

# Protein Array Services

at the **Analytical Instrumentation Core**

Boston University, AIC, DOM, BMC, BUMC



2020

# Analytical Instrumentation Core Mission:

The AIC supports investigators through both cutting-edge analytical instruments and services that facilitate research and education in the Department of Medicine, Boston University School of Medicine, and Boston Medical Center. Our goals are to:

1. Maintain core instruments
2. Train investigators how to use equipment and to help design experiments
3. Share the resources and increase accessibility of instruments for investigators
4. Introduce innovative analytical instrumentation by regularly holding seminars
5. Support investigators in their efforts to win extramural research funding

## Contacts:

### **Lynn Lingyi Deng, Ph.D**

Director of Analytical Instrumentation Core

650 Albany St, Rm 848 (Office)

617-638-6516

[lynndeng@bu.edu](mailto:lynndeng@bu.edu)

### **Core Help**

[corehelp@bu.edu](mailto:corehelp@bu.edu)

### **Matthew Au**

Associate Director of the AIC

Array Service Manager

650 Albany St, Rm 830 (Lab)

617-358-6363

[mau115@bu.edu](mailto:mau115@bu.edu)

# Introduction to Protein Array Services at the Analytical Core:

The Analytical Instrumentation Core offers an Array Service for measuring proteins, cytokines and biomarkers through the use of multiplexing technology. Researchers are able to submit a wide variety of sample types that range from plasma/serum to cell supernatants and test up to a maximum of 50 analytes at a time (multiplexing) in each well on a 96-well microplate. Including standards and quality controls up to 40 samples can be run in duplicate on each plate.

## Protein Arrays are useful for:

- Verifying that changes at the mRNA level (gene expression) correspond to changes at the protein level
- Preliminary (fishing) studies to screen a large number of proteins/biomarkers
- Screening multiple proteins simultaneously to reduce sample volume needed and costs



# Advantages of the Array Service

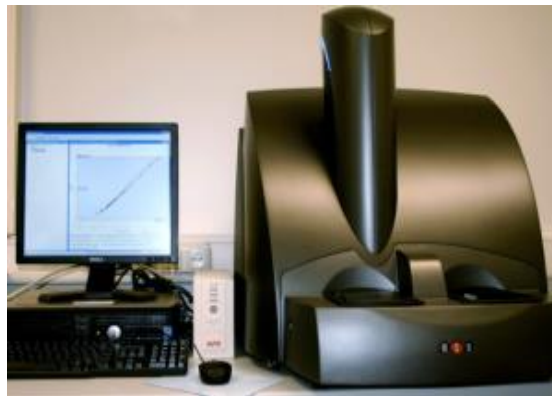
## **The Protein Array Service is cost effective and great for researchers!**

- Multiplexing allows for the detection of up to 50 analytes at a time (No need to have to run multiple ELISAs)
- Enables researchers to extract more data from a given amount of sample in the same amount of time as a single-plex ELISA assay
- Arrays offer a large dynamic range of detection with high precision and low background, eliminating the need to run several dilutions
- The service is performed by AIC professionals with consistency and accuracy
- AIC acts as liaison between array companies and BU researchers, allowing for the lowest prices on plates, supplies, and reagents.
- Researchers are able to get results in as little as one week, depending on the scope of the project and the number of plates being analyzed.



# What Exactly are Protein Arrays?

Protein arrays are an extension of PCR Arrays that are used to verify that changes at the mRNA level truly correspond to changes at the protein level. In addition, protein arrays can be used on a wide variety of samples for detecting biomarkers in diseased versus wild-type samples. They rely on the use of fluorescent magnetic beads, electrochemiluminescence or chemiluminescence to detect the presence of a particular protein or biomarker. Currently, we have the following 2 platforms available that can be used to detect proteins:



**MSD Sector (Electrochemiluminescence)**

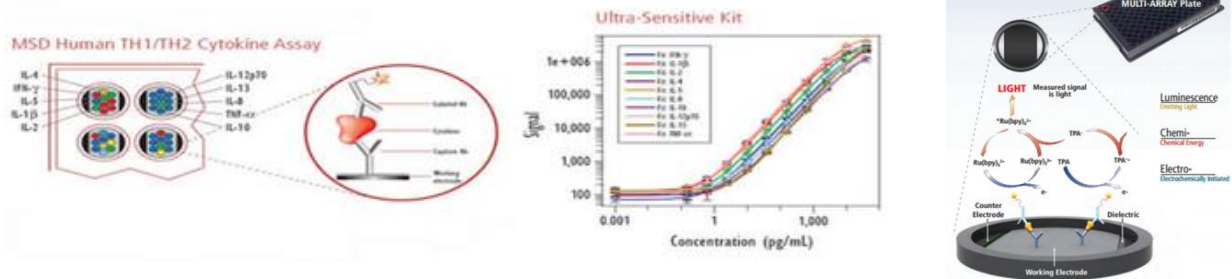


**Luminex Magpix (Fluorescent Magnetic Beads)**

# How do these Protein Arrays Work?

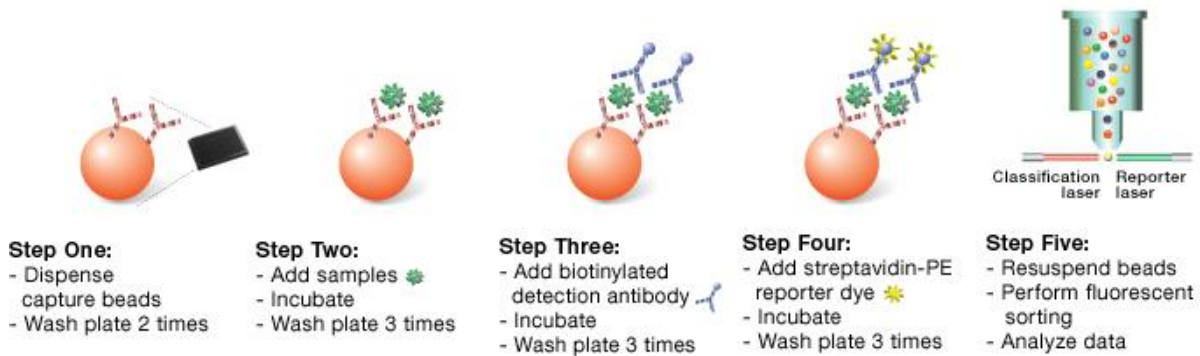
## 1. Meso Scale Discovery (MSD) Workflow

The surface of each well is coated with a carbon electrode for greater binding and to allow for electrical stimulation. Like ELISAs, it uses both capture and detection antibodies to detect the protein of interest. Detection antibodies emit light when electrochemically stimulated and is captured by the instrument.



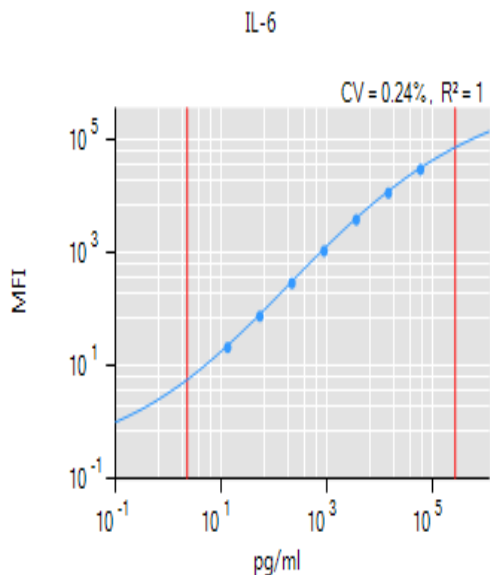
## 2. Luminex Workflow

Detection of proteins/cytokines occurs on micron-sized magnetic beads which contain capture antibodies. Each bead contains a unique blend of fluorophores that acts as a signature and is associated with a single analyte. Up to 50 different bead sets can be combined in a single well.

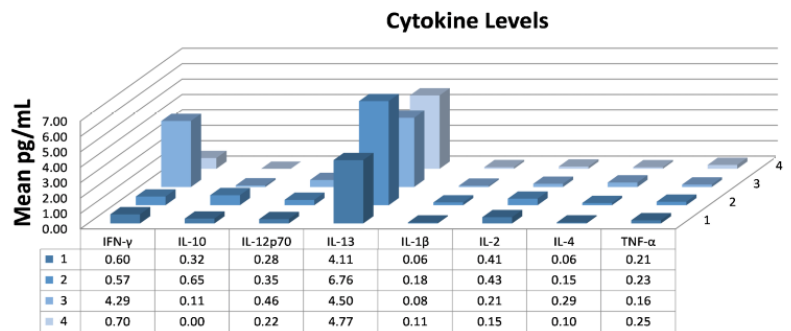


# What do the Results look like?

Data-analysis software and the ability to save results in Excel-based files allow for quick and easy interpretation of protein array data. The software included on each platform is able to use the information from the standard curves that are generated to determine the amount of protein that is in a given sample. Finally, the software is then able to organize all of the data into plots and charts which can immediately be integrated into a publication, poster, or presentation.



**Standard Curve for IL-6**



**Bar Graph of Mean Cytokine Levels**

Sample Name	hIFNg	hIL10	hIL12p70	hIL1a	hIL1b	hIL2	hIL6	hIL8	hTNFa
	pg/ml	pg/ml	pg/ml	pg/ml	pg/ml	pg/ml	pg/ml	pg/ml	pg/ml
CONTROL (3)	131.3	142.4	203.0	100.7	60.4	120.3	59.7	85.5	806.9
CONTROL (12)	111.6	120.4	181.1	116.8	60.2	128.0	57.0	108.6	720.7
Sample 01	428.7	412.1	743.3	452.1	209.9	431.4	220.1	428.6	2656.3
Sample 02	416.1	409.5	601.8	361.7	188.5	427.1	182.0	374.1	2724.4
Sample 03	427.7	442.5	649.1	423.8	212.8	418.8	202.4	387.0	2769.6
Sample 04	412.7	369.6	626.4	398.8	193.6	361.0	179.4	380.0	2457.4
Sample 05	384.3	327.3	576.2	389.1	195.8	405.0	197.9	354.1	2074.0
Sample 06	402.7	383.7	569.1	324.6	218.1	468.8	215.4	372.0	2480.9
Sample 07	458.8	572.2	852.4	521.2	358.8	743.7	416.8	740.0	3871.3
Sample 08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

**Summary Table of Analyte Concentrations**

There are over 110 cataloged arrays available from various manufacturers including EMD Millipore, Bio-Rad, Life Technologies, R&D Systems and many more! Arrays are available for a wide variety of species including human, rat, mouse, porcine, primate and bovine!

Please feel free to let us know which particular analytes you are interested in and your sample type and we would be more than happy to find the perfect kit for you!

### Example of Some Catalogued Arrays Available:

**Bone Metabolism**

**Cancer Biomarkers**

**Cardiovascular**

**Immunology/Immune Response**

**Metabolism/Endocrinology**

**Neuroscience**

**Cell Signaling**

**Toxicity**





# Custom Arrays

If you have a specific list of proteins that you would like to analyze that are not available on one of the Catalogued Array Kits there is also an option for a **Custom Array**. Custom Arrays allow for the analysis of up to 50 different analytes of your choice just as long as the analytes are compatible and show no cross-reactivity. However, Custom Arrays are more expensive than the catalogued arrays because of design, test and setup fees. In addition, the kits take longer to arrive and usually require a researcher to purchase a minimum number. If you are interested in a Custom Array, please feel free to contact us for exact pricing.

## Luminex Assay Customization Tool

Luminex Selections

Please sign-in to load or save your selections. When you click the link, you'll be taken to the sign-in page, then brought back here to pick-up where you left-off.

### Make your selections below to configure your assay

Assay Type - Luminex Assay  
 Species - Human  
 Research Area - View all analytes

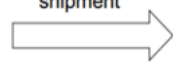
Filter Analytes	Analyte	<input type="checkbox"/> Select All	<input type="checkbox"/> Select None
<input type="checkbox"/>	4-1BB/TNFRSF9/CD137	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	alpha 2-Macroglobulin	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	ADAMTS13	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Adiponectin/Acp30	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	HMW Adiponectin/Acp30	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Aggrecan	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	AgRP/ART	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	ALCAM/CD166	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Aldheyde Dehydrogenase 1-A1/ALDH1A1	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	alpha 1-Microglobulin	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	alpha-Fetoprotein/AFP	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Angiogenin	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Angiopoietin-1	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Angiopoietin-2	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Angiopoietin-like Protein 3/ANGPTL3	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Angiopoietin-like Protein 4/ANGPTL4	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Angiopoietin-like Protein 6/ANGPTL6	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	APP	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	APRL1/TNFSF13	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Atrial Natriuretic Peptide/ANP	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	EphA2	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	ErbB2/Her2	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	ErbB3/Her3	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	ESAM	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	FABP4/A-FABP	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Fas/TNFRSF5/CD95	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Fas Ligand/TNFSF6	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Femtin	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Fetuin A/AFSG	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	FGF acidic/FGF1	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	FGF basic/FGF2	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	FGF-13	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	FGF-23	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Fibronectin	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Fibrinogen	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Flt-3 Ligand	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Follistatin-like 1/FSTL1	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Follistatin-related Gene Protein/FLRG	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Furin	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	G-CSF	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	MMP-8	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	MMP-9	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	MMP-10	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	MMP-12	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	MMP-13	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	MSP/MS1	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Myeloperoxidase/MPO	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Myoglobin	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	alpha-N-acetylglucosaminidase/NA-GLU	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	NCAM-1/CD56	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Nectin-4	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Nephrin	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Neuregulin-1 beta 1/NRG1 beta 1	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Neuropilin-1	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	beta-NGF	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	NT-3	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	NT-4	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Oncostatin M/OSM	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Osteocalcin/GP1MB	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Osteopontin/OPN	<input type="checkbox"/>	<input type="checkbox"/>

## Custom V-PLEX Panel: Sub-plex of Pre-Configured Kit

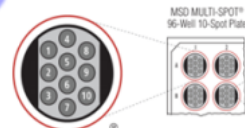
### Mouse V-Plex

- IFN- $\gamma$
- IL-1 $\beta$
- IL-2
- IL-4
- IL-5
- IL-6
- IL-10
- IL-12p70
- KC/GRO
- TNF- $\alpha$

1-3 day shipment



1. Select Assays (on website)
2. Select V-PLEX Plus
3. **Quote is generated.**
4. Customer places order.
5. Fulfillment in 1-3 days
6. Customer gets:
  - Validated panel
  - Individual detection antibodies for flexibility
  - Fast delivery
  - Controls available
  - Certificate of Analysis



Proinflammatory Panel 1 (mouse)

# Cost of Array Service

The **Basic Service** applies to researchers who wish to purchase the kits on their own and perform their own sample preparation. The researcher is only charged for using our instrument to read their plate.

## Basic Service: User Performs Plate Reading

Instrument Usage (Internal) = \$100 per plate

Instrument Usage (External) = \$170 per plate

The **Assisted Service** applies to researchers who wish to purchase the kits on their own and perform their own sample preparation. The researcher then provides their completed assay and AIC personnel will analyze it on our instrument.

## Assisted Service: AIC Performs Plate Reading

Assisted Instrument Usage (Internal) = \$170 per plate

Assisted Instrument Usage (External) = \$302.60 per plate

The **Full Service** applies to researchers who want the AIC to perform the sample preparation and plating for them. They will provide samples in the form plasma, serum, supernatants, etc. that will be further processed. The charges for the sample preparation are separate from the charges for running the array and will vary based on the number of samples that are analyzed.

## **Full Service (Internal Rate): Sample Prep, Plate Reading and Data Analysis**

Reagents and Consumables = \$35.00 per plate

Labor to Perform Experiment = \$360.00 per plate

Instrument Usage = \$100.00 per plate

Data Analysis (Optional) = \$30.00 per plate

Cost of the kit = Depends on the particular kit(s) purchased

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Total Cost = \$525 per plate (Not including the cost of the kit(s))

## **Full Service (External Rate): Sample Prep, Plate Reading and Data Analysis**

Reagents and Consumables = \$35.00 per plate

Labor to Perform Experiment = \$640.80 per plate

Instrument Usage = \$178.00 per plate

Data Analysis (Optional) = \$53.40 per plate

Cost of the kit = Depends on the particular kit(s) purchased

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Total Cost = \$907.20 per plate (Not including the cost of the kit(s))\*

\*Total Costs are also subject to a 15% Administrative Fee