Performance of the BioCheck SARS-CoV-2 IgM and IgG Antibody Tests in Clinical Specimens from China and the United States

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BIOCHECK
A manufacturer of immunodiagnostics

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Introduction

In December 2019, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was reported in China and resulted in the international pandemic of the novel coronavirus disease 2019 (COVID-19).

While reverse transcription polymerase chain reaction (RT-PCR) for the SARS-CoV-2 virus is the current standard for clinical diagnosis, the role of serology in the understanding of previous SARS-CoV-2 infection and immunologic protection continues to be defined.

The BioCheck SARS-CoV-2 IgM and IgG Antibody Test Kits are chemiluminescent immunoassays intended for the qualitative detection and differentiation of IgM and IgG antibodies to SARS-CoV-2 in human serum using the MS-Fast Analyzer. The BioCheck SARS-CoV-2 IgM and IgG Antibody Test Kits use biotinylated SARS-CoV-2 S1 antigens to bind SARS-CoV-2 IgM or IgG antibodies present in a patient serum sample.

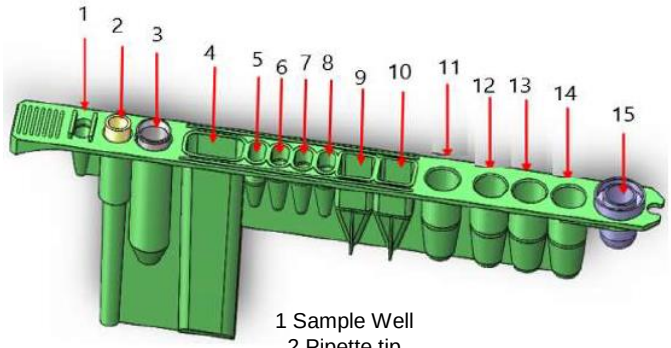
Clinical performance, cross-reactivity and reproducibility of the BioCheck SARS-CoV-2 IgM and IgG Antibody Test Kits is presented herein. The BioCheck SARS-CoV-2 IgM and IgG Antibody Combo Test received US Federal Drug Administration (FDA) Emergency Use Authorization (EUA) on August 18, 2020.[1, 2]

1. Refer to www.AccelerateDiagnostics.com for additional data and information
2. Accelerate Diagnostics, Inc. is a distributor of the BioCheck SARS-CoV-2 Antibody Tests and the MS-Fast Analyzer

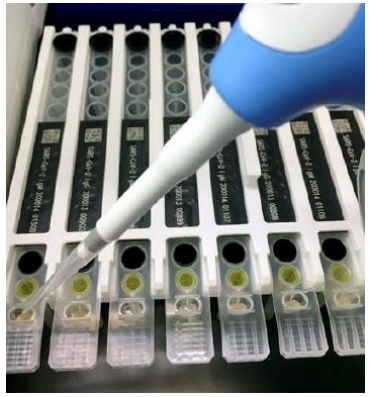
Methods

- **Clinical Performance**
  - 110 positive sera (from patients in China with confirmed SARS-CoV-2 diagnosis by RT-PCR)
  - 143 negative sera:
    - 43 from patients in China negative by SARS-CoV-2 RT-PCR
    - 100 from patients in US collected prior to December 2019
  - Positive and Negative Percent Agreement (PPA and NPA) were calculated by comparing with the diagnostic result of nucleic acid detection method (samples from China) or known negatives collected pre-pandemic
- **Cross-Reactivity**
  - Anti-sera (5 for each target) serologically positive for other known coronaviruses, respiratory pathogens (both bacterial and viral), other blood-borne pathogens, and anti-nuclear antibody were tested
  - Additionally, 100 negative samples (from patients in US collected pre-pandemic) were tested
- **Reproducibility**
  - 5 positive samples at low, moderate, and high levels and 2 negative samples were tested
  - Samples were tested in replicates of 2 by 2 different operators at 2 different labs with 3 different lots/batches of kits for 5 consecutive days

Simple Workflow



1 Sample Well
2 Pipette tip
3 Eluting sleeve
4 Wash buffer
5 Luminescent substrate
6 Magnetic separation reagent
7 Reagent B IgM or IgG (depending on cartridge)
8 Reagent A
9 Sample diluent
10 Sample diluent
11 Empty
12 Empty
13 Empty
14 Empty
15 Reading aperture



1. Equilibrate reagents to room temperature
2. Insert IgM and/or IgG test cartridges into reagent rack (holds up to 8 cartridges)
3. Add 80 µl serum to the sample well of each cartridge

4. Initiate run on the MS-Fast Analyzer (manufactured by Sophonix)
5. A full rack of samples will take 30 minutes from test start until result acquisition
6. Samples are interpreted using the relative light unit (RLU) cut-off values below

Result Reported	RLU Expected	
	IgM Test	IgG Test
Positive	≥18500	≥ 26000
Negative	<18500	<26000

Results and Conclusions

IgM and IgG PPA by Days Post Symptom Onset

Days Post Symptom Onset	# from PCR-Pos Patients	IgM or IgG Test	# of Positive Results	PPA	95% CI
≤ 7	7	IgM	7	100%	64.57-100%
		IgG	7	100%	64.57-100%
8-14	16	IgM	15	93.75%	71.67-98.89%
		IgG	16	100%	80.64-100%
≥ 15	9	IgM	8	88.89%	56.50-98.01%
		IgG	9	100%	70.08-100%
Unknown	78	IgM	75	96.15%	89.29-98.68%
		IgG	77	98.72%	93.09-99.77%

IgM and IgG NPA

# PCR Negative	IgM or IgG Test	# of Negative Results	NPA	95% CI
143	IgM	139	97.20%	93.0-99.2%
	IgG	143	100%	97.5-100%

The BioCheck SARS-CoV-2 IgM and IgG Antibody Tests showed high PPA and NPA for the qualitative detection of IgM and IgG antibodies.

Abbreviations: CI: confidence interval; CV: coefficient of variation

Cross-Reactivity

Anti-Sera Tested
Human coronavirus panel 229E/HKU1
Human coronavirus panel OC43/NL63
Influenza A
Influenza B
Parainfluenza 1, 3, 4 (not 2)
Respiratory Syncytial Virus
Adenovirus
Rhinovirus
HCV
HBV
Haemophilus influenzae
Mycoplasma pneumoniae
ANA

IgM and IgG Reproducibility*

Sample ID	N	IgM Mean Value (RLU)	IgM SD	IgM %CV	IgG Mean Value (RLU)	IgG SD	IgG %CV
Low Pos	30	25489	2053	8.1	40231	3450	8.6
Mod Pos	30	83086	5504	6.6	66647	6180	9.3
High Pos	30	203001	18413	9.1	181598	13349	7.4
Pos	30	112485	9708	8.6	83621	6184	7.4
Pos	30	65574	5620	8.6	46216	4466	9.7
Neg	30	5674	406	7.2	7498	524	7.0
Neg	30	14027	930	6.6	22974	1335	5.8

*Total precision data is shown here. Additional inter-assay, intra-assay, between-days, and between-lot data is available at www.AccelerateDiagnostics.com

No cross-reactivity was detected for the anti-sera tested on the SARS-CoV-2 IgM and IgG tests.

The BioCheck SARS-CoV-2 IgM and IgG Antibody Tests were reproducible at all positive and negative levels tested.

Summary

The BioCheck SARS-CoV-2 IgM and IgG Antibody Tests Kits deliver accurate and reproducible, qualitative results in approximately 30 min