	0.0	5486.0	109.7%
IL-11	50,000	0.0	57095.0	114.2%	0.0	47968.3	95.9%
IL-12p40	2,000	1152.9	2608.4	72.8%	0.0	2328.0	116.4%
IL-17B	20,000	0.0	22155.8	110.8%	0.0	27390.8	137.0%
IL-17E	25,000	0.0	24856.9	99.4%	0.0	31250.5	125.0%
IL-17F	20,000	295.1	22841.5	112.7%	0.0	25414.7	127.1%
IL-20	5,000	1213.1	5398.4	83.7%	0.0	4515.2	90.3%
IL-28	2,000	0.0	1319.4	66.0%	0.0	1310.1	65.5%

IX. Troubleshooting guide

Problem	Cause	Recommendation
Weak Signal	Inadequate detection	Increase laser power and PMT parameters
	Inadequate reagent volumes or improper dilution	Check pipettes and ensure correct preparation
	Short incubation time	Ensure sufficient incubation time and change sample incubation step to overnight
	Too low protein concentration in sample	Don't make too low dilution or concentrate sample
	Improper storage of kit	Store kit as suggested temperature. Don't freeze/thaw the slide.
Uneven signal	Bubble formed during incubation	Avoid bubble formation during incubation
	Arrays are not completely covered by reagent	Completely cover arrays with solution
	Reagent evaporation	Cover the incubation chamber with adhesive film during incubation
Poor standard curve	Cross-contamination from neighboring wells	Avoid overflowing wash buffer
	Comet tail formation	Air dry the slide for at least 1 hour before usage
	Inadequate detection	Increase laser power that the highest standard concentration for each cytokine receives the highest possible reading yet remains unsaturated.
	Use freeze-thawed cytokine standards	Always use new cytokine standard vial for new set of experiment. Discard any leftover.
High background	Overexposure	Lower the laser power
	Insufficient wash	Increase wash time and use more wash buffer
	Dust	Work in clean environment
	Slide is allowed to dry out	Don't dry out slides during experiment.

X. Sample Raybio® Q Analyzer Output

Raybio® Q Analyzer greatly facilitates the data analysis. Instead of tedious calculation, user can now quickly figure out the unknown sample concentration through a simple copy and paste process. The program can automatically remove the outlier spots, and users can choose either linear regression or log-log algorithms to best meet their analytical needs.



Sample Cytokine Concentration (pg/ml) (Base on Linear Regression)								
ID	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8
MMP-1	0	538	3,626	8,202	43,812	96,822	551	2,122
MMP-2	0	69	7,066	7,479	26,460	46,335	1,496	2,802
MMP-3	0	6	1,362	3,573	21,670	25,902	30,364	966
MMP-8	0	234	917	2,029	9,986	18,793	1,409	678
MMP-9	0	2,891	9,740	6,013	14,510	27,976	37,079	19,933
MMP-10	0	10,952	16,428	37,660	116,437	406,305	320,779	56,489
MMP-13	0	1,021	1,293	4,167	10,277	18,553	1,056	1,797
TIMP-1	0	1,356	1,111	2,759	6,923	19,838	71,685	9,304
TIMP-2	0	234	131	1,876	4,139	20,897	133,539	5,705
TIMP-4	0	2,288	5,917	8,094	25,384	46,641	16,342	3,912

XI. Reference List

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RayBiotech, Inc., the protein array pioneer company, strives to research and develop new products to meet demands of the biomedical community. RayBio's patent-pending technology allows detection of over 180 cytokines, chemokines and other proteins in a single experiment. Our format is simple, sensitive, reliable and cost effective. Products include: Cytokine Arrays, Chemokine Arrays, ELISA kits, Phosphotyrosine kits, Recombinant Proteins, Antibodies, and custom services.

1. Antibody arrays

- Cytokine antibody array

 - Human cytokine antibody arrays

 - Mouse cytokine antibody arrays

 - Rat cytokine antibody arrays

- Pathway- or disease-focused antibody arrays

 - Inflammation antibody array

 - Angiogenesis antibody array

 - Chemokine antibody array

 - Growth factor antibody array

 - MMP antibody array

 - Atherosclerosis antibody array

Antibody analysis tool, software

2. ELISA

3. Cell-based phosphorylation assay

4. Custom antibody arrays

5. Antibody

6. Recombinant protein

7. Cytokine protein arrays

RayBiotech also provides excellent custom service:

1. Antibody arrays

2. Protein arrays

3. Peptide synthesis

4. Production of recombinant protein and antibody

5. Peptide arrays

6. Phosphorylation arrays

7. ELISA

Just simply send your samples and we will do the assay for you.

Technology transfer program

Have you developed technologies or reagents interested to the scientific and research community? RayBiotech can help you commercialize your technologies, reagents and dream.

XII. Experiment Record Form

Date: _____

File Name: _____

Laser Power: _____

PMT: _____

Well No.	Sample Name	Dilution factor
1	CNTRL	
2	Std5	
3	Std4	
4	Std3	
5	Std2	
6	Std1	
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

1	2
3	4
5	6

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Cytokine protein arrays are RayBiotech patent-pending technology.

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