

Antigen Protein Microarrays For Effective Antibody Profiling

September 22, 2021

Presenter:

**Ed Davis, Ph.D.
Senior Application Scientist
GeneCopoeia, Inc.**

GeneCopoeia Products and Services

Functional Genomics & Cell Biology

<i>Plasmid Clones</i>	<i>Viral systems</i>	<i>Stable Cell Lines</i>	<i>Kits & reagents</i>
ORF	Lentivirus	CRISPR-Cas9 stable cell lines	Transfection
Promoter	AAV	Labeled cancer cell lines	Luciferase
miRNA	Adenovirus	Cancer biomarker mutant cell lines	FISH probes
CRISPR			Indel detection
shRNA			Cloning
			Antigen microarrays

GeneCopoeia Products and Services

Functional Genomics & Cell Biology

<i>Plasmid Clones</i>	<i>Viral systems</i>	<i>Stable Cell Lines</i>	<i>Kits & reagents</i>
ORF	Lentivirus	CRISPR-Cas9 stable cell lines	Transfection
Promoter	AAV	Labeled cancer cell lines	Luciferase
miRNA	Adenovirus	Cancer biomarker mutant cell lines	FISH probes
CRISPR			Indel detection
shRNA			Cloning
			Antigen microarrays

GeneCopoeia's OmicsArray™ antigen microarrays

7 catalog premade arrays

Catalog number	Number of Antigens	Description
PA001	120	Human autoantigens general survey
PA002	120	Human brain and central nervous system disorders
PA003	120	Human cancer and neoplasms
PA006	75	Human common allergens
PA010	120	Human Autoimmunity, Allergy, and Infection
PA012	120	Human Coronavirus-associated Autoimmunity (CAA)
PA013	58	NEW! SARS-CoV-2 coronavirus variant proteins

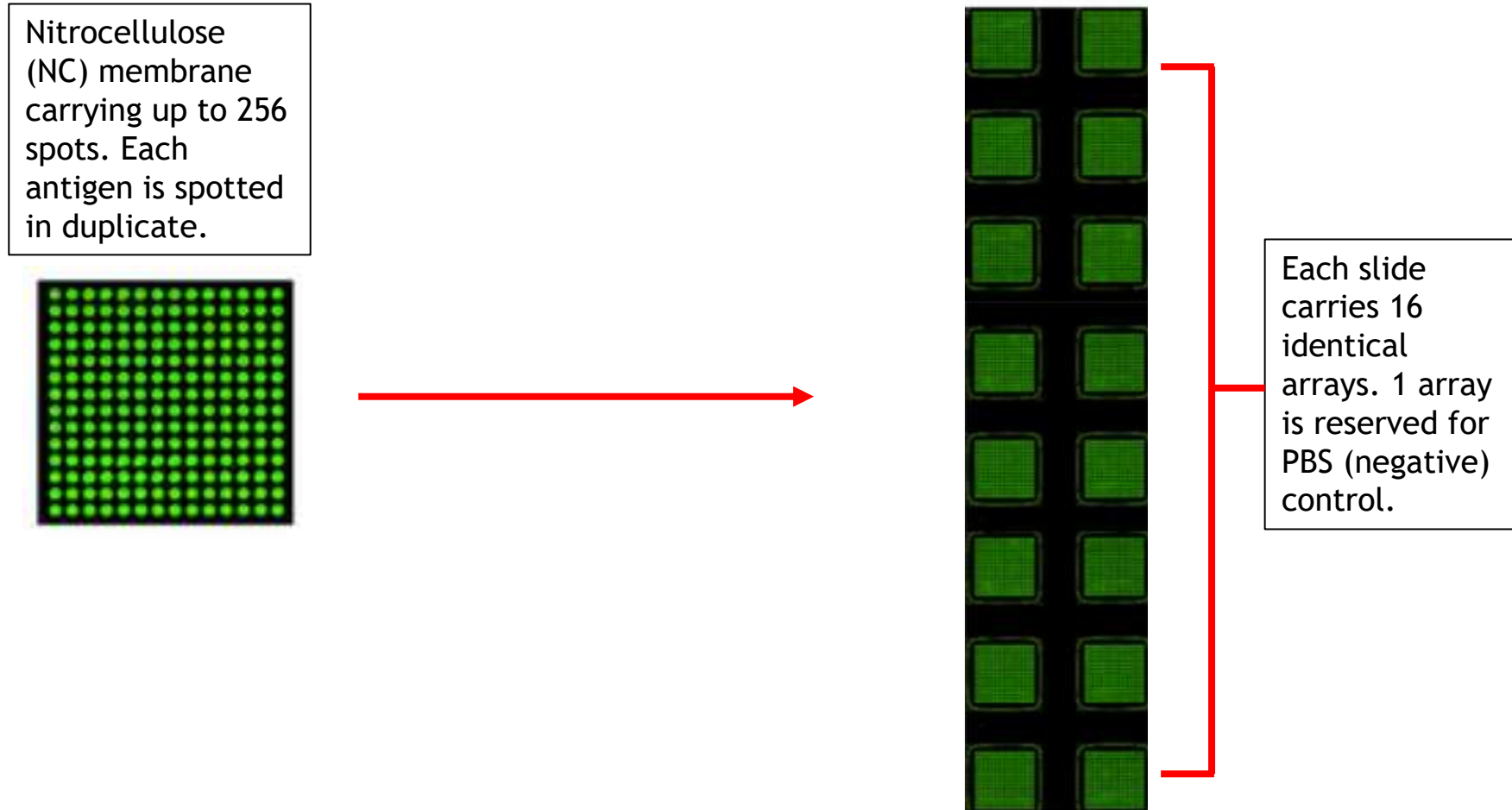
Custom arrays are available. Pricing depends on several factors (source of proteins, number of proteins).

What are OmicsArray™ antigen microarrays?

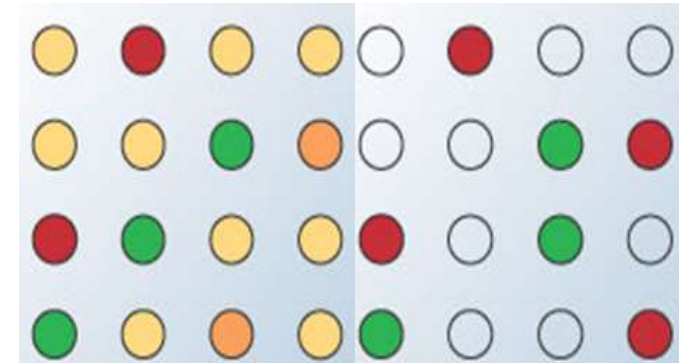
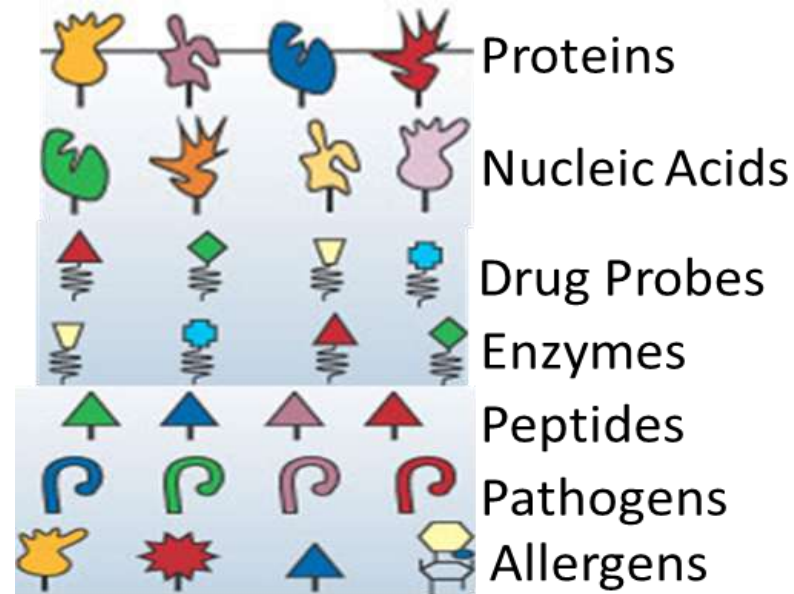
- ❖ Proteins or other molecules of interest are spotted onto nitrocellulose membrane-coated glass slides and are intended to capture antibodies from patient samples.
- ❖ Antigens are selected based on their association with specific diseases, biological functions, or pathogens.
- ❖ Antigen microarrays are used for detection of antibodies from various sample types, including serum, plasma, saliva, other body fluids and cell culture supernatants. Can also be used to validate specific antibodies.
- ❖ Antigens are usually known autoantigens in autoimmune diseases, but can be other proteins associated with other disorders, such as infectious diseases.
- ❖ Antigen microarrays can also be used to monitor the antibody response (humoral immune response) to vaccines.

What are OmicsArray™ antigen microarrays?

Full length proteins spotted onto membranes



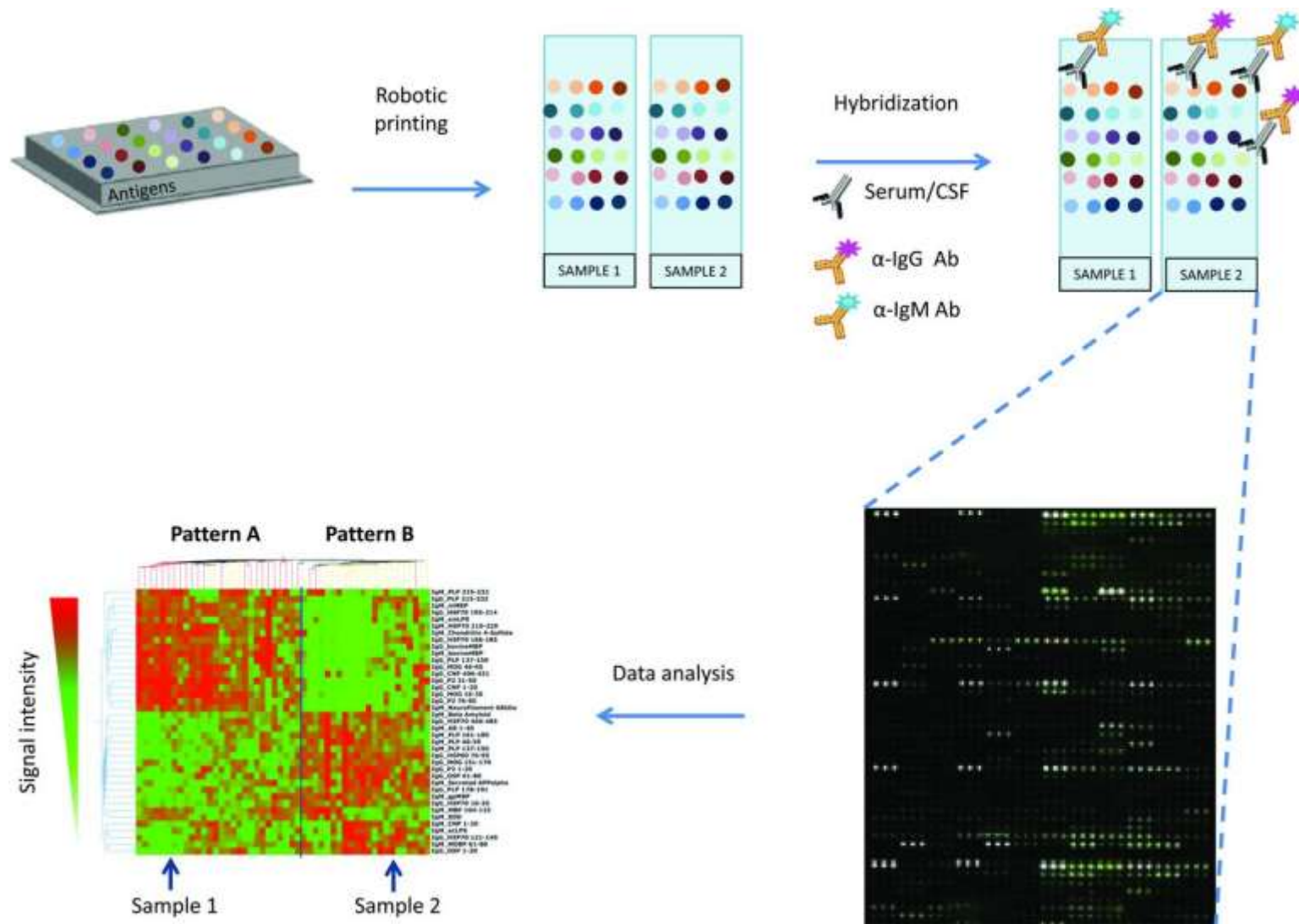
Type of antigens on OmicsArray™ antigen microarrays



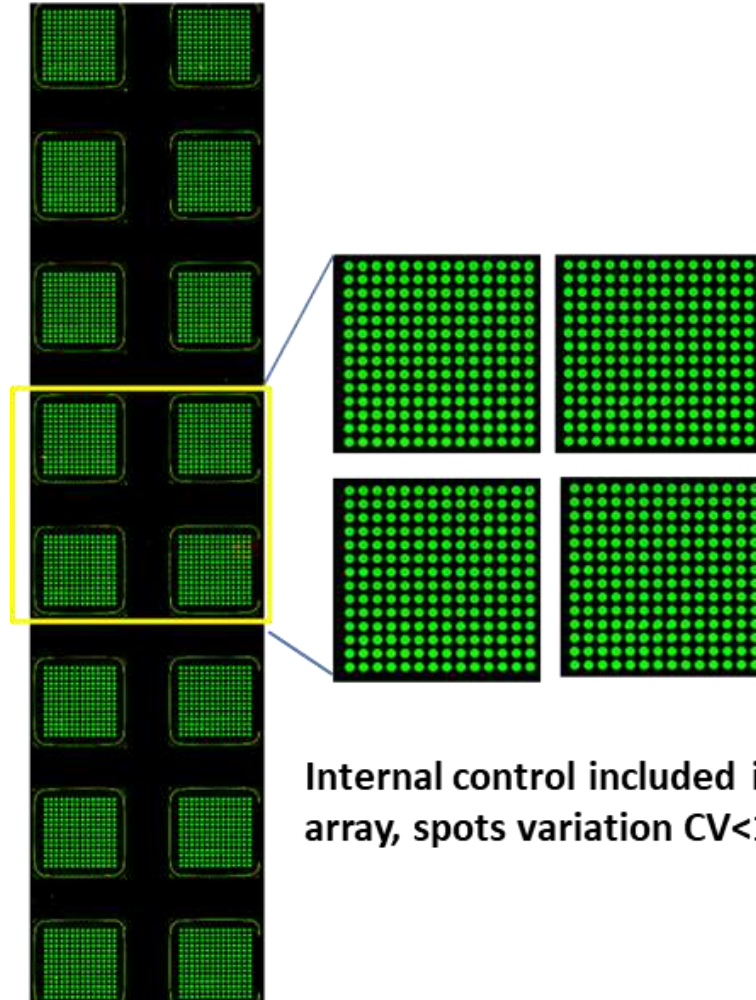
Advantages of OmicsArray™ antigen microarrays

- ❖ Multiplexing. OmicsArray™ antigen microarrays can assay up to 120 antigens at a time, compared with 1 protein at a time for ELISA.
- ❖ Full-length proteins. Most proteins are full-length, providing more opportunities for antibodies to recognize natural epitopes.
- ❖ High throughput. Each slide can process up to 16 samples in parallel.
- ❖ High flexibility. Allows for combination of different antigens (proteins, peptides, nucleic acids, etc.) and detection of different antibody types and subtypes (eg. IgG, IgA, IgM, etc.).
- ❖ High sensitivity. Each array can detect as little as 1 pg/ml of antibody, which is 100-fold more sensitive than ELISA.
- ❖ Small sample volume. As little as 1 ul of serum is needed for detection.

Antigen microarray workflow



Autoantigen array quality control procedures



Applications for antigen microarrays

- ❖ Autoimmune disease profiling and diagnostics (eg. Systemic lupus erythematosus, Rheumatoid arthritis, Crohn's disease, Type 1 diabetes, Sjögren's Syndrome, and ~100 others).
- ❖ Autoantibody profiling in response to cancer immunotherapy.
- ❖ Evaluating response to infection by pathogens (SARS-CoV-2, RSV, influenza, etc.) or vaccination.
- ❖ Autoantibody biomarker profiling for neurological and neurodegenerative diseases.
- ❖ Allergen profiling.
- ❖ Evaluation of immune response to organ transplantation.

GeneCopoeia's OmicsArray™ antigen microarrays

7 catalog premade arrays

Catalog number	Number of Antigens	Description
PA001	120	Human autoantigens general survey
PA002	120	Human brain and central nervous system disorders
PA003	120	Human cancer and neoplasms
PA006	75	Human common allergens
PA010	120	Human Autoimmunity, Allergy, and Infection
PA012	120	Human Coronavirus-associated Autoimmunity (CAA)
PA013	58	NEW! SARS-CoV-2 coronavirus variant proteins

GeneCopoeia's OmicsArray™ antigen microarrays

7 catalog premade arrays

Catalog number	Number of Antigens	Description
PA001	120	Human autoantigens general survey
PA002	120	Human brain and central nervous system disorders
PA003	120	Human cancer and neoplasms
PA006	75	Human common allergens
PA010	120	Human Autoimmunity, Allergy, and Infection
PA012	120	Human Coronavirus-associated Autoimmunity (CAA)
PA013	58	NEW! SARS-CoV-2 coronavirus variant proteins

GeneCopoeia's OmicsArray™ antigen microarrays

Autoantigens General Survey microarray

Features:

- ❖ 120 antigens plus 8 controls.
- ❖ Antigens known to be associated with specific autoimmune diseases are chosen based on a thorough review of peer-reviewed publications.
- ❖ Examples of autoimmune diseases represented on this array: Rheumatoid arthritis, muscular dystrophy, systemic lupus erythematosus, type 1 diabetes, Sjogren's syndrome, and others.

GeneCopoeia's OmicsArray™ antigen microarrays

Autoantigens General Survey microarray

Partial listing of antigens

Aggrecan
AGTR
alpha-actinine
Alpha Fodrin
Amyloid
AQP4
B2-microglobulin
B2 glycoprotein 1
BPI
Cardolipin
CENP-A
CENP-B
Chondroitin Sulfate C
Collagen I
Collagen II
Collagen III
Collagen IV
Collagen V
Collagen VI
complement C1q

Glycated Albumin
GP2
GP210
Hemocyanin
Heparan sulfate proteoglycan
Heparan Sulphate
Heparin
Histone H1
Histone H2A
Histone H2B
Histone H3
Histone H4
Insulin
Intrinsic Factor
Jo-1
KU (P70/P80)
La/SSB
Laminin
LC1
LKM1

Nucleosome antigen
Nup 62
PCNA
Peroxiredoxin 1
PL-7
PL-12
PM/Scl-75
PM/Scl 100
PR3
Proteoglycan
Prothrombin protein
Ribo Phosphoprotein P0
Ribo Phosphoprotein P1
Ribo Phosphoprotein P2
Ro/SSA (52 Kda)
Ro/SSA (60 Kda)
S100
Scl-70/Topoisomerase I
Sm
Sm/RNP



GeneCopoeia's OmicsArray™ antigen microarrays

7 catalog premade arrays

Catalog number	Number of Antigens	Description
PA001	120	Human autoantigens general survey
PA002	120	Human brain and central nervous system disorders
PA003	120	Human cancer and neoplasms
PA006	75	Human common allergens
PA010	120	Human Autoimmunity, Allergy, and Infection
PA012	120	Human Coronavirus-associated Autoimmunity (CAA)
PA013	58	NEW! SARS-CoV-2 coronavirus variant proteins

GeneCopoeia's OmicsArray™ antigen microarrays

Human Brain and Central Nervous System Disorders Antigen Microarray

Features:

- ❖ 120 antigens plus 8 controls.
- ❖ Profiles autoantibodies associated with known neurological disorders. These autoantibodies could be either causes of disease or biomarkers associated with disease.

GeneCopoeia's OmicsArray™ antigen microarrays

7 catalog premade arrays

Catalog number	Number of Antigens	Description
PA001	120	Human autoantigens general survey
PA002	120	Human brain and central nervous system disorders
PA003	120	Human cancer and neoplasms
PA006	75	Human common allergens
PA010	120	Human Autoimmunity, Allergy, and Infection
PA012	120	Human Coronavirus-associated Autoimmunity (CAA)
PA013	58	NEW! SARS-CoV-2 coronavirus variant proteins

GeneCopoeia's OmicsArray™ antigen microarrays

Cancer and Neoplasms Antigen Microarray

Features:

- ❖ 120 antigens plus 8 controls.
- ❖ Profiles autoantibodies associated with response to cancer immunotherapy, which can induce autoimmunity in some cases.

GeneCopoeia's OmicsArray™ antigen microarrays

7 catalog premade arrays

Catalog number	Number of Antigens	Description
PA001	120	Human autoantigens general survey
PA002	120	Human brain and central nervous system disorders
PA003	120	Human cancer and neoplasms
PA006	75	Human common allergens
PA010	120	Human Autoimmunity, Allergy, and Infection
PA012	120	Human Coronavirus-associated Autoimmunity (CAA)
PA013	58	NEW! SARS-CoV-2 coronavirus variant proteins

GeneCopoeia's OmicsArray™ antigen microarrays

COVID-19 Coronavirus Variant Antigen Microarray

Features:

- ❖ 58 antigens plus 8 controls.
- ❖ Proteins from SARS-CoV-2, other coronaviruses, influenza virus, and RSV are included on the array.
- ❖ Includes known SARS-CoV-2 variants (alpha, delta, etc.).

Custom antigen microarray services

- ❖ Custom printing and spotting. GeneCopoeia will create custom antigen microarrays built to customer's specifications.
- ❖ Sample processing. Customers can send blood, plasma, tissue, or other biological samples and we will prepare samples for processing and incubation with any of our predesigned antigen microarrays or custom-built antigen microarrays.
- ❖ Data analysis. Once samples are processed and incubated with an antigen microarray, we will analyze the raw data. The standard analysis service includes: 1) An Excel file of the Net Signal Intensity (NSI) for each antigen on the array, normalized to internal controls; and 2) a heat map.
- ❖ Additional analysis services, including proteomic analysis, pathway analysis, and more, are also available.

Custom antigen microarray services

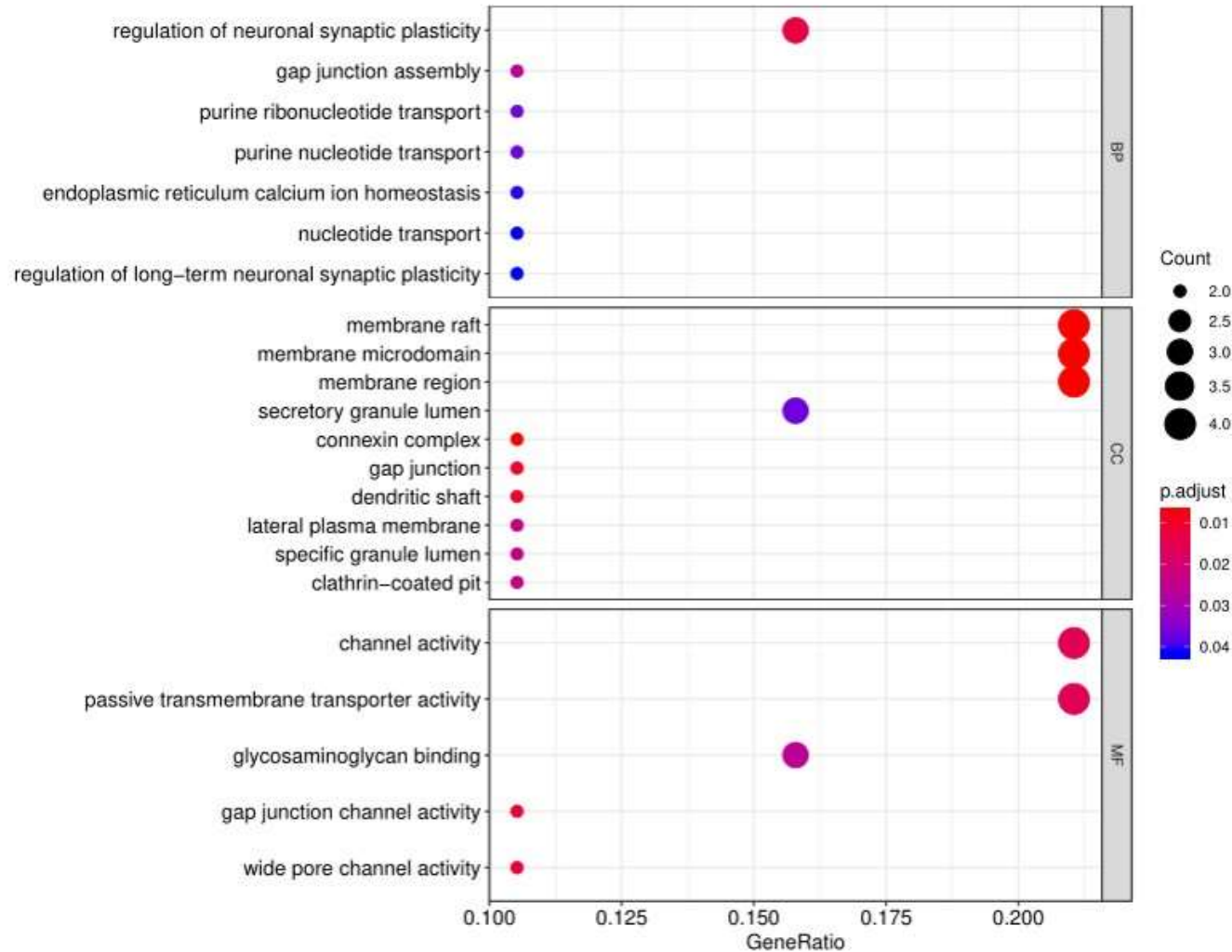
Final data output format

Antigen	Signal	SNR	Signal	SNR	Signal	SNR	Signal	SNR	Signal	SNR	Signal	SNR	Signal	SNR	Signal	SNR	
Aggrecan	13.384461	3.3325	40.384461	3.3065	14.884461	0.9385	118.384461	7.799	79.884461	3.8595	140.384461	2.8835	37.384461	12.8345	37.384461	2.22	
AGTR	3243.28923	86.3985	185.78923	9.994	368.28923	11.4255	373.28923	19.002	34052.789	227.303	2153.28923	19.4675	881.28923	19.4025	1052.28923	26.726	
alpha-act1	2.5379615	0.25	13.037961	0.6525	7.5379615	0.4495	3.0379615	0.2285	23.037961	1.1885	5.0379615	0.8895	3.0379615	0.1255	13.037961	0.7215	
Alpha.Foc1	103.23076	5.788	528.23076	11.3645	201.23076	4.121	420.23076	52.537	389.23076	9.7495	433.23076	5.8815	316.23076	8.877	265.23076	8.873	
Amyloid	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	3.692151	0.2785	3.692151	0.565	0.001	0.001	0.001	0.001	
AQP4	1230.1538	54.492	2893.6538	56.9175	1318.1538	26.7375	1890.1538	15.6835	2294.6538	84.7885	5089.6538	20.6255	4164.1538	23.378	1508.1538	28.883	
B2.mimg	5.2690384	0.7235	16.269038	1.5695	17.269038	0.6385	7.2690384	0.911	26.269038	1.949	24.769038	0.593	0.001	0.001	26.269038	2.8315	
B2.glyco	1180.6923	40.26	274.6923	11.3285	493.6923	11.774	419.1923	11.344	472.1923	28.546	474.6923	13.6475	372.6923	7.0635	1100.1923	19.7155	
BPI	141.34615	10.176	173.34615	8.8105	346.34615	13.134	202.34615	7.4265	681.34615	18.625	284.34615	3.717	354.34615	11.282	532.34615	24.8815	
Cardolip	0.001	0.001	0.001	0.001	3.384230	0.234	0.001	0.001	6.884230	0.6345	0.001	0.001	0.001	0.001	1.384230	0.3895	
CEMP.A	13.383692	1.35	28.883692	1.991	69.383692	3.9135	31.883692	1.4785	130.883692	5.557	84.883692	3.7575	57.883692	1.49	50.383692	3.887	
CEMP.B	138.84615	13.8	241.84615	13.587	391.84615	13.034	431.84615	12.413	499.84615	25.125	2938.34615	37.529	422.34615	8.778	396.84615	9.8925	
Chondron	38.384423	5.9285	85.384423	7.75	101.884423	4.5025	38.884423	1.3455	30.884423	2.4	109.384423	4.236	28.884423	0.6255	81.884423	5.857	
Collagen.1	11.115192	1.311	13.615192	1.014	21.615192	1.5955	13.115192	1.1435	82.615192	1.965	52.615192	2.078	44.615192	0.774	36.615192	1.216	
Collagen.1.0382892	0.7125	5.0382892	0.7415	7.5382892	0.7125	0.5382892	0.282	35.538289	2.573	36.538289	1.136	12.038289	0.4785	13.538289	0.867	6.5382892	0.6325
Collagen.14.692307	1.560	25.152307	1.3695	46.692307	2.389	24.692307	1.159	73.692307	1.2885	47.192307	0.893	40.692307	2.638	33.692307	5.512	36.692307	3.889
Collagen.118.07892	4.0775	165.07892	2.1735	299.07892	7.757	216.07892	6.678	414.07892	12.1115	351.07892	5.0795	409.07892	8.789	219.07892	6.227	123.07892	1.975
Collagen.58.192307	8.9555	99.192307	8.0665	180.192307	5.767	157.192307	11.5845	361.892307	15.397	309.192307	7.341	466.892307	9.9	123.892307	10.917	122.192307	8.5235
Collagen.128.60384	12.265	298.60384	15.7895	809.60384	7.574	333.15384	19.9575	583.15384	17.113	588.60384	9.4845	757.15384	14.3165	433.15384	23.9805	200.15384	6.5915
complem177.42307	11.5574	269.52307	14.2385	643.42307	19.3885	412.42307	11.8235	635.52307	41.7805	581.52307	14.2375	452.52307	8.8805	364.42307	11.7125	151.42307	12.3025
complem142.80789	13.246	204.80789	14.885	235.80789	12.017	217.80789	11.888	468.80789	13.8355	383.80789	6.9815	266.80789	13.0315	163.80789	2.376	405.80789	18.399
complem37.153846	4.5055	79.653846	1.923	49.653846	1.4275	34.653846	1.0895	348.153846	5.615	388.653846	3.11	45.653846	0.873	50.653846	2.003	137.153846	1.967
complem193	9.95	439	9.3915	262.5	7.5635	551	9.444	324.5	8.323	2860	8.372	997.5	7.4765	567.5	9.854	841.5	10.8875

- ❖ NSI: Normalized signal intensities
- ❖ SBR: Signal to background ratio
- ❖ SNR: Signal to noise ratio
- ❖ Ab-score: antibody score ($[(NSI*SNR)+1]$)

Custom antigen microarray services

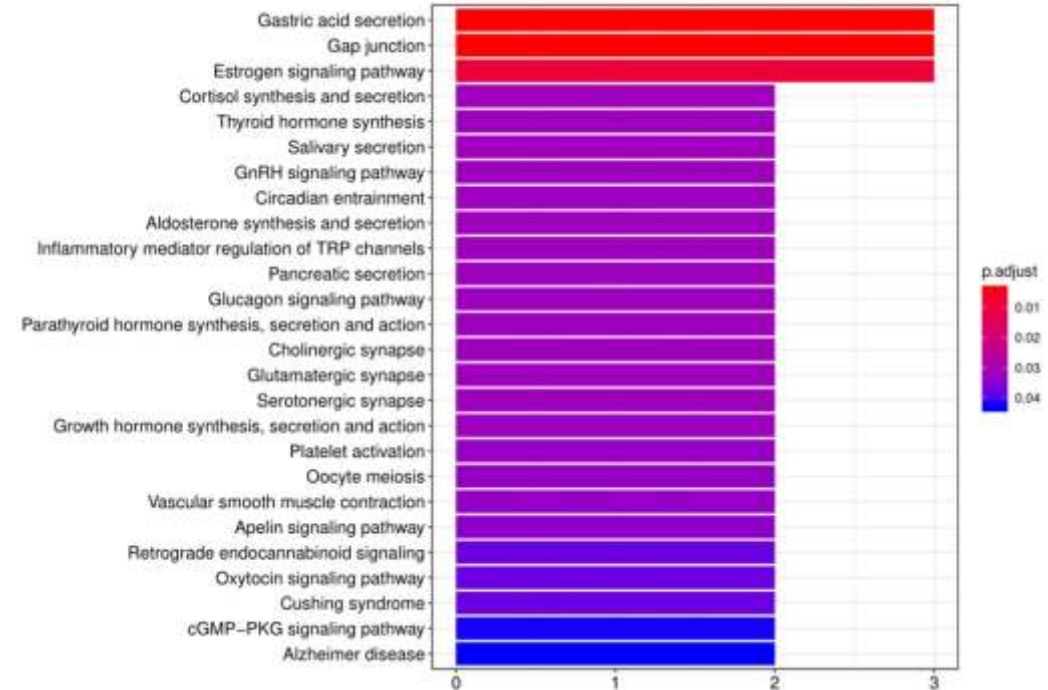
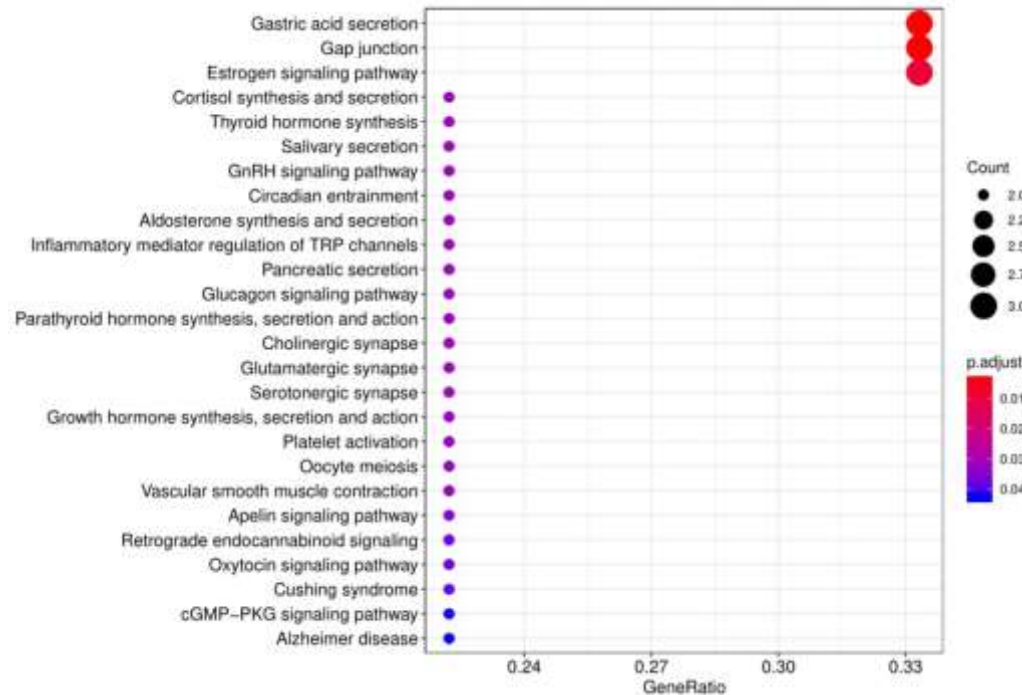
Additional analysis: Gene Ontology (GO) analysis



Classifies genes and proteins based on known biological functions

Custom antigen microarray services

Additional analysis: Pathway analysis



Groups positive antibody-antigen interactions based on defined biological pathways

Summary

- ❖ GeneCopoeia's OmicsArray™ antigen microarrays are designed for multiplex, high-throughput profiling of antibodies in many different body fluid types, such as whole blood, serum, plasma, saliva, etc.
- ❖ GeneCopoeia's OmicsArray™ antigen microarrays are a great solution for many applications, including autoimmune disease screening of patients, cancer and neurological disease autoantibody profiling, and detection of pathogens including SARS-CoV-2, the virus responsible for COVID-19.
- ❖ GeneCopoeia offers several high-performance premade antigen microarrays, as well as full custom antibody profiling services. Custom arrays are also available.

Thank You!

If you have any additional
questions, please call

1-301-762-0888

Email: inquiry@genecopoeia.com

Or visit us on the web:

www.genecopoeia.com

GeneCopoeia, Inc.

9260 Medical Center Drive Suite 101

Rockville, Maryland USA 20850

