Does Thermo Fisher Scientific have an immunoassay plate that is optimized for research on SARS-CoV-2 testing?

Yes, at Thermo Fisher, we have advanced immunoassay surface technologies to fit specific needs in your research on SARS-CoV-2 testing. These include passive binding surfaces for biomacromolecules, covalent coupling surfaces for smaller biomolecules, and affinity capture surfaces for affinity-tagged biomolecules (e.g., biotin) (Figure 1). In order to obtain accurate, reproducible, and sensitive results, it is essential that the appropriate surface be chosen and the assay conditions optimized. Our immunoassay studies with the SARS-CoV-2 spike protein showed that the Thermo Scientific™ MultiSorp™ surface had the highest sensitivity of all plates tested.

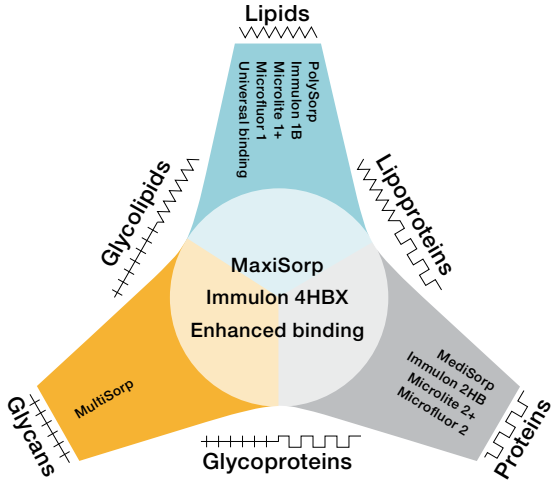

Figure 1. Types of biomacromolecules that can be bound to available modified surfaces for passive binding. Based on the physicochemical characteristics of the biomolecule to be immobilized, a surface can be chosen that is appropriate for robust binding. As indicated in the schematic, the MaxiSorp surface has the greatest breadth of application, as it is capable of binding the widest range of molecules.

Study design

We performed a study to determine which immunoassay plate surface has the highest sensitivity for detecting SARS-CoV-2. For this study, an ACE2-mFc receptor (a human ACE2 protein with a murine Fc tag at its carboxy terminus) was chosen to target the SARS-CoV-2 spike protein and was bound to Thermo Scientific™ Nunc™ Clear Flat-Bottom Immuno Nonsterile 96-Well Plates with Thermo Scientific™ PolySorp™, MediSorp™, MaxiSorp™, and MultiSorp surfaces, as well as to the medium- and high-binding plates of two other comparable suppliers (Table 1 and Figure 2).

One plate per surface type was tested, with 4 wells per plate. One measurement was taken from each well for a total of 8 measurements per surface type. The measurements taken were of actual optical density (n = 4) and background measurement per surface type (n = 4). To determine the sensitivity of the assay, optical densities measured in each well were averaged. Average background measurements for each set of wells were subtracted from the averaged raw optical density data. Single-factor ANOVA was performed for each group of plates, followed by t-tests to determine if there were statistical differences between plates.

Table 1. Immunoassay plates analyzed in this study.

	Product	Cat. No.	Surface characteristics
Nunc plates	PolySorp surface	475094	Hydrophobic
	MediSorp surface	467320	Slightly hydrophilic
	MaxiSorp surface	439454	Hydrophilic
	MultiSorp surface	467340	Very hydrophilic
Supplier A plates	A-medium	–	Medium binding
	A-high	–	High binding
Supplier B plates	B-medium	–	Medium binding
	B-high	–	High binding

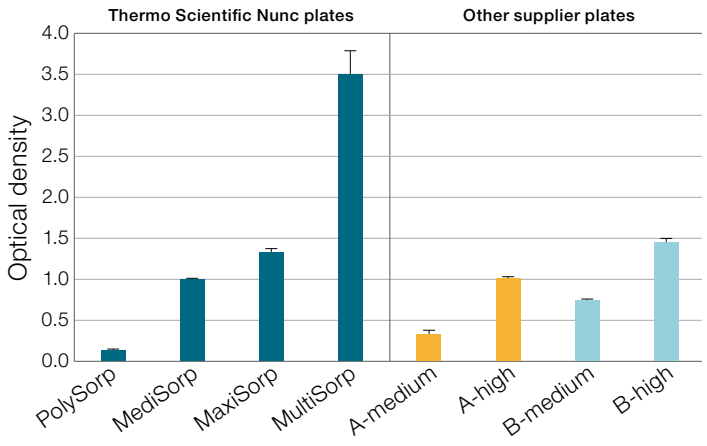

Figure 2. SARS-CoV-2 spike protein binding results for Nunc plates and plates from two other suppliers.

A calibration curve was constructed (Figure 3) using the MaxiSorp plate as a model (n = 4 wells per concentration), in order to extrapolate (for other surface types) theoretical amounts of SARS-CoV-2 spike protein bound to the ACE2-mFc receptor.

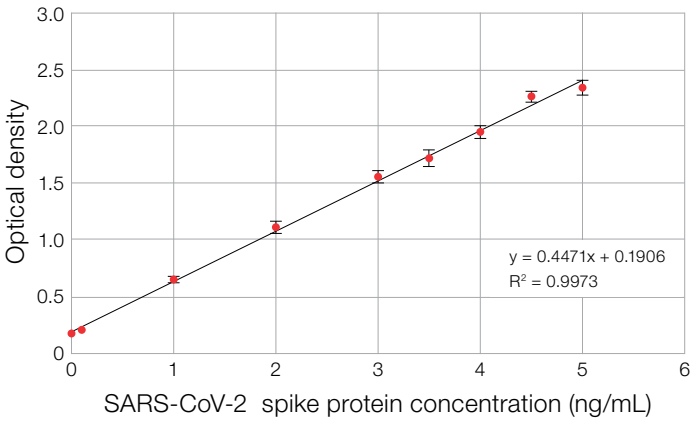

Figure 3. Calibration curve for SARS-CoV-2 spike protein binding to a MaxiSorp plate coated with ACE2-mFc receptor. Data points are averages of 4 wells per concentration. Error bars represent one standard deviation.

Results

The MultiSorp surface yielded the highest optical density ($p < 0.05$) in this study, which indicates that for the ACE2-mFc receptor, it was the most sensitive surface (Figure 2). This plate bound a significantly greater amount of ACE2-mFc, and thus more SARS-CoV-2 spike protein, when compared with the other plates analyzed. The binding performance of the Nunc MaxiSorp plates and the high-binding plates of supplier B was equivalent based on statistical analysis, and they outperformed both plate types of supplier A. Still, they bound a significantly lower amount of ACE2-mFc than the Nunc MultiSorp plates.

How much protein did each plate surface bind?

A calibration curve constructed using the MaxiSorp plate as a model (Figure 3) indicates that the MultiSorp plate surface bound approximately 3 times as much protein as the MaxiSorp plate surface in this particular assay (Table 2).

Table 2. Theoretical amounts of SARS-CoV-2 protein bound to each type of plate (n = 4).

	Theoretical mean protein concentration (ng/mL)	Standard deviation
PolySorp surface	0.0	0.4
MediSorp surface	1.8	0.4
MaxiSorp surface	2.5	0.3
MultiSorp surface	7.4	0.2
A-medium	0.3	0.3
A-high	1.8	0.4
B-medium	1.2	0.4
B-high	2.8	0.3

Conclusions

This study demonstrated that the MultiSorp surface had the highest amount of binding of the ACE2-mFc receptor, which suggests that plates with this surface are likely to yield greater sensitivity and may also deliver a greater dynamic range for this assay than plates with lower binding affinities.

Choosing the appropriate plate for a specific immunoassay is a crucial step in optimizing assay performance, and in obtaining the best results possible. We recommend testing multiple plate surfaces and assay conditions with the biomolecular components that will be utilized in the assay.

With more than 30 years of industry-leading experience in immunoassay plate technology, and a broad range of surfaces and formats to optimize your assay, we can work to fill your specific needs. Refer to our **plate guide brochure**. For guidance on the optimal immunoassay plate for your application, please use our **online plate selection tool**. Lastly, Thermo Fisher Scientific can meet any of your **SARS-CoV-2 research needs**. Please visit our online tools.

Learn more at **thermofisher.com/diagnosticplates**