AACC2023 A-235

Results and Interpretation: Serology Testing Platforms and Assays Compatibility Assessment for MAS™ SARS-CoV-2 IgG Quality Controls

Hui Wang, Darren Crandall, Narayan Krishnaswami, Ran Hu. Clinical Diagnostic Division, Thermo Fisher Scientific, Fremont, CA, USA, 94538

Abstract

Background: Since the beginning of 2020, many individuals witnessed the COVID-19 pandemic in some cases at close quarters with dire consequences. The early exposure to the virus and the immune response by the host has contributed to our understanding of the SARS-CoV-2 virus. Serology testing of antibodies against SARS-CoV-2 viruses serves many purposes: disease diagnosis, on-going and surveillance, epidemiologic and vaccine studies, etc. There was a critical need to provide standardized quality control materials for development and harmonization across different test methods and IVD platforms.

The MAS™ SARS-CoV-2 IgG Controls are human plasma-based quality controls with or without IgG antibodies against SARS-CoV-2. The control offers commutability by mimicking patient samples and is intended to be used for monitoring serological assays, providing confidence in routine test results, test methods troubleshooting and system errors identification. We report here the compatibility assessment of MAS™ SARS-CoV-2 Controls testing on different assays and platforms.

Methods: The platforms and assays compatibility was assessed for the MAS™ SARS-CoV-2 IgG Positive and Negative Controls across all 12 assays and platforms listed as below. These serology assays target either total antibodies (IgA, IgM, IgG), IgM/IgG, or IgG against either the SARS-CoV-2 nucleocapsid (N), RBD or spike (S) proteins. Replicated samples were tested for statistical confidence.

Manufacture/Platform	Assay Description	MAS™ SARS-CoV-2 IgG Positive Control	MAS™ SARS-CoV-2 Negative Control
Abbott™ ARCHITECT™ ci8200	SARS-CoV-2 IgG	Assess the assay and platform compatibility: Divide the number of positive test results by the sum of true positives and false negatives.	Assess the assay and platform compatibility: Divide the number of negative test results by the sum of true negatives and false positives.
Abbott™ ARCHITECT™ ci8200	AdviseDx SARS-CoV-2 IgG II		
Abbott™ ARCHITECT™ ci8200	AdviseDx SARS-CoV-2 IgM		
Roche™ cobas® E601	Elecsys Anti-SARS-CoV-2		
Ortho™ VITROS® ECiQ	Anti-SARS-CoV-2 Total		
Ortho™ VITROS® ECiQ	Anti-SARS-CoV-2 IgG		
Abbott™ ALINITY® Ci-Series	SARS-CoV-2 IgG		
Beckman Coulter™ Access 2® System	Access SARS-CoV-2 IgG		
bioMérieux™ VIDAS®	Anti-SARS-CoV-2 IgG		
Diasorin™ Liaison®	SARS COV 2 TrimericS IgG		
Siemens™ ADVIA™ Centaur	SARS-CoV-2 Total		
Siemens™ Atellica™ IM	SARS-CoV-2 Total		

Results: All results demonstrated conclusively the comparable performance of MAS™ SARS-CoV-2 IgG controls across different clinical diagnostic assays and platforms manufactured by Abbott, Roche, Ortho, DiaSorin, Beckman Coulter and bioMérieux. The positive control showed 100% expected reactive results (IgG Positive) and Negative control at 82% non-reactive results, respectively. Furthermore, both controls were compatible when tested on assays detecting IgG antibodies targeting specific regions (N, S or RBD).

Conclusions: SARS-CoV-2 serology testing remains unstandardized with numerous assays and platforms. MAS™ SARS-CoV-2 IgG Positive and Negative Controls were developed as external quality controls for monitoring the SARS-CoV-2 diagnostics assay performance in clinical laboratories. While tested on multiple commonly used assays and platforms, MAS™ SARS-CoV-2 IgG Positive and Negative Controls were found to be platform agnostic.

MAS™ Controls will contribute to the harmonization of the SARS-CoV-2 Serology assay offerings, monitor the clinical laboratory analytical performance, streamline the workflow on test method development, validation and verification, and routine assessment.

Introduction

The MAS™ SARS-CoV-2 Controls are ready to use liquid format products manufactured using naturally occurring material in plasma that closely mimics real patient sample. The MAS™ SARS-CoV-2 Controls are designed to be used as unbiased independent quality controls to monitor serological assay performance for diagnosis of COVID-19 disease, in terms of test variation, reagent lot consistency, system error and operator variation. In this study, the controls were tested to evaluate their compatibility to different automated bioanalyzers, immunoassay platforms and manual immunoassay methods. The results of this study demonstrate the MAS™ SARS-CoV-2 Controls are platform agnostic to the tested assays and platforms and can be used as reliable third-party control in COVID-19 disease diagnosis test.

Methods/Materials

The controls were tested across 12 different assays from each platforms with 9 samples on each assays. The product information are described as below.

Product Description	Analyte	Catalog Number	Fill Volume	Quantity per Kit
Thermo Scientific™ MAS™ SARS-CoV-2 IgG Positive Control Kit	SARS -CoV-2 IgG	10028305	3 mL	5 vials per Kit
Thermo Scientific™ MAS™ SARS-CoV-2 Negative Control Kit	Negative	10028306	3 mL	5 vials per Kit

Table 1: MAS™ SARS-CoV-2 Controls

Results

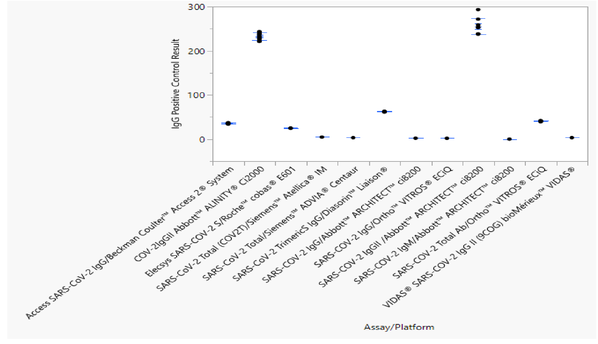

Figure 1: Numeric Results and Interpretation of MAS™ SARS-CoV-2 IgG Positive Control by assays/platforms. The six lower numbers (<5) are from assays reporting by index value. And the higher numbers (>5) are from assays reporting arbitrary unit. The units for each assay/platform are different and provided in Table 2.

Assay/Platform	Positive/Reactive Cutoff	Mean	Lower 95%	Upper 95%	Interpretation
SARS-CoV-2 IgG/Beckman Coulter™ Access 2® System	≥ 30.0 U/mL	35.96	34.90	37.01	Reactive
AdviseDx SARS-CoV-2 IgG II/Abbott™ ALINITY® ci2000	≥ 50.0 AU/mL	232.74	226.39	239.10	Positive
Elecsys SARS-COV-2 S/Roche™ cobas® E601	≥ 0.80 U/mL	24.90	24.68	25.12	Positive
SARS-CoV-2 Total (COV2T)/Siemens™ Atellica® IM	≥ 1.00 Index	4.89	4.77	5.01	Reactive
SARS-CoV-2 Total/Siemens™ ADVIA® Centaur®	≥ 1.00 Index	3.34	3.30	3.38	Reactive
SARS-CoV-2 TrimericS IgG/Diasorin™ Liaison®	≥ 33.8 BAU/mL	62.87	62.27	63.46	Positive
SARS-COV-2 IgG/Abbott™ ARCHITECT™ ci8200	≥ 1.00 Index	2.33	2.28	2.39	Positive
SARS-COV-2 IgG/Ortho™ VITROS® ECiQ	≥ 1.00 Index	2.09	2.05	2.12	Positive
SARS-COV-2 IgGII /Abbott™ ARCHITECT™ ci8200	≥ 50.0 AU/mL	255.41	241.56	269.26	Positive
SARS-COV-2 IgM/Abbott™ ARCHITECT™ ci8200	≥ 1.00 Index	0.05	0.04	0.05	Negative*
SARS-COV-2 Total Ab/Ortho™ VITROS® ECiQ	≥ 1.00 Index	40.87	39.96	41.77	Positive
SARS-COV-2 IgG II/bioMérieux™ VIDAS®	≥ 1.00 Index	3.36	3.32	3.40	Positive

Table 2: Numeric Results and Interpretation of MAS™ SARS-CoV-2 IgG Positive Control by assays/platforms. *Result is expected as the control is only reactive/positive to IgG assays.

Assay/Platform	Negative/Non Reactive cutoff	Mean	Interpretation	Lower 95%	Upper 95%
SARS-CoV-2 IgG/Beckman Coulter™ Access 2® System	<30.0 U/mL	6.70	NonReactive	6.41	6.99
AdviseDx SARS-CoV-2 IgG II/Abbott™ ALINITY® ci2000	< 50.0 AU/mL	29.24	Negative	27.98	30.51
Elecsys SARS-COV-2 S/Roche™ cobas® E601	< 0.80 U/mL	2.12	Positive*	2.10	2.14
SARS-CoV-2 Total (COV2T)/Siemens™ Atellica® IM	< 1.00 Index	<0.6	NonReactive	N/A	N/A
SARS-CoV-2 Total/Siemens™ ADVIA® Centaur	< 1.00 Index	<0.6	NonReactive	N/A	N/A
SARS-CoV-2 TrimericS IgG/Diasorin™ Liaison®	< 33.8 BAU/mL	5.54	Negative	5.46	5.63
SARS-COV-2 IgG/Abbott™ ARCHITECT™ ci8200	< 1.40 Index	0.09	Negative	0.06	0.11
SARS-COV-2 IgG/Ortho™ VITROS® ECiQ	< 1.00 Index	0.05	Negative	0.04	0.05
SARS-COV-2 IgGII /Abbott™ ARCHITECT™ ci8200	< 50.0 AU/mL	37.19	Negative	32.08	42.30
SARS-COV-2 IgM/Abbott™ ARCHITECT™ ci8200	< 1.00 Index	0.36	Negative	0.35	0.38
SARS-COV-2 Total Ab/Ortho™ VITROS® ECiQ	< 1.00 Index	2.42	Positive*	2.39	2.46
SARS-COV-2 IgG II/bioMérieux™ VIDAS®	< 1.00 Index	0.47	Negative	0.46	0.49

Table 3: Numeric Results and Interpretation of MAS™ SARS-CoV-2 Negative Control by assays/platforms. *Result shown not compatible to these assays/platforms.

Assay/Platform	Compatible with MAS SARS-CoV-2 IgG Positive Control	Compatible with MAS SARS-CoV-2 Negative Control
SARS-CoV-2 IgG/Beckman Coulter™ Access 2® System	Yes	Yes
AdviseDx SARS-CoV-2 IgG II/Abbott™ ALINITY® ci2000	Yes	Yes
Elecsys SARS-COV-2 S/Roche™ cobas® E601	Yes	No*
SARS-CoV-2 Total (COV2T)/Siemens™ Atellica® IM	Yes	Yes
SARS-CoV-2 Total/Siemens™ ADVIA® Centaur	Yes	Yes
SARS-CoV-2 TrimericS IgG/Diasorin™ Liaison®	Yes	Yes
SARS-COV-2 IgG/Abbott™ ARCHITECT™ ci8200	Yes	Yes
SARS-COV-2 IgG/Ortho™ VITROS® ECiQ	Yes	No*
SARS-COV-2 IgGII /Abbott™ ARCHITECT™ ci8200	Yes	Yes
SARS-COV-2 Total Ab/Ortho™ VITROS® ECiQ	Yes	Yes
SARS-COV-2 IgG II/bioMérieux™ VIDAS®	Yes	Yes

Table 4: Summary of Results and Interpretation of MAS™ SARS-CoV-2 controls by assays/platforms. *Result shown not compatible to these assays/platforms.

Conclusions

The assay and platforms compatibility evaluation study has provided the product performance assessment for MAS™ SARS-CoV-2 Control products when testing on different instruments at different labs.

The data for MAS SARS-CoV-2 IgG Positive Control has shown compatibility with all tested assay platforms except SARS-CoV-2 IgM assay on Abbott Architect Systems. As only IgG Positive is claimed in product's IFU, the negative results on IgM testing is expected and not impacting MAS SARS-CoV-2 IgG Positive Control's product claim for intended use as IgG Positive Control.

The data for MAS SARS-CoV-2 Negative Control has shown compatibility with all tested assay platforms except Elecsys Anti-SARS-CoV-2 S assay on Roche™ cobas® E601 as well as SARS-CoV-2 Total Ab on Ortho™ VITROS® ECiQ. In both platforms, the testing results were positive for MAS SARS-CoV-2 Negative Control. The results suggested that customers will need to validate and set up lab based cutoff while using MAS SARS-CoV-2 Negative Controls with these two assays.

It is also important to note that the IU or BAU from assays/platforms is arbitrary and not based on an analytical concentration measurement, thus each lab shall be conducting own reference value for each assay.

Overall, the MAS SARS-CoV-2 Controls have been verified to be compatible with different platforms for detection of SARS-CoV-2 IgG antibodies with exceptions in Table 3. In conclusion, the MAS SARS-CoV-2 Controls can be used as quality control materials across multiple laboratory instruments for monitoring test performance, optimizes workflow, minimizes scrap and increases productivity. The products have been discontinued since May, 2023.

Acknowledgements

The authors would like to thank Jayesh Shah, Nikita Le and Nikhita Tandon for their contributions and support throughout this project.

Trademarks

Science at a scan
Scan the QR code on the right with your mobile device to download this and many more scientific posters.

Learn more at thermofisher.com/mascov2