

U.S. Centers for
Disease Control
and Prevention

September 9, 2020

Advanced Tools For COVID-19 Coronavirus Research From GeneCopoeia

Presenter:

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Senior Application Scientist
GeneCopoeia, Inc.

GeneCopoeia SARS-CoV-2 related products

- ❖ Spike protein-pseudotyped lentivirus
- ❖ Coronavirus protein antigen microarrays
- ❖ SARS-CoV-2 RT-qPCR-based testing kits
- ❖ COVID-19-related plasmids, including open reading frame (ORF) clones expressing viral proteins and human host factors, CRISPR sgRNA, and shRNA.
- ❖ COVID-19-related lentivirus and adenoassociated virus (AAV)

GeneCopoeia SARS-CoV-2 related products

The screenshot displays the GeneCopoeia website's product page for COVID-19 Coronavirus Research Tools. The browser's address bar shows the URL <https://www.genecopoeia.com/product/covid-19-coronavirus-research-1>. The website header includes the GeneCopoeia logo with the tagline "Expressway to Discovery", a search bar, and links for Account, Cart, and Contact Us. A navigation menu lists Products & Services, Reagents, Applications, Order & Support, About Us, and Promotions. A prominent banner features a 3D model of a coronavirus and the text "COVID-19 Coronavirus Research Tools" and "New products!". Below the banner, a list of products is shown: Spike pseudotyped lentiviral particles and SARS-CoV-2 Detection Kit. A breadcrumb trail indicates the user's location: Home > Products > COVID-19 Coronavirus Research Tools. The left sidebar contains a "Products & Services" menu with categories like Clone collections, Genome editing tools, Viral delivery systems, Stable cell lines, miRNA solutions, Antigen microarrays, Exosome solutions, Custom services, and COVID-19 coronavirus research tools. The main content area has tabs for General information, Webinars, and FAQ. The "General information" tab is active, displaying a paragraph about GeneCopoeia as a one-stop shopping solution for COVID-19 research tools, followed by a list of products: SARS-CoV-2 Spike protein-pseudotyped lentivirus and SARS-CoV-2 testing kits, RT-qPCR kits, and qPCR primers. A "Send message" button is located in the bottom right corner.

COVID-19 Coronavirus Research Tools | GeneCopoeia

<https://www.genecopoeia.com/product/covid-19-coronavirus-research-1>

GeneCopoeia™
Expressway to Discovery

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COVID-19 Coronavirus Research Tools

New products!

- Spike pseudotyped lentiviral particles
- SARS-CoV-2 Detection Kit

You are here: [Home](#) > [Products](#) >

Products & Services

- ▶ Clone collections
- ▶ Genome editing tools
- ▶ Viral delivery systems
- ▶ Stable cell lines
- ▶ miRNA solutions
- ▶ Antigen microarrays
- ▶ Exosome solutions
- ▶ Custom services
- ▼ **COVID-19 coronavirus research tools**
 - SARS-CoV-2 spike-pseudotyped lentivirus
 - COVID-19 coronavirus stable cell lines

COVID-19 Coronavirus Research Tools

General information Webinars FAQ

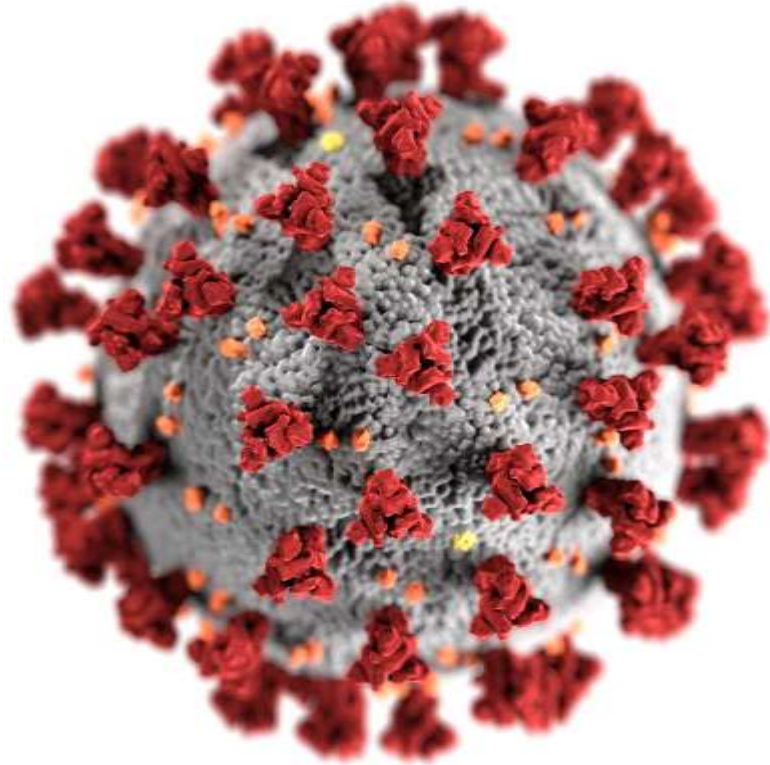
GeneCopoeia is your one-stop shopping solution for COVID-19 research tools.

For both SARS-CoV-2, the coronavirus responsible for the COVID-19 pandemic, as well as host factors like ACE2 and TMPRSS2, we provide:

- SARS-CoV-2 Spike protein-pseudotyped lentivirus.** For vaccine development, neutralizing antibody studies, and SARS-CoV-2 infection studies.
- SARS-CoV-2 testing kits, RT-qPCR kits, and qPCR primers**

Send message

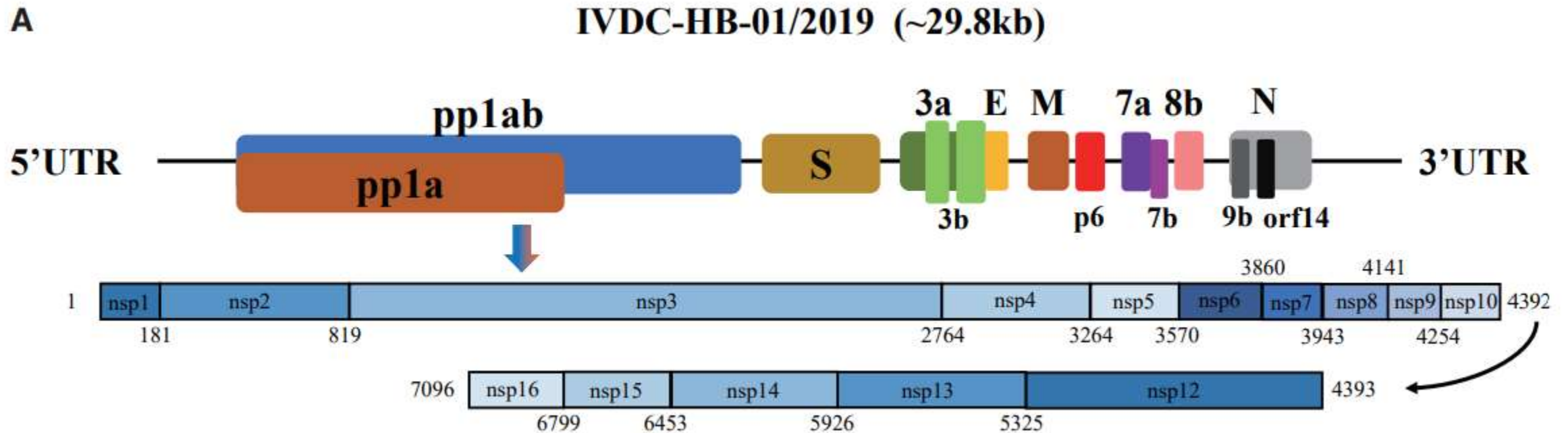
Background: SARS-CoV-2 virus



- ❖ SARS-CoV-2: Member of genus *Betacoronavirus*
- ❖ Highly similar to SARS-CoV-1, which caused the 2002-2004 Severe Acute Respiratory Syndrome (SARS) outbreak
- ❖ Less similar to MERS-CoV, which caused the ongoing Middle Eastern Respiratory Syndrome (MERS) outbreak from 2012
- ❖ Surrounded by surface glycoprotein “Spike”, which is essential for virus entry
- ❖ ~30 kb genome, positive strand RNA

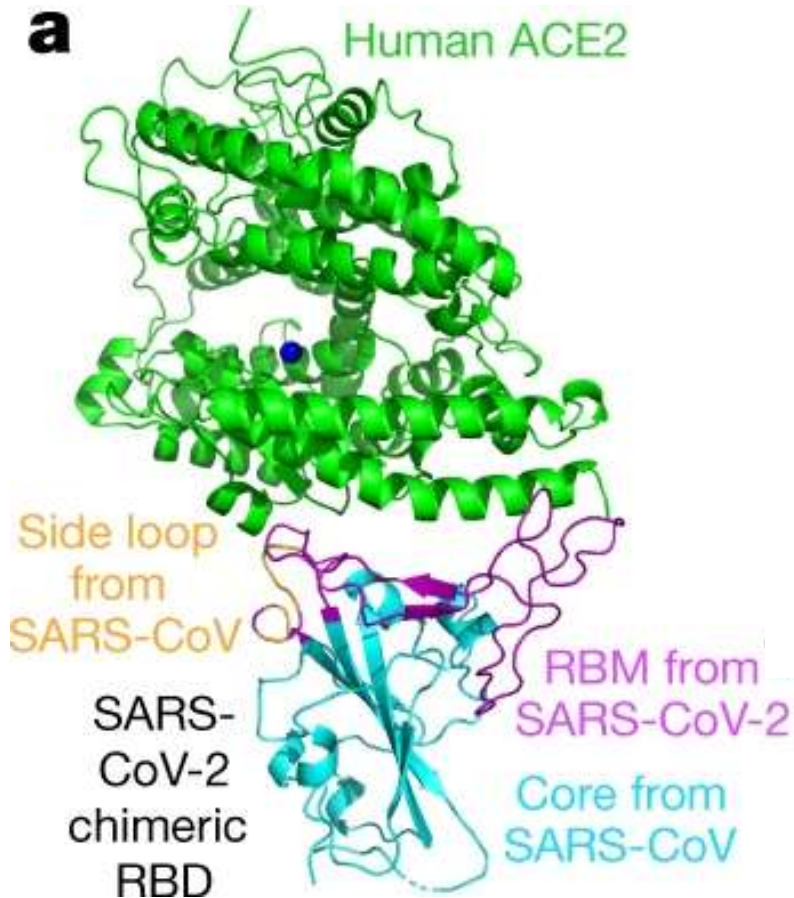


Background: SARS-CoV-2 virus



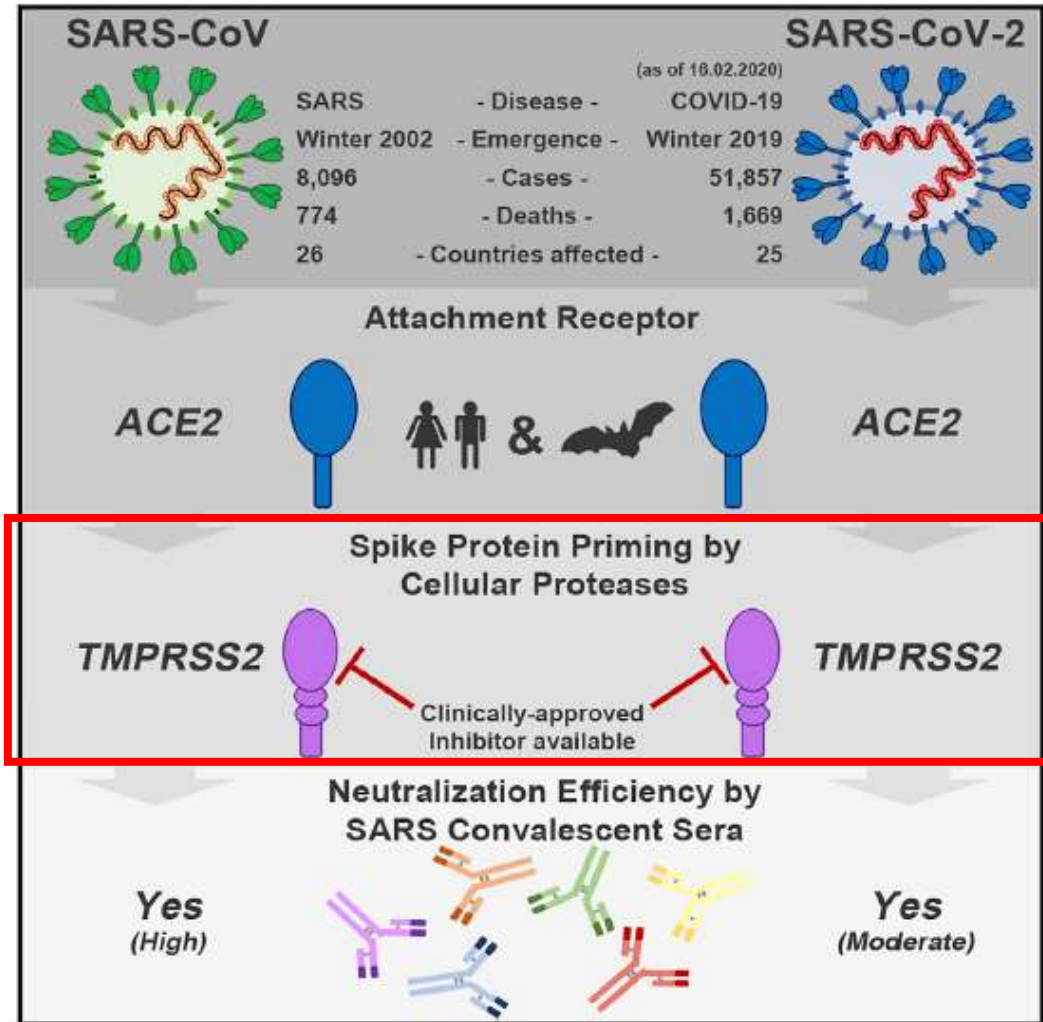
From Wu, A., et al. (2020). Cell Host and Microbe 27, 325

Background: SARS-CoV-2 interaction with host



- ❖ SARS-CoV-2 Spike protein binds to Angiotensin Converting Enzyme 2 (ACE2)
- ❖ Same receptor as SARS-CoV-1. MERS-CoV uses DPP4.
- ❖ Entry into host occurs via lung airway epithelial cells
- ❖ ACE2 is also highly expressed in other tissues, including vascular epithelial cells and kidney, which could explain some of the secondary pathology of COVID-19 (blood clots, kidney failure)

Background: SARS-CoV-2 interaction with host

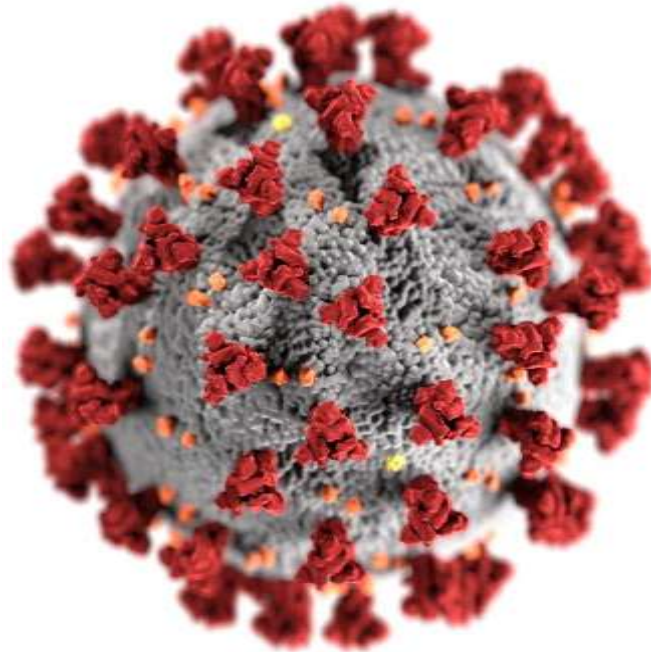


- ❖ Serine protease TMPRSS2 is required for Spike binding to ACE2

Spike Protein-pseudotyped lentivirus

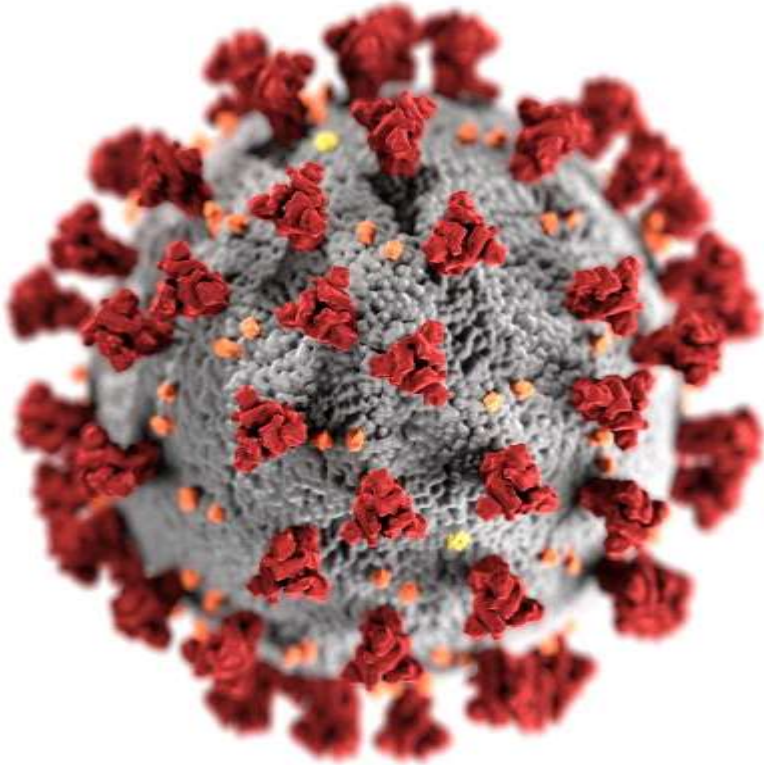
What is it?

Lentivirus that expresses the SARS-CoV-2 Spike (S) glycoprotein in its envelope. Limits the tropism of viral infection to cells that express ACE2.



Spike Protein-pseudotyped lentivirus

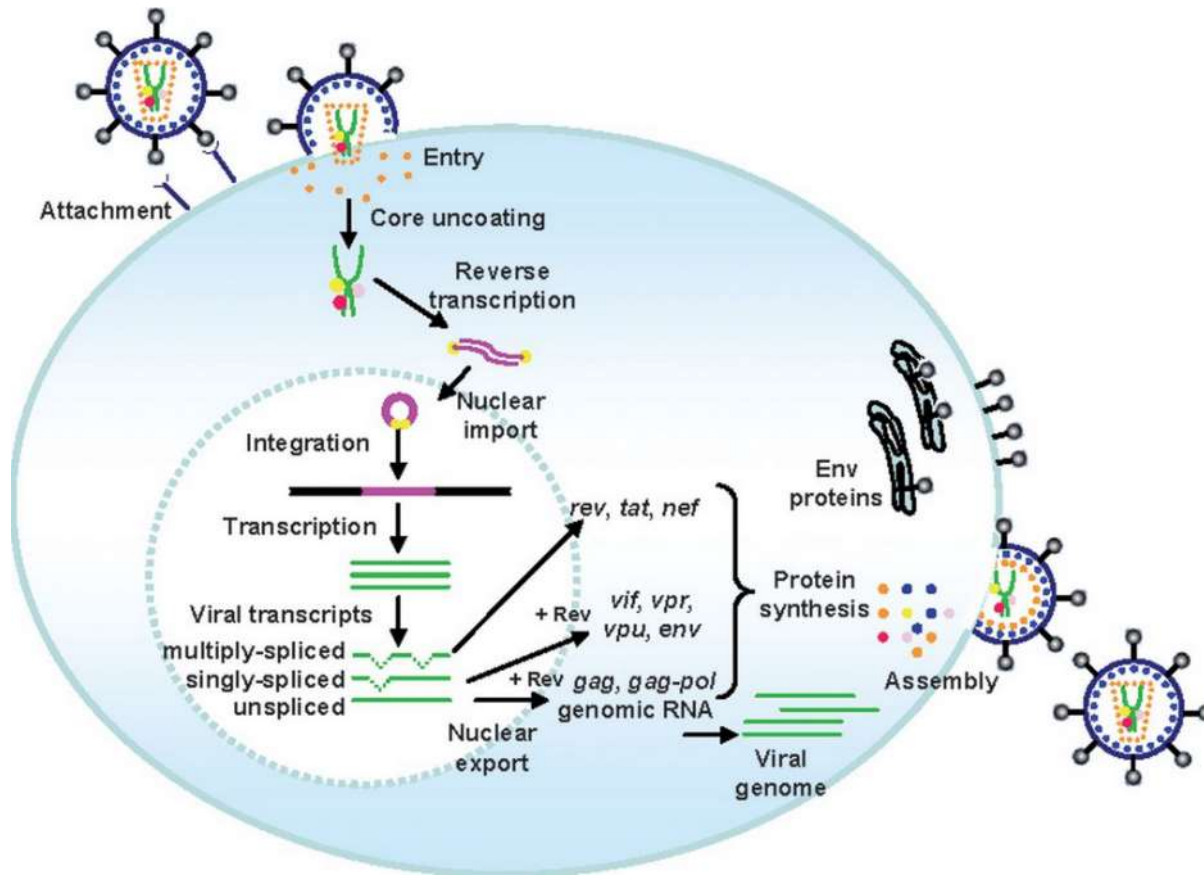
Useful for several applications in a SAFE environment



- ❖ Vaccine development for prevention of infection by SARS-CoV-2 virus
- ❖ Studying the efficacy and mechanism of neutralizing antibodies against SARS-CoV-2 virus
- ❖ Development of antiviral therapeutic agents
- ❖ Studying the mechanism of virus-receptor interaction



Lentivirus technology



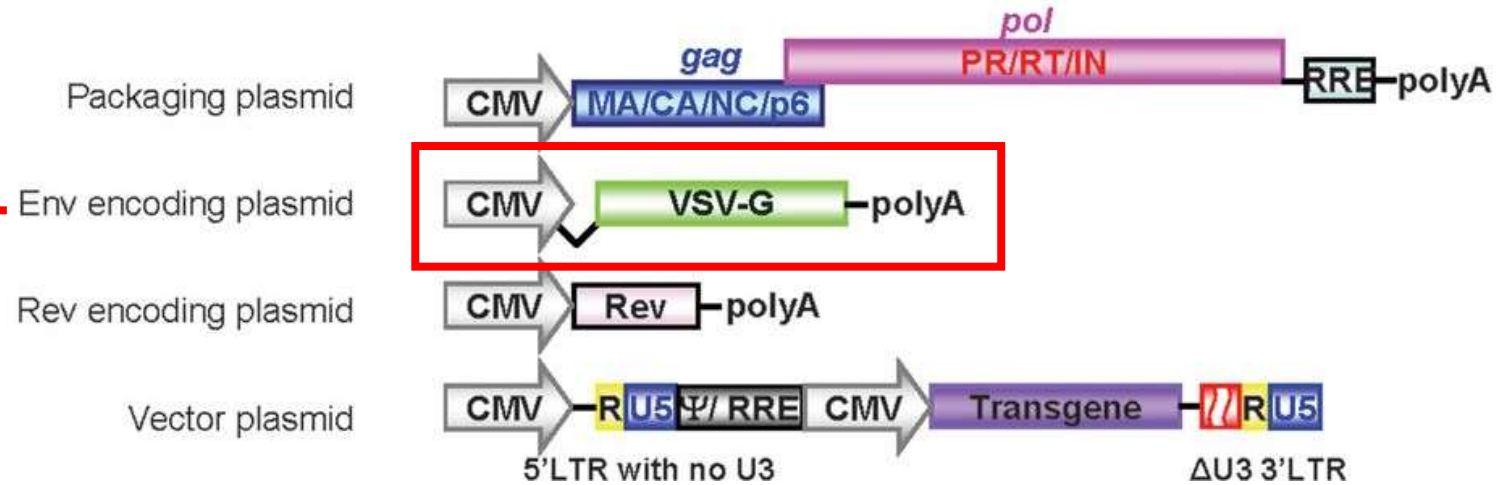
Sakuma, et al. (2012). Biochem. J. 443, 603.

- ❖ Class of retroviruses that includes human immunodeficiency virus (HIV)
- ❖ Single stranded RNA genome of ~9.7 kb
- ❖ Integrates into genomic DNA
- ❖ Infect dividing & non-dividing cells

Lentivirus technology

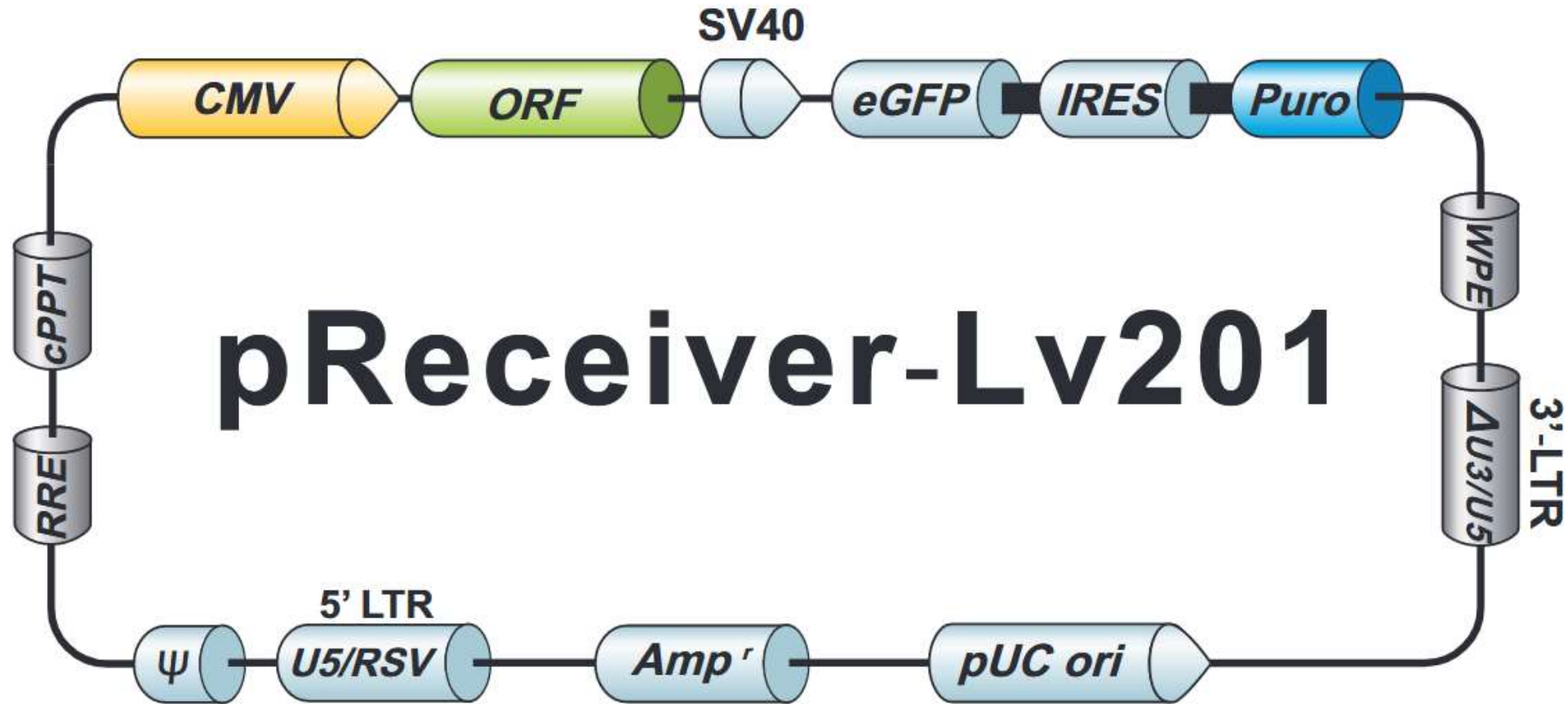
3rd generation lentivirus

Change env to another glycoprotein (tropism)



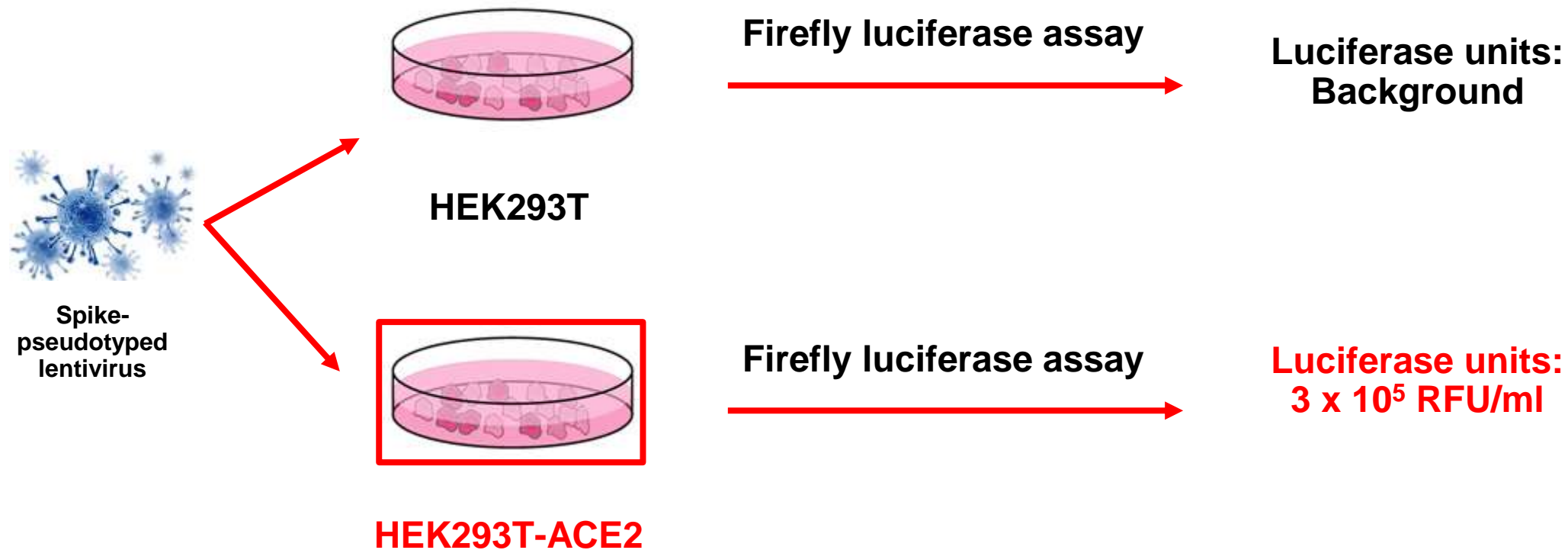
Spike Protein-pseudotyped lentivirus

Premade, expressing luciferase and eGFP



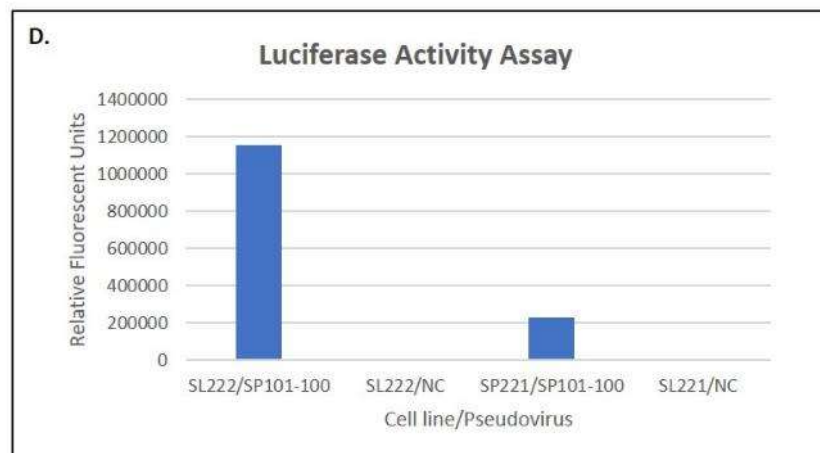
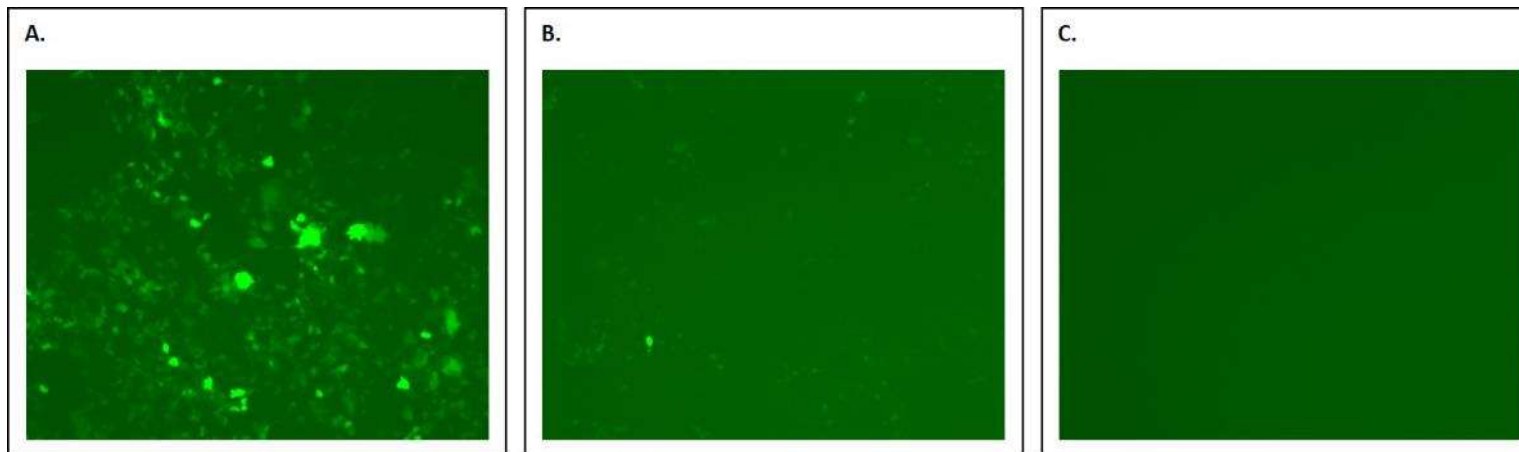
Spike Protein-pseudotyped lentivirus

Premade, expressing luciferase and eGFP



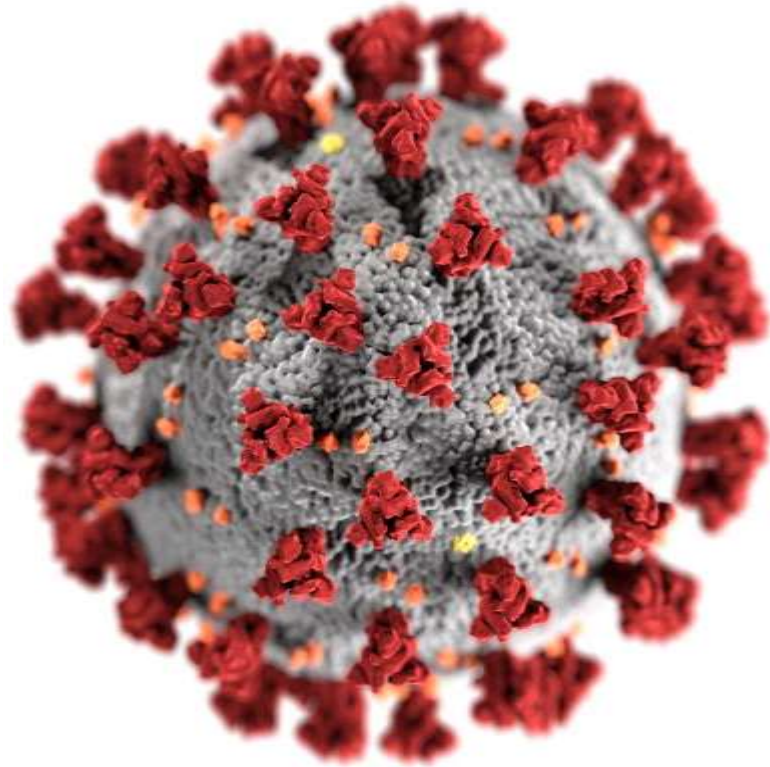
Spike Protein-pseudotyped lentivirus

Premade, expressing luciferase and eGFP



Lentifect™ Spike Protein-pseudotyped lentivirus

Advantages



- ❖ Accurate functional titers. Measured by FACS sorting of ACE2-expressing HEK293T cells infected with GFP-expressing particles.
- ❖ Complete system. Can be used with GeneCopoeia's ACE2-expressing HEK293T cells. Kits for do-it-yourself packaging are also available.
- ❖ Application versatility.
 - ❖ Can be packaged for either *in vitro* grade or ultra-purified *in vivo* grade.
 - ❖ Can express either commonly-used markers such as GFP and luciferase, or most human, mouse, and rat ORFs in GeneCopoeia's >80 lentiviral transfer vector types.



Spike Protein-pseudotyped lentivirus

Premade, expressing luciferase and eGFP

Product cat. #	Length of Spike	Spike variant
SP101-100	Full	D614
SP001-100	Truncated	D614
SP103-100	Full	G614
SP003-100	Truncated	G614

COVID-19 Antigen microarray

What are antigen microarrays?

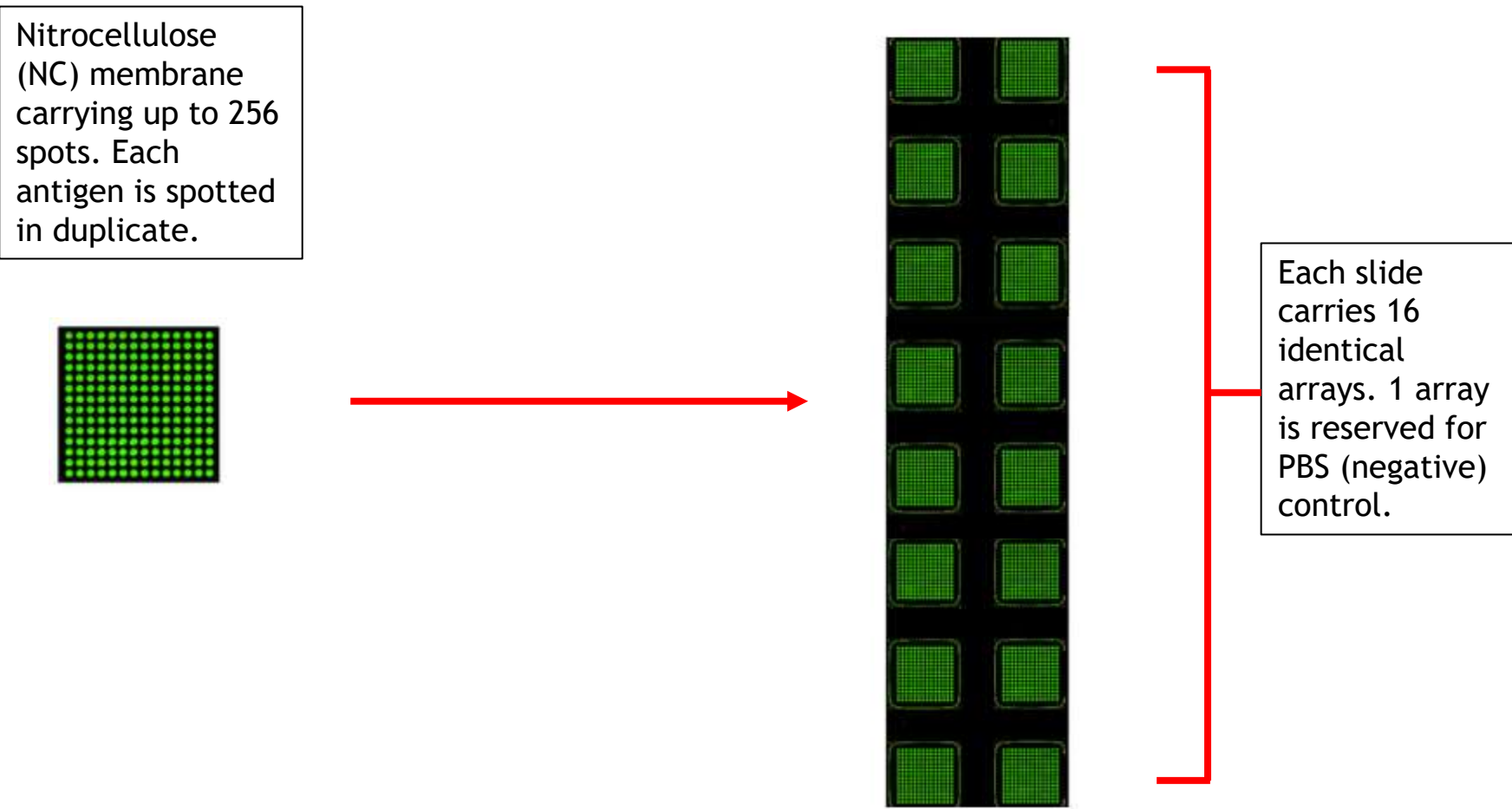
- ❖ Antigen arrays are a type of protein microarray. Proteins of interest are spotted onto membranes.
- ❖ In this case, the proteins are known to be associated with specific diseases.
- ❖ Antigen arrays are used for detection of antibodies in patient body fluids. Can also be used to validate specific antibodies.
- ❖ Usually, the antigens are proteins that are known autoantigens in autoimmune diseases, but can be other proteins associated with other disorders, such as cancers or allergies.

OmicsArray™ SARS-CoV-2 Coronavirus Antigen Microarray

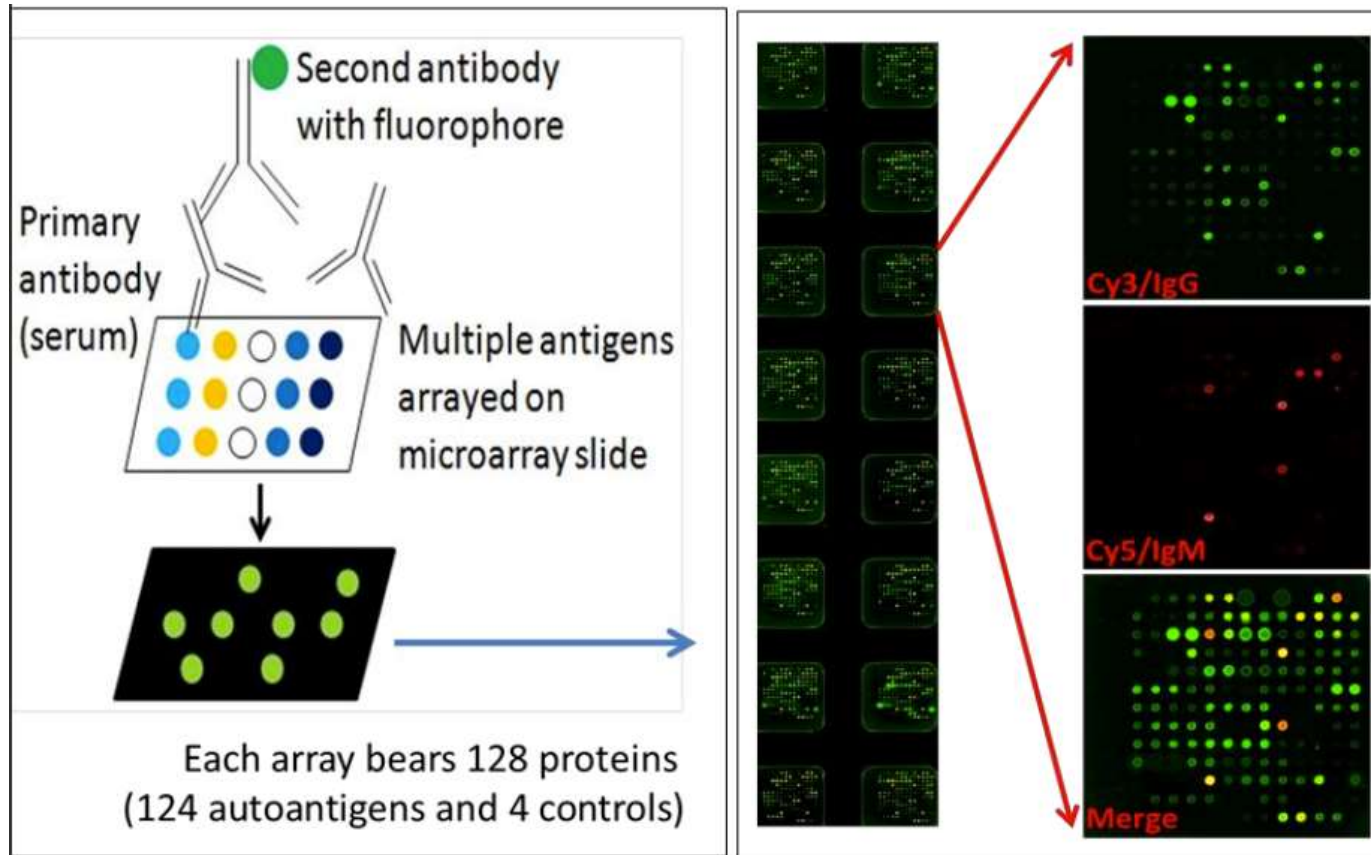
Antigen	Associated disease
SARS-CoV-2 Spike protein S1	COVID-19
SARS-CoV-2 Spike protein S1 RBD	COVID-19
SARS-CoV-2 Spike S2	COVID-19
SARS-CoV-2 Spike S2 ECD	COVID-19
SARS-CoV-2 Spike S1 + S2	COVID-19
SARS-CoV-2 Nucleocapsid protein (NCP)	COVID-19
SARS-CoV-1 Spike protein	SARS (2002-2004)
SARS-CoV-1 NCP	SARS (2002-2004)
MERS-CoV Spike Protein	MERS (2012-present)
HCoV-229E Spike protein	Common cold (seasonal)
HCoV-HKU1 Spike protein	Common cold (seasonal)
HCoV-NL63 Spike protein	Common cold (seasonal)
HCoV-OC43 Spike protein	Common cold (seasonal)
Influenza A antigen	Seasonal influenza
Influenza B antigen	Seasonal influenza
RSV Glycoprotein G	Common cold-like respiratory disease

What are antigen microarrays?

Proteins in native conformation spotted onto membranes



Autoantigen microarray workflow



From Zhu, H., et al. (2015). Genomics, Proteomics, & Bioinformatics 13, 210

Applications for antigen microarrays

- ❖ Autoimmune disease profiling and diagnostics (e.g. Systemic lupus erythematosus, Rheumatoid arthritis, Crohn's disease, Type 1 diabetes, Sjögren's Syndrome, and ~100 others).
- ❖ Cancer biomarker profiling.
- ❖ Infectious disease/pathogen marker profiling
- ❖ Allergen profiling.
- ❖ Transplantation evaluation.
- ❖ Evaluation of the efficacy, toxicity, and other side effects from clinical applications of drugs and therapies.
- ❖ Evaluation of human body responses to pollutants and impacts on health.
- ❖ Vaccine efficacy evaluation

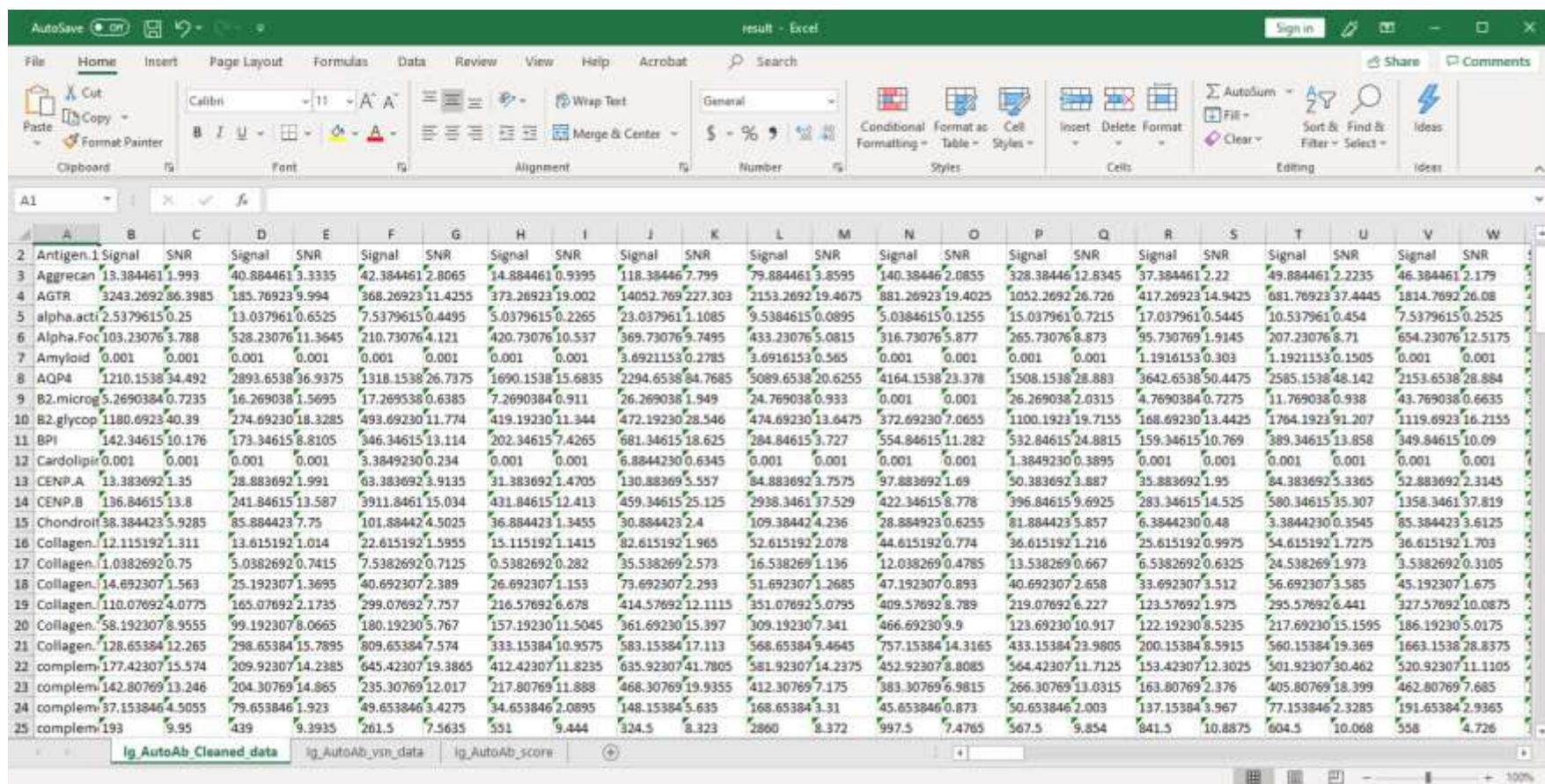
Custom antigen microarray services

- ❖ Custom printing and spotting. GeneCopoeia will create custom antigen microarrays built to customer's specifications.
- ❖ Sample processing. Customer can send blood, plasma, tissue, or other biological sample and we will prepare it 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

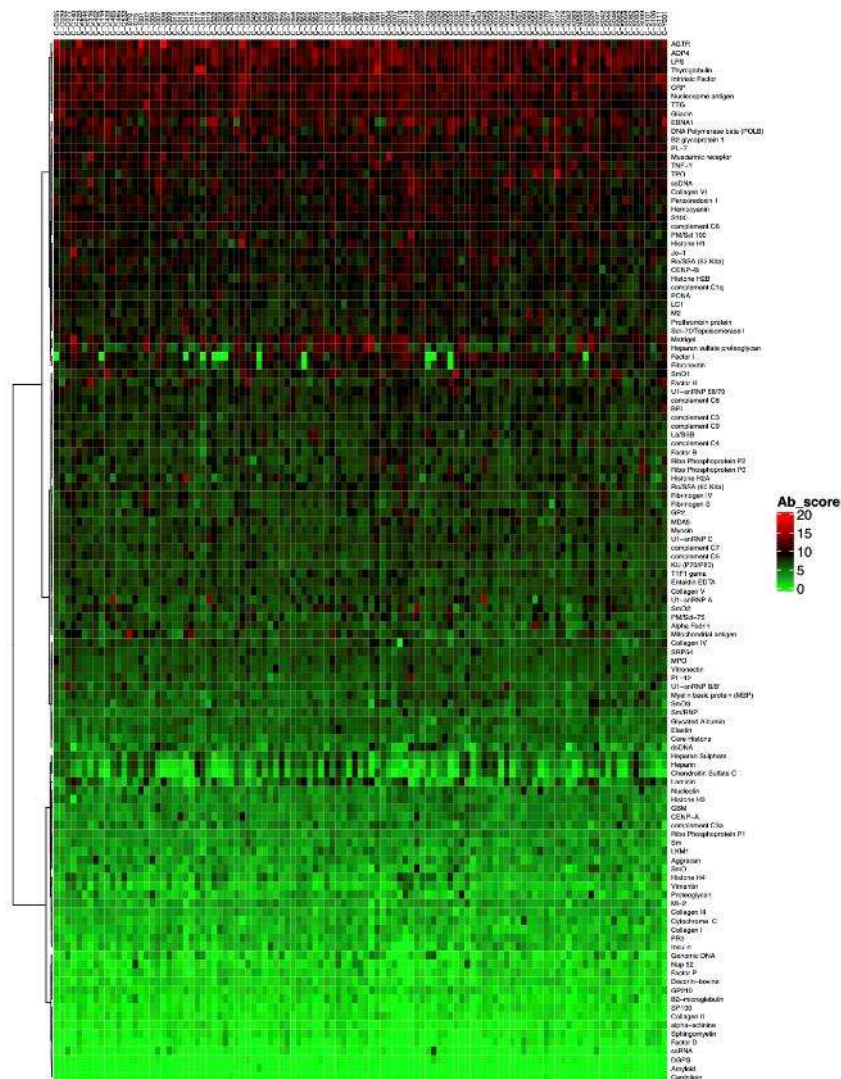
Standard analysis: Normalized data (Net signal intensities, or NSI)



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
2	Antigen.1	Signal	SNR	Signal	SNR	Signal	SNR	Signal	SNR	Signal	SNR	Signal	SNR	Signal	SNR	Signal	SNR	Signal	SNR	Signal	SNR	Signal	SNR
3	Aggrecan	13.384461	1.993	40.884461	3.3335	42.384461	2.8065	14.884461	0.9395	118.38446	7.799	79.884461	3.8595	140.38446	2.0855	328.38446	12.8345	37.384461	2.22	49.884461	2.2235	46.384461	2.179
4	AGTR	3243.2692	86.3985	185.76923	9.994	368.26923	11.4255	373.26923	19.002	14052.769	227.303	2153.2692	19.4675	881.26923	19.4025	1052.2692	26.726	417.26923	14.9425	681.76923	37.4445	1814.7692	26.08
5	alpha.acti	2.5379615	0.25	13.037961	0.6525	7.5379615	0.4495	5.0379615	0.2265	23.037961	1.1085	9.5384615	0.0895	5.0384615	0.1255	15.037961	0.7215	17.037961	0.5445	10.537961	0.454	7.5379615	0.2525
6	Alpha.Foc	103.23076	3.788	528.23076	11.3645	210.73076	4.121	420.73076	10.537	369.73076	9.7495	433.23076	5.0815	316.73076	5.877	265.73076	8.873	95.730769	1.9145	207.23076	8.71	654.23076	12.5175
7	Amyloid	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	3.6921153	0.2785	3.6916153	0.565	0.001	0.001	0.001	0.001	1.1916153	0.303	1.1921153	0.1505	0.001	0.001
8	AQP4	1210.1538	34.492	2893.6538	36.9375	1318.1538	26.7375	1690.1538	15.6835	2294.6538	84.7685	5089.6538	20.6255	4164.1538	23.378	1508.1538	28.883	3642.6538	50.4475	2585.1538	48.142	2153.6538	28.884
9	B2.microg	5.2690384	0.7235	16.269038	1.5695	17.269538	0.6385	7.2690384	0.911	26.269038	1.949	24.769038	0.933	0.001	0.001	26.269038	2.0315	4.7690384	0.7275	11.769038	0.938	43.769038	0.6635
10	B2.glycop	1180.6923	40.39	274.69230	18.3285	493.69230	11.774	419.19230	11.344	472.19230	28.546	474.69230	13.6475	372.69230	7.0655	1100.1923	19.7155	168.69230	13.4425	1764.1923	91.207	1119.6923	16.2155
11	BPI	142.34615	10.176	173.34615	8.8105	346.34615	13.114	202.34615	7.4265	681.34615	18.625	284.84615	3.727	554.84615	11.282	532.84615	24.8815	159.34615	10.769	389.34615	13.858	349.84615	10.09
12	Cardiolip	0.001	0.001	0.001	0.001	5.3849230	0.234	0.001	0.001	6.8844230	0.6345	0.001	0.001	0.001	0.001	1.3849230	0.3895	0.001	0.001	0.001	0.001	0.001	0.001
13	CENP.A	13.383692	1.35	28.883692	1.991	63.383692	3.9135	31.383692	1.4705	130.88369	5.557	84.883692	3.7575	97.883692	1.69	50.383692	3.887	35.883692	1.95	84.383692	5.3365	52.883692	2.3145
14	CENP.B	136.84615	13.8	241.84615	13.587	3911.8461	15.034	431.84615	12.413	459.34615	25.125	2938.3461	37.529	422.34615	8.778	396.84615	9.6925	283.34615	14.525	580.34615	35.307	1358.3461	37.819
15	Chondroit	38.384423	5.9285	85.884423	7.75	101.88442	4.5025	36.884423	1.3455	30.884423	2.4	109.38442	4.236	28.884923	0.6255	81.884423	5.857	6.3844230	0.48	3.3844230	0.3545	85.384423	3.6125
16	Collagen.	12.115192	1.311	13.615192	1.014	22.615192	1.5955	15.115192	1.1415	82.615192	1.965	52.615192	2.078	44.615192	0.774	36.615192	1.216	25.615192	0.9975	54.615192	1.7275	36.615192	1.703
17	Collagen.	1.0382692	0.75	5.0382692	0.7415	7.5382692	0.7125	0.5382692	0.282	35.538269	2.573	16.538269	1.136	12.038269	0.4785	13.538269	0.667	6.5382692	0.6325	24.538269	1.973	3.5382692	0.3105
18	Collagen.	14.692307	1.563	25.192307	1.3695	40.692307	2.389	26.692307	1.153	73.692307	2.293	51.692307	1.2685	47.192307	0.893	40.692307	2.658	33.692307	3.512	56.692307	3.585	45.192307	1.675
19	Collagen.	110.07692	4.0775	165.07692	2.1735	299.07692	7.757	216.57692	6.678	414.57692	12.1115	351.07692	5.0795	409.57692	8.789	219.07692	6.227	123.57692	1.975	295.57692	6.441	327.57692	10.0875
20	Collagen.	58.192307	8.9555	99.192307	8.0665	180.19230	5.767	157.19230	11.5045	361.69230	15.397	309.19230	7.341	466.69230	9.9	123.69230	10.917	122.19230	8.5235	217.69230	15.1595	186.19230	5.0175
21	Collagen.	128.65384	12.265	298.65384	15.7895	809.65384	7.574	333.15384	10.9575	583.15384	17.113	568.65384	9.4645	757.15384	14.3165	433.15384	23.9805	200.15384	8.5915	560.15384	19.369	1663.1538	28.8375
22	complem	177.42307	15.574	209.92307	14.2385	645.42307	19.3865	412.42307	11.8235	635.92307	41.7805	581.92307	14.2375	452.92307	8.8085	564.42307	11.7125	153.42307	12.3025	501.92307	30.462	520.92307	11.1105
23	complem	142.80769	13.246	204.30769	14.865	235.30769	12.017	217.80769	11.888	668.30769	19.9355	412.30769	7.175	383.30769	6.9815	266.30769	13.0315	163.80769	2.376	405.80769	18.399	462.80769	7.685
24	complem	37.153846	4.5055	79.653846	1.923	49.653846	3.4275	34.653846	2.0895	148.15384	5.635	168.65384	3.31	65.653846	0.873	50.653846	2.003	137.15384	3.967	77.153846	2.3285	191.65384	2.9365
25	complem	193	9.95	439	9.3935	261.5	7.5635	531	9.444	324.5	8.323	2860	8.372	997.5	7.4765	567.5	9.854	841.5	10.8875	604.5	10.068	558	4.726

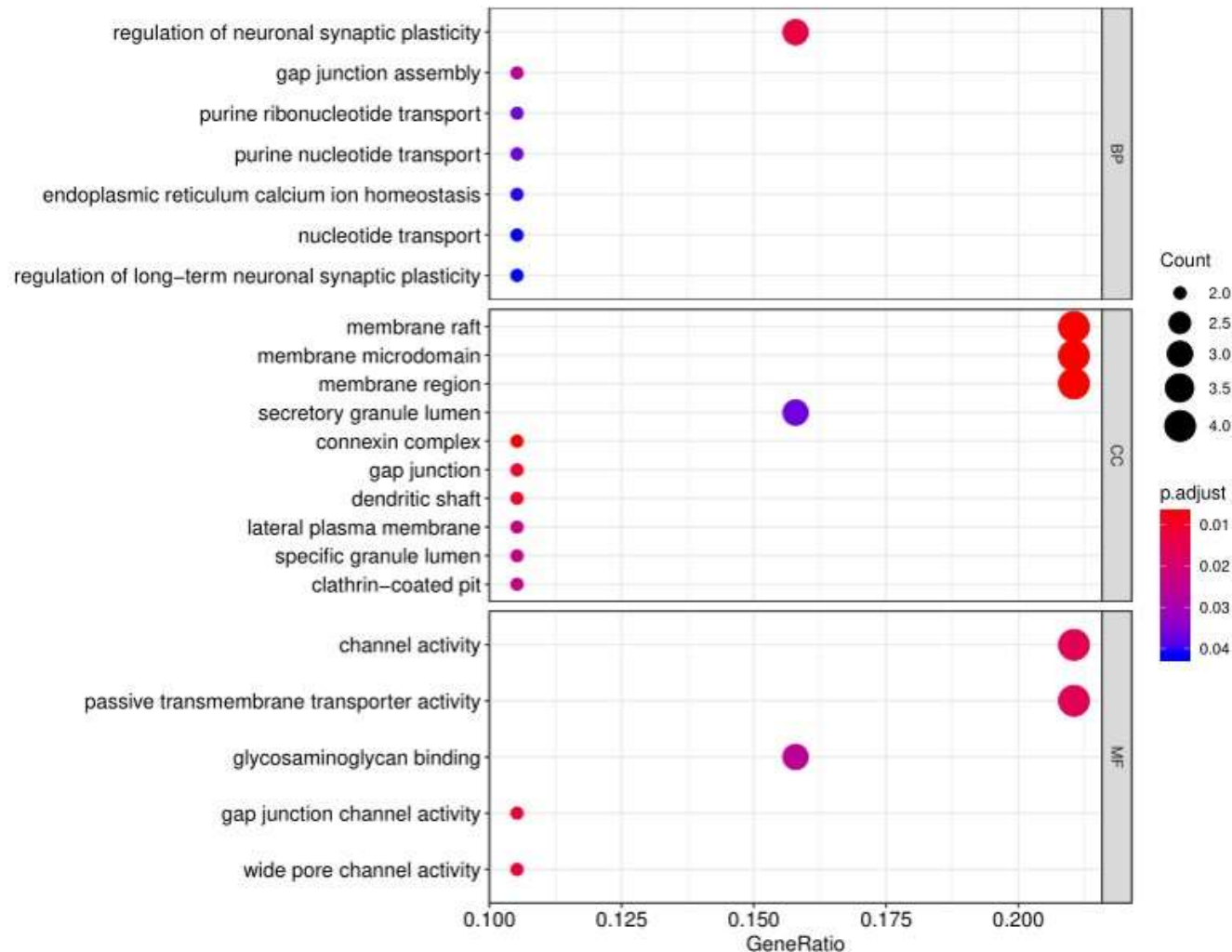
Custom antigen microarray services

Standard analysis: Heat map (antibody score)



Custom antigen microarray services

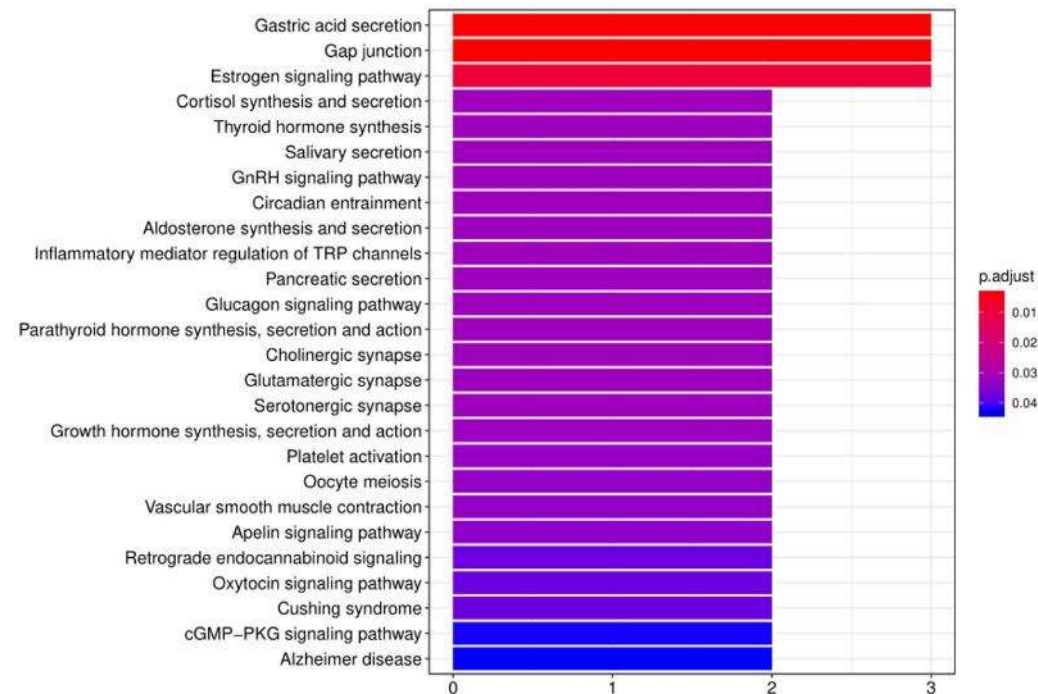
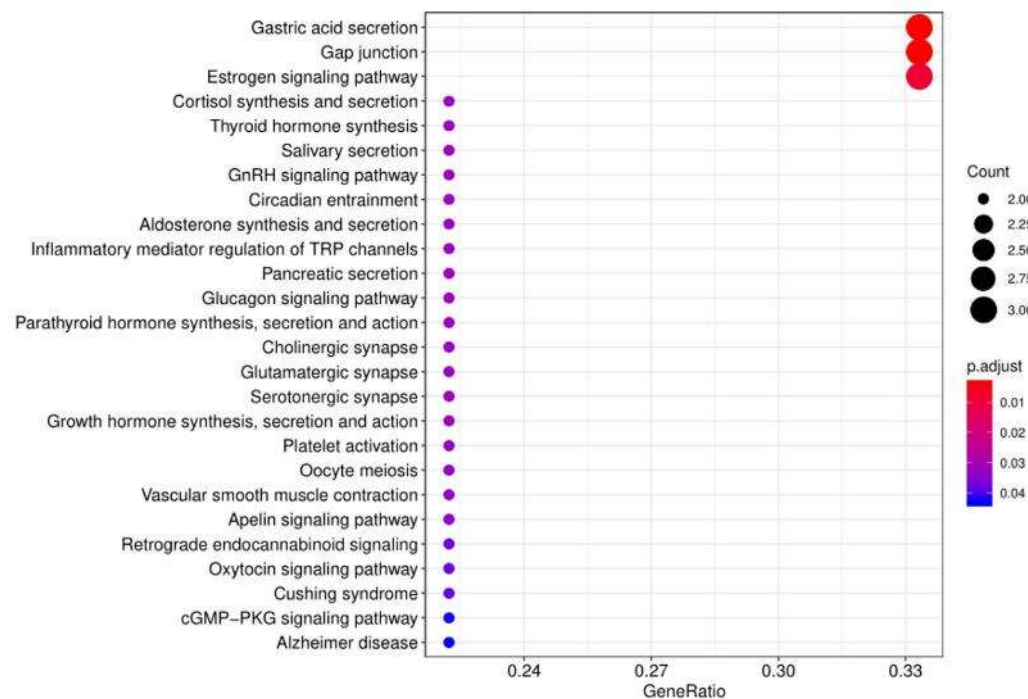
Additional analysis: Gene Ontology (GO) analysis



Classifies genes and proteins based on known biological functions

Custom antigen microarray services

Additional analysis: Pathway analysis

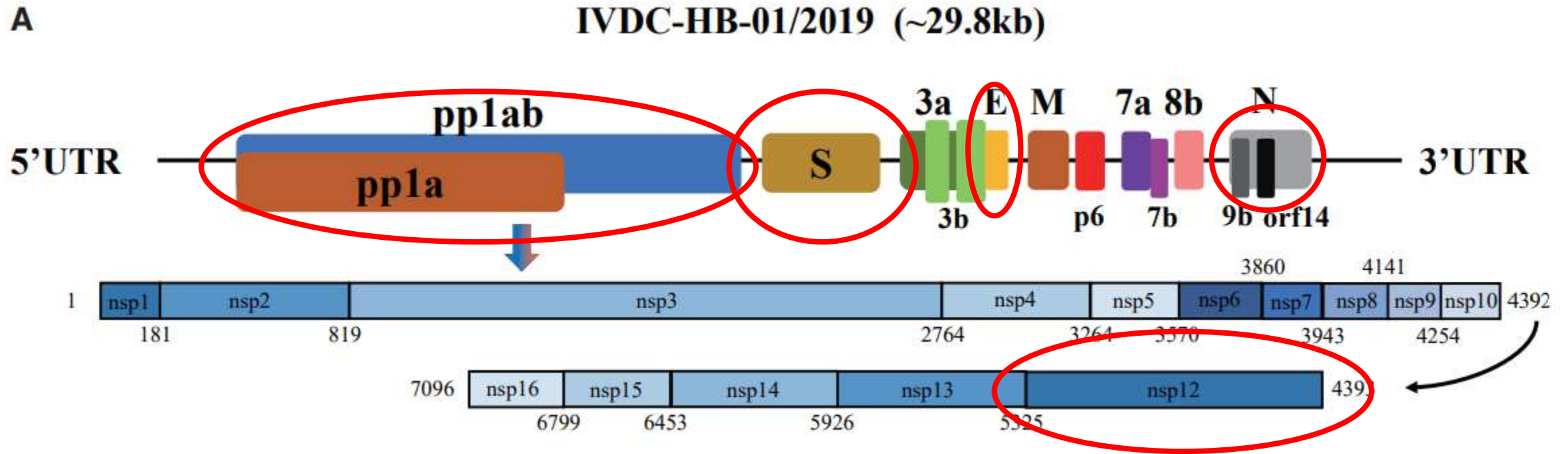


Groups positive antibody-antigen interactions based on defined biological pathways

BlazeTaq™ Probe One-Step SARS-CoV-2 Testing Kit

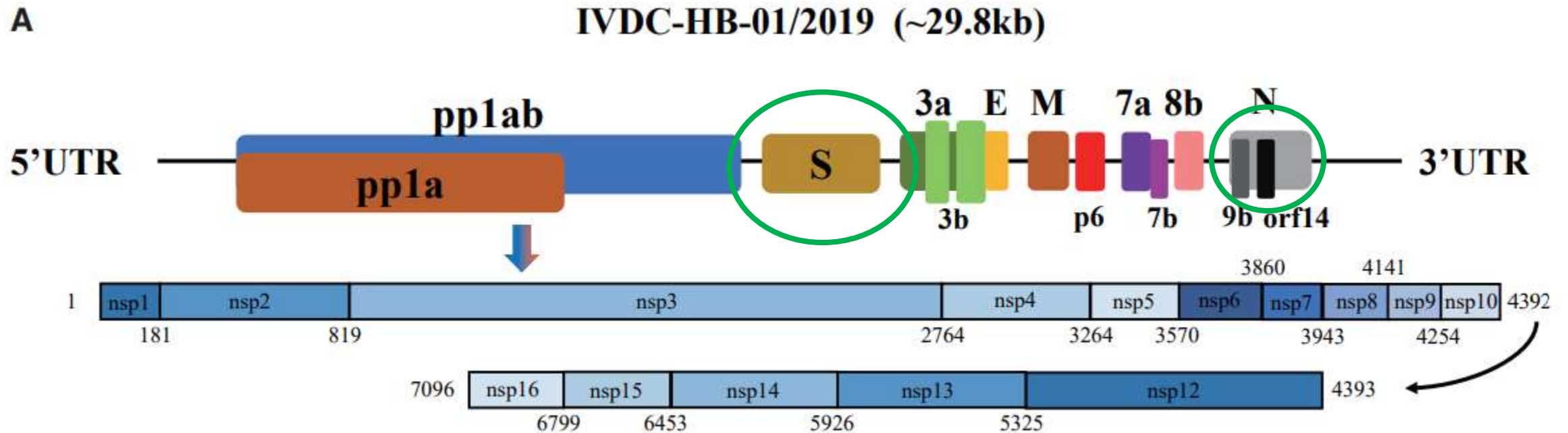
Application: For detection of SARS-CoV-2 viral RNA via RT-qPCR

SARS-CoV-2 detection via RT-qPCR



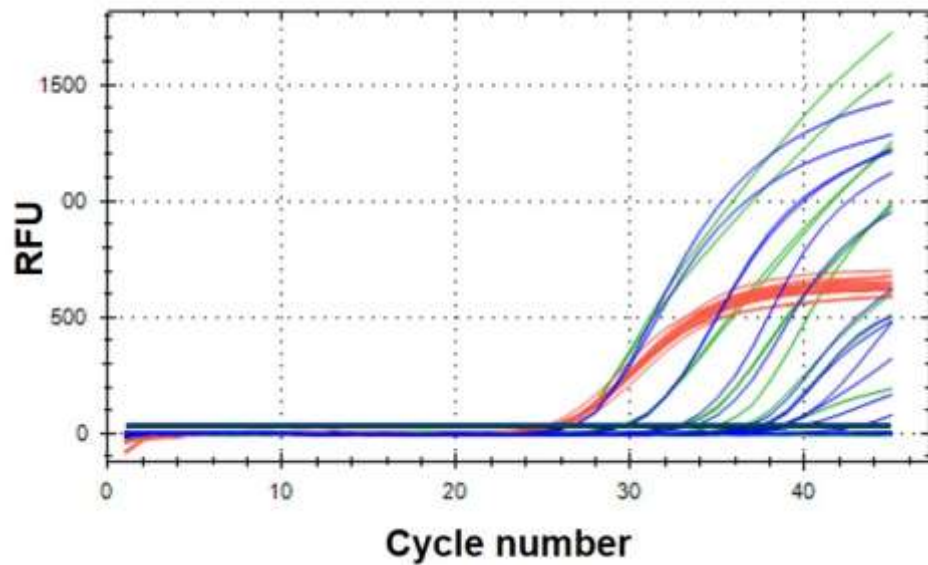
From Wu, A., et al. (2020). Cell Host and Microbe 27, 325

BlazeTaq™ Probe One-Step SARS-CoV-2 Testing Kit



From Wu, A., et al. (2020). Cell Host and Microbe 27, 325

BlazeTaq™ Probe One-Step SARS-CoV-2 Testing Kit



Features

- ❖ High sensitivity. Can detect as few as 10 copies of the viral target sequences.
- ❖ Broad-spectrum detection. Proprietary primer/probe designs enable detection of most SARS-CoV-2 strains.
- ❖ Specificity. Inclusion of UDG and dUTP in the reaction reduces carryover contamination, resulting in fewer false positives.
- ❖ Instrument compatibility. Optional ROX dye ensures compatibility with virtually all qPCR instruments in use.

Copies/Rxn	Fam (S)		Hex (N)		Cy5 (GAPDH)	
10,000	26.09	26.12	26.53	26.46	25.33	25.58
1,000	29.67	29.66	29.54	29.55	25.82	26.61
100	33.2	33.1	33.4	32.39	25.98	26.13
10	36.54	35.13	37.2	39.54	25.98	25.95
5	37.48	N/A	38.52	38.27	25.89	26.14
2.5	N/A	38.97	37.37	N/A	25.87	26.28
1.25	N/A	N/A	N/A	43.01	26.23	26.16
0.625	N/A	N/A	N/A	N/A	26.19	25.94
NTC	N/A	N/A	N/A	N/A	N/A	N/A

BlazeTaq™ Probe One-Step SARS-CoV-2 Testing Kit

COVID-19 Coronavirus Research

BlazeTaq™ Probe One-Step SAR

https://www.genecopoeia.com/product/blazetaq-prob

Search

Note: The BlazeTaq™ Probe One-Step SARS-CoV-2 Detection Kit is for research purposes only. It is not intended for diagnostic or treatment usage in humans.

Ordering information

Performance data

Related products

Ordering information

In addition to the standard size kits listed in the table below, custom size kits are also available. For more information, please contact inquiry@genecopoeia.com.

Buy	Catalog#	Description	Price
<input type="checkbox"/>	QP201	BlazeTaq™ Probe One-Step SARS-CoV-2 Detection Kit with ROX dye (20 ul x 200rxn)	\$795
<input type="checkbox"/>	QP202	BlazeTaq™ Probe One-Step SARS-CoV-2 Detection Kit with ROX dye (20 ul x 1,000rxn)	\$2795
<input type="checkbox"/>	QP203	BlazeTaq™ Probe One-Step SARS-CoV-2 Detection Kit without ROX dye (20 ul x 200rxn)	\$795
<input type="checkbox"/>	QP204	BlazeTaq™ Probe One-Step SARS-CoV-2 Detection Kit without ROX dye (20 ul x 1,000rxn)	\$2795

+ Add to cart to view price

User manual

For more information or to request a quote, please contact inquiry@genecopoeia.com.

Performance data >>

About Us

Products & Services

Order Support

Resources

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GeneCopoeia™

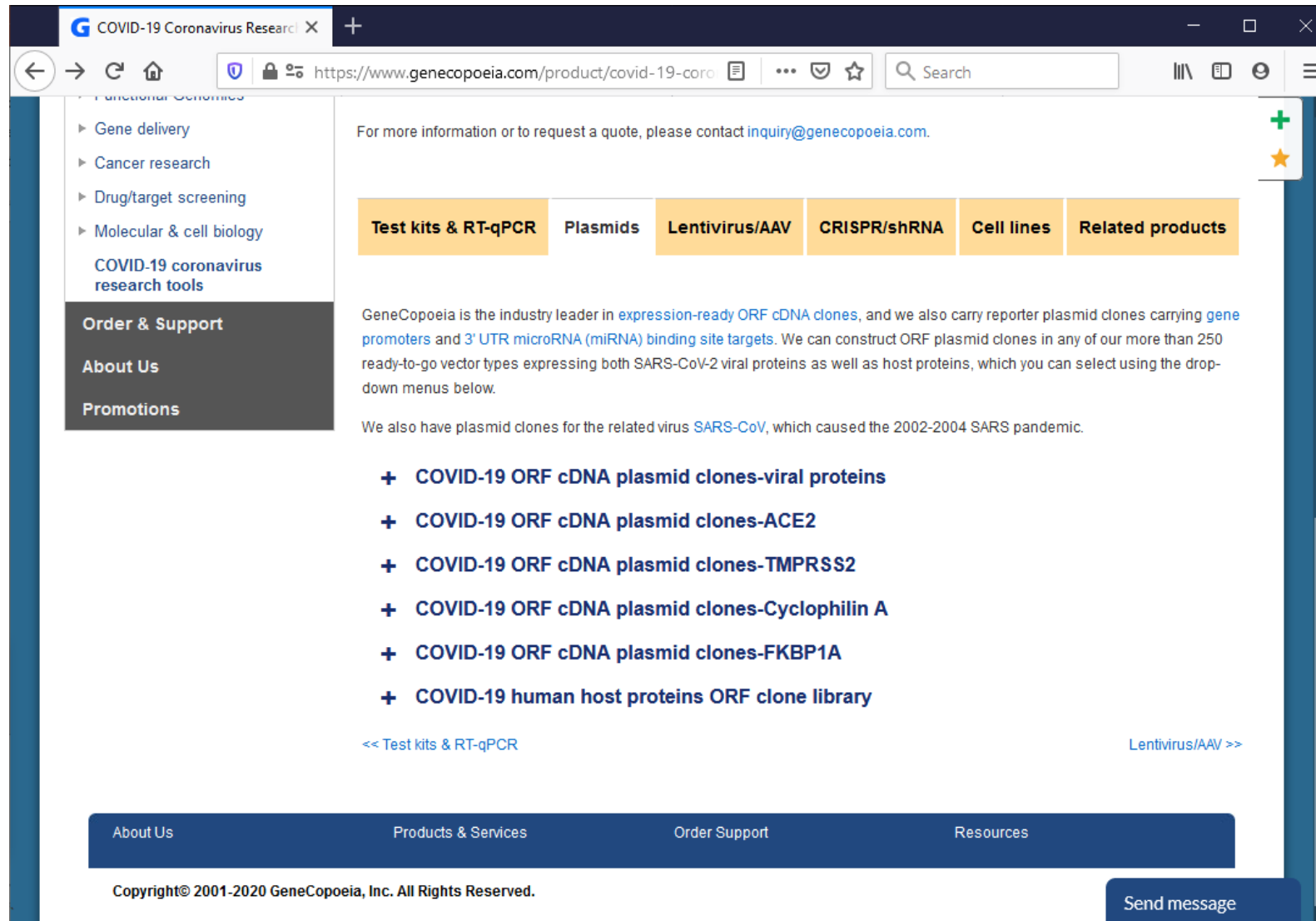
Expressway to Discovery

BlazeTaq™ Probe One-Step SARS-CoV-2 Testing Kit

Note: The BlazeTaq™ Probe One-Step SARS-CoV-2 Detection Kit is for research purposes only. It is not intended for diagnostic or treatment usage in humans.

Other GeneCopoeia SARS-CoV-2 related products

Plasmids



The screenshot displays the GeneCopoeia website's product page for COVID-19 research. The browser's address bar shows the URL <https://www.genecopoeia.com/product/covid-19-coro>. The left sidebar contains a navigation menu with categories like 'Functional Genomics', 'Gene delivery', 'Cancer research', 'Drug/target screening', 'Molecular & cell biology', 'COVID-19 coronavirus research tools', 'Order & Support', 'About Us', and 'Promotions'. The main content area features a horizontal navigation bar with tabs: 'Test kits & RT-qPCR', 'Plasmids' (which is selected), 'Lentivirus/AAV', 'CRISPR/shRNA', 'Cell lines', and 'Related products'. Below this, a paragraph states: 'GeneCopoeia is the industry leader in [expression-ready ORF cDNA clones](#), and we also carry reporter plasmid clones carrying [gene promoters](#) and [3' UTR microRNA \(miRNA\) binding site targets](#). We can construct ORF plasmid clones in any of our more than 250 ready-to-go vector types expressing both SARS-CoV-2 viral proteins as well as host proteins, which you can select using the drop-down menus below.' This is followed by another paragraph: 'We also have plasmid clones for the related virus [SARS-CoV](#), which caused the 2002-2004 SARS pandemic.' A list of products is shown with plus signs: '+ COVID-19 ORF cDNA plasmid clones-viral proteins', '+ COVID-19 ORF cDNA plasmid clones-ACE2', '+ COVID-19 ORF cDNA plasmid clones-TMPRSS2', '+ COVID-19 ORF cDNA plasmid clones-Cyclophilin A', '+ COVID-19 ORF cDNA plasmid clones-FKBP1A', and '+ COVID-19 human host proteins ORF clone library'. Navigation links '<< Test kits & RT-qPCR' and 'Lentivirus/AAV >>' are present. The footer includes a dark blue bar with links 'About Us', 'Products & Services', 'Order Support', and 'Resources', followed by the copyright notice 'Copyright© 2001-2020 GeneCopoeia, Inc. All Rights Reserved.' and a 'Send message' button. The GeneCopoeia logo with the tagline 'Expressway to Discovery' is in the bottom right corner.

COVID-19 Coronavirus Research

For more information or to request a quote, please contact inquiry@genecopoeia.com.

Test kits & RT-qPCR Plasmids Lentivirus/AAV CRISPR/shRNA Cell lines Related products

GeneCopoeia is the industry leader in [expression-ready ORF cDNA clones](#), and we also carry reporter plasmid clones carrying [gene promoters](#) and [3' UTR microRNA \(miRNA\) binding site targets](#). We can construct ORF plasmid clones in any of our more than 250 ready-to-go vector types expressing both SARS-CoV-2 viral proteins as well as host proteins, which you can select using the drop-down menus below.

We also have plasmid clones for the related virus [SARS-CoV](#), which caused the 2002-2004 SARS pandemic.

- + COVID-19 ORF cDNA plasmid clones-viral proteins
- + COVID-19 ORF cDNA plasmid clones-ACE2
- + COVID-19 ORF cDNA plasmid clones-TMPRSS2
- + COVID-19 ORF cDNA plasmid clones-Cyclophilin A
- + COVID-19 ORF cDNA plasmid clones-FKBP1A
- + COVID-19 human host proteins ORF clone library

<< Test kits & RT-qPCR Lentivirus/AAV >>

About Us Products & Services Order Support Resources

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Other GeneCopoeia SARS-CoV-2 related products

ORF clones

COVID-19 Coronavirus Research

https://www.genecopoeia.com/product/covid-19-coro

COVID-19 ORF cDNA plasmid clones-viral proteins

Order ORF cDNA clones expressing SARS-CoV-2 viral proteins

To order ORF cDNA clones expressing SARS-CoV-2 viral proteins in one of out more than 250 non-viral and lentiviral vector types, select the product ID from the table below and contact inquiry@genecopoeia.com.

Product ID	Protein accession	Symbol	Alias	Description
CoV201 (please inquire)	YP_009724389.1	orf1ab	GU280_gp01	orf1ab polyprotein [Severe acute respiratory syndrome coronavirus 2], full-length gene
CoV202	YP_009725297.1	orf1ab	GU280_gp01	leader protein [Severe acute respiratory syndrome coronavirus 2], mature peptide*
CoV203	YP_009725298.1	orf1ab	GU280_gp01	nsp2n [Severe acute respiratory syndrome coronavirus 2], mature peptide*
CoV204	YP_009725299.1	orf1ab	GU280_gp01	nsp3n [Severe acute respiratory syndrome coronavirus 2], mature peptide*
CoV205	YP_009725300.1	orf1ab	GU280_gp01	nsp4n [Severe acute respiratory syndrome coronavirus 2], mature peptide*
CoV206	YP_009725301.1	orf1ab	GU280_gp01	3C-like proteinase [Severe acute respiratory syndrome coronavirus 2], mature peptide*
CoV207	YP_009725302.1	orf1ab	GU280_gp01	nsp6n [Severe acute respiratory syndrome coronavirus 2], mature peptide*
CoV208	YP_009725303.1	orf1ab	GU280_gp01	nsp7n [Severe acute respiratory syndrome coronavirus 2], mature peptide*
CoV209	YP_009725304.1	orf1ab	GU280_gp01	nsp8n [Severe acute respiratory syndrome coronavirus 2], mature peptide*
CoV210	YP_009725305.1	orf1ab	GU280_gp01	nsp9n [Severe acute respiratory syndrome coronavirus 2], mature peptide*
CoV211	YP_009725306.1	orf1ab	GU280_gp01	nsp10n [Severe acute respiratory syndrome coronavirus 2], mature peptide*

Send message

Other GeneCopoeia SARS-CoV-2 related products

ORF clones

The screenshot shows the GeneCopoeia website's COVID-19 research section. The left sidebar contains navigation links: Drug/target screening, Molecular & cell biology, COVID-19 coronavirus research tools, Order & Support, About Us, and Promotions. The main content area features a top navigation bar with tabs: Test kits & RT-qPCR, Plasmids, Lentivirus/AAV, CRISPR/shRNA, Cell lines, and Related products. Below this, a paragraph describes GeneCopoeia's expertise in ORF cDNA clones and plasmids. A section titled 'COVID-19 ORF cDNA plasmid clones-viral proteins' is followed by a sub-section 'COVID-19 ORF cDNA plasmid clones-ACE2'. This section explains that ORF cDNA clones expressing human host proteins that SARS-CoV-2 interacts with, including ACE2, are available. It mentions that more than 250 non-viral and lentiviral vector types are available. A promotional banner states 'View all ACE2 ORF cDNA clones for human, mouse, and rat — Up to 20% OFF*'. Below this are three buttons: 'View all ORF clones for Human ACE2', 'View all ORF clones for Mouse ACE2', and 'View all ORF clones for Rat ACE2'. Another section titled 'Order human ACE2 ORF cDNA clones in popular vector types' includes a yellow callout box stating 'Clones in yellow shading are available for next-day shipping in bacterial stock format.**'. At the bottom, a table lists ORF cDNA plasmid clones expressing human ACE2.

Buy	Catalog#	Vector Type	Promoter	Tag / Reporter / Other Features	Mammalian Selection Markers	Vector Name	List Price	Discount price
<input type="checkbox"/>	EX-U1285-M02-B (Bacterial stock)	Mammalian	CMV	Untagged	Neomycin	pReceiver-M02	\$779	\$386
<input type="checkbox"/>	EX-U1285-M02-10 (10 ug purified plasmid)	Mammalian	CMV	Untagged	Neomycin	pReceiver-M02	\$829	\$431
	EX-U1285-M02-B							

Other GeneCopoeia SARS-CoV-2 related products

ORF clones

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Search (Enter keyword, gene name, accession #, etc.)

Products & Services | Reagents | Applications | Order & Support | About Us | Promotions

GeneHero™ CRISPR Solutions

Clones for knockout & more-starting from \$119

Cas9 cell lines-great for lentiviral CRISPR, library screening

NEW! CRISPRa/CRISPRi lines for gene activation or repression

ORF cDNA clones | CRISPR / TALEN | Lentivirus | AAV | Promoter clones | qPCR primers | shRNA clones | miRNA products | miRNA target clones | TALE-TE | ORF knockin clones

Select ORF Clones - which contains only the protein-coding open reading frame, without its natural 5' and 3' UTR

Product ID: U1285 (click here to view gene annotation page)
Symbol: ACE2
Accession: NM_021804.2
ORF Length: 2418 bp
Alias: ACEH
Description: Homo sapiens angiotensin I converting enzyme 2 (ACE2), mRNA.
Delivery format: purified plasmid or bacterial stock (Add to shopping cart to view options)
Warning: Please note that the protein for this clone has been annotated or predicted in the UNIPROT database to have a signal peptide. Placing a tag at the N-terminus of this protein may result in loss of the signal peptide function.

More info ...

Add clones to shopping cart to view shipping formats, prices and proceed with order

Add to cart to view price

Reset

show 50 entries

starting from \$63 for selected genes (US And Canada Only)

Search:

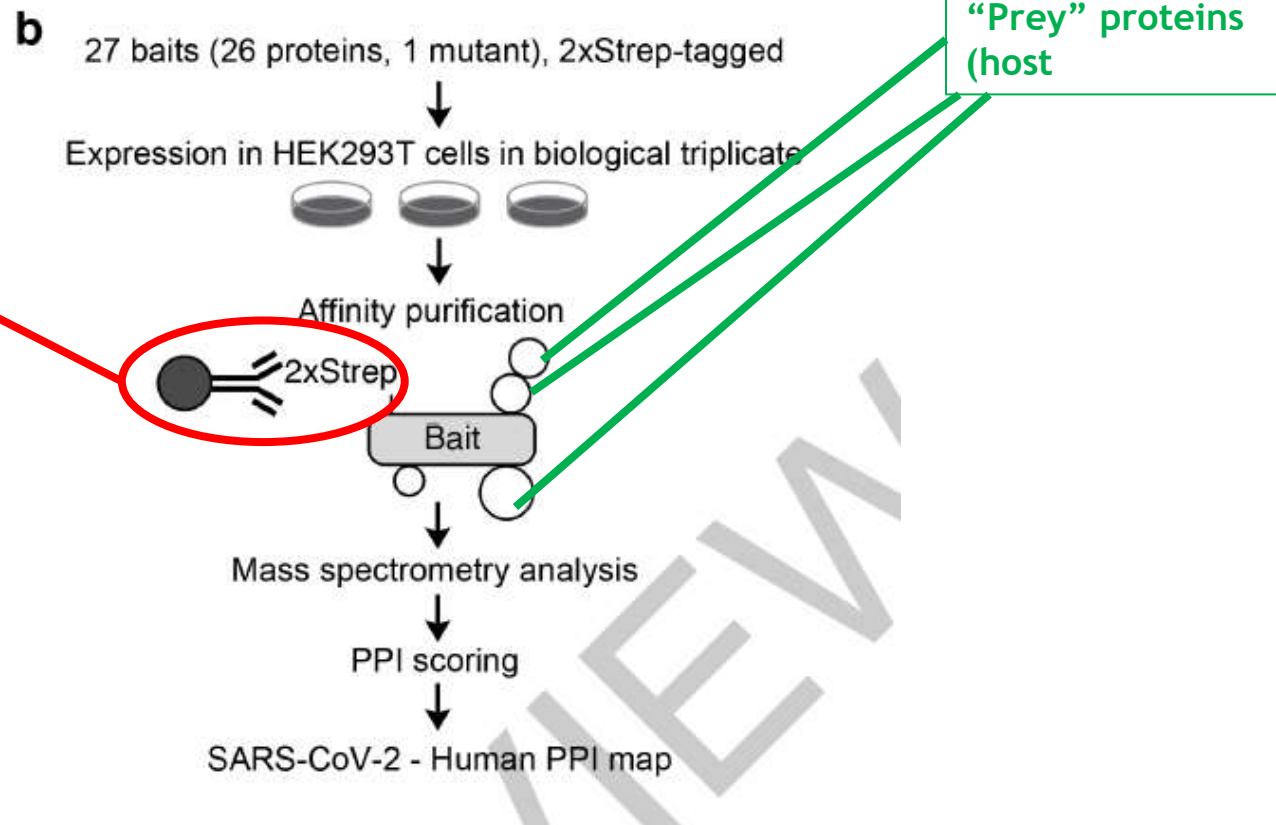
Vector Type:	Buy	Catalog#	Vector Type	Promoter	Tag / Reporter / Other Features	Mammalian Selection Markers	Vector Name	Price
<input type="checkbox"/> Mammalian	<input type="checkbox"/>	EX-U1285-102	Mammalian	CMV	Untagged	Neomycin	pReceiv-U102	\$429
<input type="checkbox"/> Lentiviral	<input type="checkbox"/>	EX-U1285-LV105	Lentiviral	CMV	Untagged	Puromycin	pReceiv-LV105	\$479
<input type="checkbox"/> Gateway	<input type="checkbox"/>	GC-U1285	Gateway/ PLUS shuttle	-	Untagged	-	pShuttle™	\$479
<input type="checkbox"/> Bacterial	<input type="checkbox"/>	EX-U1285-109	Mammalian	CMV	C-eGFP(monomeric)	Neomycin	pReceiv-U109	\$429
<input type="checkbox"/> Yeast								
<input type="checkbox"/> Insect Cell								

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Gordon, et al. interaction screen

Affinity purification-mass spectrometry (AP-MS)

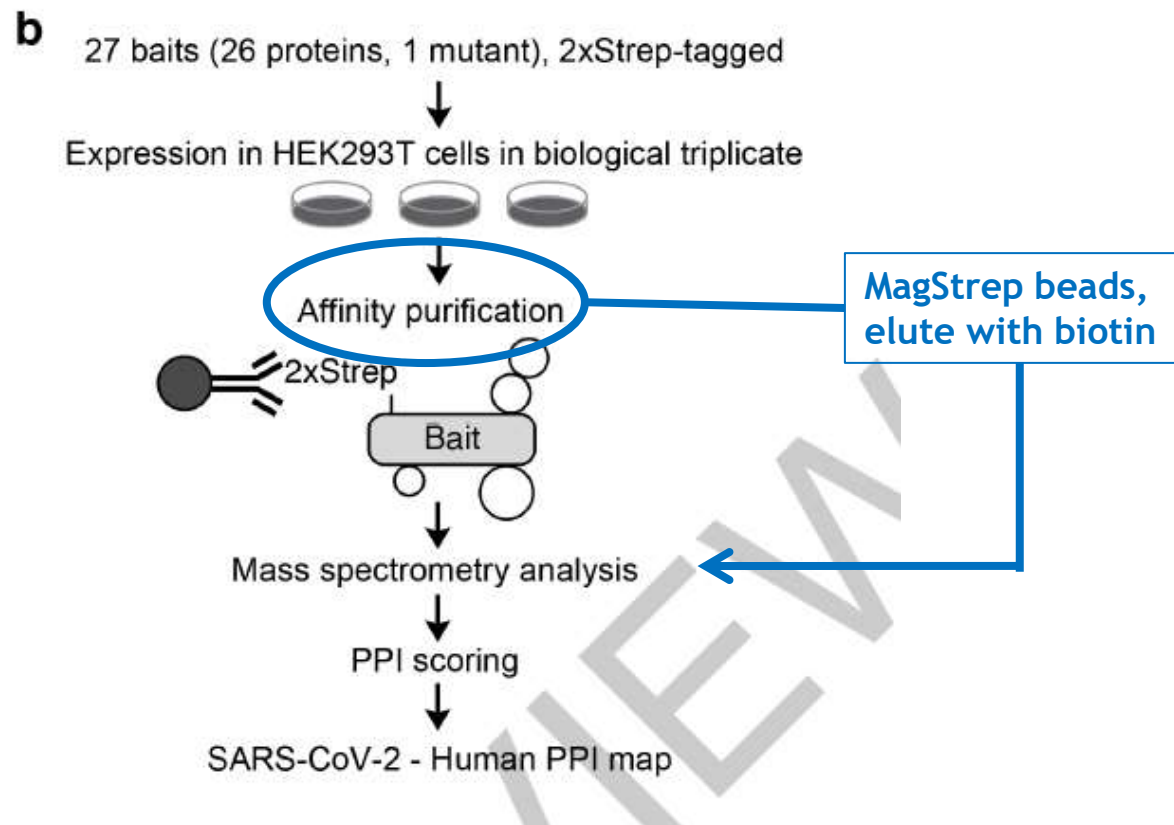


Bait proteins (27 viral proteins)

“Prey” proteins (host)

Gordon, et al. interaction screen

Affinity purification-mass spectrometry (AP-MS)



332 interacting proteins identified

Caveats

- ❖ Possible false positives. Because this is an artificial system, it's possible that some, most, or even all of the reported interactions are not biologically relevant
- ❖ Possible false negatives. 2 host proteins of note, ACE2 and TMPRSS2, were not identified in the screen. TMPRSS2 is an enzyme, so it might not physically interact despite its essential role in viral pathogenesis.

Repurposing of drugs for antiviral use

Search 2 pharmacological sources for ligands of host proteins

- ❖ IUPHAR/BPS Guide to Pharmacology (2020-3-12) and ChEMBL25 databases
- ❖ 16 drugs previously approved for other uses.
- ❖ 3 “investigational new drugs” (“A substance that has been tested in the laboratory and has been approved by the U.S. Food and Drug Administration (FDA) for testing in people”-NCI)
- ❖ 18 “pre-clinical candidates”.

Repurposing of drugs for antiviral use

Search 2 pharmacological sources for ligands of host proteins

- ❖ Literature searches

- ❖ 13 drugs previously approved for other uses.
- ❖ 9 “investigational new drugs”
- ❖ 10 “pre-clinical candidates”.
- ❖ 69 total drugs targeting 66 human proteins.

Implications

- ❖ Repurposing of existing or development of new antiviral drugs that act on host proteins instead of viral proteins. Drug resistance is less likely to be caused by genetic drift for host-directed drugs than for virus-directed drugs.
- ❖ Basic research to learn more about virus life cycle and biology.

Why focus on antiviral drugs?

- ❖ The ultimate way to eradicate a disease-causing virus is through a fully-effective vaccine.
- ❖ However, there is no guarantee that we will ever have, or soon have, a SARS-CoV-2 vaccine:
 - ❖ There are examples of viruses for which a vaccine has never been developed, despite decades of effort (HIV, EBV, RSV). A vaccine for Zika was developed in 2019, but has only been tested on macaques.
 - ❖ There has never been a vaccine against any coronaviruses shown to work in humans. 4 coronaviruses cause common colds, so there is less incentive to create vaccines, even though common colds cause workplace disruptions with people getting sick.
 - ❖ Vaccines were developed against SARS (2002-2004) and MERS (2012-), which are also caused by coronaviruses. These were tested in mice and shown to produce antibodies, but were never tested in humans because the groups studying them were unable to get funding. SARS is not currently active, MERS still is, although the number of known cases is only about 2,500 globally after 8 years.



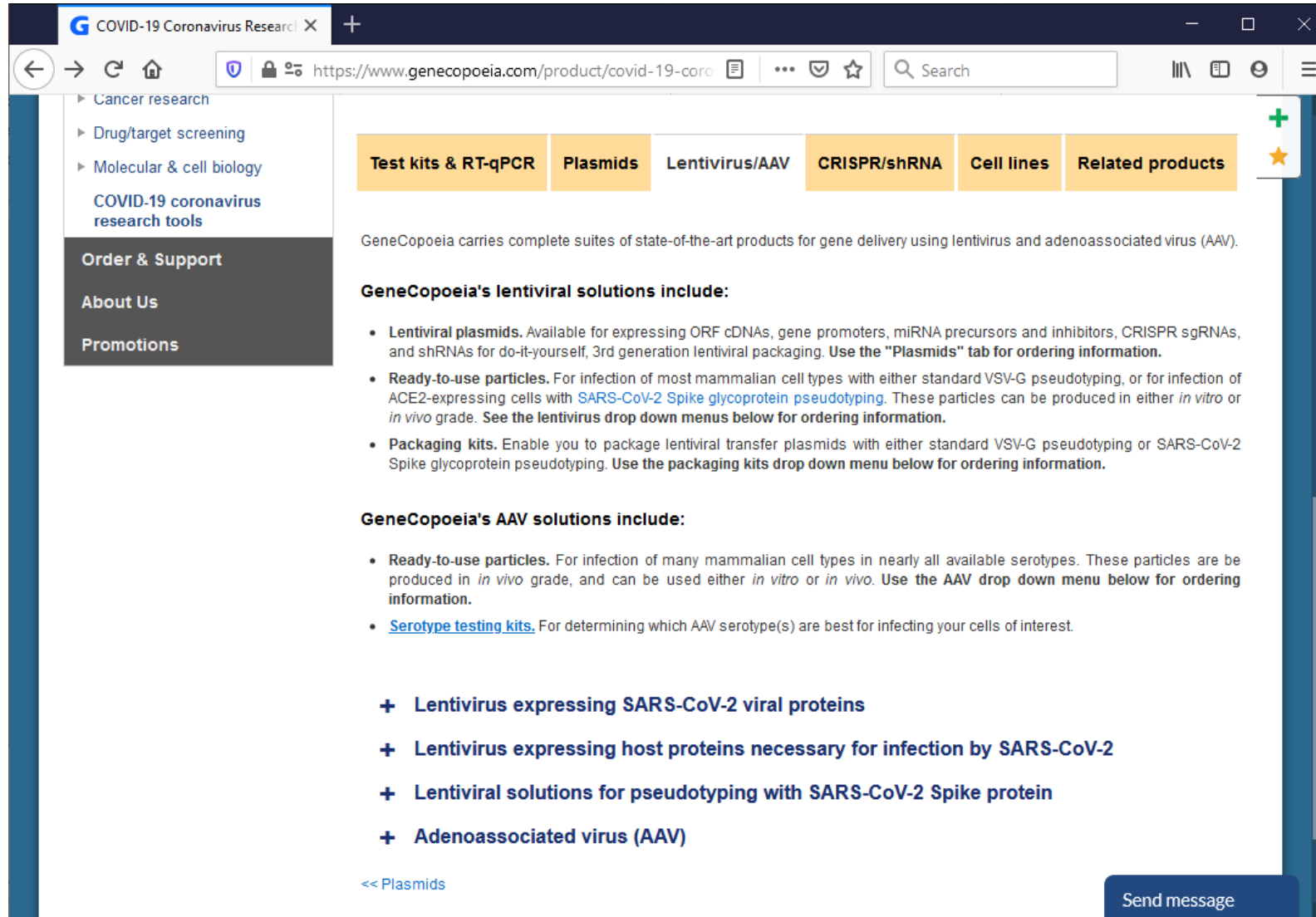
Why focus on antiviral drugs?

- ❖ Therefore:

- ❖ The earliest we will have a mass-produced vaccine will be 2021. So effective antiviral drugs, such as Remdesivir, could fill that gap.
- ❖ It is possible that we will never get a fully-effective vaccine, or even any vaccine, so effective antiviral drugs might be one of two treatment options or the only treatment option.

Other GeneCopoeia SARS-CoV-2 related products

Lentivirus & AAV



The screenshot shows a web browser window with the GeneCopoeia website. The address bar shows the URL: <https://www.genecopoeia.com/product/covid-19-coronavirus-research-tools>. The left sidebar contains a navigation menu with the following items: Cancer research, Drug/target screening, Molecular & cell biology, COVID-19 coronavirus research tools (highlighted), Order & Support, About Us, and Promotions. The main content area has a horizontal navigation bar with tabs: Test kits & RT-qPCR, Plasmids, Lentivirus/AAV (selected), CRISPR/shRNA, Cell lines, and Related products. Below the tabs, the text reads: "GeneCopoeia carries complete suites of state-of-the-art products for gene delivery using lentivirus and adenoassociated virus (AAV)."

GeneCopoeia's lentiviral solutions include:

- **Lentiviral plasmids.** Available for expressing ORF cDNAs, gene promoters, miRNA precursors and inhibitors, CRISPR sgRNAs, and shRNAs for do-it-yourself, 3rd generation lentiviral packaging. **Use the "Plasmids" tab for ordering information.**
- **Ready-to-use particles.** For infection of most mammalian cell types with either standard VSV-G pseudotyping, or for infection of ACE2-expressing cells with [SARS-CoV-2 Spike glycoprotein pseudotyping](#). These particles can be produced in either *in vitro* or *in vivo* grade. **See the lentivirus drop down menus below for ordering information.**
- **Packaging kits.** Enable you to package lentiviral transfer plasmids with either standard VSV-G pseudotyping or SARS-CoV-2 Spike glycoprotein pseudotyping. **Use the packaging kits drop down menu below for ordering information.**

GeneCopoeia's AAV solutions include:

- **Ready-to-use particles.** For infection of many mammalian cell types in nearly all available serotypes. These particles are produced in *in vivo* grade, and can be used either *in vitro* or *in vivo*. **Use the AAV drop down menu below for ordering information.**
- [Serotype testing kits.](#) For determining which AAV serotype(s) are best for infecting your cells of interest.

+ Lentivirus expressing SARS-CoV-2 viral proteins

+ Lentivirus expressing host proteins necessary for infection by SARS-CoV-2

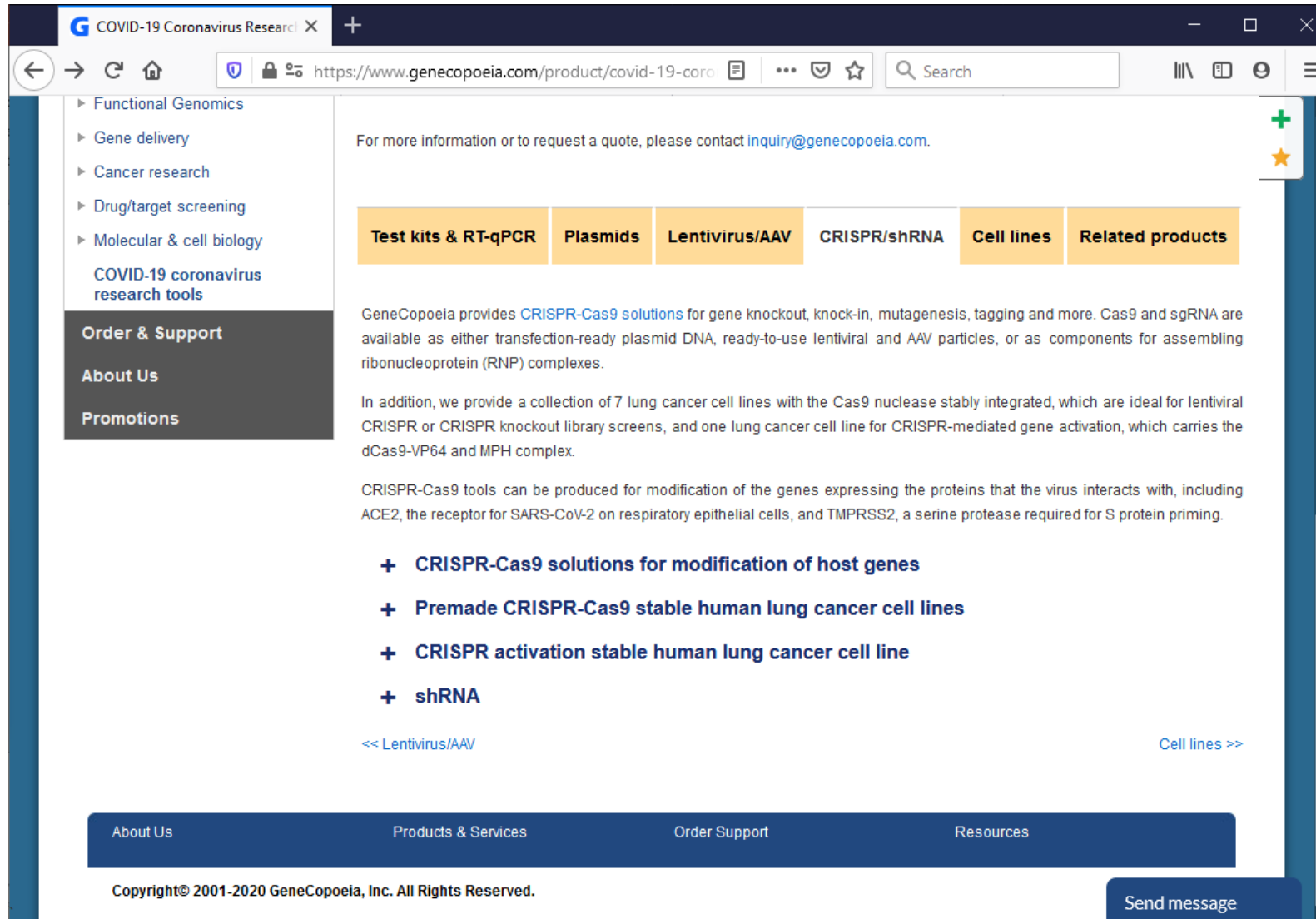
+ Lentiviral solutions for pseudotyping with SARS-CoV-2 Spike protein

+ Adenoassociated virus (AAV)

At the bottom left, there is a link: << Plasmids. At the bottom right, there is a button: Send message.

Other GeneCopoeia SARS-CoV-2 related products

CRISPR & shRNA



The screenshot shows the GeneCopoeia website's product page for CRISPR and shRNA. The browser address bar shows the URL <https://www.genecopoeia.com/product/covid-19-coronavirus-research-tools>. The left sidebar contains navigation links: Functional Genomics, Gene delivery, Cancer research, Drug/target screening, Molecular & cell biology, COVID-19 coronavirus research tools, Order & Support, About Us, and Promotions. The main content area features a navigation bar with links: Test kits & RT-qPCR, Plasmids, Lentivirus/AAV, CRISPR/shRNA, Cell lines, and Related products. The CRISPR/shRNA section is active, displaying text about CRISPR-Cas9 solutions and a list of products. The footer includes links for About Us, Products & Services, Order Support, and Resources, along with a copyright notice and a 'Send message' button.

COVID-19 Coronavirus Research

For more information or to request a quote, please contact inquiry@genecopoeia.com.

Test kits & RT-qPCR **Plasmids** **Lentivirus/AAV** **CRISPR/shRNA** **Cell lines** **Related products**

GeneCopoeia provides [CRISPR-Cas9 solutions](#) for gene knockout, knock-in, mutagenesis, tagging and more. Cas9 and sgRNA are available as either transfection-ready plasmid DNA, ready-to-use lentiviral and AAV particles, or as components for assembling ribonucleoprotein (RNP) complexes.

In addition, we provide a collection of 7 lung cancer cell lines with the Cas9 nuclease stably integrated, which are ideal for lentiviral CRISPR or CRISPR knockout library screens, and one lung cancer cell line for CRISPR-mediated gene activation, which carries the dCas9-VP64 and MPH complex.

CRISPR-Cas9 tools can be produced for modification of the genes expressing the proteins that the virus interacts with, including ACE2, the receptor for SARS-CoV-2 on respiratory epithelial cells, and TMPRSS2, a serine protease required for S protein priming.

- + **CRISPR-Cas9 solutions for modification of host genes**
- + **Premade CRISPR-Cas9 stable human lung cancer cell lines**
- + **CRISPR activation stable human lung cancer cell line**
- + **shRNA**

[<< Lentivirus/AAV](#) [Cell lines >>](#)

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Other GeneCopoeia SARS-CoV-2 related products

Stable cell lines

The screenshot shows a web browser window with the URL <https://www.genecopoeia.com/product/covid-19-coro>. The page features a dark blue sidebar on the left with navigation links: "COVID-19 coronavirus research tools", "Reagents", "Applications" (with sub-links for Functional Genomics, Gene delivery, Cancer research, Drug/target screening, and Molecular & cell biology), "COVID-19 coronavirus research tools", "Order & Support", "About Us", and "Promotions". The main content area has a header with "CRISPR solutions" and "And more!". Below this is a red banner for a "NEW product! SARS-CoV-2 Spike protein-pseudotyped lentivirus". A paragraph follows, stating: "For more information or to request a quote, please contact inquiry@genecopoeia.com." A horizontal navigation bar contains tabs: "Test kits & RT-qPCR", "Plasmids", "Lentivirus/AAV", "CRISPR/shRNA", "Cell lines", and "Related products". The "Cell lines" tab is active. The text below the tabs reads: "GeneCopoeia carries collections of cell lines expressing human host factors needed for SARS-CoV-2 infection, as well as labeled cancer cell lines, which include 5 lung cancer cell line derivatives. The labeled lung cancer cell lines carry stable integration of either a combination of Firefly luciferase and GFP together, or GFP alone, and are great for drug target identification and compound screening either *in vitro* or *in vivo*." This is followed by: "You can get more information and order these cell lines using the drop-down menus below." Two expandable sections are listed: "+ Cell lines expressing human host factors for SARS-CoV-2" and "+ Labeled stable lung cancer cell lines". Navigation links "<< CRISPR/shRNA" and "Related products >>" are at the bottom of the main content area. The footer includes a dark blue bar with links: "About Us", "Products & Services", "Order Support", and "Resources". Below this is the copyright notice: "Copyright© 2001-2020 GeneCopoeia, Inc. All Rights Reserved." and a "Send message" button. The GeneCopoeia logo with the tagline "Expressway to Discovery" is in the bottom right corner.

COVID-19 coronavirus research tools

Reagents

Applications

- Functional Genomics
- Gene delivery
- Cancer research
- Drug/target screening
- Molecular & cell biology

COVID-19 coronavirus research tools

Order & Support

About Us

Promotions

- CRISPR solutions
- And more!

NEW product! SARS-CoV-2 Spike protein-pseudotyped lentivirus

For more information or to request a quote, please contact inquiry@genecopoeia.com.

Test kits & RT-qPCR | Plasmids | Lentivirus/AAV | CRISPR/shRNA | **Cell lines** | Related products

GeneCopoeia carries collections of cell lines expressing human host factors needed for SARS-CoV-2 infection, as well as labeled cancer cell lines, which include 5 lung cancer cell line derivatives. The labeled lung cancer cell lines carry stable integration of either a combination of Firefly luciferase and GFP together, or GFP alone, and are great for drug target identification and compound screening either *in vitro* or *in vivo*.

You can get more information and order these cell lines using the drop-down menus below.

- + Cell lines expressing human host factors for SARS-CoV-2
- + Labeled stable lung cancer cell lines

<< CRISPR/shRNA | Related products >>

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Thank You!

If you have any additional
questions, please call

1-301-762-0888 x227

Email: edavis@genecopoeia.com

Or visit us on the web:

www.genecopoeia.com

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