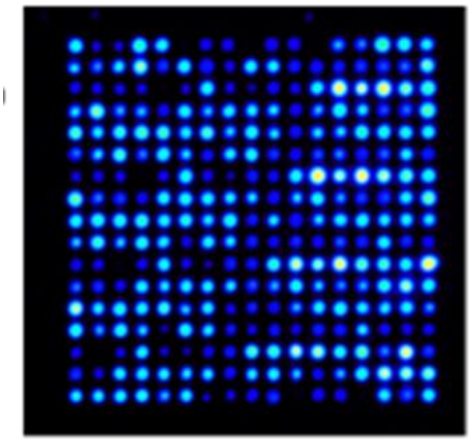
SARS-CoV-2 (COVID-19) Antigen Microarray



Product Information

The CoVAM contains a total of 67 antigens from all seven known coronaviruses including SARS-CoV-2 (8 antigens), as well as SARS-1, MERS, and the 4 seasonal human coronavirus strains (Table 1), printed onto nitrocellulose-coated slides along with several types of adenovirus, RSV, MPV, parainfluenza and Influenza viruses. The test can reveal IgG and IgA seroreactivities to different viruses (*Khan S. et al., bioRxiv, 2020*). This assay may be useful to determine the seroprevalence of SARS-CoV-2 and shed light into possible vaccine targets.

Virus	Subtypes	Antigens	Replicates	Spots
Coronavirus	HKU1, OC43, NL63, 229E	12	4	48
	MERS	9	4	36
	SARS	5	4	20
	2019-nCoV	7	4	28
Total		**33**		**132**
RSV	A, B	8	4	32
Metapneumovirus	A, B	3	4	12
Parainfluenza	1, 3, 4	5	4	20
Adenovirus	3, 4, 7	6	4	24
Influenza	H1N1, H3N2, H5N1, H7N9, B(Yam), B(Vic)	12	4	48
Total		**34**		**136**

Table 1. List of 274 viral antigens printed on CoVAM array including 67 antigens from known Coronaviruses, with 8 antigens specific to SARS-CoV-2 (*Khan S. et al., bioRxiv, 2020*).

Steps for printing, sample probing, imaging and analysis of data from the CoVAM is illustrated in Figure 1 (*Khan S. et al., bioRxiv, 2020*). The CoVAM has many advantages, including the ability to simultaneously detect both IgG (indicative of past infections), and IgA (reflects acute infections) against all of these antigens from less than 100 microliters of blood collected by fingerstick in a capillary tube. Using the CoVAM, a single operator can perform 1000 tests per week.

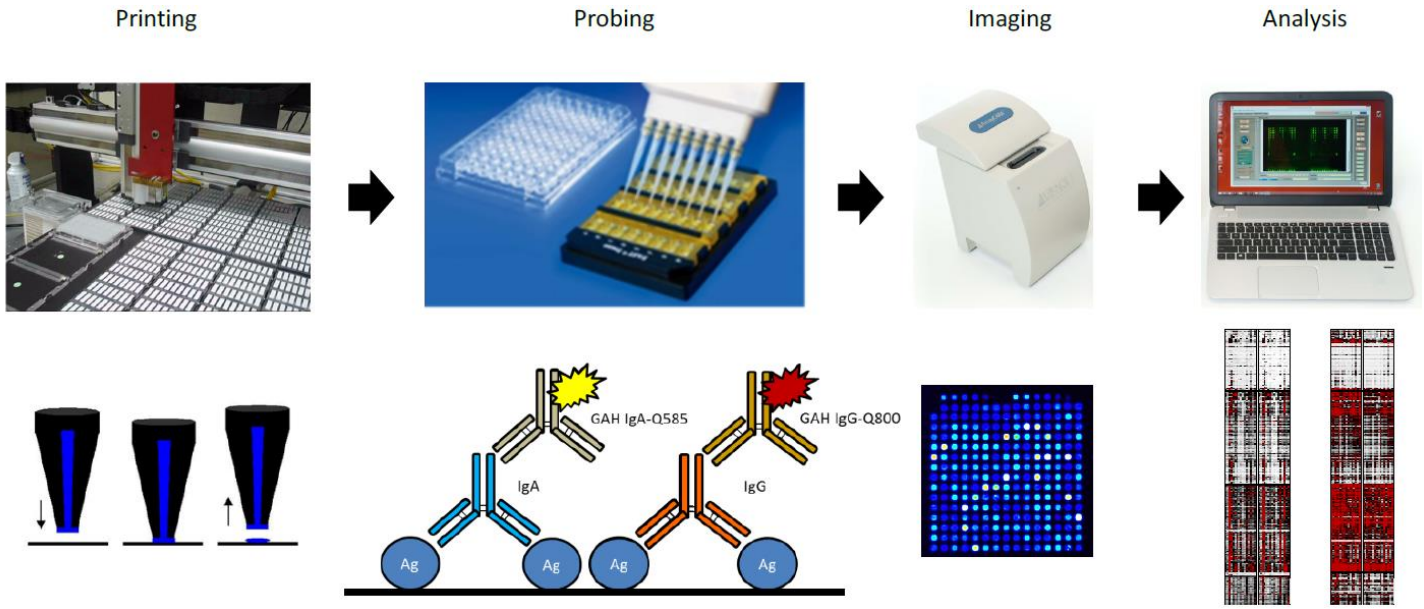


Figure 1. Schematic diagram illustrating the steps for printing, sample probing, array imaging and analysis of data from the CoVAM (*Khan S. et al., bioRxiv, 2020*).

Background

In 2019, a novel Corona Virus referred to as SARS-CoV-2 was identified in Wuhan China. SARS-CoV-2 causes COVID-19, which is a Severe Acute Respiratory Syndrome (SARS) with wide-ranging symptoms including pneumonia, fever, dry cough, headache, chills, fatigue, and myalgia. According to ongoing data collected by John Hopkins University, to date, SARS-CoV-2 has precipitated a global pandemic and has infected over 1.7 million people globally leading to over 100,000 deaths with the United States alone accounting for more than 500,000 cases and over 18,000 deaths.

Everything we need to know about SARS-CoV-2 is predicated on knowing the true denominator of the number of people that have been infected and their immunologic state after that exposure. The true mortality rate, the capacity to create an effective vaccine and the percentage of the population that may be immune due to a symptom-free infection are all critically dependent on understanding this number.

To answer this critical questions, Nanommune has leveraged its vast expertise in the area of pathogen-specific proteomics in close collaboration with Sino Biological Inc to develop a serological testing method based on a coronavirus antigen microarray (CoVAM) that effectively captures the adaptive antibody responses to

symptomatic and asymptomatic SARS-CoV-2 infections. The CoVAM contains a total of 67 antigens from all seven known coronaviruses including SARS-CoV-2 (8 antigens), as well as SARS-1, MERS, and the 4 seasonal human coronavirus strains (Table 1), printed onto nitrocellulose-coated slides along with several types of adenovirus, RSV, MPV, parainfluenza and Influenza viruses. The test can reveal IgG and IgA seroreactivities to different viruses (*Khan S. et al., bioRxiv, 2020*). This assay may be useful to determine the seroprevalence of SARS-CoV-2 and shed light into possible vaccine targets

The CoVAM has been validated using 5 sera samples from a naïve population. The results demonstrate overall low IgG reactivity in this naïve population for antigens from SARS-CoV-2, SARS, and MERS, with high IgG reactivity for common human coronaviruses and other respiratory viruses known to circulate seasonally (Figure 2)

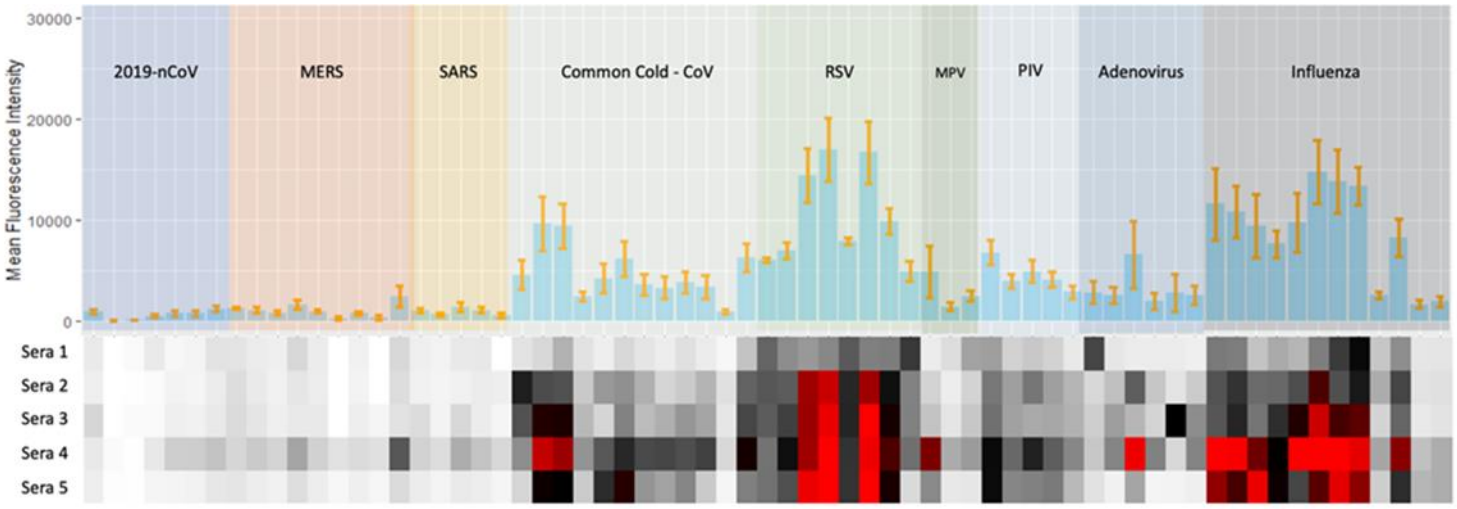


Figure 2. Serum IgG antibody responses from 5 naïve individuals on the CoVAM (*Khan S. et al., bioRxiv, 2020*).

The CoVAM was further validated using blood from 8 patients with PCR-confirmed infection and blood from 136 uninfected patients collected before the pandemic (Figure 3). To date, the array has not had a false-negative or false-positive result. More importantly, unlike other serologic methods, the CoVAM can distinguish SARS-CoV-2 strain-specific antibodies from cross-reactive antibodies due to infection with other coronaviruses (Figure 3) (*de Assis R. et al., bioRxiv, 2020*).

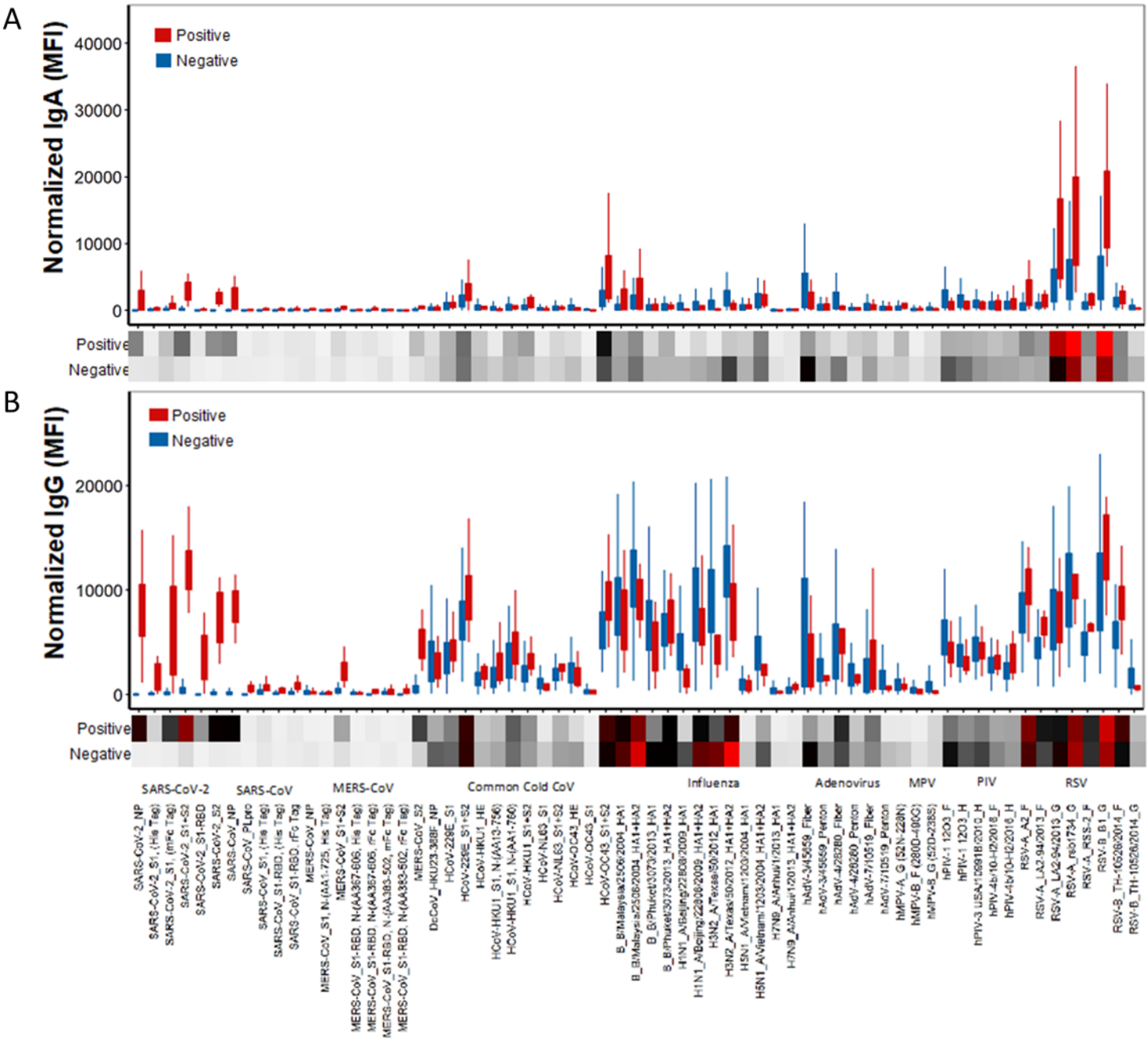


Figure 3. Probing of the CoVAM with sera from 8 COVID-19 positive and 136 naïve individuals. 3A. Serum IgA antibody reactivities of COVID-19 positive and negative individuals. 3B. Serum IgG antibody responses from COVID-19 positive and negative individuals. (*de Assis R. et al., bioRxiv, 2020*).