B-195

Correlation of the Rapid Point of Care LumiraDx SARS-CoV-2 Antibody Test to Other SARS-CoV-2 Antibody Tests and to Viral Neutralization

[1]Damodara Rao Mendu, PhD, [1]Adolfo-Firpo- Betancourt, MD, [1]Florian Krammer, PhD,
[1]Stella Simotas, BS, [1]Matilda Boal, [2]Brian DuChateau, PhD, [1]Carlos Cordon-Cardo, MD, PhD

Affiliations [1]Ichan School of Medicine at Mt. Sinai Medical Center, New York, NY, USA [2]LumiraDx, Waltham, MA, USA

Introduction

A rapid, point-of-care (POC) SARS-CoV-2 antibody test that could effectively predict an individuals' immune status to SARS-CoV-2 infection could be used to indicate when vaccinations and boosters should be administered. Currently however, no rapid SARS-CoV-2 antibody test can predict immunity to SARS-CoV-2 infection.[1] If this clinical utility is to be realized, SARS-CoV-2 antibody tests will likely have to be able to detect antibodies that are capable of conferring immunity to SARS-CoV-2 (eg. neutralizing antibodies). It is known that almost all neutralizing antibodies present after SARS-CoV-2 infection are elicited to the S1 and receptor binding domain (RBD) portions of the spike protein.[2] The Mt. Sinai Hospital Covid Seroklir SARS-CoV-2 IgG Antibody assay has FDA Emergency Use Authorization (EUA), uses both full length spike antigen and RBD proteins, and the results of this test have been shown to correlate with in vitro Microneutralization assay (figure 2).[2,3] In this study we show the interpretative result correlation of the rapid, POC LumiraDx SARS-CoV-2 Antibody Test to the Mt. Sinai Hospital COVID-19 ELISA IgG Antibody Test and to viral neutralization.

Methods

The rapid, POC LumiraDx SARS-CoV-2 Antibody Test has EUA for the qualitative detection of total antibodies to SARS-CoV-2. The LumiraDx test utilizes both S1 and RBD proteins for the detection of total antibody to SARS-CoV-2[4] (Figure 1a and 1b). Although the EUA version of the test reports a single qualitative result, this study utilizes a research only version software application (Connect Manager) to access separate results to antibodies binding to S1 and RBD SARS-CoV-2 proteins. The study was conducted utilizing a set of community derived serum samples (N=253) obtained from Mt. Sinai Hospital's biorepository. Samples were interrogated with the LumiraDx SARS-CoV-2 Antibody Test and the Mt. Sinai orthogonal Covid Seroklir SARS-CoV-2 ELISA, both assays were performed according to the manufacturer's instructions. Microneutralization assay (MNA) ID50's were also reported for these samples. Qualitative results from these tests were compared using contingency tables and concordances calculated.

Figure 1a.

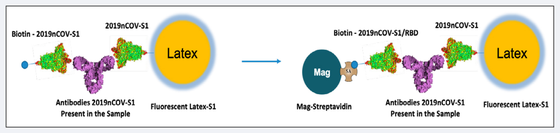
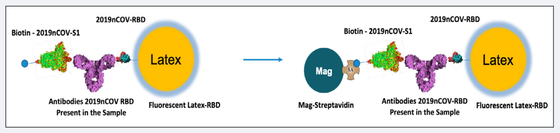


Figure 1b.



The LumiraDx SARS-CoV-2 Ab Test uses 2 independent assay channels in the strip to analyze the antibodies in the test sample. An independent channel comprises On-Board Control reagents (OBC) that are used to verify the test operated correctly. The S1-S1 Bridge and RBD-S1 Bridge Serology assay components and immune-complex formation are illustrated in Figures 1 (a and b).

Figure 2.

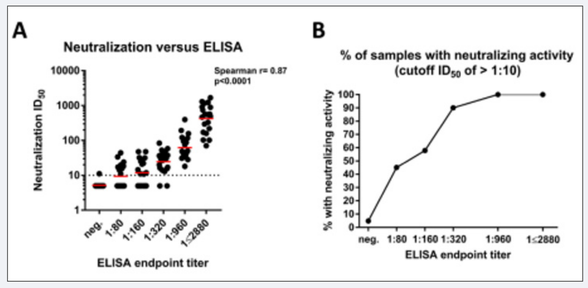


Fig. 2. Neutralizing activity of serum samples in relation to ELISA titers. (A) A correlation analysis between ELISA titers on the x axis and neutralization titers in a microneutralization assay on the y axis. The Spearman ρ was determined. Red bars indicate the geometric mean. (B) The proportion of sera that exert any neutralizing activity in each of the ELISA titer categories. Testing was performed once using an FDA EUA ELISA in a CLIA laboratory or twice following a standardized neutralization protocol.

Ref: Robust neutralizing antibodies to SARS-CoV-2 infection persist for months. Science 370, 1227–1230 (2020)

Results

The SARS-CoV-2 S1 antibody results yielded by LumiraDx and Mt. Sinai Hospital Covid Seroklir assay demonstrated 96.1% (243/253) concordance (figure 3). Discordant S1 results consisted of 1.6% (4/253) and 2.4% (6/253) of results that were Mt. Sinai (-)/LumiraDx (+) and Mt. Sinai (+)/LumiraDx (-) respectively.

Figure 3

LumiraDx S1

Sinai S EIA	Positive	Negative
Strong Positive	114	1
Moderate Positive	46	1
Weak Positive	59	4
Negative	4	24

N = 253
Concordance = 243/253 = 96.1%

The SARS-CoV-2 RBD antibody results yielded by LumiraDx and Mt. Sinai Hospital tests demonstrated 94.9% (240/253) concordance (figure 4). Discordant RBD results consisted of 0.8% (2/253) and 4.4% (11/253) of results that were Mt. Sinai (-)/LumiraDx (+) and Mt. Sinai (+)/LumiraDx (-) respectively.

Figure 4

LumiraDx RBD AOS

Sinai RBD EIA	Positive	Negative
Positive	226	11
Negative	2	14

N = 253
Concordance = 240/253 = 94.9%

In addition, the LumiraDx SARS-CoV-2 antibody test results demonstrated 90.1% (228/253) concordance with MNA assay (figure 5). Discordant results consisted of 2.4% (6/253) and 7.5% (19/253) of results that were MNA (-)/LumiraDx (+) and MNA (+)/LumiraDx (-) respectively.

Figure 5

Overall LumiraDx Result

MN IC50	Positive	Negative
Positive	222	19
Negative	6	6

N = 253
Concordance = 240/253 = 94.9%

Conclusions

Qualitative results yielded by the rapid, POC LumiraDx SARS-CoV-2 Antibody Test show strong concordance to MNA results and to other SARS-CoV-2 antibody test results that are known to correlate with viral neutralization. These results suggest that the rapid, POC LumiraDx SARS-CoV-2 Antibody Test detects antibodies that may be capable of conferring immunity to SARS-CoV-2 infection.

References

1. Centers for Disease Control and Prevention. Interim guidelines for COVID-19 antibody testing. https://www.cdc.gov/coronavirus/2019-ncov/lab/resources/antibody-tests-guidelines.html. Updated January 24, 2022. Accessed June 2022.
2. A. Wajnberg, F. Amanat, A. Firpo, D. R. Altman, M. J. Bailey, M. Mansour, M. McMahon, P. Meade, D. R. Mendu, K. Muellers, D. Stadlbauer, K. Stone, S. Strohmeier, V. Simon, J. Aberg, D. L. Reich, F. Krammer, C. Cordon-Cardo, Robust neutralizing antibodies to SARS-CoV-2 infection persist for months. Science 370, 1227–1230 (2020)
3. Mt. Sinai COVID-SeroKlir SARS-CoV-2 IgG Antibody Test Instrucions for Use. Accessed June 2022
4. LumiraDx. LumiraDx SARS-CoV-2 Ab Test product instert 2021. Accessed June 2022

Contact information

Brian DuChateau, Ph.D., D(ABMLI)
brian.duchateau@lumiradx.com
Vice President, North America Scientific & Clinical Affairs - LumiraDx

Further information

www.lumiradx.com