



Chicken Cytokine/Chemokine Panel

96-Well Plate Assay

**Cat. # GCYT1-16K, GCYT1-16K-PX12,
GCYT1-16K-PXBK12**

MILLIPLEX®

**Chicken Cytokine/Chemokine Panel
96-Well Plate Assay**

**# GCYT1-16K or
GCYT1-16K-PX12 or GCYT1-16K-PXBK12**

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By purchasing this product, which contains fluorescently labeled microsphere beads authorized by Luminex® Corporation ("Luminex®"), you, the customer, acquire the right under Luminex®'s patent rights, if any, to use this product or any portion of this product, including without limitation the microsphere beads contained herein, only with Luminex®'s laser based fluorescent analytical test instrumentation marketed under the name of Luminex® 100™ IS, 200™, HTS, FLEXMAP 3D®, MAGPIX®.

Chicken Cytokine/Chemokine Panel

INTRODUCTION

Cytokines are immunomodulatory polypeptides that play key roles in both adaptive and innate immune responses. A generic term, “cytokines” includes myokines (produced by mononuclear phagocytic cells), lymphokines (produced by activated Th cells), interleukins (acting as mediators between T cells) and chemokines (responsible for T-cell migration). One of the regulatory mechanisms of the immune system, cytokines act at the recognition, activation, or effector phases of an immune response, modulating the development and functional activities of the subtypes of T cells, B cells and myeloid cells. Consequently, research involving cytokines plays a significant role in achieving a deeper understanding of the immune system and its multi-faceted response to most antigens, especially those responses that make up the inflammatory process.

Inflammation and immune cell response are key to maintaining homeostasis. The more we understand the mechanisms of disease, the more we discover the role that inflammation plays in the etiology of disease. This is as true for chicken as it is for humans. Both experience immunological diseases, such as infectious disease, osteoarthritis and respiratory disease, as well as neurologic, metabolic and cardiovascular disease and even cancer. However, until now the ability to measure levels of cytokines and chemokines in chicken has been limited primarily to ELISAs. Researchers now have the ability to measure multiple inflammation biomarkers simultaneously using EMD Millipore’s MILLIPLEX® Chicken Cytokine/Chemokine Panel 1, based on the Luminex® xMAP® technology.

Each MILLIPLEX® panel and kit includes:

- Quality controls (QCs) provided to qualify assay performance
- Comparison of standard (calibrator) and QC lots to a reference lot to ensure lot-to-lot consistency
- Optimized serum matrix to mimic native analyte environment
- Detection antibody cocktails designed to yield consistent analyte profiles within panel

In addition each panel and kit meets stringent manufacturing criteria to ensure batch-to-batch reproducibility. The MILLIPLEX® Chicken Cytokine/Chemokine Panel thus enables you to focus on the therapeutic potential of cytokines and chemokines. Coupled with the Luminex® xMAP® platform in a magnetic bead format, you receive the advantage of ideal speed and sensitivity, allowing quantitative multiplex detection of dozens of analytes simultaneously, which can dramatically improve productivity.

EMD Millipore’s MILLIPLEX® Chicken Cytokine/Chemokine Panel is part of the most versatile system available for cytokine and chemokine research. From our single to multiplex biomarker solutions, we partner with you to design, develop, analytically validate and build the most comprehensive library available for protein detection and quantitation.

- MILLIPLEX® offers you:
 - The ability to select a 12-plex or premixed option.
 - The ability to choose any combination of analytes from our panel of 12 analytes to design a custom kit that better meets your needs.
 - A convenient “all-in-one” box format that gives you the assurance that you will have all the necessary reagents you need to run your assay.

EMD Millipore's MILLIPLEX® Chicken Cytokine/Chemokine Panel is a 12-plex kit to be used for the simultaneous quantification of any or all of the following analytes in chicken serum, plasma and PBMC samples: Interferon alpha (IFN α), Interferon gamma (IFN γ), Interleukin 2 (IL-2), Interleukin 6 (IL-6), Interleukin 10 (IL-10), Interleukin 16 (IL-16), Interleukin 21 (IL-21), Macrophage Inflammatory protein-1 β (MIP-1b), Macrophage Inflammatory protein-3 (MIP-3a), RANTES (regulated on activation, normal T cell expressed and secreted), Macrophage colony-stimulating factor (M-CSF), Vascular endothelial growth factor (VEGF).

For Research Use Only. Not for Use in Diagnostic Procedures.

Please read entire protocol before use.

It is important to use same assay incubation conditions throughout your study.

PRINCIPLE

MILLIPLEX® is based on the Luminex® xMAP® technology — one of the fastest growing and most respected multiplex technologies offering applications throughout the life-sciences and capable of performing a variety of bioassays including immunoassays on the surface of fluorescent-coded magnetic beads known as MagPlex®-C microspheres.

- Luminex® uses proprietary techniques to internally color-code microspheres with two fluorescent dyes. Through precise concentrations of these dyes, distinctly colored bead sets of 500 5.6 µm polystyrene microspheres or 80 6.45 µm magnetic microspheres can be created, each of which is coated with a specific capture antibody.
- After an analyte from a test sample is captured by the bead, a biotinylated detection antibody is introduced.
- The reaction mixture is then incubated with Streptavidin-PE conjugate, the reporter molecule, to complete the reaction on the surface of each microsphere.
- EMD Millipore provides three Luminex® instruments to acquire and analyze data using two detection methods:
 - The Luminex® analyzers Luminex® 200™ and FLEXMAP 3D®, flow cytometry-based instruments that integrate key xMAP® detection components, such as lasers, optics, advanced fluidics and high-speed digital signal processors.
 - The Luminex® analyzer (MAGPIX®), a CCD-based instrument that integrates key xMAP® capture and detection components with the speed and efficiency of magnetic beads.
- Each individual microsphere is identified and the result of its bioassay is quantified based on fluorescent reporter signals. EMD Millipore combines the streamlined data acquisition power of Luminex® xPONENT® acquisition software with sophisticated analysis capabilities of the new MILLIPLEX® Analyst 5.1, integrating data acquisition and analysis seamlessly with all Luminex® instruments.

The capability of adding multiple conjugated beads to each sample results in the ability to obtain multiple results from each sample. Open-architecture xMAP® technology enables multiplexing of many types of bioassays reducing time, labor and costs over traditional methods.

STORAGE CONDITIONS UPON RECEIPT

- Recommended storage for kit components is 2 - 8°C.
- For long-term storage, freeze reconstituted standards and controls at ≤ -20°C. Avoid multiple (>2) freeze/thaw cycles.
- **DO NOT FREEZE Antibody-Immobilized Beads, Detection Antibody, and Streptavidin-Phycoerythrin.**

REAGENTS SUPPLIED

Note: Store all reagents at 2 – 8°C

Reagents Supplied	Catalog Number	Volume	Quantity
Chicken Cytokine/Chemokine Panel Standard	GCYT1-8016	Lyophilized	1 vial
Chicken Cytokine/Chemokine Panel Quality Controls 1 and 2	GCYT1-6016	Lyophilized	1 vial each
Serum Matrix Note: Contains 0.08% Sodium Azide	GCYT1-SM	Lyophilized	2 vials
Set of one 96-Well Plate with 2 sealers	-----	-----	1 plate 2 sealers
Assay Buffer	L-AB	30 mL	1 bottle
10X Wash Buffer Note: Contains 0.05% Proclin <i>include if applicable</i>	L-WB	60 mL	1 bottle
Chicken Cytokine/Chemokine Panel Detection Antibodies	GCYT1-1016	3.2 mL	1 bottle
Streptavidin-Phycoerythrin	L-SAPE10	3.2 mL	1 bottle
Mixing Bottle	-----	-----	1 bottle

Chicken Cytokine/Chemokine Antibody-Immobilized Premixed Magnetic Beads:

Premixed 12-plex Beads	GCYT1PMX12-MAG	3.5 mL	1 bottle
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Included Chicken Cytokine/Chemokine Antibody-Immobilized Beads are dependent on customizable selection of analytes within the panel (see next page).

Chicken Cytokine/Chemokine Antibody-Immobilized Magnetic Beads:

Bead/Analyte Name	Luminex [®] Magnetic Bead Region	Customizable 12 Analytes (50X concentration, 90 µL) Available Cat. #		12-Plex Magnetic Premixed Beads
Anti-Chicken IL-16 Bead	21	✓	CNIL16-MAG	✓
Anti-Chicken IFNα Bead	22	✓	CNIFNA-MAG	✓
Anti-Chicken IFNγ Bead	25	✓	CNIFNG-MAG	✓
Anti-Chicken IL-10 Bead	27	✓	CNIL10-MAG	✓
Anti-Chicken IL-21 Bead	42	✓	CNIL21-MAG	✓
Anti-Chicken IL-2 Bead	48	✓	CNIL2-MAG	✓
Anti-Chicken M-CSF Bead	51	✓	CNMCSF-MAG	✓
Anti-Chicken IL-6 Bead	57	✓	CNIL6-MAG	✓
Anti-Chicken MIP-3a Bead	72	✓	CNMIP3A-MAG	✓
Anti-Chicken MIP-1b Bead	73	✓	CNMIP1B-MAG	✓
Anti-Chicken RANTES Bead	74	✓	CNRNTS-MAG	✓
Anti-Chicken VEGF Bead	78	✓	BVEGFA-MAG	✓

MATERIALS REQUIRED BUT NOT PROVIDED

Reagents

1. Luminex® Sheath Fluid (EMD Millipore Catalog # 40-50015) or Luminex® Drive Fluid (EMD Millipore Catalog # MPXDF-4PK)

Instrumentation / Materials



1. Adjustable Pipettes with Tips capable of delivering 25 µL to 1000 µL
2. Multichannel Pipettes capable of delivering 5 µL to 50 µL or 25 µL to 200 µL
3. Reagent Reservoirs
4. Polypropylene Microfuge Tubes
5. Rubber Bands
6. Aluminum Foil
7. Absorbent Pads
8. Laboratory Vortex Mixer
9. Sonicator (Branson Ultrasonic Cleaner Model # B200 or equivalent)
10. Titer Plate Shaker (VWR® Microplate Shaker Cat # 12620-926 or equivalent)
11. Luminex® 200™, HTS, FLEXMAP 3D®, or MAGPIX® with xPONENT® software by Luminex® Corporation
12. Automatic Plate Washer for magnetic beads (BioTek® 405 LS and 405 TS, EMD Millipore Catalog #40-094, # 40-095, # 40-096, # 40-097 or equivalent) or Handheld Magnetic Separation Block (EMD Millipore Catalog # 40-285 or equivalent).






Note: If a plate washer or handheld magnetic separation block for magnetic beads is not available, one can use a microtiter filter plate (EMD Millipore Catalog # MX-PLATE) to run the assay using a Vacuum Filtration Unit (EMD Millipore Vacuum Manifold Catalog # MSVMHTS00 or equivalent with EMD Millipore Vacuum Pump Catalog # WP6111560 or equivalent).

SAFETY PRECAUTIONS

- All blood components and biological materials should be handled as potentially hazardous. Follow universal precautions as established by the Centers for Disease Control and Prevention and by the Occupational Safety and Health Administration when handling and disposing of infectious agents.
- Sodium Azide or Proclin has been added to some reagents as a preservative. Although the concentrations are low, Sodium Azide and Proclin may react with lead and copper plumbing to form highly explosive metal azides. Dispose of unused contents and waste in accordance with international, federal, state, and local regulations.

Full Hazard label:

Ingredient, Cat #		Full Label	
10X Wash Buffer	L-WB		<p>Warning. May cause an allergic skin reaction. Wear protective gloves. IF ON SKIN: Wash with plenty of soap and water.</p>
Chicken Cyto/Chemo Panel Standard & Chicken Cyto/Chemo Panel QC 1 & 2	GCYT1-8016 GCYT1-6016		<p>Danger. Harmful if swallowed or if inhaled. Toxic in contact with skin. Causes serious eye damage. May cause damage to organs Respiratory Tract through prolonged or repeated exposure. May cause damage to organs Brain through prolonged or repeated exposure if swallowed. Harmful to aquatic life with long lasting effects. Do not breathe dust/ fume/ gas/ mist/ vapors/ spray. Wash skin thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Wear protective gloves/ protective clothing/ eye protection/ face protection. IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth. IF ON SKIN: Wash with plenty of water. Call a POISON CENTER/ doctor if you feel unwell. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/ attention if you feel unwell. Take off contaminated clothing and wash before reuse. Store locked up. Dispose of contents/ container to an approved waste disposal plant.</p>

Chicken Cyto/Chemo Panel Detection	GCYT1-1016	 	<p>Warning. Causes serious eye irritation. May cause damage to organs Respiratory Tract through prolonged or repeated exposure. Do not breathe dust/ fume/ gas/ mist/ vapors/ spray. Wash skin thoroughly after handling. Wear eye protection/ face protection. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/ attention if you feel unwell. If eye irritation persists: Get medical advice/ attention. Dispose of contents/ container to an approved waste disposal plant.</p>
Serum Matrix	GCYT1-SM	 	<p>Warning. Harmful in contact with skin. May cause damage to organs brain through prolonged or repeated exposure. Do not breathe dust/ fume/ gas/ mist/ vapors/ spray. Wear protective gloves/ protective clothing. IF ON SKIN: Wash with plenty of soap and water. Get medical advice/ attention if you feel unwell. Specific measures (see supplemental first aid instructions on this label). Wash contaminated clothing before reuse. Dispose of contents/ container to an approved waste disposal plant.</p>
Streptavidin-Phycoerythrin	L-SAPE10		<p>Warning. Causes serious eye irritation. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.</p>

TECHNICAL GUIDELINES

To obtain reliable and reproducible results, the operator should carefully read this entire manual and fully understand all aspects of each assay step before running the assay. The following notes should be reviewed and understood before the assay is set up.

- FOR RESEARCH USE ONLY. NOT FOR USE IN DIAGNOSTIC PROCEDURES.
- Do not use beyond the expiration date on the label.
- Do not mix or substitute reagents with those from other lots or sources.
- The Antibody-Immobilized Beads are light sensitive and must be protected from light at all times. Cover the assay plate containing beads with opaque plate lid or aluminum foil during all incubation steps.
- It is important to allow all reagents to warm to room temperature (20-25°C) before use in the assay.
- Incomplete washing can adversely affect the assay outcome. All washing must be performed with the Wash Buffer provided.
- The standards prepared by serial dilution must be used within 1 hour of preparation. Discard any unused standards except the standard stock which may be stored at $\leq -20^{\circ}\text{C}$ for 1 month and at $\leq -80^{\circ}\text{C}$ for greater than one month.
- If samples fall outside the dynamic range of the assay, further dilute the samples with the appropriate diluent and repeat the assay.
- Any unused mixed Antibody-Immobilized Beads may be stored in the Mixing Bottle at 2-8°C for up to one month.
- During the preparation of the standard curve, make certain to mix the higher concentration well before making the next dilution. Use a new tip with each dilution.
- The plate should be read immediately after the assay is finished. If, however, the plate cannot be read immediately, seal the plate, cover with aluminum foil or an opaque lid, and store the plate at 2-8°C for up to 24 hours. Prior to reading, agitate the plate on the plate shaker at room temperature for 10 minutes. Delay in reading a plate may result in decreased sensitivity for some analytes.
- The titer plate shaker should be set at a speed to provide maximum orbital mixing without splashing of liquid outside the wells. For the recommended plate shaker, this would be a setting of 5-7 which is approximately 500-800 rpm.
- Ensure that the needle probe is clean. This may be achieved by sonication and/or alcohol flushes.
- When reading the assay on Luminex[®] 200™, adjust probe height according to the protocols recommended by Luminex[®] to the kit solid plate or to the recommended EMD Millipore filter plates using 3 alignment discs. When reading the assay on MAGPIX[®], adjust probe height according to the protocols recommended by Luminex[®] to the kit solid plate or to the recommended EMD Millipore filter plates using 2 alignment discs. When reading the assay on FLEXMAP 3D[®], adjust probe height according to the protocols recommended by Luminex[®] to the kit solid plate using 1 alignment disc.
For FLEXMAP 3D[®] when using the solid plate in the kit, the final resuspension should be with 150 μL Sheath Fluid in each well and 75 μL should be aspirated.
- For cell culture supernatants or tissue extraction, use the culture or extraction medium as the matrix solution in background, standard curve and control wells. If samples are diluted in Assay Buffer, use the Assay Buffer as matrix.

TECHNICAL GUIDELINES (continued)

- For serum/plasma samples, dilute 1:4, use the Matrix provided in the kit.
- For cell/tissue homogenate, the final cell or tissue homogenate should be prepared in a buffer that has a neutral pH, contains minimal detergents or strong denaturing detergents, and has an ionic strength close to physiological concentration. Avoid debris, lipids, and cell/tissue aggregates. Centrifuge samples before use.
- Vortex all reagents well before adding to plate.

SAMPLE COLLECTION AND STORAGE

A. Preparation of Serum Samples:

- Allow the blood to clot for at least 30 minutes before centrifugation for 10 minutes at 1000xg. Remove serum and assay immediately or aliquot and store samples at $\leq -20^{\circ}\text{C}$.
- Avoid multiple (>2) freeze/thaw cycles.
- When using frozen samples, it is recommended to thaw the samples completely, mix well by vortexing and centrifuge prior to use in the assay to remove particulates.
- Serum samples should be diluted 1:4 in the Matrix provided in the kit. For example, in a tube, 25 μL of serum may be combined with 75 μL of Matrix. When further dilution beyond 1:4 dilution is required, use Serum Matrix as the diluent.

B. Preparation of Plasma Samples:

- Plasma collection using EDTA as an anti-coagulant is recommended. Centrifuge for 10 minutes at 1000xg within 30 minutes of blood collection. Remove plasma and assay immediately or aliquot and store samples at $\leq -20^{\circ}\text{C}$.
- Avoid multiple (>2) freeze/thaw cycles.
- When using frozen samples, it is recommended to thaw the samples completely, mix well by vortexing and centrifuge prior to use in the assay to remove particulates.
- Plasma samples should be diluted 1:4 in the Matrix provided in the kit. For example, in a tube, 25 μL of plasma may be combined with 75 μL of Matrix. When further dilution beyond 1:4 dilution is required, use Serum Matrix as the diluent.

C. Preparation of Tissue Culture Supernatant:

- Centrifuge the sample to remove debris and assay immediately or aliquot and store samples at $\leq -20^{\circ}\text{C}$.
- Avoid multiple (>2) freeze/thaw cycles.
- Tissue culture supernatant may require a dilution with an appropriate control medium prior to assay. Tissue/cell extracts should be done in neutral buffers containing reagents and conditions that do not interfere with assay performance. Excess concentrations of detergent, salt, denaturants, high or low pH, etc. will negatively affect the assay. Organic solvents should be avoided. The tissue/cell extract samples should be free of particles such as cells or tissue debris.

NOTE:

- A maximum of 25 μL per well of diluted serum or plasma can be used. Tissue culture or other media may also be used.
- All samples must be stored in polypropylene tubes. **DO NOT STORE SAMPLES IN GLASS.**
- Avoid debris, lipids and cells when using samples with gross hemolysis or lipemia.
- Care must be taken when using heparin as an anti-coagulant since an excess of heparin will provide falsely high values. Use no more than 10 IU heparin per mL of blood collected.

PREPARATION OF REAGENTS FOR IMMUNOASSAY

A. Preparation of Antibody-Immobilized Beads

If premixed beads are used, sonicate the premixed bead bottle 30 seconds and then vortex for 1 minute before use.

For individual vials of beads, sonicate each antibody-bead vial for 30 seconds; vortex for 1 minute. Add 60 μL from each antibody-bead vial to the Mixing Bottle and bring final volume to 3.0 mL with Assay Buffer. Vortex the mixed beads well. Unused portion may be stored at 2-8°C for up to one month. (Note: Due to the composition of magnetic beads, you may notice a slight color in the bead solution. This does not affect the performance of the beads or the kit.)

Example 1: When using 2 antibody-immobilized beads, add 60 μL from each of the 2 bead vials to the Mixing Bottle. Then add 2.88 mL Assay Buffer.

Example 2: When using 10 antibody-immobilized beads, add 60 μL from each of the 10 bead vials to the Mixing Bottle. Then add 2.4 mL Assay Buffer.

B. Preparation of Quality Controls

Before use, reconstitute Quality Control 1 and Quality Control 2 with 250 μL deionized water. Invert the vial several times to mix and vortex. Allow the vial to sit for 5-10 minutes. Unused portion may be stored at $\leq -20^\circ\text{C}$ for up to one month.

C. Preparation of Wash Buffer

Bring the 10X Wash Buffer to room temperature and mix to bring all salts into solution. Dilute 60 mL of 10X Wash Buffer with 540 mL deionized water. Store the unused portion at 2-8°C for up to one month.

D. Preparation of Serum Matrix

This step is required for serum or plasma samples only.

Add 2 mL deionized water to the bottle containing lyophilized Serum Matrix. Mix well. Allow at least 10 minutes for complete reconstitution. Leftover reconstituted Serum Matrix should be stored at $\leq -20^\circ\text{C}$ for up to one month.

PREPARATION OF REAGENTS FOR IMMUNOASSAY (continued)

E. Preparation of Chicken Cytokine/Chemokine Standard

1.) Prior to use, reconstitute the Chicken Cytokine/Chemokine Standard with 250 μL deionized water. Refer to table below for analyte concentrations. Invert the vial several times to mix. Vortex the vial for 10 seconds. Allow the vial to sit for 5-10 minutes. This will be used as Standard 7; the unused portion may be stored at $\leq -20^{\circ}\text{C}$ for up to one month.

2). Preparation of Working Standards

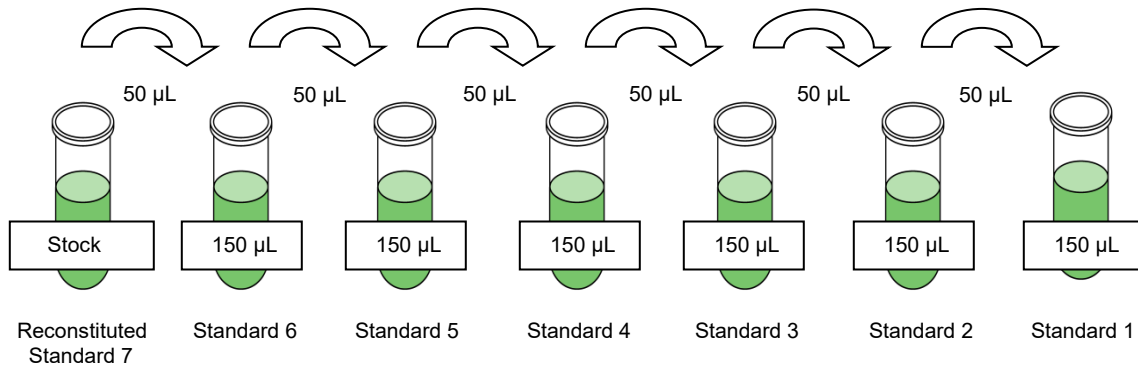
Label 6 polypropylene microfuge tubes Standard 1 through Standard 6. Add 150 μL of Assay Buffer to each of the 6 tubes. Prepare serial dilutions by adding 50 μL of the reconstituted standard to the Standard 6 tube, mix well and transfer 50 μL of Standard 6 to the Standard 5 tube, mix well and transfer 50 μL of Standard 5 to the Standard 4 tube, mix well and transfer 50 μL of Standard 4 to the Standard 3 tube, mix well and transfer 50 μL of Standard 3 to the Standard 2 tube, mix well and transfer 50 μL of Standard 2 to the Standard 1 tube and mix well. The 0 [pg/mL] standard (Background) will be Assay Buffer.

Standard #	Volume of Deionized Water to Add	Volume of Standard to Add
Standard 7	250 μL	0

Standard #	Volume of Assay Buffer to Add	Volume of Standard to Add
Standard 6	150 μL	50 μL of Standard 7
Standard 5	150 μL	50 μL of Standard 6
Standard 4	150 μL	50 μL of Standard 5
Standard 3	150 μL	50 μL of Standard 4
Standard 2	150 μL	50 μL of Standard 3
Standard 1	150 μL	50 μL of Standard 2

PREPARATION OF REAGENTS FOR IMMUNOASSAY (continued)

Preparation of Standards



Standard	IL-16 pg/mL	IFN α pg/mL	IFN γ pg/mL	IL-10 pg/mL	IL-21 pg/mL	IL-2 pg/mL
Standard 1	7.32	3.66	18.3	24.4	36.6	48.8
Standard 2	29	14.6	73	98	147	195
Standard 3	117	59	293	391	586	781
Standard 4	469	234	1,172	1,563	2,344	3,125
Standard 5	1,875	938	4,688	6,250	9,375	12,500
Standard 6	7,500	3,750	18,750	25,000	37,500	50,000
Standard 7	30,000	15,000	75,000	100,000	150,000	200,000

Standard	M-CSF pg/mL	IL-6 pg/mL	MIP-3a pg/mL	MIP-1b & VEGF pg/mL	RANTES pg/mL
Standard 1	9.75	122.1	18.3	4.88	12.21
Standard 2	39	488	73	19.5	48.8
Standard 3	156	1,953	293	78	195
Standard 4	625	7,813	1,172	313	781
Standard 5	2,500	31,250	4,688	1,250	3,125
Standard 6	10,000	125,000	18,750	5,000	12,500
Standard 7	40,000	500,000	75,000	20,000	50,000

IMMUNOASSAY PROCEDURE

- Prior to beginning this assay, it is imperative to read this protocol completely and to thoroughly understand the Technical Guidelines.
- Allow all reagents to warm to room temperature (20-25°C) before use in the assay.
- Diagram the placement of Standards [0 (Background), Standard 1 through 7, Controls 1 and 2, and Samples on Well Map Worksheet in a vertical configuration. (Note: Most instruments will only read the 96-well plate vertically by default.) It is recommended to run the assay in duplicate.
- If using a filter plate, set the filter plate on a plate holder at all times during reagent dispensing and incubation steps so that the bottom of the plate does not touch any surface.

1. Add 200 μ L of Assay Buffer into each well of the plate. Seal and mix on a plate shaker for 10 minutes at room temperature (20-25°C).
2. Decant Buffer and remove the residual amount from all wells by inverting the plate and tapping it smartly onto absorbent towels several times.
3. Add 25 μ L of each Standard or Control into the appropriate wells. Assay Buffer should be used for 0 pg/mL standard (Background).
4. Add 25 μ L of Assay Buffer to the sample wells.
5. Add 25 μ L of appropriate matrix solution to the background, standards, and control wells. When assaying serum or plasma, use the Serum Matrix. When assaying tissue culture or other supernatant, use proper control culture medium as the matrix solution.
6. Add 25 μ L of Sample diluted or neat into the appropriate wells.
7. Vortex Mixing Bottle and add 25 μ L of the Mixed or Premixed Beads to each well. (Note: During addition of Beads, shake bead bottle intermittently to avoid settling.)
8. Seal the plate with a plate sealer. Wrap the plate with foil and incubate with agitation on a plate shaker overnight 16-18 hours at 2-8°C. Alternatively, incubate for 2 hours at room temperature (20-25°C).

Add 200 μ L Assay Buffer per well



Shake 10 min, RT

Decant

- Add 25 μ L Standard or Control to appropriate wells
- Add 25 μ L Assay Buffer to background and sample wells
- Add 25 μ L appropriate matrix solution to background, standards, and control wells
- Add 25 μ L diluted or neat Samples to sample wells
- Add 25 μ L Beads to each well



Incubate overnight 16-18 hours at 2-8°C or 2 hours at room temperature

9. Gently remove well contents and wash plate 3 times following instructions listed in the **PLATE WASHING** section.
10. Add 25 μ L of Detection Antibodies into each well. (Note: Allow the Detection Antibodies to warm to room temperature prior to addition.)
11. Seal, cover with foil and incubate with agitation on a plate shaker for 1 hour at room temperature (20-25°C). **DO NOT ASPIRATE AFTER INCUBATION.**
12. Add 25 μ L Streptavidin-Phycoerythrin to each well containing the 25 μ L of Detection Antibodies.
13. Seal, cover with foil and incubate with agitation on a plate shaker for 30 minutes at room temperature (20-25°C).
14. Gently remove well contents and wash plate 3 times following instructions listed in the **PLATE WASHING** section.
15. Add 150 μ L of Sheath Fluid (or Drive Fluid if using MAGPIX[®]) to all wells. Resuspend the beads on a plate shaker for 5 minutes.
16. Run plate on Luminex[®] 200[™], HTS, FLEXMAP 3D[®] or MAGPIX[®] with xPONENT[®] software.
17. Save and analyze the Median Fluorescent Intensity (MFI) data using a 5-parameter logistic or spline curve-fitting method for calculating analyte concentrations in samples. (Note: For diluted samples, final sample concentrations should be multiplied by the dilution factor. For samples diluted as per protocol instructions, multiply by 4 (*dilution factor listed in Sample Collection & Storage section*). If using another dilution factor, multiple by the appropriate dilution factor.)



Remove well contents and wash 3X with 200 μ L Wash Buffer

Add 25 μ L Detection Antibodies per well



Incubate 1 hour at RT

Do Not Aspirate

Add 25 μ L Streptavidin-Phycoerythrin per well



Incubate for 30 minutes at RT

Remove well contents and wash 3X with 200 μ L Wash Buffer

Add 150 μ L Sheath Fluid or Drive Fluid per well

Read on Luminex[®] (100 μ L, 50 beads per bead set)

PLATE WASHING

If using a solid plate, use either a handheld magnet or magnetic plate washer.

1.) Solid Plate

- A.) Handheld magnet (**EMD Millipore Catalog #40-285**) - Rest plate on magnet for 60 seconds to allow complete settling of magnetic beads. Remove well contents by gently decanting the plate in an appropriate waste receptacle and gently tapping on absorbent pads to remove residual liquid. Wash plate with 200 μ L of Wash Buffer by removing plate from magnet, adding Wash Buffer, shaking for 30 seconds, reattaching to magnet, letting beads settle for 60 seconds and removing well contents as previously described after each wash. Repeat wash steps as recommended in Assay Procedure.
- B.) Magnetic plate washer (**EMD Millipore Catalog #40-094, #40-095, #40-096 and #40-097**) - Please refer to specific automatic plate washer manual for appropriate equipment settings. Please note that after the final aspiration, there will be approximately 25 μ L of residual wash buffer in each well. This is expected when using the BioTek[®] plate washer and this volume does not need to be aspirated from the plate.

If using an automatic plate washer other than BioTek[®] 405 LS or 405 TS, please refer to the manufacturer's recommendations for programming instructions.

2.) Filter Plate (EMD Millipore Catalog #MX-PLATE)

If using a filter plate, use a vacuum filtration manifold to remove well contents. Wash plate with 200 μ L/well of Wash Buffer, removing Wash Buffer by vacuum filtration after each wash. Repeat wash steps as recommended in the Assay Procedure.

EQUIPMENT SETTINGS

Luminex[®] 200[™], HTS, FLEXMAP 3D[®], and MAGPIX[®] with xPONENT[®] software:

These specifications are for the Luminex[®] 200[™], Luminex[®] HTS, Luminex[®] FLEXMAP 3D[®], and Luminex[®] MAGPIX[®] with xPONENT[®] software. Luminex[®] instruments with other software (e.g. MasterPlex[®], StarStation, LiquiChip, Bio-Plex[®] Manager[™], LABScan[™] 100) would need to follow instrument instructions for gate settings and additional specifications from the vendors for reading Luminex[®] magnetic beads.

For magnetic bead assays, the Luminex[®] 200[™] and HTS instruments must be calibrated with the xPONENT[®] 3.1 compatible Calibration Kit (EMD Millipore Catalog # LX2R-CAL-K25) and performance verified with the Performance Verification Kit (EMD Millipore Catalog # LX2R-PVER-K25). The Luminex[®] FLEXMAP 3D[®] instrument must be calibrated with the FLEXMAP 3D[®] Calibrator Kit (EMD Millipore Catalog # F3D-CAL-K25) and performance verified with the FLEXMAP 3D[®] Performance Verification Kit (EMD Millipore Catalog # F3D-PVER-K25). The Luminex[®] MAGPIX[®] instrument must be calibrated with the MAGPIX[®] Calibration Kit (EMD Millipore Catalog # MPX-CAL-K25) and performance verified with the MAGPIX[®] Performance Verification Kit (EMD Millipore Catalog # MPX-PVER-K25).

NOTE: When setting up a Protocol using the xPONENT[®] software, you must select MagPlex[®] as the Bead Type in the Acquisition settings.

NOTE: These assays cannot be run on any instruments using Luminex[®] IS 2.3 or Luminex[®] 1.7 software.

EQUIPMENT SETTINGS (continued)

The Luminex® probe height must be adjusted to the plate provided in the kit. Please use Catalog #MAG-PLATE, if additional plates are required for this purpose.

Events:	50, per bead	
Sample Size:	100 µL	
Gate Settings:	8,000 to 15,000	
Reporter Gain:	Default (low PMT)	
Time Out:	60 seconds	
Bead Set:	Customizable 12-plex Beads	
	IL-16	21
	IFNa	22
	IFNg	25
	IL-10	27
	IL-21	42
	IL-2	48
	M-CSF	51
	IL-6	57
	MIP-3a	72
	MIP-1b	73
	RANTES	74
	VEGF	78

QUALITY CONTROLS

The ranges for each analyte in Quality Control 1 and 2 are provided on the card insert or can be located at the EMD Millipore website emdmillipore.com using the catalog number as the keyword.

ASSAY CHARACTERISTICS

Cross-Reactivity

There was no or negligible cross-reactivity between the antibodies for an analyte and any of the other analytes in this panel.

Assay Sensitivities (minimum detectable concentrations, pg/mL)

Minimum Detectable Concentration (MinDC) is calculated using MILLIPLEX® Analyst 5.1. It measures the true limits of detection for an assay by mathematically determining what the empirical MinDC would be if an infinite number of standard concentrations were run for the assay under the same conditions.

Analyte	Overnight Protocol (n = 9 Assays)		2 Hour Protocol (n = 2 Assays)	
	MinDC (pg/mL)	MinDC+2SD (pg/mL)	MinDC (pg/mL)	MinDC+2SD (pg/mL)
IL-16	5.57	8.74	1.02	2.25
IFNa	0.96	3.10	0.32	1.12
IFNg	3.12	12.58	0.45	1.61
IL-10	7.18	25.82	5.88	6.30
IL-21	18.65	31.30	19.27	46.74
IL-2	14.42	45.68	48.78	69.43
M-CSF	2.24	7.01	2.87	10.88
IL-6	39.93	71.46	36.49	139.30
MIP-3a	6.02	15.50	5.16	5.25
MIP-1b	3.37	5.76	1.59	2.08
RANTES	5.26	10.16	4.90	12.23
VEGF	3.05	5.13	1.15	1.38

ASSAY CHARACTERISTICS (continued)

Precision

Intra-assay precision is generated from the mean of the %CV's from 8 reportable results across two different concentrations of analytes in a single assay. Inter-assay precision is generated from the mean of the %CV's across two different concentrations of analytes across 9 different assays.

Analyte	Overnight Protocol		2 Hour Protocol
	Intra-assay %CV	Inter-assay %CV	Intra-assay %CV
IL-16	<10	<20	<10
IFNa	<10	<20	<10
IFNg	<10	<20	<10
IL-10	<10	<20	<10
IL-21	<10	<20	<10
IL-2	<10	<20	<10
M-CSF	<10	<20	<10
IL-6	<10	<20	<10
MIP-3a	<10	<20	<10
MIP-1b	<10	<20	<10
RANTES	<10	<20	<10
VEGF	<10	<20	<10

Accuracy

Spike Recovery: The data represent mean percent recovery of spiked standards ranging from low, medium, and high concentration in serum matrices (n=6).

Analyte	Overnight Protocol	2 Hour Protocol
	% Recovery in Serum Matrix	% Recovery in Serum Matrix
IL-16	97	88
IFNa	96	88
IFNg	97	88
IL-10	97	89
IL-21	98	90
IL-2	99	92
M-CSF	98	89
IL-6	96	89
MIP-3a	95	87
MIP-1b	100	88
RANTES	100	88
VEGF	99	90

TROUBLESHOOTING GUIDE

Problem	Probable Cause	Solution
Insufficient bead count	Plate washer aspirate height set too low	Adjust aspiration height according to manufacturers' instructions.
	Bead mix prepared inappropriately	Sonicate bead vials and vortex just prior to adding to bead mix bottle according to protocol. Agitate bead mix intermittently in reservoir while pipetting this into the plate.
	Samples cause interference due to particulate matter or viscosity	See above. Also sample probe may need to be cleaned with alcohol flushes, back flushes and washes; or, if needed, probe should be removed and sonicated.
	Probe height not adjusted correctly	When reading the assay on Luminex [®] 200™, adjust probe height to the kit solid plate or to the recommended EMD Millipore filter plates using 3 alignment discs. When reading the assay on MAGPIX [®] , adjust probe height to the kit solid plate or to the recommended EMD Millipore filter plates using 2 alignment discs. When reading the assay on FLEXMAP 3D [®] , adjust probe height to the kit solid plate using 1 alignment disc. For FLEXMAP 3D [®] when using the solid plate in the kit, the final resuspension should be with 150 µL Sheath Fluid in each well and 75 µL should be aspirated.
Background is too high	Background wells were contaminated	Avoid cross-well contamination by using sealer appropriately and pipetting with multichannel pipettes without touching reagent in plate.
	Matrix used has endogenous analyte or interference	Check matrix ingredients for cross-reacting components (e.g. interleukin modified tissue culture medium).
	Insufficient washes	Increase number of washes.
Beads not in region or gate	Luminex [®] instrument not calibrated correctly or recently	Calibrate Luminex [®] instrument based on manufacturer's instructions, at least once a week or if temperature has changed by >3°C.
	Gate settings not adjusted correctly	Some Luminex [®] instruments (e.g. Bio-Plex [®]) require different gate settings than those described in the kit protocol. Use instrument default settings.
	Wrong bead regions in protocol template	Check kit protocol for correct bead regions or analyte selection.
	Incorrect sample type used	Samples containing organic solvents or if highly viscous should be diluted or dialyzed as required.
	Instrument not washed or primed	Prime the Luminex [®] instrument 4 times to rid it of air bubbles, wash 4 times with sheath fluid or water if there is any remnant alcohol or sanitizing liquid.
	Beads were exposed to light	Keep plate and bead mix covered with dark lid or aluminum foil during all incubation steps.

Problem	Probable Cause	Solution
Signal for whole plate is same as background	<p>Incorrect or no Detection Antibody was added</p> <p>Streptavidin-Phycoerythrin was not added</p>	<p>Add appropriate Detection Antibody and continue.</p> <p>Add Streptavidin-Phycoerythrin according to protocol. If Detection Antibody has already been removed, sensitivity may be low.</p>
Low signal for standard curve	<p>Detection Antibody may have been removed prior to adding Streptavidin-Phycoerythrin</p> <p>Incubations done at inappropriate temperatures, timings or agitation</p>	<p>May need to repeat assay if desired sensitivity not achieved.</p> <p>Assay conditions need to be checked.</p>
Signals too high, standard curves are saturated	<p>Calibration target value set too high</p> <p>Plate incubation was too long with standard curve and samples</p>	<p>With some Luminex® instruments (e.g. Bio-Plex®) default target setting for RP1 calibrator is set at high PMT. Use low target value for calibration and reanalyze plate.</p> <p>Use shorter incubation time.</p>
Sample readings are out of range	<p>Samples contain no or below detectable levels of analyte</p> <p>Samples contain analyte concentrations higher than highest standard point</p> <p>Standard curve was saturated at higher end of curve</p>	<p>If below detectable levels, it may be possible to use higher sample volume. Check with technical support for appropriate protocol modifications.</p> <p>Samples may require dilution and reanalysis for just that particular analyte.</p> <p>See above.</p>
High variation in samples and/or standards	<p>Multichannel pipette may not be calibrated</p> <p>Plate washing was not uniform</p> <p>Samples may have high particulate matter or other interfering substances</p> <p>Plate agitation was insufficient</p> <p>Cross-well contamination</p>	<p>Calibrate pipettes.</p> <p>Confirm all reagents are removed completely in all wash steps.</p> <p>See above.</p> <p>Plate should be agitated during all incubation steps using an orbital plate shaker at a speed where beads are in constant motion without causing splashing.</p> <p>Check when reusing plate sealer that no reagent has touched sealer. Care should be taken when using same pipette tips that are used for reagent additions and that pipette tip does not touch reagent in plate.</p>

FOR FILTER PLATES ONLY		
Problem	Probable Cause	Solution
Filter plate will not vacuum	Vacuum pressure is insufficient	Increase vacuum pressure such that 0.2 mL buffer can be suctioned in 3-5 seconds.
	Samples have insoluble particles	Centrifuge samples just prior to assay set-up and use supernatant.
	High lipid concentration	After centrifugation, remove lipid layer and use supernatant.
Plate leaked	Vacuum pressure too high	Adjust vacuum pressure such that 0.2 mL buffer can be suctioned in 3-5 seconds. May need to transfer contents to a new (blocked) plate and continue.
	Plate set directly on table or absorbent towels during incubations or reagent additions	Set plate on plate holder or raised edge so bottom of filter is not touching any surface.
	Insufficient blotting of filter plate bottom causing wicking	Blot the bottom of the filter plate well with absorbent towels after each wash step.
	Pipette touching plate filter during additions	Pipette to the side of plate.
	Probe height not adjusted correctly	Adjust probe to 3 alignment discs in well H6.
	Sample too viscous	May need to dilute sample.

REPLACEMENT REAGENTS

Catalog

Chicken Cytokine/Chemokine Panel Standard	GCYT1-8016
Chicken Cytokine/Chemokine Panel Quality Controls 1 & 2	GCYT1-6016
Serum Matrix	GCYT1-SM
Chicken Cytokine/Chemokine Panel Detection Antibodies	GCYT1-1016
Streptavidin-Phycoerythrin	L-SAPE10
Assay Buffer	L-AB
Set of two 96-Well plates with sealers	MAG-PLATE
10X Wash Buffer	L-WB

Antibody-Immobilized Magnetic Beads

<i>Analyte</i>	<i>Bead #</i>	<i>Cat. #</i>
IL-16	21	CNIL16-MAG
IFNa	22	CNIFNA-MAG
IFNg	25	CNIFNG-MAG
IL-10	27	CNIL10-MAG
IL-21	42	CNIL21-MAG
IL-2	48	CNIL2-MAG
M-CSF	51	CNMCSF-MAG
IL-6	57	CNIL6-MAG
MIP-3a	72	CNMIP3A-MAG
MIP-1b	73	CNMIP1B-MAG
RANTES	74	CNRNTS-MAG
VEGF	78	BVEGFA-MAG

ORDERING INFORMATION

To place an order or to obtain additional information about our immunoassay products, please contact your Customer Service or Technical Support Specialist.

Contact information for each region can be found on our website:

emdmillipore.com/contact

Conditions of Sale

For Research Use Only. Not for Use in Diagnostic Procedures.

Safety Data Sheets (SDS)

Safety Data Sheets for EMD Millipore products may be downloaded through our website at emdmillipore.com/msds.

WELL MAP

	1	2	3	4	5	6	7	8	9	10	11	12
A	0 pg/mL Standard (Background	Standard 4	QC-1 Control									
B	0 pg/mL Standard (Background	Standard 4	QC-1 Control									
C	Standard 1	Standard 5	QC-2 Control									
D	Standard 1	Standard 5	QC-2 Control									
E	Standard 2	Standard 6	Sample 1									
F	Standard 2	Standard 6	Sample 1									
G	Standard 3	Standard 7	Sample 2									
H	Standard 3	Standard 7	Sample 2									