

RayBio[®] Human Cytokine Antibody Array C Series 1000

Patent Pending Technology

User Manual

- RayBio[®] Human Cytokine Antibody Array C series 1000**
(Combination of Array VI & VII Cat# H0108010)
- RayBio[®] Human Cytokine Antibody Array C series 1000.1**
(Combination of Array 6.1 & 7.1 Cat# H0109810)
- RayBio[®] Human Cytokine Antibody Array VI**
(Cat# H0108006)
- RayBio[®] Human Cytokine Antibody Array VII**
(Cat# H0108007)
- RayBio[®] Human Cytokine Antibody Array 6.1**
(Cat# H0109806)
- RayBio[®] Human Cytokine Antibody Array 7.1**
(Cat# H0109807)



RayBiotech, Inc.

**We Provide You With Excellent
Protein Array System And Service**

**Tel:(Toll Free) 1-888-494-8555 or 770-729-2992; Fax: 1-888-547-0580;
www.raybiotech.com Email: info@raybiotech.com**



RayBiotech, Inc.

RayBio[®] Human Cytokine Antibody Array C Series 1000 Protocol

TABLE OF CONTENTS

I.	Introduction.....	3
	How It Works.....	4
II.	Materials Provided.....	5
	Additional Materials Required.....	5
III.	Overview and General Considerations.....	6
	A. Preparation of Samples.....	6
	B. Handling Array Membrane.....	6
	C. Incubation.....	6
IV.	Protocol.....	6
	A. Blocking and Incubation.....	6
	B. Detection.....	7
V.	Interpretation of Results.....	8
VI.	Troubleshooting Guide.....	10
VII.	Reference List.....	11

Cytokine Antibody Arrays are RayBiotech patent-pending technology.

RayBio[®] is the trademark of RayBiotech, Inc.

I. Introduction

All cell functions, including cell proliferation, cell death and differentiation, as well as maintenance of health status and development of disease, are controlled by many genes and signaling pathways. New techniques such as cDNA microarrays have enabled us to analyze the global gene expression¹⁻³. However, almost all cell functions are executed by proteins, which cannot be studied by DNA and RNA alone. Experimental analysis clearly shows a disparity between the relative expression levels of mRNA and their corresponding proteins⁴. Therefore, it is critical to analyze the protein profile. Currently, two-dimensional polyacrylamide SDS page coupled with mass spectrometry is the mainstream approach to analyzing multiple protein expression levels^{5,6}. However, the requirement of sophisticated devices and the lack of quantitative measurements greatly limit its broad application. Thus, no simple, cost effective and rapid method of analysis of multiple protein expression levels has been available to researchers until now.

Our RayBio[®] Human Cytokine Antibody Array is the first commercially available protein array system⁷⁻¹¹. By using the RayBiotech system, scientists can rapidly and accurately identify the expression profiles of multiple cytokines in several hours inexpensively.

The RayBiotech kit provides a simple array format, and highly sensitive approach to simultaneously detect multiple cytokine expression levels from conditioned media, patient's sera and other sources. Array C Series 1000 are specifically designed for conditioned media, serum and plasma. Arrays C series 1000.1 are specifically designed for cell lysate and certain tissue lysates.

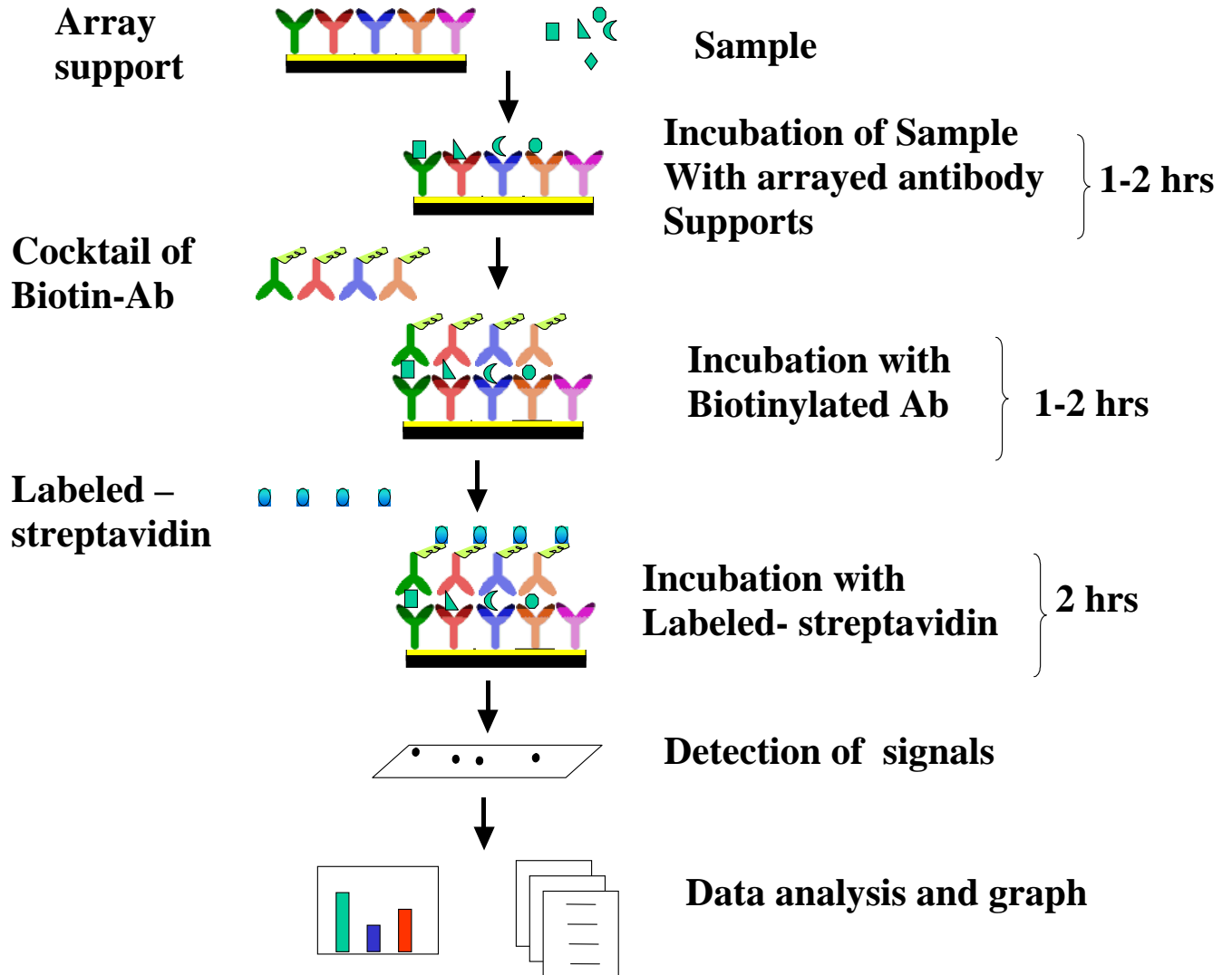
Cytokines are traditionally detected by ELISA, however, RayBiotech's approach has several advantages over ELISA. First and most importantly is that our approach can detect many cytokines simultaneously. Secondly, sensitivity is greatly increased. As little as 4 pg/ml of MCP-1 can be detected using the protein array format. In contrast, at least, 40 pg/ml of MCP-1 is required to produce a clear signal in an ELISA assay. Furthermore, the detection range is much greater than ELISA. For example, the detection

range of IL-2 varies from 25 to 250,000 pg/ml using RayBiotech technology, whereas the detection range varies only within 100-1000 fold in a typical ELISA. Therefore, the detection range is at least 100-fold greater with protein array compared with ELISA. The variation is lower than ELISA as well. As determined by densitometry, the variation between two spots ranged from 0 to 10% in duplicated experiments. In contrast, variation (about 20%) in ELISA is much higher. Finally, the system is much quicker and can be much easier to adapt to high-throughput format.

Pathway-specific array systems allow investigators to focus on the specific problem and are becoming an increasingly powerful tool in cDNA microarray system. RayBiotech's first protein array system, known as RayBio[®] Human Cytokine Antibody Array, is particularly useful compared with the human cytokine cDNA microarray system. Besides the ability to detect protein expression, RayBiotech's system is a more accurate reflection of active cytokine levels because it only detects secreted cytokines, and no amplification step is needed. Furthermore, it is much simpler, faster, environmentally friendlier, and more sensitive.

Simultaneous detection of multiple cytokines undoubtedly provides a powerful tool to study cytokines. Cytokines play an important role in innate immunity, apoptosis, angiogenesis, cell growth and differentiation¹². Cytokines are involved in most disease processes, including cancer and cardiac diseases. The interaction between cytokines and the cellular immune system is a dynamic process. The interactions of positive and negative stimuli, and positive as well as negative regulatory loops are complex and often involve multiple cytokines.

Here's how it works



II. Materials Provided

Upon receipt, the array membranes and 2X Blocking Buffer should be kept at -20°C . And all other component should be stored at 4°C . Please use within three months of purchase.

- RayBio[®] Human Cytokine Antibody Array membranes (2/4/8 array membranes VI and 2/4/8 array membranes VII)
- Biotin-Conjugated Anti-Cytokines (1/2/4 tubes, each tube for two membranes)
- 1,000X HRP-Conjugated Streptavidin
- 2X Blocking Buffer
- 20X Wash Buffer I
- 20X Wash Buffer II
- Detection Buffer A *
- Detection Buffer B *
- 2X Cell Lysis Buffer *
- Detection Buffer C**
- Detection Buffer D **
- Eight-Well Tray (1 each)
- Manual

* For RayBio[®] Human Cytokine Antibody Array C series 1000.1

** For RayBio[®] Human Cytokine Antibody Array C series 1000

Use array C series 1000 for conditioned medium, serum, plasma, and urine.
Use array C series 1000.1 for cell lysates and certain tissue lysates.

Additional Materials Required

- Small plastic boxes or containers

- Orbital shaker
- Plastic sheet protector or SaranWrap
- Kodak x-omat AR film (REF 165 1454) and film processor or Chemiluminescence imaging system

III. Overview and General Considerations

A. Preparation of Samples

- Use serum-free conditioned media if possible.
- If serum-containing conditioned media is required, use serum as control since many types of sera contain cytokines.
- For cell lysates and tissue lysates, we recommend using 1X Cell Lysis Buffer to extract proteins from cell or tissue (e.g. using homogenizer). After extraction, spin the sample and save supernatant for experiment. Determine protein concentration. Dilute 2X Cell Lysis Buffer with H₂O (we recommend adding proteinase inhibitors to Cell Lysis Buffer before use).
- We recommend using
 - 1 ml of Conditioned media
 - or
 - 1 ml of original or 10-fold diluted sera or plasma
 - or
 - 50-500 µg of protein for cell lysates and tissue lysates.

If you experience high background, you may further dilute your sample.

B. Handling Array Membranes

- Always use forceps to handle membranes, and grip the membranes by the edges only.
- Never allow array membranes to dry during experiments.

C. Incubation

- Completely cover membranes with sample or buffer during incubation, and cover eight-well tray with lid to avoid drying.
- Avoid foaming during incubation steps.
- Perform all incubation and wash steps under gentle rotation.

- Several incubation steps such as step 2 (blocking), or step 3 (sample incubation), or step 8 (biotin-Ab incubation) or step 11 (HRP-streptavidin incubation) may be done at 4⁰C for overnight.

IV. Protocol

A. Blocking and Incubation

1. Place one array membrane VI (top left corner marked with “-”) and one array membrane VII (top left corner marked with “+”) into same well of the provided eight-well tray (“-” or “+” marked side is the antibody printed side). Use C series 1000 for conditioned medium, serum and plasma, and C series 1000.1 for cell lysate and certain tissue lysate.
2. Add 2 ml 1X Blocking Buffer and incubate at room temperature for 30 min to block membranes. Dilute 2X Blocking Buffer with H₂O. Add some Blocking Buffer between two membranes. Make sure there is no bubble between membranes.
3. Decant Blocking Buffer from each container, and incubate membranes with sample at room temperature for 1 to 2 hours. Dilute sample using 1X Blocking Buffer if necessary.

*Note: We recommend using 1.2 ml of conditioned media or 1.2 ml of original or 10-fold diluted sera or plasma or 50-500 of protein for cell lysates and tissue lysates. **Dilute the lysate at least 10 folds with 1 X blocking buffer. Add some samples between array membrane VI and VII. Make sure there is no bubble between membranes.***

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

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

4. Decant the samples from each container, and wash 3 times with 2 ml of 1X Wash Buffer I at room temperature with shaking. 5 min per wash. Dilute 20X Wash Buffer I with H₂O.
5. Wash 2 times with 2 ml of 1X Wash Buffer II at room temperature with shaking. 5 min per wash. Dilute 20X Wash Buffer II with H₂O.
6. **From this step, place array membrane VI (or 6.1 marked with “-”) into one well and array membrane VII (or 7.1 marked with “+”) into another well.**
7. Prepare working solution for biotin-conjugated antibodies.

Add 100 µl of 1x blocking buffer to the Biotin-Conjugated Antibody VI tube. Mix gently and transfer all mixture to a tube containing 2 ml of 1x blocking buffer.

Add 100 µl of 1x blocking buffer to the Biotin-Conjugated Antibody VII tube. Mix gently and transfer all mixture to a tube containing 2 ml of 1x blocking buffer.

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

8. Add 1 ml of diluted biotin-conjugated antibodies to each membrane (1 ml of diluted biotin-conjugated antibodies VI to array membrane VI marked with “-” and 1 ml of diluted biotin-conjugated antibodies VII to array membrane VII marked with “+”). Incubate at room temperature for 1-2 hours.

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

9. Wash as directed in steps 4 and 5.

10. Add 2 ml of **1,000** fold diluted HRP-conjugated streptavidin (e.g. add **2** μ l of HRP-conjugated streptavidin to **1998** μ l 1X Blocking Buffer) to each membrane.

Note: mix tube containing 1,000X HRP-Conjugated Streptavidin well before use since precipitation may form during storage.

11. Incubate at room temperature for 2 hours.

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

12. Wash as directed in steps 4 and 5.

B. Detection

*** Do not let the membrane dry out during detection. The detection process must be completed within 40 minutes without stopping.**

1. Proceed with detection reaction.

For RayBio[®] Human Cytokine Antibody Arrays **C series 1000**, use 1X Detection Buffer **C** and **D**. Add 250 μ l of 1X Detection Buffer **C** and 250 μ l of 1X Detection Buffer **D** for one membrane; mix both solutions; Drain off excess wash buffer by holding the membrane vertically with forceps. Place membrane protein side up (“-“ mark is on the protein side top left corner) on a clean plastic sheet (provided in the kit). Transfer the mixed Detection Buffer onto the membrane and incubated at room temperature for **2** minute. Ensure that the detection mixture is completely and evenly covering the membrane without any air bubbles.

For RayBio[®] Human Cytokine Antibody Arrays **C series 1000.1**, use Detection Buffer **A** and **B**. Add 250 μ l of 1X Detection Buffer **A** and 250 μ l of 1X Detection Buffer **B** for one membrane; mix both solutions; Drain off excess wash buffer by holding the membrane vertically with forceps. Place membrane protein side up (“-“ mark is on the protein side top left corner) on a clean plastic sheet (provided in the kit). Transfer the

mixed Detection Buffer onto the membrane and incubated at room temperature for *1* minute. Ensure that the detection mixture is completely and evenly covering the membrane without any air bubbles.

2. Drain off excess detection reagent by holding the membrane vertically with forceps and touching the edge against a tissue. Gently place the membrane, protein side up, on a piece of plastic sheet (“-“ mark is on the protein side top left corner). Cover another piece of plastic sheet on the array. Gently smooth out any air bubble. Avoid using pressure on the membrane.
3. Expose to x-ray film (we recommend to use Kodak x-omat AR film) and detect signal using film developer.
or detect signal directly from membrane using chemiluminescence imaging system.

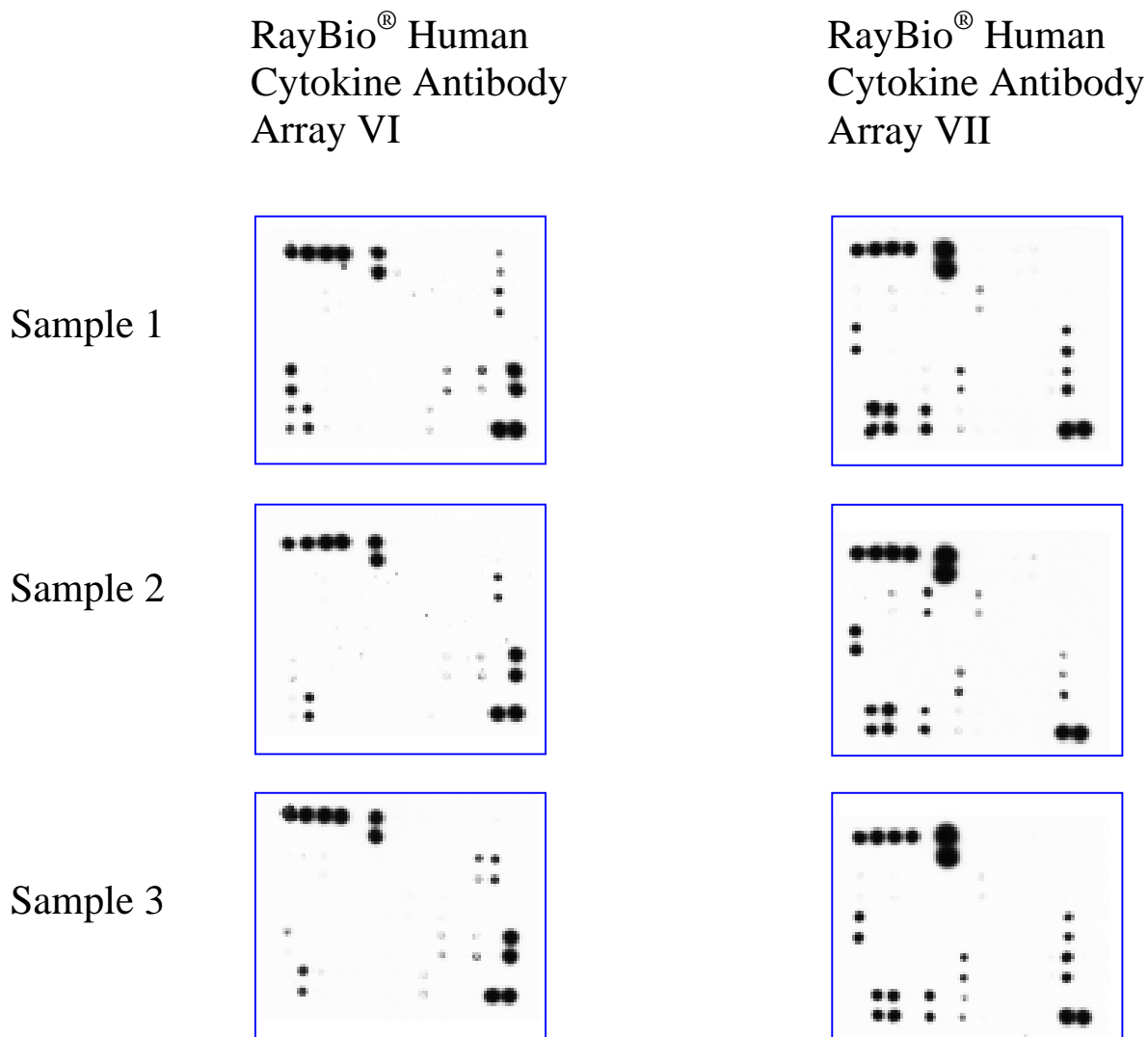
Expose the membranes for 40 Seconds. Then re-expose the film according to the intensity of signals. If the signals are too strong (background too high), reduce exposure time (e.g. 5-30 seconds). If the signals are too weak, increase exposure time (e.g. 5-20 min or overnight). Or re-incubate membranes overnight with 1x HRP-conjugated streptavidin, and redo detection in the second day.

4. Save membranes in -20°C to -80°C for future references.

V. Interpretation of Results:

The following figure shows RayBio[®] Human Cytokine Antibody Array membranes C series 1000 probed with different patient’s plasma. Membranes were exposed to Kodak x-omat film at room temperature for 1 minute. The biotin-conjugated IgG produces positive signals, which can be used to identify the orientation and to compare the relative expression levels among the different membranes.

One important parameter is background. To obtain the best results, we suggest that several exposures be attempted. We also strongly recommend using a negative control in which the sample is replaced with an appropriate mock buffer according to the array protocol, particularly during your first experiment.



By comparing the signal intensities, relative expression levels of cytokines can be made. The intensities of signals can be quantified by densitometry. Positive control can be used to normalize the results from different membranes being compared.

The signals also can be detected and quantitated by using a chemiluminescence imaging device.

RayBio® Human Cytokine Antibody Array VI & 6.1 (60)

	a	b	c	d	e	f	g	h	i	j	k	l	m	n
1	POS	POS	POS	POS	Blank	Angiogenin	BDNF	BLC	BMP-4	BMP-6	CK β 8-1	CNTF	EGF	Eotaxin
2	NEG	NEG	NEG	NEG	Blank	Angiogenin	BDNF	BLC	BMP-4	BMP-6	CK β 8-1	CNTF	EGF	Eotaxin
3	Eotaxin-2	Eotaxin-3	FGF-6	FGF-7	Fit-3 Ligand	Fractalkine	GCP-2	GDNF	GM-CSF	I-309	IFN-γ	IGFBP-1	IGFBP-2	IGFBP-4
4	Eotaxin-2	Eotaxin-3	FGF-6	FGF-7	Fit-3 Ligand	Fractalkine	GCP-2	GDNF	GM-CSF	I-309	IFN-γ	IGFBP-1	IGFBP-2	IGFBP-4
5	IGF-I	IL-10	IL-13	IL-15	IL-16	IL-1α	IL-1β	IL-1ra	IL-2	IL-3	IL-4	IL-5	IL-6	IL-7
6	IGF-I	IL-10	IL-13	IL-15	IL-16	IL-1α	IL-1β	IL-1ra	IL-2	IL-3	IL-4	IL-5	IL-6	IL-7
7	Leptin	LIGHT	MCP-1	MCP-2	MCP-3	MCP-4	M-CSF	MDC	MIG	MIP-1δ	MIP-3α	NAP-2	NT-3	PARC
8	Leptin	LIGHT	MCP-1	MCP-2	MCP-3	MCP-4	M-CSF	MDC	MIG	MIP-1δ	MIP-3α	NAP-2	NT-3	PARC
9	PDGF-BB	RANTES	SCF	SDF-1	TARC	TGF-β1	TGF-β3	TNF-α	TNF-β	Blank	Blank	Blank	Blank	Blank
10	PDGF-BB	RANTES	SCF	SDF-1	TARC	TGF-β1	TGF-β3	TNF-α	TNF-β	Blank	Blank	Blank	POS	POS

RayBio® Human Cytokine Antibody Array VII & 7.1 (60)

	a	b	c	d	e	f	g	h	i	j	k	l	m	n
1	POS	POS	POS	POS	Blank	Acrp30	AgRP	Angiopoietin-2	Amphiregulin	Axl	bFGF	b-NGF	BTC	CCL-28
2	NEG	NEG	NEG	NEG	Blank	Acrp30	AgRP	Angiopoietin-2	Amphiregulin	Axl	bFGF	b-NGF	BTC	CCL-28
3	CTACK	Dtk	EGF-R	ENA-78	Fas/TNFRSF6	FGF-4	FGF-9	GCSF	GITR-Ligand	GITR	GRO	GRO-α	HCC-4	HGF
4	CTACK	Dtk	EGF-R	ENA-78	Fas/TNFRSF6	FGF-4	FGF-9	GCSF	GITR-Ligand	GITR	GRO	GRO-α	HCC-4	HGF
5	ICAM-1	ICAM-3	IGFBP-3	IGFBP-6	IGF-I SR	IL-1 R4/ST2	IL-1 RI	IL-11	IL-12 p40	IL-12 p70	IL-17	IL-2 Rα	IL-6 R	IL-8
6	ICAM-1	ICAM-3	IGFBP-3	IGFBP-6	IGF-I SR	IL-1 R4/ST2	IL-1 RI	IL-11	IL-12 p40	IL-12 p70	IL-17	IL-2 Rα	IL-6 R	IL-8
7	I-TAC	Lymphotoxin	MIF	MIP-1α	MIP-1β	MIP-3β	MSP-α	NT-4	Osteoprotegerin	Oncostatin M	PIGF	sgp130	sTNF RI	sTNF-RI
8	I-TAC	Lymphotoxin	MIF	MIP-1α	MIP-1β	MIP-3β	MSP-α	NT-4	Osteoprotegerin	Oncostatin M	PIGF	sgp130	sTNF RI	sTNF-RI
9	TECK	TIMP-1	TIMP-2	Thrombopoietin	TRAIL R3	TRAIL R4	uPAR	VEGF	VEGF-D	Blank	Blank	Blank	Blank	Blank
10	TECK	TIMP-1	TIMP-2	Thrombopoietin	TRAIL R3	TRAIL R4	uPAR	VEGF	VEGF-D	Blank	Blank	Blank	POS	POS

We also offer Custom Human Cytokine Antibody Arrays. You can select the cytokines of interest from the following list and we will produce the

customized array at an affordable price. For more information, please visit our website, www.raybiotech.com.

Abbreviations: Pos-positive control; Neg-negative control. All others use standard abbreviations.

Note: IL-12 reacts both IL-12p40 and IL-12p70. IL-12p70 only recognizes IL-12p70.

4-1BB/TNFRSF9	Adiponectin/Acrp30	AgRP(ART)	Angiogenin	Angiopoietin-2	AR (amphiregulin)	Axl
BDNF	bFGF	BLC	BMP-4	BMP-6	β -NGF	BTC
CCL28/VIC	CK β 8-1	CNTF	CTACK/CCL27	Dtk	EGF	EGF R
ENA-78	Eotaxin	Eotaxin-2	Eotaxin-3	Fas/TNFRSF6	FGF-4	FGF-6
FGF-7	FGF-9	Flt-3L	Fractalkine	GCP-2	GCSF	GDNF
GITR Ligand/TNFSF18	GITR/TNFRF18	GM-CSF	GRO	GRO- α	HCC-4/CCL16	HGF
I-309	ICAM-1	ICAM-3	IFN- γ	IGFBP-1	IGFBP-2	IGFBP-3
IGFBP-4	IGFBP-6	IGF-I	IGF-I SR	IL-1 R4/ST2	IL-1 sRI	IL-1 sRII
IL-10	IL-12 p40p70	IL-12 p40	IL-12 p70	IL-13	IL-15	IL-16
IL-17	IL-1 α	IL-1 β	IL-1ra	IL-2	IL-2 sR α	IL-3
IL-4	IL-5	IL-6	IL-6 sR	IL-7	IL-8	IP-10
I-TAC/CXCL11	LEPTIN(OB)	LIF	LIGHT	Lymphotoctin	MCP-1	MCP-2
MCP-3	MCP-4	MCSF	MDC	MIF	MIG	MIP-1 α
MIP-1 β	MIP-1 δ	MIP-3 α	MIP-3 β	MSP α	NAP-2	NT-3
NT-4	Osteoprotegerin	oncostatin M	PARC	PDGF-BB	PIGF	RANTES
SCF	SDF-1	sgp130	sTNF RI / TNFRS1A	sTNF RII / TNFRS1B	TARC	TECK/CCL25
TGF- β 1	TGF- β 2	TGF- β 3	TIMP-1	TIMP-2	TNF- α	TNF- β
Thrombopoietin	TRAIL s R3/TNFRS10C	TRAIL s R4/TNFRS10D	u PAR	VEGF	VEGF-D	

VI. Troubleshooting guide

Problem	Cause	Recommendation
Weak signal or no signal	1. Taking too much time for Detection.	1. The whole Detection process must be completed in 30 min.
	2. Film developer does not work properly.	2. Fix film developer.
	3. Did not mix HRP-streptavidin well before use.	3. Mix tube containing 1,000X HRP-Conjugated Streptavidin well before use since precipitation may form during storage.
	4. Sample is too dilute.	4. Increase sample volume, (e.g. using undilute sample) or using more cells (e.g. seed 2 million cells. After 1 or 2 days, change complete medium with low serum medium and collect conditioned medium 2 day later. Use about 1 to 2 ml of conditioned medium f
	5. Other.	1. Reduce blocking concentration by diluting in 1X Wash Buffer II.
		2. Slightly increase HRP concentrations.
		3. Slightly increase biotin-antibody concentrations.
		4. Expose film for overnight to detect weak signal.
Uneven signal	1. Bubbles formed during incubation.	1. Remove bubble during incubation.
	2. Membranes were not completely covered by solution.	2. Completely cover membranes with solution.
High background	1. Exposure to x-ray file is too long.	1. Decrease exposure time.
	2. Membranes were allowed to dry out during experiment.	2. Completely cover membranes with solution during experiment.
	3. Sample is too concentrated.	3. Use more diluted sample.

Reference List

1. HIV-1-mediated apoptosis of neuronal cells: Proximal molecular mechanisms of HIV-1-induced encephalopathy. Pomerantz. **PNAS**. 2004 May 4, 2004 Vol. 101 No. 18.
2. Veto-like activity of mesenchymal stem cells: functional discrimination between cellular responses to alloantigens and recall antigens. Rameshwar P. **Journal of Immunology**. 2003 Oct 1;171(7):3426-34.
3. Cytokine responses elicited in endothelial cells after treatment with a specific toxin. Jaya Pandey. **BioCompare Product Review**. May 13, 2004
4. Proteomic Characterization of the Interstitial Fluid Perfusing the Breast Tumor Microenvironment. A Novel Resource for Biomarker and Therapeutic Target Discovery. Julio E. Celis, **Molecular Cellular Proteomics**. April 2004; 11(3):328-39.
5. Increased Expression and Secretion of Interleukin-6 in Patients with Barrett's Esophagus.. Katerina Dvorakova, Harinder Garewal **Clinical Cancer Research**. 2004 Mar 15;10(6):2020-8.
6. Antibody array-generated profiles of cytokine release from THP-1 leukemic monocytes exposed to different amphotericin B formulations. Turtinen LW, **Antimicrobial Agents Chemotherapy**. 2004 Feb;48(2):396-403.
7. Reduced T-cell and dendritic cell function is related to cyclooxygenase-2 overexpression and prostaglandin e(2) secretion in patients with breast cancer". Pockaj BA, . **Annals of Surgical Oncology**. 3:327-344, 2004.
8. Inhibition of macrophage migration inhibitory factor decreases proliferation and cytokine expression in bladder cancer cells. Katherine L Meyer-Siegler, **BMC Cancer**. 2004, 4:34.
9. The malaria metabolite hemozoin initiates proinflammatory signaling via a MyD88- dependent pathway.**International Congress of Immunology**. 2004 July W23-81.
10. In Vivo Proteomic Analysis of Cytokine Expression in Laser Capture-Microdissected Urothelial Cells of Obstructed Ureteropelvic Junction Procured by Laparoscopic Dismembered Pyeloplasty. **Journal of Endourology**. 2003 June; Volume:17 Number:5 Page:333--336.
11. Cytokine Antibody Arrays: A Promising Tool to Identify Molecular Targets for Drug Discovery. Huang, **Combinatorial Chemistry & High Throughput Screening**. 2003, 6,79-99

RayBio[®] is the trademark of RayBiotech, Inc.

Cytokine protein arrays are RayBiotech patent-pending technology.

This product is intended for research only and is not to be used for clinical diagnosis. Our products may not be resold, modified for resale, or used to manufacture commercial products without written approval by RayBiotech, Inc.

Under no circumstances shall RayBiotech be liable for any damages arising out of the use of the materials.

Products are guaranteed for six months from the date of purchase when handled and stored properly. In the event of any defect in quality or merchantability, RayBiotech's liability to buyer for any claim relating to products shall be limited to replacement or refund of the purchase price.

ECL[™] is the trademark of Amersham Pharmacia Biotech.

This product is for research use only.



©2004 RayBiotech, Inc.