Antibody Screening Results for Anti-Nucleocapsid Antibodies Towards the Development of a SARS-CoV-2 Nucleocapsid Protein Antigen Detecting Lateral Flow Assay

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Submitted date: 09/01/2021 • Posted date: 11/01/2021
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Citation information: Cate, David; Hsieh, Helen; Glukhova, Veronika; Bishop, Joshua D; Hermansky, H Gleda; Barrios-Lopez, Brianda; et al. (2020): Antibody Screening Results for Anti-Nucleocapsid Antibodies Towards the Development of a SARS-CoV-2 Nucleocapsid Protein Antigen Detecting Lateral Flow Assay. ChemRxiv. Preprint. https://doi.org/10.26434/chemrxiv.12709538.v2

The global COVID-19 pandemic has created an urgent demand for large numbers of inexpensive, accurate, rapid, point-of-care diagnostic tests. Analyte-based assays are suitably inexpensive and can be rapidly mass-produced, but for sufficiently accurate performance they require highly optimized antibodies and assay conditions. We used an automated liquid handling system, customized to handle arrays of lateral flow immunoassay (LFA) tests in a high-throughput screen, to identify anti-nucleocapsid antibodies that will perform optimally in an LFA. We tested 1021 anti-nucleocapsid antibody pairs as LFA capture and detection reagents with the goal of highlighting pairs that have the greatest affinity for unique epitopes of the nucleocapsid protein of SARS-CoV-2 within the LFA format. In contrast to traditional antibody screening methods (e.g., ELISA, bio-layer interferometry), the method described here integrates real-time reaction kinetics with transport in, and immobilization directly onto, nitrocellulose. We have identified several candidate antibody pairs that are suitable for further development of an LFA for SARS-CoV-2.

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Antibody Screening Results for Anti-Nucleocapsid Antibodies Towards the Development of a SARS-CoV-2 Nucleocapsid Protein Analyte Detecting Lateral Flow Assay

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Abstract

The global COVID-19 pandemic has created an urgent demand for large numbers of inexpensive, accurate, rapid, point-of-care diagnostic tests. Analyte-based assays are suitably inexpensive and can be rapidly mass-produced, but for sufficiently accurate performance they require highly optimized antibodies and assay conditions. We used an automated liquid handling system, customized to handle arrays of lateral flow immunoassay (LFA) tests in a high-throughput screen, to identify anti-nucleocapsid antibodies that will perform optimally in an LFA. We tested 1021 anti-nucleocapsid antibody pairs as LFA capture and detection reagents with the goal of highlighting pairs that have the greatest affinity for unique epitopes of the nucleocapsid protein of SARS-CoV-2 within the LFA format. In contrast to traditional antibody screening methods (e.g., ELISA, bio-layer interferometry), the method described here integrates real-time reaction kinetics with transport in, and immobilization directly onto, nitrocellulose. We have identified several candidate antibody pairs that are suitable for further development of an LFA for SARS-CoV-2.

Introduction

The emergence of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has led to a global pandemic of COVID-19, infecting more than 81 million people worldwide in less than a year, and killing over 1.8 million persons by the end of 2020.1,2 Strategies to suppress transmission of SARS-CoV-2, the virus that causes COVID-19, have been constrained by limitations in the availability of tests that can detect viral infection early. The predominant test format used to detect SARS-CoV-2 is reverse transcriptase polymerase chain reaction (RT-PCR), conducted most on specimens collected from the nasopharynx or oropharynx of symptomatic or exposed individuals. Demand for RT-PCR testing for SARS-CoV-2 in most of the world has exceeded the available supply.

Diagnostic testing is central to detecting the virus in symptomatic and asymptomatic persons, or those identified as contacts exposed to COVID-19 cases, to guide community interventions that are predicted to contain ongoing transmission. The pandemic has resulted in unprecedented demand for the RT-PCR testing capacity of all countries. Demand for testing has been coupled with a global shortage of commercial kits, reagents, consumables, disruptions in the global transport networks, and exacerbated
by international competition for testing resources. Accordingly, even many high-income countries have inadequate RT-PCR testing capacity to effectively suppress ongoing transmission, and most low and middle-income countries (LMICs) are unlikely to be able to establish even minimally needed RT-PCR capacity in the immediate future.

Direct analyte-based tests for SARS-CoV-2 offer an attractive alternative solution to testing needs and possibly the only viable solution for most LMICs. Analyte tests, which detect the presence of viral proteins, can be directly conducted on biological samples, such as tissue swabbed from the anterior nasal cavity, oropharynx, or even directly on saliva. Such analyte tests already exist for influenza, strep throat, and other infectious diseases. Analyte tests in the LFA test format already have extremely high production capacities in the billions of units/year, are inexpensive and easy to use, return results in minutes, and crucially, like RT-PCR and unlike serological tests, can reveal an active infection.

The use case for a low-cost, highly accessible SARS-CoV-2 test is strong even if the test were to be less sensitive than current RT-PCR testing. Modeling shows that decentralized, point-of-care testing with rapid return of results would have greater potential impact on transmission than the absolute limit-of-detection of the test. These models build on the important observation that infectious viral particles have not been recovered below around 100 copies/mL.

Rapid analyte tests are beginning to enter the commercial market. Thus far, however, few analyte tests for SARS-CoV-2, compared to nucleic acid tests, have received authorization from regulatory authorities worldwide. Therefore, a concerted effort is underway to catalyze the development of analyte-based rapid diagnostic tests that require no or minimal instrumentation, and to prepare manufacturing capability to meet the needs of the larger global market. Required performance characteristics of a SARS-CoV-2 analyte detection assay have been published by the World Health Organization.

A key step in the development of an LFA is the selection of selective antibodies for the target of interest. To expedite this process, our group has pioneered a high-throughput, robotic, antibody-screening process directly on nitrocellulose. This method allows us to rapidly screen hundreds of combinations of antibodies more quickly than is typical of early-stage LFA development, while simultaneously utilizing nitrocellulose-specific reaction kinetics and flow rates that are difficult-to-impossible to mimic in other multiplexed analytical systems (e.g., ELISA, biolayer interferometry). Chemical gradients, residence times, binding orientations, affinity rates, drying and subsequent rehydration of reagents, and spatial distributions of antibodies are different in LFAs than in other immunoassays, and therefore, the best antibodies for LFAs may be different than for the best antibodies for ELISA, for example.

In this paper we describe the results of an extensive antibody screening effort that utilized our high-throughput, robotic, antibody-screening platform to screen through 1021 unique combinations of antibodies that target the SARS-CoV-2 nucleocapsid protein. Over the course of several months, as various SARS-CoV-2-related reagents became available, five screening rounds were conducted against a total of three different sources of SARS-CoV-2 nucleocapsid analyte. We primarily focused on the outcomes of three screening rounds (one each against different recombinant analytes and one against a diluted positive clinical positive pool) to highlight the differences in antibody pair rankings we obtained as a function of analyte variant.
Materials and Methods

Reagents and materials
The following LFA reagents were purchased: Triton X-100, Tween 20, 10× PBS, sucrose, and IGEPAL CA-630 from Sigma Aldrich (St. Louis, MO, USA); Surfactant 10G from Fitzgerald Industries (Acton, MA, USA); 20× Borate, pH 8.5 and 10× PBST from Thermo Fisher Scientific (Waltham, MA, USA); PBS tablets from VWR (Radnor, PA, USA); BSA from Seracare Life Sciences (Milford, MA, USA).

Recombinant SARS-CoV-2 nucleocapsid analytes were purchased from Acro Biosystems (Cat. No. NUNC5227), Creative Diagnostics (Cat. No. DAGC094), Genemedi (Cat. No. GMP-V-2019nCoV-N002), Genscript (Cat. No. Z03480-1), MyBiosource (Cat. No. MBS7135899), Sino Biological (Cat. No. 40588-V088), and The Native Analyte Co. (Cat. No. REC31812-100). Anti-SARS-CoV-2-nucleocapsid antibodies were sourced from many vendors; a complete list of antibodies screened in this work are provided in Table S1.

The following LFA materials were used for antibody screening: backed nitrocellulose (20 mm wide, CN95, Sartorius Lab Instruments GmbH & Co. KG, Otto-Brenner-Straße 20, Göttingen, Germany), conjugate pad (10 mm wide, No. 6613, Ahlstrom-Munksjö Oyj, Finland), sample pad (18 mm wide, Cat. No. 1281, Ahlstrom-Munksjö), wicking pad (14 mm wide, Cat. No. 440, Ahlstrom-Munksjö), cover tape (13 mm wide, Cat. No. 300H2, 3M, St. Paul, MN, USA) and backing card (50 mm wide, Cat. No. KN2211, Kenosha, Schweitzerlaan, The Netherlands).

All primers and probes, purified 2019-nCoV_N control plasmid, and Hs_RPP30 human control plasmid were purchased from IDT (Coralville, IA, USA). The Research Use Only (RUO) QIAamp Viral Mini Kit for RNA extraction was purchased from Qiagen (Hilden, Germany). The qScript XLT 1-Step RT-qPCR ToughMix was purchased from QuantaBio (Beverly, MA, USA). Molecular biology grade water was purchased from Fisher Scientific (Waltham, MA, USA).

A total of nine de-identified samples were purchased from Medix (Lombard, IL, USA). These samples included six SARS-CoV-2 positives and three negatives. All samples were de-identified and discarded after use and therefore did not require IRB approval.

RT-qPCR for detection of COVID-19 and quantification of SARS-CoV-2 viral load
The COVID-19 status of clinical samples used in this work was determined in-house using a multiplex RT-qPCR for the N1, N2, and RP targets. Briefly, 70 or 140 µL of sample was purified using the QIAamp Viral Mini Kit according to the manufacturer’s protocol and purified RNA was eluted in either 70 or 140 µL based on CDC recommendations. The multiplexed reaction was performed using the qScript master mix from QuantaBio with N1 and RP primers and probe concentrations of 500 nM and 250 nM (final) and N2 primers and probe concentrations of 2000 nM and 500 nM (final). The probes used were N1-FAM, N2-AlexaFluor594, and RP-Cy5. For each reaction, 5 µL of sample was added to 15 µL of amplification mix. Samples were classified as positive if both N1 and N2 targets were detected with Ct values below 40 cycles. Viral load was determined using a standard curve for the N1 target generated...
from purified 2019-nCoV_N control plasmid. The SARS-CoV-2 control plasmid from IDT was quantified in-house using the BioRad QX200 Digital Droplet PCR System.

Analyte selection using Octet
Antibody–analyte interactions were evaluated with an Octet RED96 biolayer interferometry instrument (Molecular Devices, Sartorius AG, Göttingen, Germany). All measurements were performed in 96-well microplates (Greiner Bio-one, Frickenhausen, Germany) at ambient temperature. Antibodies were loaded at 25 nM in 1× Kinetics Buffer for 120 seconds and captured using AMC tips for mouse antibodies, AHC tips for humanized recombinant antibodies, and Protein A tips for rabbit antibodies. Materials for the Octet were purchased from Molecular Devices. New sensors were used for every reaction and no tip regeneration was performed.

Typical immobilization levels were 1 ± 0.2 nm for monoclonal antibodies, and 2 nm for rabbit polyclonal antibodies. Following the load step, all sensors were equilibrated to baseline for 120 seconds in 1× Kinetics Buffer. An association step was performed for 300 seconds with analyte at 100 nM quantity, followed by 300 second dissociation into 1× Kinetics buffer.

Antibody/analyte evaluation by SDS-PAGE
Analytes were evaluated for purity and size using SDS-PAGE. Concentration was measured for all proteins using BCA assay (Thermo Pierce cat. 23225). Samples were premixed 1× NuPAGE LDS Sample Buffer (4×, Thermo Pierce cat. NP0007) and heated at 70°C for 10 minutes. Gels with a 4–12% Bis-Tris gradient were used to achieve separation. Coomassie Imperial Protein Stain (Thermo Pierce cat. 24615) was used to visualize bands. Novex Sharp Pre-stained protein standard (Thermo Fisher scientific) was used as a molecular weight marker.

Latex bead conjugation
For both test and control line detection conjugates, 400 nm carboxylic blue latex beads (Cat. No. CAB400NM, Magsphere, Pasadena CA, USA) were washed three times with 0.1 M MES buffer, pH 6. Then, latex beads were activated using EDC/NHS coupling reagents at 0.15 and 10 mg/mL respectively for 30 minutes. Afterwards, the blue latex particles were conjugated in 1× PBS, pH 7.2 to various anti-nucleocapsid antibodies at a w/w ratio of 30:1 and 10:1 (bead:antibody) for test and control line antibodies, respectively, for three hours. Finally, latex conjugates were quenched using 0.1 M ethanolamine before being washed and blocked with 6% (w/v) casein, final concentration 1.2%, overnight. The latex conjugates were stored in buffer containing 50 mM borate and 1% casein, pH 8.5. The latex conjugates were quantified using the spectrophotometer by measuring absorbance at 660 nm and comparing to absorbance of unconjugated beads.

LFA reagent deposition
Capture antibodies at 1 mg/mL in 1× PBS, pH 7.4 and 2.5% (w/v) sucrose were striped (ZX1010, BioDot, Irvine, CA, USA) on nitrocellulose CN95 and dried at 25°C for 30 min. The control line was striped at 0.75 mg/mL donkey anti-chicken IgY (Cat. No. 703-005-155, Jackson ImmunoResearch, West Grove, PA, USA). For antibody screening, the nitrocellulose was unblocked. The test and control lines were located at 8 mm and 13 mm from the upstream edge of the nitrocellulose membrane.
The conjugate pad was dip-coated with two blocking solutions. First, 6613 conjugate pads were soaked in a 0.05% (w/v) Tween 20 in diH2O solution for 15–20 seconds and dried at 40°C for 60 min. Pads were again soaked in 50 mM borate, pH 8.5; 0.25% (w/v) Triton X-100; 1% (w/v) Surfactant 10G; 1% (w/v) sucrose; and 6% (w/v) casein for another 15–20 seconds. The conjugate pad was dried for 60 min at 40°C before assembly.

**LFA Assembly**
Card assembly was performed on a clamshell laminator (Matrix 2210, Kinematic Automation, Sonora CA, USA). Pads were placed on the backing card in the following order: nitrocellulose, cover tape, conjugate pad, sample pad, wicking pad. Individual strips (3.3 mm wide) were cut with a Matrix 2360 sheet cutter (Kinematic Automation) and assembled in cassettes (proprietary design) using an assembly roller (YK725, Kinbio Tech Co., Shanghai, China).

**Hamilton screening procedure**
Antibody pairs were screened on an integrated robotic system used previously to test antibody performance directly on nitrocellulose. In this system, the Hamilton STAR automated liquid handling robot (Hamilton Company, Reno, NV, USA), camera (IDS UI-1460SE-C-H detector with a Tamron M118FM16 lens), custom plate that held up to 96 LFAs, and custom control software developed in-house were combined to allow rapid screening of antibody pairs directly in LFA format. The robot used 8-channel pipetting for parallel application to LFAs and the camera for imaging. The custom control software applied 1 µL of conjugate mix (0.15% anti-nucleocapsid-antibody–latex-bead test line conjugate and 0.1% or 0.05% chicken-IgY-antibody–latex-bead control line conjugate in 50 mM borate, pH 8.5) to the conjugate pad of the LFA. After a 10-minute delay to let the conjugate mix dry, 75 µL of sample, nucleocapsid protein, or buffer (2.5% BSA in PBST or 2.5% BSA and 1% IGEPAL in 1× PBS) was added to the sample pad. Images were acquired 20 minutes after sample addition. For each antibody pair, for positive and negative samples, four technical replicates were run in rounds with rNP, and three technical replicates were run in the round with pooled clinical samples.

**Screening rNPs on LFAs**
We conducted four rounds of testing using rNP as the target analyte, followed by one round using pooled NP positive swab samples from donors. The first round used the best-available-at-the-time rNP analyte, sourced from GeneMedi (GMP-V-2019nCoV-N002), at 50 ng/mL. The second through fourth rounds used a higher-affinity rNP analyte, sourced from Acro Biosystems (NUN-C5227), at 50, 25, and 10 ng/mL, respectively. The third and fourth rounds eliminated antibody pairs that performed poorly in the previous round and added new pairs as antibodies became commercially available. In other words, antibody pair combinations varied round-by-round. A complete list of pairs from all rounds is in Table S2.

**Screening clinical samples on LFAs**
In-house RT-qPCR was performed on banked nasopharyngeal clinical samples to confirm infection status prior to LFA testing (Table 1).

When testing clinical samples on the benchtop, test and control line conjugates were hand spotted prior to sample application. Four Ab pair conditions, of various levels of performance with rNP, were used for clinical sample validation. The test line conjugate was diluted to a final concentration of 0.10%
and control line chicken IgY conjugate to 0.15% in 50 mM borate, pH 8.5. First, 1 µL of conjugate mixture was pipetted onto the conjugate pad and allowed to dry at ambient temperature for 10 minutes prior to application of the sample. All samples were diluted 1:25 in sample buffer containing 2.5% BSA and 1% IGEPAL CA-630 in 1x PBS. Samples were incubated on ice for 30 minutes prior to use. Second, 75 µL of each sample diluted in sample buffer was added to the conjugate pad and run at ambient conditions inside a biosafety cabinet for 20 minutes prior to being read in an LFA reader (Axxin, Fairfield, Australia).

Clinical samples were pooled to conduct screening in Round 5 (Table S1). A 1:100 titration was confirmed to produce visibly weak signal intensity at the test line and was therefore used as the positive control antibody pair SiB-MM08 / SiB-R004 (capture antibody / detection antibody). Aliquots of 1:100 clinical pooled samples were prepared and stored at -80°C until thawed for a single experimental use, then discarded.

**Data analysis**

Image analysis for the integrated robotic system was performed with a custom Python-based tool developed in-house. This tool identified the test and control lines, measured nitrocellulose background intensity, and reported line strength as the height of the strip-width-averaged, background-subtracted, peak pixel intensity in the red image channel. Faulty LFAs were identified by weak control lines and removed as outliers, however outlier removal was rare, occurring in fewer than 2% of all LFAs tested.

Antibody pair rankings were determined by comparing mean test line strength from tests run with analyte-positive samples (signal, S) versus from tests run with analyte-negative samples (non-specific binding or noise, N). Two comparisons, or metrics, were used, signal divided by noise (S/N) and signal subtracted by noise (S−N). Both metrics were used to ensure the best pairs had both high positive control and low negative control signals.

Image analysis for LFAs run on the benchtop was performed using an LED-based LFA reader (Axxin). This reader reported test and control lines strengths on a different scale from our custom robot image analysis tool, but previous validation experiments indicate good correlation between the outputs of the two algorithms (data not shown).

**Results and Discussion**

We performed bio-layer interferometry on recombinant nucleocapsid proteins (rNP analytes) for the purpose of selecting the most “native-like” rNP analyte for early LFA antibody screening. We first used the estimated Rmax of five different rNP analytes to quantify binding affinity against a random selection of 21 anti-nucleocapsid-protein (α-NP) antibodies from seven vendors (Rockland, Novus Biologicals, Sino Biological, Creative Diagnostics, Bioss, Fitzgerald, and MyBiosource). Rmax as a metric was calculated based on the theoretical saturation of 100% of the bound antibody (ligand) with the rNP analyte. In practice, analyte binding sites are not completely occupied, so the measured saturation value is typically less than Rmax. Moreover, because Rmax is proportional to analyte size, we were also able to detect aggregation or multimer formation in solution. Theoretically, the closer—and more
predictable—values were to $R_{\text{max}}$ the more likely the analyte was to interact with antibodies as expected.

Among the rNP analytes available at the beginning of screening, we selected the rNP analyte from Genemedi (GM-rNP) as the starting analyte because the average $R_{\text{max}}$ for GM-rNP across 21 different $\alpha$-NP antibodies was closest to its theoretical $R_{\text{max}}$ (data not provided). We subsequently obtained an rNP analyte from Acro Biosystems (AB-rNP) and determined, using the available $\alpha$-NP antibodies at that time and a similar kinetic analysis as above, that it produced higher-affinity antibody interactions (on aggregate) than GM-rNP. Additional discussion of the differences between the two rNP analyte sources can be found in the supplemental information. None of rNP analyte sources, however, allowed for testing the effects of the patient sample nasal matrix, so clinical SARS-CoV-2 patient nasopharyngeal swab samples stored in viral transport medium (VTM) were also sourced. Separate pools containing six high positives and six negatives (by qRT-PCR, Table 1) were diluted to create the additional analyte source.

**Table 1** | Banked samples were used to compare performance of select anti-nucleocapsid antibody pairs in LFA. In total, six RT-qPCR-confirmed SARS-CoV-2 positives, three SARS-CoV-2 negatives, and two potential coronavirus cross-reactive samples were screened.

| Clinical Pool | Patient ID/Cat. No. | Vendor | Volume ratio of pooled sample | SARS-CoV-2 qPCR Results (pos v neg) | SARS-CoV-2 Viral Load (c/µL) | MSD NP sample mean concentration (pg/mL) |
|---------------|---------------------|--------|-------------------------------|-----------------------------------|---------------------------|--------------------------------------|
| +             | 352-COP-0023-0      | LabCorp| 0.18                          | +                                 | 2.58E+05                  | 5.76E+05                            |
| +             | 352-COP-0050-0      | LabCorp| 0.23                          | +                                 | 3.99E+05                  | 3.07E+05                            |
| +             | 352-COP-0056-0      | LabCorp| 0.088                         | +                                 | 5.58E+05                  | 4.80E+05                            |
| +             | 352-COP-0090-0      | LabCorp| 0.16                          | +                                 | 9.79E+05                  | 2.05E+05                            |
| +             | 352-COP-0099-0      | LabCorp| 0.18                          | +                                 | 1.69E+04                  | 1.19E+05                            |
| +             | 352-COP-0100-0      | LabCorp| 0.16                          | +                                 | 7.26E+05                  | 6.82E+05                            |
| -             | 352-CON-1001-0      | LabCorp| 0.17                          | -                                 | -                         | 0.00E+00                            |
| -             | 352-CON-1003-0      | LabCorp| 0.17                          | -                                 | -                         | 0.00E+00                            |
| -             | 352-CON-1005-0      | LabCorp| 0.17                          | -                                 | -                         | 0.00E+00                            |
| -             | 352-CON-1011-0      | LabCorp| 0.17                          | -                                 | -                         | 0.00E+00                            |
| -             | 352-CON-1012-0      | LabCorp| 0.17                          | -                                 | -                         | 0.00E+00                            |
| -             | 352-CON-1084-0      | LabCorp| 0.17                          | -                                 | -                         | 0.00E+00                            |

The robotic screening system automated the first screening round against GM-rNP at 50 ng/mL in the round’s positive tests, and a buffer control in the round’s negative tests (Round 1). Subsequently, the robotic screening system automated three more rounds against AB-rNP at concentrations of 50, 25 and 10 ng/mL in each round’s positive tests, and a buffer control in each round’s negative tests (Rounds 2, 3, and 4, respectively). We stepped down the concentration of the AB-rNP in three successive rounds because as vendors developed (and we sourced) new $\alpha$-NP antibodies, better antibody pairs emerged and the average signal intensity in the LFA tests reached the non-linear region of the response curve. The number of unique antibody pairs screened in all rNP rounds were 106, 150, 144, and 288, respectively. At the conclusion of each round, we carried over at least the top 20 antibody pairs by signal (average test line signal from positive LFA tests for a given pair) minus noise (average test line signal from negative LFA tests using a pair), or “$S-N$,” and signal divided by noise, or “$S/N$,” given
available stocks. Due to the time-dependent commercial availability of the antibodies, we considered Rounds 2 and 3 to be “weed-out” rounds and summarized their results in Figure S1. We subsequently considered Round 4 as a representative screen of the best-available-at-the-time antibodies against AB-rNP, in preference to Rounds 2 and 3.

After four rounds against the two rNP analytes, the robotic screening system automated a final round of screening against diluted, pooled, positive patient samples in the round’s positive tests, and diluted, pooled, negative patient samples in the round’s negative tests (Round 5). This last round screened the 26 antibodies which had not been previously dropped due to poor performance and for which we had sufficient stock (676 pairs). The purpose of this final screen was two-fold: (1) determine if relative performance of top pairs from rounds against the rNP analytes persisted in a round against clinical samples, and (2) we had the opportunity to compare, head-to-head, the relative performance of all α-NP antibody pairs. The only antibody pairs excluded from this round performed poorly in several prior rounds (rankings for all pairs in all rounds in Table S2). Additionally, three newly available antibodies were screened in the clinical pool round for the first time. Antibody pairs containing these antibodies performed well, appearing as a top-five pair twice (pair indices 736 and 608, Table S2) and nine times in the top 20 (pair indices 736, 608, 686, 30, 689, 708, 815, 416, and 171, Table S2). The five best antibody pairs against the diluted clinical sample pool (Round 5) are listed in Table 2 along with the top five pairs against GM-rNP (Round 1) and against the lowest-concentration of AB-rNP (Round 4). The top antibody pairs against the three different analyte sources are highlighted in the scatter plots (S−N vs. S/N) in Figure 1, and in the average of S−N and S/N rankings in Table S3.

![Figure 1](image)

**Figure 1** | Performance of 1021 individual antibody pairs as a function of signal / noise and signal – noise. The pairs in the top 10 for both metrics are shown in the highlighted box.

Nine of the top-20 antibody pairs screened against GM-rNP and 15 of the top-20 pairs screened against the lowest concentration of AB-rNP were available to be screened against the diluted clinical sample pool. Of these 24 antibody pairs, few performed well in the screen against the diluted clinical sample pool. One of these 24 (pair index 900, Table S2) had an average rank (i.e. average of S−N rank and S/N rank) of 24.5 in the clinical sample screen, whereas the average rank of the other 23 pairs ranged from 110 to 671.5, with a median value of 336.5 (where the total number of pairs in this round was 676).
This disagreement highlighted the importance of using native analyte in realistic sample types when screening antibody pairs for assay development. We were unable to completely determine in the course of this work whether performance against GM-rNP or AB-rNP better predicted performance against the diluted clinical sample pool (although neither appeared to predict the latter results as noted above) because every round consisted of a slightly different set of antibodies (as antibodies became commercially available or became depleted from vendor stocks). Surrogate samples can provide the advantages of more reliable sourcing, more experimental control, and less expense than clinical samples. However, it can be difficult to create surrogate samples that are completely representative of real samples, not least due to patient-to-patient variability in the matrix. Additionally, we sourced clinical samples that were stored in VTM, which would not be the diluent used in a clinical LFA test. Nonetheless, we chose to move to the clinical samples at first availability, and to test the best-to-date antibodies still available against a diluted sample pool, to get as close to real samples as possible.

Table 2 | Antibody pairs in the top 20 for both S/N and S–N are ranked according to the round in which they were tested. Table S2 contains a complete list of all pairs that were screened.

| Index | Capture antibody | Detection antibody | Average rank |
|-------|------------------|--------------------|--------------|
|       |                  |                    | Genemedi rNP | Acro rNP | Sample pool |
| 870   | Sino Biological 40143-MM08 | Creative Diagnostics DCABH-4693 | 1.5 | - | 573 |
| 900   | Sino Biological 40143-MM08 | Sino Biological 40143-R004 | 2.5 | - | 28 |
| 897   | Sino Biological 40143-MM08 | Sino Biological 40143-MM05 | 4 | 12.5 | 328.5 |
| 940   | Sino Biological 40143-R001 | Sino Biological 40143-MM08 | 4 | 16 | 87 |
| 939   | Sino Biological 40143-R001 | Sino Biological 40143-MM05 | 7.5 | 13.5 | - |

| Index | Capture antibody | Detection antibody | Average rank |
|-------|------------------|--------------------|--------------|
|       |                  |                    | Genemedi rNP | Acro rNP | Sample pool |
| 614   | Genemedi GMP-V-2019nCoV-Nab001 | Sino Biological 40143-MM08 | - | 2.5 | 491 |
| 36    | Bioss bsm-41411M | Sino Biological 40143-MM08 | - | 3 | 309 |
| 99    | Bioss bsm-41413M | Sino Biological 40143-MM08 | - | 3.5 | 400.5 |
| 613   | Genemedi GMP-V-2019nCoV-Nab001 | Sino Biological 40143-MM05 | - | 4 | 221.5 |
| 585   | Genemedi GMP-V-2019nCoV-Nab001 | Creative Diagnostics CABT-CS037 | - | 5.5 | 671.5 |

| Index | Capture antibody | Detection antibody | Average rank |
|-------|------------------|--------------------|--------------|
|       |                  |                    | Genemedi rNP | Acro rNP | Sample pool |
| 630   | Genemedi GMP-V-2019nCoV-Nab002 | Genemedi GMP-V-2019nCoV-Nab001 | - | - | 1.5 |
| 807   | MyBiosource MB5569961 | Fitzgerald 10-2853 | - | - | 3.5 |
| 445   | Fitzgerald 10-2854 | MyBiosource MB5569939 | - | - | 5.5 |
| 736   | MyBiosource MB5569937 | Leinco LT7000 | - | - | 6.5 |
| 608   | Genemedi GMP-V-2019nCoV-Nab001 | Meridian Life Science 9548 | - | - | 7.5 |

While performance (by S–N or S/N) was not necessarily consistent across sample type, one important outcome of running a large antibody screen in an LFA format was the identification of pairs that non-specifically bind at the test line. Non-specific binding is a major problem for LFA tests, as they represent false positive results in real-world applications. Screening data from non-LFA formats sometimes does not predict non-specific binding in an LFA format, because of the unique interplay of flow dynamics and chemical kinetics across reagents and materials in an LFA. We have found that...
screening data from the high-throughput robotic platform does predict non-specific binding in the LFA even when screened with different sample matrices, such as clinical negatives at multiple dilutions (Figure S3). Additionally, several rounds of negative sample screening data can often be combined—even if positive samples are varied across rounds—if the negative samples are consistent across rounds, as was the case here. Combined negative sample data was used to remove pairs from contention when non-specific binding was greater than a chosen threshold (e.g., a nominal specificity target), which was helpful because the number of candidate pairs was large. This method reduced the likelihood that a high positive signal was primarily driven by non-specific binding (a false positive), which would incorrectly suggest that a candidate antibody pair deserved further optimization.

Conclusions

We screened 1021 α-NP antibody pairs against three sources of SARS-CoV-2 nucleocapsid protein, and identified multiple pairs, inclusive of antibodies from several different commercially available sources, as promising candidates towards the development of lateral flow assays for the detection of SARS-CoV-2. Further work is required for the development of a point-of-care test for SARS-CoV-2, though the high-performance antibodies identified in this work may hasten its development. The antibody pairs identified as top-ranking pairs against pooled clinical samples should be interpreted as worth further testing, not necessarily a precisely ordered list of the best candidate reagents for developing an LFA. The top-ranking pairs against clinical samples have demonstrated strong affinity for (some form of) native antigen in the context of lateral flow through nitrocellulose. However, we suggest that multiple of these top antibody pairs be tested further by anyone attempting to develop an LFA using these data, as the precise interaction of all assay components, materials, and methods (especially when different from the conditions in our tests) can affect pair performance.

Acknowledgements

Funding provided by The Global Good Fund and Global Health Labs, a nonprofit organization created by Gates Ventures and the Gates Foundation to develop innovative solutions to address unmet needs in primary health care centers and the last mile.
References

(1) Zhu, N.; Zhang, D.; Wang, W.; Li, X.; Yang, B.; Song, J.; Zhao, X.; Huang, B.; Shi, W.; Lu, R.; Niu, P.; Zhan, F.; Ma, X.; Wang, D.; Xu, W.; Wu, G.; Gao, G. F.; Tan, W. A Novel Coronavirus from Patients with Pneumonia in China, 2019. *N. Engl. J. Med.* 2020, 382 (8), 727–733. https://doi.org/10.1056/NEJMoa2001017.

(2) Coronavirus disease (COVID-19) Situation Report https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200723-covid-19-sitrep-185.pdf?sfvrsn=9395b7bf_2 (accessed Jul 23, 2020).

(3) Larremore, D. B.; Wilder, B.; Lester, E.; Shehata, S.; Burke, J. M.; Hay, J. A.; Tambe, M.; Mina, M. J.; Parker, R. Test Sensitivity Is Secondary to Frequency and Turnaround Time for COVID-19 Surveillance. *medRxiv* 2020, 2020.06.22.20136309. https://doi.org/10.1101/2020.06.22.20136309.

(4) He, X.; Lau, E. H. Y.; Wu, P.; Deng, X.; Wang, J.; Hao, X.; Lau, Y. C.; Wong, J. Y.; Guan, Y.; Tan, X.; Mo, X.; Chen, Y.; Liao, B.; Chen, W.; Hu, F.; Zhang, Q.; Zhong, M.; Wu, Y.; Zhao, L.; Zhang, F.; Cowling, B. J.; Li, F.; Leung, G. M. Temporal Dynamics in Viral Shedding and Transmissibility of COVID-19. *Nat. Med.* 2020, 26 (5), 672–675. https://doi.org/10.1038/s41591-020-0869-5.

(5) Alexandersen, S.; Chamings, A.; Bhatta, T. R. SARS-CoV-2 Genomic and Subgenomic RNAs in Diagnostic Samples Are Not an Indicator of Active Replication. *medRxiv* 2020, 2020.06.01.20119750. https://doi.org/10.1101/2020.06.01.20119750.

(6) Expression of interest - FIND https://www.finddx.org/eoi-covid19-ag-rdt/ (accessed Jul 23, 2020).

(7) COVID-19 Target product profiles for priority diagnostics to support response to the COVID-19 pandemic v.0.1 https://www.who.int/publications/m/item/covid-19-target-product-profiles-for-priority-diagnostics-to-support-response-to-the-covid-19-pandemic-v.0.1 (accessed Aug 8, 2020).

(8) Huynh, T.; Cate, D. M.; Nichols, K. P.; Weigl, B. H.; Anderson, C. E.; Gasperino, D. J.; Harston, S. P.; Hsieh, H. V.; Marzan, R.; Williford, J. R.; Oncina, C. I.; Glukhova, V. A. Integrated Robotic System for the Development Lateral Flow Assays. In *2019 IEEE Global Humanitarian Technology Conference, GHTC 2019*; Institute of Electrical and Electronics Engineers Inc., 2019. https://doi.org/10.1109/GHTC46095.2019.9033066.

(9) Byrnes, S. A.; Gallagher, R.; Steadman, A.; Bennett, C.; Rivera, R.; Ortega, C.; Motley, S. T.; Jain, P.; Weigl, B. H.; Connelly, J. T. Multiplexed and Extraction-Free Amplification for Simplified SARS-CoV-2 RT-PCR Tests. *medRxiv* 2020, 2020.05.21.20106195. https://doi.org/10.1101/2020.05.21.20106195.

(10) QIAamp Viral RNA Mini Handbook - QIAGEN https://www.qiagen.com/us/resources/resourcedetail?id=c80685c0-4103-49ea-aa72-8989420e3018&lang=en (accessed Jul 23, 2020).

(11) *CDC 2019-Novel Coronavirus (2019-NCoV) Real-Time RT-PCR Diagnostic Panel For Emergency Use Only Instructions for Use.*

(12) Bustin, S. A.; Benes, V.; Garson, J. A.; Hellemans, J.; Huggett, J.; Kubista, M.; Mueller, R.; Nolan, T.; Pfaffl, M. W.; Shipley, G. L.; Vandesompele, J.; Wittwer, C. T. The MIQE Guidelines: Minimum Information for Publication of Quantitative Real-Time PCR Experiments. *Clin. Chem.* 2009, 55 (4), 611–622. https://doi.org/10.1373/clinchem.2008.112797.
Supplemental Information: Antibody Screening Results for Anti-Nucleocapsid Antibodies Towards the Development of a SARS-CoV-2 Nucleocapsid Protein Analyte Detecting Lateral Flow Assay

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Antibody Screening Rounds 1-4 with rNP analyte

Round 1 screened anti-nucleocapsid (α-NP) antibodies on LFAs, using an 11 × 11 grid to match α-NP antibodies in distinct immunoassay pairs. Not every antibody was in sufficient stock to test every possible antibody pair, so Round 1 screened 106 unique pairs out of a possible 121 pairs. For each antibody pair, one antibody was striped on nitrocellulose as a test line (the “capture” antibody) and the other was coupled to latex nanoparticles using EDC/NHS chemistry (the “detection” antibody). Round 1 used 50 ng/mL of the rNP analyte from Genemedi (GM-rNP). The negative control was 2.5% BSA in PBST. As anticipated, self-pairs did not perform well compared to non–self-pairs because the GM-rNP was monomeric and therefore likely to only contain a single copy of the sequence targeted by antibodies in the screen. Competition for the same epitope likely reduced the number of complete sandwich formation at the test line. Octet analysis also confirmed poor self-pair performance (data not shown). After completing Round 1, 75 antibody pairs were eliminated from further evaluation. To maintain a large antibody pair pool for subsequent rounds, antibodies from any pair in the top 20 for S−N or S/N were re-screened in Round 2, along with three newly available α-NP antibodies.

Round 2 screened 150 α-NP antibody pairs (out of a possible 195 pairs, due to availability of antibody stocks) selected from overlapping sets of 13 capture and 15 detection antibodies. Three antibodies were screened as capture only, five were screened as detection only, and ten were screened in both positions. Round 2 used 50 ng/mL of the rNP analyte from Acro Biosystems (AB-rNP). The negative control was 2.5% BSA in PBST. We switched to AB-rNP in Round 2 because we observed more consistent antibody binding (Octet measurement of binding saturation relative to R_max, data not provided) against a random selection of α-NP antibodies when compared head-to-head with GM-rNP. Additionally, AB-rNP was expressed in HEK293T cells whereas GM-rNP was produced in E. coli; therefore, we hypothesized that the mammalian cell expressed protein was most likely to display the biologically-relevant glycosylation patterns that viral proteins from infected human cells would express. All five top pairs from Round 1 were in the top 60% of performers in Round 2.

Round 3 screened 144 α-NP antibody pairs selected from overlapping sets of 12 capture and 12 detection antibodies. Three antibodies were screened as capture only, three were screened as detection only, and nine were screened in both positions. By the third round, seven antibody pairs were producing saturating signal intensity at the test line at 50 ng/mL, so we decided to reduce the concentration of AB-rNP from 50 to 25 ng/mL for Round 3 to increase selectivity and emphasize the highest-performing pairs.

Round 4 screened 288 α-NP antibody pairs selected from overlapping sets of 18 capture and 16 detection antibodies. Four antibodies were screened as capture only, two were screened as detection only, and 14 were screened in both positions. We decreased AB-rNP concentration again for Round 4, from 25 to 10 ng/mL. Because Round 4 contained the best-performing antibody pairs from Rounds 2 and 3, and comprised the most stringent screen against AB-rNP (i.e. lowest concentration of the analyte), we considered it as representative of the top collection of antibody pairs against AB-rNP. Results of the screening rounds against AB-rNP are visualized in the scatter plots (S−N vs. S/N) in Figure S1.

To demonstrate the difference between pairs identified as high, moderate, and low-performers in rounds using rNPs, we selected 16 pairs to check performance using banked clinical SARS-CoV-2 positive, negative, and potentially cross-reactive samples. The two cross-reactive samples tested were confirmed positive for non-SARS-CoV-2 coronavirus (types 229E and NL63). No additional optimization of the LFA was performed beyond basic steps such as blocking the conjugate pad. Results from this clinical comparison are shown in Figure S2. The top and bottom charts measure performance as a function of S−N and S/N, respectively. Signals were derived from three technical replicates on up to four positive clinical samples. Noise was pooled from three technical replicates across a blank sample and/or up to three negative clinical samples. Two additional positive clinical samples were tested but showed little-to-no response across all pairs and were excluded from the analysis. Finally, the S−N and S/N results corresponding to each positive sample were normalized by the logarithm of the viral load in each positive sample to allow for a more accurate performance comparison across test conditions.

The data showed that the best pairs (e.g. index pairs 567, 527) were at least 15-fold higher in S−N intensity, on average, across all positive samples when compared with LFA pairs identified in the screen as poor performers (e.g. index pairs
Signal intensities varied for different clinical positives, as expected, however 2/6 samples (pair indices 846 and 188, Table S1) were not visible on any LFA and were therefore excluded from analysis. A complete dataset is visualized in Figure S2. After dilution, the viral load of these two samples was $3\text{–}7\times10^4$ (c/µL), indicating the LOD of these LFAs, without additional optimization is roughly $1\times10^5$ c/µL. A previous paper from our group reported the optimization of a half-strip LFA targeting SARS-CoV-2 viral NP. There was no visible non-specific binding or cross-reactivity to related coronavirus samples 229E and NL63 (Figure S1), but additional screening of potential cross-reactivity should be performed on candidate pairs.

Interestingly, pairs testing well in Rounds 2–4 against the AB-rNP did not perform as well as expected in the clinical screen. Table S3 ranks pairs from the clinical screen as well as each pair’s ranking (avg. of S/N and S–N) in Rounds 1–4. Pairs 33, 70, 7, and 423, for example, were top-10 performers in one or more rounds, however in the clinical screening round, the average S–N intensity across all positive samples was 75-94% lower than the best performing pair (index pair 567). Specific antibodies (e.g. Bioss bsm-41411M) appeared to have higher affinity for AB-rNP but performed below expectation when they were included in pairs that were tested against banked clinical samples pairs.

Due to the differences in performance for pairs against rNP analytes and the clinical samples used in the limited clinical comparison, we conducted a further screening round using diluted clinical sample pools (one with six high positive samples and six negatives, as measured by qRT-PCR). Round 5 screened 676 α-NP antibody pairs selected one set of 26 antibodies. All antibodies in this round were screened in both capture and detection positions.
Table S1 | A list of anti-nucleocapsid antibodies and their commercial sources.

| Antibody Cat. No. | Vendor | Host | Isotype          |
|-------------------|--------|------|------------------|
| Ab01690-10.0      | Absolute Antibody | humanized | IgG1, kappa |
| Ab01691-10.0      |         | humanized | IgG1, kappa |
| bsm-41411M       | mouse  | IgG2b  |
| bsm-41412M       | mouse  | IgG2b  |
| bsm-41415M       | mouse  | IgG2b  |
| bsm-41413M       | mouse  | IgG2b  |
| bsm-41414M       | mouse  | IgG2b  |
| CABT-RM320       | rabbit | IgG    |
| CABT-CS037       | Creative Diagnostics | humanized | IgG |
| DCABH-4693       | mouse  | IgG1   |
| HM1066           | mouse  | IgG2a  |
| HM1054           | mouse  | IgG2b  |
| HM1055           | mouse  | IgG1   |
| HM1056           | mouse  | IgG1   |
| HM1057           | mouse  | IgG1   |
| HM1058           | mouse  | IgG1   |
| HM1063           | mouse  | IgG1   |
| HM1064           | mouse  | -      |
| HM1065           | mouse  | -      |
| HM1068           | mouse  | IgG    |
| HM1069           | mouse  | IgG    |
| 348717           | mouse  | IgG1   |
| 349082           | mouse  | IgG1   |
| 10-CR9003M1      | mouse  | IgG2b  |
| 10-CR9003M2      | mouse  | IgG1   |
| 10 2860          | murine ascites | IgG |
| 10 2861          | murine ascites | IgG |
| 10 2856          | murine ascites | IgG2b |
| 10 2857          | murine ascites | IgG1 |
| 348352           | mouse  | IgG1   |
| GMP-V-2019nCov-NAb001 | Genemedi | humanized | IgG |
| GMP-V-2019nCov-NAb002 | GMP-V-2019nCov-NAb002 | humanized | sdFv-Fc |
| 9547             | Meridian Life Science | mouse | IgG |
| 9548             |         | mouse | IgG |
| MB5569951        | Bioss Antibodies | mouse | mouse Mab |
| MB5569961        | Bioss Antibodies | mouse | IgG |
| MB5569938        | Bioss Antibodies | mouse | mouse Mab |
| MB5569937        | MyBiosource | mouse | mouse Mab |
| MB5569939        | MyBiosource | mouse | mouse Mab |
| MB5569961        | Bioss Antibodies | mouse | IgG |
| NB100-56576      | Novus Biological | rabbit | IgG |
| NB100-56683      | Novus Biological | rabbit | IgG |
| NB100-56049      | Novus Biological | rabbit | IgG |
| NB100-56576      | Novus Biological | polyclonal rabbit | IgG |
| NB100-56683      | Novus Biological | polyclonal rabbit | IgG |
| NB100-56049      | Novus Biological | polyclonal rabbit | IgG |
| NBP2-24747       | Novus Biological | monoclonal | IgG2b, kappa |
| NB100-56576      | Novus Biological | polyclonal rabbit | IgG |
| NB100-56683      | Novus Biological | polyclonal rabbit | IgG |
| NB100-56049      | Novus Biological | polyclonal rabbit | IgG |
| 40588-R0004      | Sino Biological | monoclonal rabbit | IgG |
| 40143-MM08       | Sino Biological | monoclonal mouse | IgG |
| 40143-R001       | Sino Biological | monoclonal rabbit | IgG |
| 40143-R019       | Sino Biological | monoclonal rabbit | IgG |
| 40143-R040       | Sino Biological | monoclonal rabbit | IgG |
| 40143-MM05       | Sino Biological | monoclonal mouse | IgG |
| 40143-R019       | Sino Biological | monoclonal rabbit | IgG |
| PAB21469-250     | The Native Antigen Co. | rabbit | IgG |
Table S2 | Indexed list of antibody pairs screened in Rounds 1–5.

| Index | Capture antibody | Detector antibody | Average rank |
|-------|------------------|-------------------|--------------|
| 1     | Bioss bsm-41411M | Bioss bsm-41411M  | round 1 74.5 | round 2 82.5 | round 3 122.5 | round 4 302 |
| 2     | Bioss bsm-41411M | Bioss bsm-41412M  | - 11 28.5    | - 29         |
| 3     | Bioss bsm-41411M | Bioss bsm-41413M  | - 21 507.5   |
| 4     | Bioss bsm-41411M | Bioss bsm-41414M  | - 60 33.5    |
| 5     | Bioss bsm-41411M | Bioss bsm-41415M  | - 61.5 35    |
| 6     | Bioss bsm-41411M | Creative Diagnostics CABT-CS037 | - 4 5.5 9 | 341.5 |
| 7     | Bioss bsm-41411M | Creative Diagnostics CABT-RM320 | - 65 | - - |
| 8     | Bioss bsm-41411M | Creative Diagnostics DCABH-4693 | - 14 | - - |
| 9     | Bioss bsm-41411M | East Coast Bio HM1054 | - 21 |
| 10    | Bioss bsm-41411M | East Coast Bio HM1055 | - 33.5 |
| 11    | Bioss bsm-41411M | East Coast Bio HM1056 | - 162 |
| 12    | Bioss bsm-41411M | East Coast Bio HM1057 | - 184 |
| 13    | Bioss bsm-41411M | East Coast Bio HM1058 | - 74.5 |
| 14    | Bioss bsm-41411M | East Coast Bio HM1063 | - 130.5 |
| 15    | Bioss bsm-41411M | East Coast Bio HM1064 | - 85.5 |
| 16    | Bioss bsm-41411M | East Coast Bio HM1065 | - 109.5 |
| 17    | Bioss bsm-41411M | East Coast Bio HM1066 | - 111.5 |
| 18    | Bioss bsm-41411M | East Coast Bio HM1068 | - 217.5 |
| 19    | Bioss bsm-41411M | East Coast Bio HM1069 | - 75 |
| 20    | Bioss bsm-41411M | Fitzgerald 10-2853 | - 454.5 |
| 21    | Bioss bsm-41411M | Fitzgerald 10-2854 | - 417 |
| 22    | Bioss bsm-41411M | Fitzgerald 10-2856 | - 448.5 |
| 23    | Bioss bsm-41411M | Fitzgerald 10-2857 | - 642 |
| 24    | Bioss bsm-41411M | Fitzgerald 10-2860 | - 351 |
| 25    | Bioss bsm-41411M | Fitzgerald 10-2861 | - 321.5 |
| 26    | Bioss bsm-41411M | Genemedi GMP-V-2019nCoV-Nab001 | - 135.5 | 296 |
| 27    | Bioss bsm-41411M | Genemedi GMP-V-2019nCoV-Nab002 | - 51.5 | 309 |
| 28    | Bioss bsm-41411M | Leinco LT7000 | - 437 |
| 29    | Bioss bsm-41411M | Meridian Life Science 9547 | - | 112 |
| 30    | Bioss bsm-41411M | Meridian Life Science 9548 | - | 11.5 |

| Index | Capture antibody | Detector antibody | Average rank |
|-------|------------------|-------------------|--------------|
| 31    | Bioss bsm-41411M | MyBiosource MB569937 | - 65 |
| 32    | Bioss bsm-41411M | MyBiosource MB569939 | - 143 |
| 33    | Bioss bsm-41411M | MyBiosource MB569951 | - 122.5 |
| 34    | Bioss bsm-41411M | MyBiosource MB569961 | - 105.5 |
| 35    | Bioss bsm-41411M | Sino Biological 40143-MM05 | - 9 |
| 36    | Bioss bsm-41411M | Sino Biological 40143-MM08 | - 3 |
| 37    | Bioss bsm-41411M | Sino Biological 40143-R001 | - 10 |
| 38    | Bioss bsm-41411M | Sino Biological 40143-R004 | - 90.5 |
| 39    | Bioss bsm-41412M | Bioss bsm-41411M | - 59 |
| 40    | Bioss bsm-41412M | Bioss bsm-41412M | - 140 |
| 41    | Bioss bsm-41412M | Bioss bsm-41413M | - 77 |
| 42    | Bioss bsm-41412M | Bioss bsm-41414M | - 409.5 |
| 43    | Bioss bsm-41412M | Bioss bsm-41415M | - 108 |
| 44    | Bioss bsm-41412M | Creative Diagnostics CABT-CS037 | - 112 |
| 45    | Bioss bsm-41412M | Creative Diagnostics DCABH-4693 | - 74 |
| 46    | Bioss bsm-41412M | Fitzgerald 10-2853 | - 162.5 |
| 47    | Bioss bsm-41412M | Fitzgerald 10-2854 | - 283.5 |
| 48    | Bioss bsm-41412M | Fitzgerald 10-2856 | - 632.5 |
| 49    | Bioss bsm-41412M | Fitzgerald 10-2857 | - 363.5 |
| 50    | Bioss bsm-41412M | Fitzgerald 10-2860 | - 112 |
| 51    | Bioss bsm-41412M | Fitzgerald 10-2861 | - 404.5 |
| 52    | Bioss bsm-41412M | Genemedi GMP-V-2019nCoV-Nab001 | - |
| 53    | Bioss bsm-41412M | Genemedi GMP-V-2019nCoV-Nab002 | - |
| 54    | Bioss bsm-41412M | Leinco LT7000 | - 168.5 |
| 55    | Bioss bsm-41412M | Meridian Life Science 9547 | - |
| 56    | Bioss bsm-41412M | Meridian Life Science 9548 | - | 160 |
| Index | Capture antibody | Detector antibody | Average rank |
|-------|------------------|------------------|--------------|
|       | biosm-41412M     | MyBiosource MB5596997 | round 1 round 2 round 3 round 4 round 5 |
| 57    | biosm-41412M     | MyBiosource MB5596999 | - - - 180 |
| 58    | biosm-41412M     | MyBiosource MB5596991 | - - 101 210.5 |
| 59    | biosm-41412M     | MyBiosource MB5596996 | - - 138 461 |
| 60    | biosm-41412M     | Sino Biological 40143-MM05 | - 133 473.5 |
| 61    | biosm-41412M     | Sino Biological 40143-MM08 | - 99 271 |
| 62    | biosm-41412M     | Sino Biological 40143-R001 | - 36 24.5 430 |
| 63    | biosm-41412M     | Sino Biological 40143-R004 | - 42 438.5 |
| 64    | biosm-41412M     | Biosm-41411M | - - - 643.5 |
| 65    | Biosm-41413M     | Biosm-41412M | - - 72 171 |
| 66    | Biosm-41413M     | Biosm-41413M | - - 90.5 463 |
| 67    | Biosm-41413M     | Biosm-41414M | - - 42 438.5 |
| 68    | Biosm-41413M     | Biosm-41415M | - - 457 |
| 69    | Biosm-41413M     | Creative Diagnostics CABT-CS037 | - 4.5 519.5 |
| 70    | Biosm-41413M     | Creative Diagnostics DCABH-4693 | - - 261.5 |
| 71    | Biosm-41413M     | East Coast Bio HM1054 | - - 41 |
| 72    | Biosm-41413M     | East Coast Bio HM1055 | - - 140.5 |
| 73    | Biosm-41413M     | East Coast Bio HM1056 | - - 44.5 |
| 74    | Biosm-41413M     | East Coast Bio HM1057 | - - 161 |
| 75    | Biosm-41413M     | East Coast Bio HM1058 | - - 62.5 |
| 76    | Biosm-41413M     | East Coast Bio HM1063 | - - 266.5 |
| 77    | Biosm-41413M     | East Coast Bio HM1064 | - - 40 |
| 78    | Biosm-41413M     | East Coast Bio HM1065 | - - 157 |
| 79    | Biosm-41413M     | East Coast Bio HM1066 | - - 214 |
| 80    | Biosm-41413M     | East Coast Bio HM1069 | - - 257.5 |
| 81    | Biosm-41413M     | East Coast Bio HM1072 | - - 243 |
| 82    | Biosm-41413M     | Fitzgerald 10-2853 | - - 579.5 |
| 83    | Biosm-41413M     | Fitzgerald 10-2854 | - - 454.5 |
| 84    | Biosm-41413M     | Fitzgerald 10-2856 | - - 231 |
| 85    | Biosm-41413M     | Fitzgerald 10-2857 | - - 373 |
| 86    | Biosm-41413M     | Fitzgerald 10-2858 | - - |
| 87    | Biosm-41413M     | Fitzgerald 10-2860 | - - 68.5 82.5 |
| 88    | Biosm-41413M     | Fitzgerald 10-2861 | - - 134 - 474 |
| 89    | Biosm-41413M     | Genemedi GMP-V-2019nCoV-Nab001 | - - 128 47.5 |
| 90    | Biosm-41413M     | Genemedi GMP-V-2019nCoV-Nab002 | - - 38.5 591.5 |
| 91    | Biosm-41413M     | Leinco LT7000 | - - - 455 |
| 92    | Biosm-41413M     | Meridian Life Science 9547 | - - - 356 |
| 93    | Biosm-41413M     | Meridian Life Science 9548 | - - - 292 |
| 94    | Biosm-41413M     | MyBiosource MB5596937 | - - - 183 |
| 95    | Biosm-41413M     | MyBiosource MB5596939 | - - - 57.5 |
| 96    | Biosm-41413M     | MyBiosource MB5596951 | - - - 468 |
| 97    | Biosm-41413M     | MyBiosource MB5599952 | - - 138.5 142 |
| 98    | Biosm-41413M     | Sino Biological 40143-MM05 | - - 20.5 10.5 265 |
| 99    | Biosm-41413M     | Sino Biological 40143-MM08 | - - 3 3.5 400.5 |
| 100   | Biosm-41413M     | Sino Biological 40143-R001 | - - - 398 |
| 101   | Biosm-41413M     | Sino Biological 40143-R004 | - - 115 - 166.5 |
| 102   | Biosm-41413M     | Biosm-41411M | - - 94.5 - 133.5 |
| 103   | Biosm-41413M     | Biosm-41412M | - - 72.5 - 160.5 |
| 104   | Biosm-41413M     | Biosm-41413M | - - 77.5 - 73.5 |
| 105   | Biosm-41413M     | Biosm-41414M | - - 132 - 164 |
| 106   | Biosm-41413M     | Biosm-41415M | - - - 114 |
| 107   | Biosm-41413M     | Creative Diagnostics CABT-CS037 | - - 75.5 - 480.5 |
| 108   | Biosm-41413M     | Creative Diagnostics DCABH-4693 | - - - 303 |
| 109   | Biosm-41413M     | Fitzgerald 10-2853 | - - - 297 |
| 110   | Biosm-41413M     | Fitzgerald 10-2854 | - - - 147 |
| 111   | Biosm-41413M     | Fitzgerald 10-2856 | - - - 276.5 |
| 112   | Biosm-41413M     | Fitzgerald 10-2857 | - - - 330.5 |
| 113   | Biosm-41413M     | Fitzgerald 10-2860 | - - - 555.5 |
| 114   | Biosm-41413M     | Fitzgerald 10-2861 | - - 42 - 364 |
| Index | Capture antibody | Detector antibody | round 1 | round 2 | round 3 | round 4 | round 5 | Average rank |
|-------|------------------|-------------------|---------|---------|---------|---------|---------|--------------|
| 115   | Bioss bsm-41414M | Genemedi GMP-V-2019nCoV-Nab001 | -       | -       | 81      |         |         | 136          |
| 116   | Bioss bsm-41414M | Genemedi GMP-V-2019nCoV-Nab002 | -       | -       | 125     | -       |         | 126          |
| 117   | Bioss bsm-41414M | Leinco LT7000     | -       | -       | -       | -       | -       | 133          |
| 118   | Bioss bsm-41414M | Meridian Life Science 9547 | - | - | - | 212 |         |         |
| 119   | Bioss bsm-41414M | Meridian Life Science 9548 | - | - | - | 62 |         |         |
| 120   | Bioss bsm-41414M | MyBiosource MBSS69997 | - | - | - | 104.5 |         |         |
| 121   | Bioss bsm-41414M | MyBiosource MBSS69999 | - | - | - | 621 |         |         |
| 122   | Bioss bsm-41414M | MyBiosource MBSS69951 | - | - | - | 590 |         |         |
| 123   | Bioss bsm-41414M | MyBiosource MBSS69961 | - | - | 65 | 361.5 |         |         |
| 124   | Bioss bsm-41414M | Sino Biological 40143-MM05 | - | - | 84 | - | 550 |         |
| 125   | Bioss bsm-41414M | Sino Biological 40143-MM08 | - | - | 62.5 | - | 504.5 |         |
| 126   | Bioss bsm-41414M | Sino Biological 40143-R001 | - | - | - | - | 549 |         |
| 127   | Bioss bsm-41414M | Sino Biological 40143-R004 | - | - | 84 | - | 386.5 |         |
| 128   | Bioss bsm-41415M | Bioss bsm-41411M | - | 81 | - | - | 592.5 |         |
| 129   | Bioss bsm-41415M | Bioss bsm-41412M | - | 56.5 | - | - | 376 |         |
| 130   | Bioss bsm-41415M | Bioss bsm-41413M | - | - | - | - | 144.5 |         |
| 131   | Bioss bsm-41415M | Bioss bsm-41414M | - | - | - | 82.5 |         |         |
| 132   | Bioss bsm-41415M | Bioss bsm-41415M | - | 91 | - | - | 96.5 |         |
| 133   | Bioss bsm-41415M | Creative Diagnostics CABT-CS037 | - | 56 | - | - | 315 |         |
| 134   | Bioss bsm-41415M | Creative Diagnostics DCABH-4693 | - | 103 | - | - | 427.5 |         |
| 135   | Bioss bsm-41415M | Fitzgerald 10-2853 | - | - | - | - | 514 |         |
| 136   | Bioss bsm-41415M | Fitzgerald 10-2854 | - | - | - | 246.5 |         |         |
| 137   | Bioss bsm-41415M | Fitzgerald 10-2856 | - | 60.5 | - | - | 472 |         |
| 138   | Bioss bsm-41415M | Fitzgerald 10-2857 | - | 98.5 | - | - | 588.5 |         |
| 139   | Bioss bsm-41415M | Fitzgerald 10-2860 | - | - | - | 209.5 |         |         |
| 140   | Bioss bsm-41415M | Fitzgerald 10-2861 | - | - | - | 314 |         |         |
| 141   | Bioss bsm-41415M | Genemedi GMP-V-2019nCoV-Nab001 | - | - | - | - | 387 |         |
| Index | Capture antibody | Detector antibody | Average rank |
|-------|------------------|------------------|--------------|
|       | Creative Diagnostics | Fitzgerald 10-2857 | 193 |
| 165   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Fitzgerald 10-2860 | 164 |
| 166   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Fitzgerald 10-2861 | 413.5 |
| 167   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Genemedi GMP-V-2019nCoV-Nab001 | 620.5 |
| 168   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Genemedi GMP-V-2019nCoV-Nab002 | 333 |
| 169   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Leinco LT7000 | 540.5 |
| 170   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Meridian Life Science 9547 | 25 |
| 171   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Meridian Life Science 9548 | 240 |
| 172   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | MyBiosource MB569937 | 98 |
| 173   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | MyBiosource MB569939 | 335 |
| 174   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | MyBiosource MB569951 | 235.5 |
| 175   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | MyBiosource MB569961 | 325.5 |
| 176   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Sino Biological 40143-MM05 | 636 |
| 177   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Sino Biological 40143-MM08 | 522.5 |
| 178   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Sino Biological 40143-R001 | 115 |
| 179   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Sino Biological 40143-R004 | 375 |
| 180   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Sino Biological 40143-R004 | 375 |
| 181   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Sino Biological 40143-R019 | 70.5 |
| 182   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Sino Biological 40143-R040 | 43 |
| 183   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Sino Biological 40588-T62 | 56 |
| 184   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Creative Diagnostics CABT-CS037 | 37 |
| 185   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Creative Diagnostics CABT-RM320 | 82 |
| 186   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | DCABH-4693 | 47 |
| 187   | CABT-CS037        | -                | - |
|       | Creative Diagnostics | Sino Biological 40143-MM05 | 59.5 |
| 188   | Creative Diagnostics | Sino Biological 40143-MM08 | 33.5 |
| 189   | Creative Diagnostics | Sino Biological 40143-MM08 | 102.5 |
| 190   | Creative Diagnostics | Sino Biological 40143-MM08 | 46 |
| 191   | Creative Diagnostics | Sino Biological 40143-MM08 | 80.5 |
| 192   | Creative Diagnostics | Sino Biological 40143-MM08 | 99 |
| 193   | Creative Diagnostics | Sino Biological 40588-T62 | 83 |
| 194   | Creative Diagnostics | DCABH-4693 | 144.5 |
| 195   | Creative Diagnostics | DCABH-4693 | 497 |
| 196   | Creative Diagnostics | DCABH-4693 | 136.5 |
| 197   | Creative Diagnostics | DCABH-4693 | 523.5 |
| 198   | Creative Diagnostics | DCABH-4693 | 155 |
| 199   | Creative Diagnostics | DCABH-4693 | 216.5 |
| 200   | Creative Diagnostics | DCABH-4693 | 75.5 |
| 201   | Creative Diagnostics | DCABH-4693 | 492.5 |
| 202   | Creative Diagnostics | DCABH-4693 | 75.5 |
| 203   | Creative Diagnostics | Fitzgerald 10-2853 | 433.5 |
| 204   | Creative Diagnostics | Fitzgerald 10-2853 | 200 |
| 205   | Creative Diagnostics | Fitzgerald 10-2856 | 183.5 |
| 206   | Creative Diagnostics | Fitzgerald 10-2857 | 474.5 |
| 207   | Creative Diagnostics | Fitzgerald 10-2860 | 510.5 |
| 208   | Creative Diagnostics | Fitzgerald 10-2861 | 260 |
| 209   | Creative Diagnostics | Genemedi GMP-V-2019nCoV-Nab001 | 21 |
| 210   | Creative Diagnostics | Genemedi GMP-V-2019nCoV-Nab002 | 436.5 |
| 211   | Creative Diagnostics | Leinco LT7000 | 577 |
| Index | Capture antibody          | Detector antibody          | Average rank | round 1 | round 2 | round 3 | round 4 | round 5 |
|-------|---------------------------|---------------------------|--------------|---------|---------|---------|---------|---------|
| 211   | Creative Diagnostics DCABH-4693 | Meridian Life Science 9547 | 313          | -       | -       | -       | -       |         |
| 212   | Creative Diagnostics DCABH-4693 | Meridian Life Science 9548 | 198.5        | -       | -       | -       | -       |         |
| 213   | Creative Diagnostics DCABH-4693 | MyBiosource MBS699937     | 359          | -       | -       | -       | -       |         |
| 214   | Creative Diagnostics DCABH-4693 | MyBiosource MBS699999    | 155.5        | -       | -       | -       | -       |         |
| 215   | Creative Diagnostics DCABH-4693 | MyBiosource MBS699951    | 454          | -       | -       | -       | -       |         |
| 216   | Creative Diagnostics DCABH-4693 | MyBiosource MBS69961     | 442          | -       | -       | -       | -       |         |
| 217   | Creative Diagnostics DCABH-4693 | Sino Biological 40143-MM05 | 45.5         | -       | -       | -       | -       | 625.5   |
| 218   | Creative Diagnostics DCABH-4693 | Sino Biological 40143-MM08 | 31           | -       | -       | -       | -       | 263     |
| 219   | Creative Diagnostics DCABH-4693 | Sino Biological 40143-MM01 | 68.5         | -       | -       | -       | -       | 59      |
| 220   | Creative Diagnostics DCABH-4693 | Sino Biological 40143-MM04 | 53.5         | -       | -       | -       | -       | 409     |
| 221   | Creative Diagnostics DCABH-4693 | Sino Biological 40143-MM09 | 91           | -       | -       | -       | -       |         |
| 222   | Creative Diagnostics DCABH-4693 | Sino Biological 40143-MM10 | 63.5         | -       | -       | -       | -       |         |
| 223   | Creative Diagnostics DCABH-4693 | Sino Biological 40588-T62 | 60           | -       | -       | -       | -       |         |
| 224   | East Coast Bio HM1054        | Bios bsm-411411M         | 20           | -       | -       | -       | -       |         |
| 225   | East Coast Bio HM1054        | Creative Diagnostics CABT-CS037 | 45           | -       | -       | -       | -       |         |
| 226   | East Coast Bio HM1054 East Coast Bio HM1054 | - | 258 | - | - | - | - | |
| 227   | East Coast Bio HM1054 East Coast Bio HM1055 | - | 202 | - | - | - | - | |
| 228   | East Coast Bio HM1054 East Coast Bio HM1056 | - | 277 | - | - | - | - | |
| 229   | East Coast Bio HM1054 East Coast Bio HM1057 | - | 222.5 | - | - | - | - | |
| 230   | East Coast Bio HM1054 East Coast Bio HM1058 | - | 264 | - | - | - | - | |
| 231   | East Coast Bio HM1054 East Coast Bio HM1063 | - | 131.5 | - | - | - | - | |
| 232   | East Coast Bio HM1054 East Coast Bio HM1064 | - | 85.5 | - | - | - | - | |
| 233   | East Coast Bio HM1054 East Coast Bio HM1065 | - | 172 | - | - | - | - | |
| 234   | East Coast Bio HM1054 East Coast Bio HM1066 | - | 264 | - | - | - | - | |
| 235   | East Coast Bio HM1054 East Coast Bio HM1068 | - | 251.5 | - | - | - | - | |
| 236   | East Coast Bio HM1054 East Coast Bio HM1069 | - | 43 | - | - | - | - | |
| 237   | East Coast Bio HM1054 Fitzgerald 10-2860 | - | 249.5 | - | - | - | - | |

| Index | Capture antibody          | Detector antibody          | Average rank | round 1 | round 2 | round 3 | round 4 | round 5 |
|-------|---------------------------|---------------------------|--------------|---------|---------|---------|---------|---------|
| 238   | East Coast Bio HM1054        | Sino Biological 40143-MM05 | 16.5         | -       | -       | -       | -       |         |
| 239   | East Coast Bio HM1054        | Sino Biological 40143-MM08 | 13           | -       | -       | -       | -       |         |
| 240   | East Coast Bio HM1055        | Bios bsm-411411M         | 39.5         | -       | -       | -       | -       |         |
| 241   | East Coast Bio HM1055        | Creative Diagnostics CABT-CS037 | 283.5 | - | - | - | - | |
| 242   | East Coast Bio HM1055 East Coast Bio HM1054 | - | 230 | - | - | - | - | |
| 243   | East Coast Bio HM1055 East Coast Bio HM1055 | - | 194 | - | - | - | - | |
| 244   | East Coast Bio HM1055 East Coast Bio HM1056 | - | 266.5 | - | - | - | - | |
| 245   | East Coast Bio HM1055 East Coast Bio HM1057 | - | 192.5 | - | - | - | - | |
| 246   | East Coast Bio HM1055 East Coast Bio HM1058 | - | 217.5 | - | - | - | - | |
| 247   | East Coast Bio HM1055 East Coast Bio HM1063 | - | 86.5 | - | - | - | - | |
| 248   | East Coast Bio HM1055 East Coast Bio HM1064 | - | 138 | - | - | - | - | |
| 249   | East Coast Bio HM1055 East Coast Bio HM1065 | - | 107 | - | - | - | - | |
| 250   | East Coast Bio HM1055 East Coast Bio HM1066 | - | 183 | - | - | - | - | |
| 251   | East Coast Bio HM1055 East Coast Bio HM1068 | - | 265 | - | - | - | - | |
| 252   | East Coast Bio HM1055 East Coast Bio HM1069 | - | 205.5 | - | - | - | - | |
| 253   | East Coast Bio HM1055 Fitzgerald 10-2860 | - | 116 | - | - | - | - | |
| 254   | East Coast Bio HM1055 Sino Biological 40143-MM05 | - | 215.5 | - | - | - | - | |
| 255   | East Coast Bio HM1055 Sino Biological 40143-MM08 | - | 96.5 | - | - | - | - | |
| 256   | East Coast Bio HM1056        | Bios bsm-411411M         | 70           | -       | -       | -       | -       |         |
| 257   | East Coast Bio HM1056        | Creative Diagnostics CABT-CS037 | 246.5 | - | - | - | - | |
| 258   | East Coast Bio HM1056 East Coast Bio HM1054 | - | 43.5 | - | - | - | - | |
| 259   | East Coast Bio HM1056 East Coast Bio HM1055 | - | 229.5 | - | - | - | - | |
| 260   | East Coast Bio HM1056 East Coast Bio HM1056 | - | 216.5 | - | - | - | - | |
| 261   | East Coast Bio HM1056 East Coast Bio HM1057 | - | 191.5 | - | - | - | - | |
| 262   | East Coast Bio HM1056 East Coast Bio HM1058 | - | 125.5 | - | - | - | - | |
| 263   | East Coast Bio HM1056 East Coast Bio HM1063 | - | 85 | - | - | - | - | |
| 264   | East Coast Bio HM1056 East Coast Bio HM1064 | - | 269.5 | - | - | - | - | |
| 265   | East Coast Bio HM1056 East Coast Bio HM1065 | - | 47 | - | - | - | - | |
| 266   | East Coast Bio HM1056 East Coast Bio HM1066 | - | 131 | - | - | - | - | |
| 267   | East Coast Bio HM1056 East Coast Bio HM1068 | - | 156.5 | - | - | - | - | |
| 268   | East Coast Bio HM1056 East Coast Bio HM1069 | - | 133 | - | - | - | - | |
| 269   | East Coast Bio HM1056 Fitzgerald 10-2860 | - | 275 | - | - | - | - | |
| Index | Capture antibody       | Detector antibody       | round 1 | round 2 | round 3 | round 4 | round 5 | Average rank |
|-------|------------------------|------------------------|---------|---------|---------|---------|---------|--------------|
| 270   | East Coast Bio HM1056  | Sino Biological 40143-MM05 |         |         |         | 214.5   |         |              |
| 271   | East Coast Bio HM1056  | Sino Biological 40143-MM08 |         |         |         | 48.5    |         |              |
| 272   | East Coast Bio HM1057  | Bloss bsm-41411M       |         |         |         | 48.5    |         |              |
| 273   | East Coast Bio HM1057  | Creative Diagnostics   |         |         |         | 74      |         |              |
| 274   | East Coast Bio HM1057 East Coast Bio HM1054 |         | 237 |         |         |         |         |              |
| 275   | East Coast Bio HM1057 East Coast Bio HM1055 |         | 149 |         |         |         |         |              |
| 276   | East Coast Bio HM1057 East Coast Bio HM1056 |         | 106.5 |         |         |         |         |              |
| 277   | East Coast Bio HM1057 East Coast Bio HM1057 |         | 181 |         |         |         |         |              |
| 278   | East Coast Bio HM1057 East Coast Bio HM1058 |         | 132.5 |         |         |         |         |              |
| 279   | East Coast Bio HM1057 East Coast Bio HM1063 |         | 263.5 |         |         |         |         |              |
| 280   | East Coast Bio HM1057 East Coast Bio HM1064 |         | 99 |         |         |         |         |              |
| 281   | East Coast Bio HM1057 East Coast Bio HM1065 |         | 227 |         |         |         |         |              |
| 282   | East Coast Bio HM1057 East Coast Bio HM1066 |         | 94.5 |         |         |         |         |              |
| 283   | East Coast Bio HM1057 East Coast Bio HM1068 |         | 87 |         |         |         |         |              |
| 284   | East Coast Bio HM1057 East Coast Bio HM1069 |         | 68.5 |         |         |         |         |              |
| 285   | East Coast Bio HM1057 Fitzgerald 10-2860 |         | 138 |         |         |         |         |              |
| 286   | East Coast Bio HM1057 Sino Biological 40143-MM05 |         | 93.5 |         |         |         |         |              |
| 287   | East Coast Bio HM1057 Sino Biological 40143-MM08 |         | 85.5 |         |         |         |         |              |
| 288   | East Coast Bio HM1058 Bloss bsm-41411M |         | 85.5 |         |         |         |         |              |
| 289   | East Coast Bio HM1058 Creative Diagnostics |         | 173.5 |         |         |         |         |              |
| 290   | East Coast Bio HM1058 East Coast Bio HM1054 |         | 235.5 |         |         |         |         |              |
| 291   | East Coast Bio HM1058 East Coast Bio HM1055 |         | 148 |         |         |         |         |              |
| 292   | East Coast Bio HM1058 East Coast Bio HM1056 |         | 245.5 |         |         |         |         |              |
| 293   | East Coast Bio HM1058 East Coast Bio HM1057 |         | 217.5 |         |         |         |         |              |
| 294   | East Coast Bio HM1058 East Coast Bio HM1058 |         | 250.5 |         |         |         |         |              |
| 295   | East Coast Bio HM1058 East Coast Bio HM1063 |         | 266 |         |         |         |         |              |
| 296   | East Coast Bio HM1058 East Coast Bio HM1064 |         | 256 |         |         |         |         |              |
| 297   | East Coast Bio HM1058 East Coast Bio HM1065 |         | 241 |         |         |         |         |              |
| 298   | East Coast Bio HM1058 East Coast Bio HM1066 |         | 66.5 |         |         |         |         |              |
| 299   | East Coast Bio HM1058 East Coast Bio HM1068 |         | 226.5 |         |         |         |         |              |
| 300   | East Coast Bio HM1058 East Coast Bio HM1069 |         | 104.5 |         |         |         |         |              |
| 301   | East Coast Bio HM1058 Fitzgerald 10-2860 |         | 221 |         |         |         |         |              |

| Index | Capture antibody       | Detector antibody       | round 1 | round 2 | round 3 | round 4 | Average rank |
|-------|------------------------|------------------------|---------|---------|---------|---------|--------------|
| 302   | East Coast Bio HM1058  | Sino Biological 40143-MM05 |         |         |         |         | 133 |              |
| 303   | East Coast Bio HM1058  | Sino Biological 40143-MM08 |         |         |         |         | 265 |              |
| 304   | East Coast Bio HM1063  | Bloss bsm-41411M       |         |         |         |         | 147.5 |              |
| 305   | East Coast Bio HM1063  | Creative Diagnostics   |         |         |         |         | 75 |              |
| 306   | East Coast Bio HM1063 East Coast Bio HM1054 |         | 229 |         |         |         |         |              |
| 307   | East Coast Bio HM1063 East Coast Bio HM1055 |         | 119 |         |         |         |         |              |
| 308   | East Coast Bio HM1063 East Coast Bio HM1056 |         | 224 |         |         |         |         |              |
| 309   | East Coast Bio HM1063 East Coast Bio HM1057 |         | 127.5 |         |         |         |         |              |
| 310   | East Coast Bio HM1063 East Coast Bio HM1058 |         | 198 |         |         |         |         |              |
| 311   | East Coast Bio HM1063 East Coast Bio HM1063 |         | 35.5 |         |         |         |         |              |
| 312   | East Coast Bio HM1063 East Coast Bio HM1064 |         | 259.5 |         |         |         |         |              |
| 313   | East Coast Bio HM1063 East Coast Bio HM1065 |         | 211 |         |         |         |         |              |
| 314   | East Coast Bio HM1063 East Coast Bio HM1066 |         | 173.5 |         |         |         |         |              |
| 315   | East Coast Bio HM1063 East Coast Bio HM1068 |         | 263 |         |         |         |         |              |
| 316   | East Coast Bio HM1063 East Coast Bio HM1069 |         | 254.5 |         |         |         |         |              |
| 317   | East Coast Bio HM1063 Fitzgerald 10-2860 |         | 239 |         |         |         |         |              |
| 318   | East Coast Bio HM1063 Sino Biological 40143-MM05 |         | 71 |         |         |         |         |              |
| 319   | East Coast Bio HM1063 Sino Biological 40143-MM08 |         | 180 |         |         |         |         |              |
| 320   | East Coast Bio HM1064 Bloss bsm-41411M |         | 50.5 |         |         |         |         |              |
| 321   | East Coast Bio HM1064 Creative Diagnostics |         | 64.5 |         |         |         |         |              |
| 322   | East Coast Bio HM1064 East Coast Bio HM1054 |         | 105.5 |         |         |         |         |              |
| 323   | East Coast Bio HM1064 East Coast Bio HM1055 |         | 37 |         |         |         |         |              |
| 324   | East Coast Bio HM1064 East Coast Bio HM1056 |         | 110.5 |         |         |         |         |              |
| 325   | East Coast Bio HM1064 East Coast Bio HM1057 |         | 143.5 |         |         |         |         |              |
| 326   | East Coast Bio HM1064 East Coast Bio HM1058 |         | 234 |         |         |         |         |              |
| 327   | East Coast Bio HM1064 East Coast Bio HM1063 |         | 217.5 |         |         |         |         |              |
| 328   | East Coast Bio HM1064 East Coast Bio HM1064 |         | 282.5 |         |         |         |         |              |
| 329   | East Coast Bio HM1064 East Coast Bio HM1065 |         | 226 |         |         |         |         |              |
| 330   | East Coast Bio HM1064 East Coast Bio HM1066 |         | 210 |         |         |         |         |              |
| 331   | East Coast Bio HM1064 East Coast Bio HM1068 |         | 74 |         |         |         |         |              |
| 332   | East Coast Bio HM1064 East Coast Bio HM1069 |         | 226.5 |         |         |         |         |              |
| 333   | East Coast Bio HM1064 Fitzgerald 10-2860 |         | 41.5 |         |         |         |         |              |
| Index | Capture antibody          | Detector antibody          | round 1 | round 2 | round 3 | round 4 | round 5 | Average rank |
|-------|---------------------------|---------------------------|---------|---------|---------|---------|---------|--------------|
| 334   | East Coast Bio HM1064     | Sino Biological 40143-MM05| -       | -       | -       | 96.5    | -       |              |
| 335   | East Coast Bio HM1064     | Sino Biological 40143-MM08| -       | -       | -       | 44.5    | -       |              |
| 336   | East Coast Bio HM1065     | Bios bsm-41411M           | -       | -       | -       | 254     | -       |              |
| 337   | East Coast Bio HM1065     | Creative Diagnostics      | -       | -       | -       | 214.5   | -       |              |
| 338   | East Coast Bio HM1065     | East Coast Bio HM1054     | -       | -       | -       | 274     | -       |              |
| 339   | East Coast Bio HM1065     | East Coast Bio HM1055     | -       | -       | -       | 73      | -       |              |
| 340   | East Coast Bio HM1065     | East Coast Bio HM1056     | -       | -       | -       | 108.5   | -       |              |
| 341   | East Coast Bio HM1065     | East Coast Bio HM1057     | -       | -       | -       | 139.5   | -       |              |
| 342   | East Coast Bio HM1065     | East Coast Bio HM1058     | -       | -       | -       | 73.5    | -       |              |
| 343   | East Coast Bio HM1065     | East Coast Bio HM1063     | -       | -       | -       | 29.5    | -       |              |
| 344   | East Coast Bio HM1065     | East Coast Bio HM1064     | -       | -       | -       | 86      | -       |              |
| 345   | East Coast Bio HM1065     | East Coast Bio HM1065     | -       | -       | -       | 202     | -       |              |
| 346   | East Coast Bio HM1065     | East Coast Bio HM1066     | -       | -       | -       | 79.5    | -       |              |
| 347   | East Coast Bio HM1065     | East Coast Bio HM1068     | -       | -       | -       | 210     | -       |              |
| 348   | East Coast Bio HM1065     | East Coast Bio HM1069     | -       | -       | -       | 287     | -       |              |
| 349   | East Coast Bio HM1065     | Fitzgerald 10-2860       | -       | -       | -       | 83      | -       |              |
| 350   | East Coast Bio HM1065     | Sino Biological 40143-MM05| -       | -       | -       | 97.5    | -       |              |
| 351   | East Coast Bio HM1065     | Sino Biological 40143-MM08| -       | -       | -       | 71.5    | -       |              |
| 352   | East Coast Bio HM1066     | Bios bsm-41411M           | -       | -       | -       | 174     | -       |              |
| 353   | East Coast Bio HM1066     | Creative Diagnostics      | -       | -       | -       | 167     | -       |              |
| 354   | East Coast Bio HM1066     | East Coast Bio HM1054     | -       | -       | -       | 169     | -       |              |
| 355   | East Coast Bio HM1066     | East Coast Bio HM1055     | -       | -       | -       | 200     | -       |              |
| 356   | East Coast Bio HM1066     | East Coast Bio HM1056     | -       | -       | -       | 246     | -       |              |
| 357   | East Coast Bio HM1066     | East Coast Bio HM1057     | -       | -       | -       | 123     | -       |              |
| 358   | East Coast Bio HM1066     | East Coast Bio HM1058     | -       | -       | -       | 231     | -       |              |
| 359   | East Coast Bio HM1066     | East Coast Bio HM1063     | -       | -       | -       | 200.5   | -       |              |
| 360   | East Coast Bio HM1066     | East Coast Bio HM1064     | -       | -       | -       | 143     | -       |              |
| 361   | East Coast Bio HM1066     | East Coast Bio HM1065     | -       | -       | -       | 242.5   | -       |              |
| 362   | East Coast Bio HM1066     | East Coast Bio HM1066     | -       | -       | -       | 199.5   | -       |              |
| 363   | East Coast Bio HM1066     | East Coast Bio HM1068     | -       | -       | -       | 150.5   | -       |              |
| 364   | East Coast Bio HM1066     | East Coast Bio HM1069     | -       | -       | -       | 86.5    | -       |              |
| 365   | East Coast Bio HM1066     | Fitzgerald 10-2860       | -       | -       | -       | 155     | -       |              |
| Index | Capture antibody | Detector antibody | Average rank |
|-------|------------------|------------------|--------------|
| 398   | East Coast Bio HM1069 | Sino Biological 40143-MM05 | round 1 round 2 round 3 round 4 round 5 |
| 399   | East Coast Bio HM1069 | Sino Biological 40143-MM08 | 173 |
| 400   | Fitzgerald 10-2853 | Bioss bsm-41411M | 216.5 |
| 401   | Fitzgerald 10-2853 | Bioss bsm-41412M | 47 |
| 402   | Fitzgerald 10-2853 | Bioss bsm-41413M | 31.5 |
| 403   | Fitzgerald 10-2853 | Bioss bsm-41414M | 162.5 |
| 404   | Fitzgerald 10-2853 | Bioss bsm-41415M | 580.5 |
| 405   | Fitzgerald 10-2853 | Creative Diagnostics CABT-CS037 | 267 |
| 406   | Fitzgerald 10-2853 | Creative Diagnostics DCABH-4693 | 240 |
| 407   | Fitzgerald 10-2853 | Fitzgerald 10-2853 | 346 |
| 408   | Fitzgerald 10-2853 | Fitzgerald 10-2854 | 669 |
| 409   | Fitzgerald 10-2853 | Fitzgerald 10-2856 | 360.5 |
| 410   | Fitzgerald 10-2853 | Fitzgerald 10-2857 | 183.5 |
| 411   | Fitzgerald 10-2853 | Fitzgerald 10-2860 | 108.5 |
| 412   | Fitzgerald 10-2853 | Fitzgerald 10-2861 | 296.5 |
| 413   | Fitzgerald 10-2853 | Genemedi GMP-V-2019nCoV-Nab001 | 351 |
| 414   | Fitzgerald 10-2853 | Genemedi GMP-V-2019nCoV-Nab002 | 668.5 |
| 415   | Fitzgerald 10-2853 | Leinco LT7000 | 523 |
| 416   | Fitzgerald 10-2853 | Meridian Life Science 9547 | 279.5 |
| 417   | Fitzgerald 10-2853 | Meridian Life Science 9548 | 18.5 |
| 418   | Fitzgerald 10-2853 | MyBiosource MB5569937 | 149.5 |
| 419   | Fitzgerald 10-2853 | MyBiosource MB5569939 | 100 |
| 420   | Fitzgerald 10-2853 | MyBiosource MB5569951 | 127.5 |
| 421   | Fitzgerald 10-2853 | MyBiosource MB5569961 | 480 |
| 422   | Fitzgerald 10-2853 | Sino Biological 40143-MM05 | 476 |
| 423   | Fitzgerald 10-2853 | Sino Biological 40143-MM08 | 296 |
| 424   | Fitzgerald 10-2853 | Sino Biological 40143-R001 | 426 |
| 425   | Fitzgerald 10-2853 | Sino Biological 40143-R004 | 448 |

| Index | Capture antibody | Detector antibody | Average rank |
|-------|------------------|------------------|--------------|
| 426   | Fitzgerald 10-2854 | Bioss bsm-41411M | 173.5 |
| 427   | Fitzgerald 10-2854 | Bioss bsm-41412M | 216.5 |
| 428   | Fitzgerald 10-2854 | Bioss bsm-41413M | 47 |
| 429   | Fitzgerald 10-2854 | Bioss bsm-41414M | 31.5 |
| 430   | Fitzgerald 10-2854 | Bioss bsm-41415M | 162.5 |
| 431   | Fitzgerald 10-2854 | Creative Diagnostics CABT-CS037 | 580.5 |
| 432   | Fitzgerald 10-2854 | Creative Diagnostics DCABH-4693 | 267 |
| 433   | Fitzgerald 10-2854 | Fitzgerald 10-2853 | 346 |
| 434   | Fitzgerald 10-2854 | Fitzgerald 10-2854 | 669 |
| 435   | Fitzgerald 10-2854 | Fitzgerald 10-2856 | 360.5 |
| 436   | Fitzgerald 10-2854 | Fitzgerald 10-2857 | 183.5 |
| 437   | Fitzgerald 10-2854 | Fitzgerald 10-2860 | 108.5 |
| 438   | Fitzgerald 10-2854 | Fitzgerald 10-2861 | 296.5 |
| 439   | Fitzgerald 10-2854 | Genemedi GMP-V-2019nCoV-Nab001 | 351 |
| 440   | Fitzgerald 10-2854 | Genemedi GMP-V-2019nCoV-Nab002 | 668.5 |
| 441   | Fitzgerald 10-2854 | Leinco LT7000 | 523 |
| 442   | Fitzgerald 10-2854 | Meridian Life Science 9547 | 279.5 |
| 443   | Fitzgerald 10-2854 | Meridian Life Science 9548 | 18.5 |
| 444   | Fitzgerald 10-2854 | MyBiosource MB5569937 | 149.5 |
| 445   | Fitzgerald 10-2854 | MyBiosource MB5569939 | 100 |
| 446   | Fitzgerald 10-2854 | MyBiosource MB5569951 | 127.5 |
| 447   | Fitzgerald 10-2854 | MyBiosource MB5569961 | 480 |
| 448   | Fitzgerald 10-2854 | Sino Biological 40143-MM05 | 476 |
| 449   | Fitzgerald 10-2854 | Sino Biological 40143-MM08 | 296 |
| 450   | Fitzgerald 10-2854 | Sino Biological 40143-R001 | 426 |
| 451   | Fitzgerald 10-2854 | Sino Biological 40143-R004 | 448 |
| Index | Capture antibody | Detector antibody  | Average rank |
|-------|-----------------|-------------------|--------------|
|       | Fitzgerald 10-2856 | Bioss bsm-41411M | 43.5 32.5 274.5 557.5 |
| 452   | Fitzgerald 10-2856 | Bioss bsm-41412M | 77.5 67.5 27.5 |
| 453   | Fitzgerald 10-2856 | Bioss bsm-41413M | - 38.5 297 |
| 454   | Fitzgerald 10-2856 | Bioss bsm-41414M | - 70.5 671.5 |
| 455   | Fitzgerald 10-2856 | Bioss bsm-41415M | - 39 - 486.5 |
| 456   | Fitzgerald 10-2856 | Creative Diagnostics CABT-CS037 | 19.5 26 41 545 |
| 457   | Fitzgerald 10-2856 | Creative Diagnostics CABT-RM320 | 102.5 - - - |
| 458   | Fitzgerald 10-2856 | Creative Diagnostics DCABH-4693 | 36.5 - - 354.5 |
| 459   | Fitzgerald 10-2856 | East Coast Bio HM1054 | - - 55 |
| 460   | Fitzgerald 10-2856 | East Coast Bio HM1055 | - - 88.5 |
| 461   | Fitzgerald 10-2856 | East Coast Bio HM1065 | - - 251 |
| 462   | Fitzgerald 10-2856 | East Coast Bio HM1057 | - - 85 |
| 463   | Fitzgerald 10-2856 | East Coast Bio HM1058 | - - 188 |
| 464   | Fitzgerald 10-2856 | East Coast Bio HM1063 | - - 84 |
| 465   | Fitzgerald 10-2856 | East Coast Bio HM1064 | - - 177.5 |
| 466   | Fitzgerald 10-2856 | East Coast Bio HM1065 | - - 245 |
| 467   | Fitzgerald 10-2856 | East Coast Bio HM1066 | - - 271 |
| 468   | Fitzgerald 10-2856 | East Coast Bio HM1068 | - - 177.5 |
| 469   | Fitzgerald 10-2856 | East Coast Bio HM1069 | - - 37.5 |
| 470   | Fitzgerald 10-2856 | Fitzgerald 10-2853 | - - - 287.5 |
| 471   | Fitzgerald 10-2856 | Fitzgerald 10-2854 | - - - 533 |
| 472   | Fitzgerald 10-2856 | Fitzgerald 10-2856 | - 51 - 401.5 |
| 473   | Fitzgerald 10-2856 | Fitzgerald 10-2857 | - 61.5 - 108 |
| 474   | Fitzgerald 10-2856 | Fitzgerald 10-2860 | - - 260.5 142.5 |
| 475   | Fitzgerald 10-2856 | Fitzgerald 10-2861 | - 63.5 - 543.5 |
| 476   | Fitzgerald 10-2856 | Genemedi GMP-V-2019nCoV-Nab001 | - - 104 - 190 |
| 477   | Fitzgerald 10-2856 | Genemedi GMP-V-2019nCoV-Nab002 | - - 55.5 - 556 |
| 478   | Fitzgerald 10-2856 | Leinco LT7000 | - - - 382 |
| 479   | Fitzgerald 10-2856 | Meridian Life Science 9547 | - - - 460.5 |
| 480   | Fitzgerald 10-2856 | Meridian Life Science 9548 | - - - 219 |
| 481   | Fitzgerald 10-2856 | MyBiosource MB569937 | - 107.5 - 257.5 |

| Index | Capture antibody | Detector antibody  | Average rank |
|-------|-----------------|-------------------|--------------|
| 482   | Fitzgerald 10-2856 | MyBiosource MB569937 | - 89.5 - 141 |

| Index | Capture antibody | Detector antibody  | Average rank |
|-------|-----------------|-------------------|--------------|
| 483   | Fitzgerald 10-2856 | MyBiosource MB569939 | - 103.5 - - 9.5 |
| 484   | Fitzgerald 10-2856 | MyBiosource MB569951 | - 141 - - 204 |
| 485   | Fitzgerald 10-2856 | MyBiosource MB569961 | - 137 137.5 - 80 |
| 486   | Fitzgerald 10-2856 | Sino Biological 40143-MM05 | - 13.5 28.5 18 593 |
| 487   | Fitzgerald 10-2856 | Sino Biological 40143-MM08 | - 3.5 14 13.5 517 |
| 488   | Fitzgerald 10-2856 | Sino Biological 40143-R001 | - - - 470 |
| 489   | Fitzgerald 10-2856 | Sino Biological 40143-R004 | - 33.5 75.5 - 28.5 |
| 490   | Fitzgerald 10-2857 | Bioss bsm-41411M | - - - - 131.5 |
| 491   | Fitzgerald 10-2857 | Bioss bsm-41412M | - - - - 32.5 |
| 492   | Fitzgerald 10-2857 | Bioss bsm-41413M | - - - - 245 |
| 493   | Fitzgerald 10-2857 | Bioss bsm-41414M | - - - - 328.5 |
| 494   | Fitzgerald 10-2857 | Bioss bsm-41415M | - 79 - 104 |
| 495   | Fitzgerald 10-2857 | Creative Diagnostics CABT-CS037 | - 57.5 - - 275.5 |
| 496   | Fitzgerald 10-2857 | Creative Diagnostics CABT-RM320 | - 113 - - - |
| 497   | Fitzgerald 10-2857 | Creative Diagnostics DCABH-4693 | - 40.5 - - 252.5 |
| 498   | Fitzgerald 10-2857 | Fitzgerald 10-2853 | - - - - 485.5 |
| 499   | Fitzgerald 10-2857 | Fitzgerald 10-2854 | - - - - 437.5 |
| 500   | Fitzgerald 10-2857 | Fitzgerald 10-2856 | - 54.5 - - 163.5 |
| 501   | Fitzgerald 10-2857 | Fitzgerald 10-2857 | - 130 - - 172 |
| 502   | Fitzgerald 10-2857 | Fitzgerald 10-2860 | - - - - 46.5 |
| 503   | Fitzgerald 10-2857 | Fitzgerald 10-2861 | - - - - 566 |
| 504   | Fitzgerald 10-2857 | Genemedi GMP-V-2019nCoV-Nab001 | - - - - 525.5 |
| 505   | Fitzgerald 10-2857 | Genemedi GMP-V-2019nCoV-Nab002 | - - - - 141 |
| 506   | Fitzgerald 10-2857 | Leinco LT7000 | - - - - 93 |
| 507   | Fitzgerald 10-2857 | Meridian Life Science 9547 | - - - - 138.5 |
| 508   | Fitzgerald 10-2857 | Meridian Life Science 9548 | - - - - 128 |
| 509   | Fitzgerald 10-2857 | MyBiosource MB569937 | - 89.5 - - 141 |
| Index | Capture antibody       | Detector antibody       | round 1 | round 2 | round 3 | round 4 | round 5 |
|-------|------------------------|------------------------|---------|---------|---------|---------|---------|
| 510   | Fitzgerald 10-2857     | My Biosource MB569939  | -       | 143     | -       | -       | 640     |
| 511   | Fitzgerald 10-2857     | My Biosource MB569951  | -       | -       | -       | -       | 319.5   |
| 512   | Fitzgerald 10-2857     | My Biosource MB569961  | -       | 128.5   | -       | -       | 671.5   |
| 513   | Fitzgerald 10-2857     | Sino Biological 40143-MM05 | -   | 126     | -       | -       | 647     |
| 514   | Fitzgerald 10-2857     | Sino Biological 40143-MM08 | -   | 59      | -       | -       | 490     |
| 515   | Fitzgerald 10-2857     | Sino Biological 40143-R001 | -  | -       | -       | -       | 142     |
| 516   | Fitzgerald 10-2857     | Sino Biological 40143-R004 | -  | 64.5    | -       | -       | 571     |
| 517   | Fitzgerald 10-2860     | Bioss bsm-41411M       | -       | -       | 69.5    | 208     |
| 518   | Fitzgerald 10-2860     | Bioss bsm-41412M       | -       | -       | -       | -       | 604     |
| 519   | Fitzgerald 10-2860     | Bioss bsm-41413M       | -       | -       | -       | -       | 514     |
| 520   | Fitzgerald 10-2860     | Bioss bsm-41414M       | -       | -       | -       | -       | 323.5   |
| 521   | Fitzgerald 10-2860     | Bioss bsm-41415M       | -       | -       | -       | -       | 3.5     |
| 522   | Fitzgerald 10-2860     | Creative Diagnostics CABT-CS037 | - | - | - | 130 | 43.5 |
| 523   | Fitzgerald 10-2860     | Creative Diagnostics DCABH-4693 | - | - | - | - | 257 |
| 524   | Fitzgerald 10-2860     | East Coast Bio HM1054   | -       | -       | -       | -       | 250     |
| 525   | Fitzgerald 10-2860     | East Coast Bio HM1055   | -       | -       | -       | -       | 226.5   |
| 526   | Fitzgerald 10-2860     | East Coast Bio HM1056   | -       | -       | -       | -       | 64.5    |
| 527   | Fitzgerald 10-2860     | East Coast Bio HM1057   | -       | -       | -       | -       | 141.5   |
| 528   | Fitzgerald 10-2860     | East Coast Bio HM1058   | -       | -       | -       | -       | 72.5    |
| 529   | Fitzgerald 10-2860     | East Coast Bio HM1063   | -       | -       | -       | -       | 140     |
| 530   | Fitzgerald 10-2860     | East Coast Bio HM1064   | -       | -       | -       | -       | 180     |
| 531   | Fitzgerald 10-2860     | East Coast Bio HM1065   | -       | -       | -       | -       | 259     |
| 532   | Fitzgerald 10-2860     | East Coast Bio HM1066   | -       | -       | -       | -       | 240.5   |
| 533   | Fitzgerald 10-2860     | East Coast Bio HM1068   | -       | -       | -       | -       | 120     |
| 534   | Fitzgerald 10-2860     | East Coast Bio HM1069   | -       | -       | -       | -       | 26.5    |
| 535   | Fitzgerald 10-2860     | Fitzgerald 10-2853      | -       | -       | -       | -       | 627.5   |
| 536   | Fitzgerald 10-2860     | Fitzgerald 10-2854      | -       | -       | -       | -       | 43      |
| 537   | Fitzgerald 10-2860     | Fitzgerald 10-2856      | -       | -       | -       | -       | 227.5   |
| 538   | Fitzgerald 10-2860     | Fitzgerald 10-2857      | -       | -       | -       | -       | 434.5   |
| 539   | Fitzgerald 10-2860     | Fitzgerald 10-2860      | -       | -       | -       | 245     | 613.5   |
| Index | Capture antibody                  | Detector antibody                  | round 1 | round 2 | round 3 | round 4 | round 5 |
|-------|----------------------------------|------------------------------------|---------|---------|---------|---------|---------|
| 567   | Fitzgerald 10-2861               | Genemedi GMP-V-2019nCoV-Nab001     | -       | -       | 139.5   | 616.5   |         |
| 568   | Fitzgerald 10-2861               | Genemedi GMP-V-2019nCoV-Nab002     | -       | -       | 128     | 518     |         |
| 569   | Fitzgerald 10-2861               | Leinco LT7000                      | -       | -       | -       | 608.5   |         |
| 570   | Fitzgerald 10-2861               | Meridian Life Science 9547         | -       | -       | -       | 624     |         |
| 571   | Fitzgerald 10-2861               | Meridian Life Science 9548         | -       | -       | -       | 661     |         |
| 572   | Fitzgerald 10-2861               | MyBiosource MBSS69937              | -       | -       | -       | 666     |         |
| 573   | Fitzgerald 10-2861               | MyBiosource MBSS69939              | -       | -       | -       | 660.5   |         |
| 574   | Fitzgerald 10-2861               | MyBiosource MBSS69951              | -       | -       | -       | 16      |         |
| 575   | Fitzgerald 10-2861               | MyBiosource MBSS69961              | -       | -       | 78      | 32.5    |         |
| 576   | Fitzgerald 10-2861               | Sino Biological 40143-MM05         | -       | -       | 75.5    | 332.5   |         |
| 577   | Fitzgerald 10-2861               | Sino Biological 40143-MM08         | -       | -       | 60.5    | 529     |         |
| 578   | Fitzgerald 10-2861               | Sino Biological 40143-R001         | -       | -       | 108     | 53      |         |
| 579   | Fitzgerald 10-2861               | Sino Biological 40143-R004         | -       | -       | 59      | 372.5   |         |
| 580   | Genemedi GMP-V-2019nCoV-Nab001   | Bioss bsm-41411M                   | -       | -       | 81.5    | 58.5    | 372.5   |
| 581   | Genemedi GMP-V-2019nCoV-Nab001   | Bioss bsm-41412M                   | -       | -       | 34.5    | 17.5    |         |
| 582   | Genemedi GMP-V-2019nCoV-Nab001   | Bioss bsm-41413M                   | -       | -       | 23      | 399     |         |
| 583   | Genemedi GMP-V-2019nCoV-Nab001   | Bioss bsm-41414M                   | -       | -       | 51      | 33.5    |         |
| 584   | Genemedi GMP-V-2019nCoV-Nab001   | Bioss bsm-41415M                   | -       | -       | -       | 74      |         |
| 585   | Genemedi GMP-V-2019nCoV-Nab001   | Creative Diagnostics               | -       | -       | 19      | 5.5     | 671.5   |
| 586   | Genemedi GMP-V-2019nCoV-Nab001   | Creative Diagnostics               | -       | -       | -       | 134     |         |
| 587   | Genemedi GMP-V-2019nCoV-Nab001   | East Coast Bio HM1054               | -       | -       | -       | 16.5    |         |
| 588   | Genemedi GMP-V-2019nCoV-Nab001   | East Coast Bio HM1055               | -       | -       | -       | 24.5    |         |
| 589   | Genemedi GMP-V-2019nCoV-Nab001   | East Coast Bio HM1056               | -       | -       | -       | 89.5    |         |

**Average rank**

| Index | Capture antibody                  | Detector antibody                  | round 1 | round 2 | round 3 | round 4 | round 5 |
|-------|----------------------------------|------------------------------------|---------|---------|---------|---------|---------|
| 590   | Genemedi GMP-V-2019nCoV-Nab001   | East Coast Bio HM1057               | -       | -       | -       | 104.5   |         |
| 591   | Genemedi GMP-V-2019nCoV-Nab001   | East Coast Bio HM1058               | -       | -       | -       | 70.5    |         |
| 592   | Genemedi GMP-V-2019nCoV-Nab001   | East Coast Bio HM1063               | -       | -       | -       | 246     |         |
| 593   | Genemedi GMP-V-2019nCoV-Nab001   | East Coast Bio HM1064               | -       | -       | -       | 37.5    |         |
| 594   | Genemedi GMP-V-2019nCoV-Nab001   | East Coast Bio HM1065               | -       | -       | -       | 237     |         |
| 595   | Genemedi GMP-V-2019nCoV-Nab001   | East Coast Bio HM1066               | -       | -       | -       | 235.5   |         |
| 596   | Genemedi GMP-V-2019nCoV-Nab001   | East Coast Bio HM1068               | -       | -       | -       | 125     |         |
| 597   | Genemedi GMP-V-2019nCoV-Nab001   | East Coast Bio HM1069               | -       | -       | -       | 55.5    |         |
| 598   | Genemedi GMP-V-2019nCoV-Nab001   | Fitzgerald 10-2853                  | -       | -       | -       | 128     |         |
| 599   | Genemedi GMP-V-2019nCoV-Nab001   | Fitzgerald 10-2854                  | -       | -       | -       | 127.5   |         |
| 600   | Genemedi GMP-V-2019nCoV-Nab001   | Fitzgerald 10-2856                  | -       | -       | -       | 426     |         |
| 601   | Genemedi GMP-V-2019nCoV-Nab001   | Fitzgerald 10-2857                  | -       | -       | -       | 510     |         |
| 602   | Genemedi GMP-V-2019nCoV-Nab001   | Fitzgerald 10-2860                  | -       | -       | -       | 238.5   | 139.5   |
| 603   | Genemedi GMP-V-2019nCoV-Nab001   | Fitzgerald 10-2861                  | -       | -       | -       | 73.5    | 372.5   |
| 604   | Genemedi GMP-V-2019nCoV-Nab001   | Genemedi GMP-V-2019nCoV-Nab001      | -       | -       | -       | 80.5    | 596     |
| 605   | Genemedi GMP-V-2019nCoV-Nab001   | Genemedi GMP-V-2019nCoV-Nab001      | -       | -       | -       | 118.5   | 301     |
| 606   | Genemedi GMP-V-2019nCoV-Nab001   | Genemedi GMP-V-2019nCoV-Nab001      | -       | -       | -       | 605.0   |         |
| 607   | Genemedi GMP-V-2019nCoV-Nab001   | Leinco LT7000                       | -       | -       | -       | 196.5   |         |
| 608   | Genemedi GMP-V-2019nCoV-Nab001   | Meridian Life Science 9547          | -       | -       | -       | 8.5     |         |
| 609   | Genemedi GMP-V-2019nCoV-Nab001   | MyBiosource MBSS69937               | -       | -       | -       | 610.5   |         |
| 610   | Genemedi GMP-V-2019nCoV-Nab001   | MyBiosource MBSS69939               | -       | -       | -       | 250.5   |         |
| 611   | Genemedi GMP-V-2019nCoV-Nab001   | MyBiosource MBSS69951               | -       | -       | -       | 278     |         |
| 612   | Genemedi GMP-V-2019nCoV-Nab001   | MyBiosource MBSS69961               | -       | -       | -       | 118.5   |         |
| Index | Capture antibody | Detector antibody | Average rank |
|-------|------------------|------------------|--------------|
|       |                  |                  | round 1 | round 2 | round 3 | round 4 | round 5 |
| 613   | Genemedi GMP-V-2019nCoV-Nab001 | Sino Biological 40143-MM05 | - | - | 11 | 4 | 221.5 |
| 614   | Genemedi GMP-V-2019nCoV-Nab001 | Sino Biological 40143-MM08 | - | - | 8.5 | 2.5 | 491 |
| 615   | Genemedi GMP-V-2019nCoV-Nab001 | Sino Biological 40143-R001 | - | - | - | - | 88 |
| 616   | Genemedi GMP-V-2019nCoV-Nab001 | Sino Biological 40143-R004 | - | - | 33 | - | 351 |
| 617   | Genemedi GMP-V-2019nCoV-Nab002 | Bioss bsm-41411M | - | - | 27.5 | - | 317 |
| 618   | Genemedi GMP-V-2019nCoV-Nab002 | Bioss bsm-41412M | - | - | 55 | - | 305.5 |
| 619   | Genemedi GMP-V-2019nCoV-Nab002 | Bioss bsm-41413M | - | - | 37 | - | 382.5 |
| 620   | Genemedi GMP-V-2019nCoV-Nab002 | Bioss bsm-41414M | - | - | 123.5 | - | 483.5 |
| 621   | Genemedi GMP-V-2019nCoV-Nab002 | Bioss bsm-41415M | - | - | - | - | 399.5 |
| 622   | Genemedi GMP-V-2019nCoV-Nab002 | Creative Diagnostics CABT-CS037 | - | - | 34.5 | - | 202 |
| 623   | Genemedi GMP-V-2019nCoV-Nab002 | Creative Diagnostics DCABH-4693 | - | - | - | - | 381 |
| 624   | Genemedi GMP-V-2019nCoV-Nab002 | Fitzgerald 10-2853 | - | - | - | - | 452.5 |
| 625   | Genemedi GMP-V-2019nCoV-Nab002 | Fitzgerald 10-2854 | - | - | - | - | 214 |
| 626   | Genemedi GMP-V-2019nCoV-Nab002 | Fitzgerald 10-2856 | - | - | - | - | 453.5 |
| 627   | Genemedi GMP-V-2019nCoV-Nab002 | Fitzgerald 10-2857 | - | - | - | - | 144.5 |
| 628   | Genemedi GMP-V-2019nCoV-Nab002 | Fitzgerald 10-2860 | - | - | - | - | 316.5 |
| 629   | Genemedi GMP-V-2019nCoV-Nab002 | Fitzgerald 10-2861 | - | - | 123.5 | - | 78 |
| 630   | Genemedi GMP-V-2019nCoV-Nab002 | Genemedi GMP-V-2019nCoV-Nab001 | - | - | 130.5 | - | 1.5 |
| 631   | Genemedi GMP-V-2019nCoV-Nab002 | Genemedi GMP-V-2019nCoV-Nab002 | - | - | 100.5 | - | 647 |
| 632   | Genemedi GMP-V-2019nCoV-Nab002 | Leinco LT7000 | - | - | - | - | 50.5 |
| 633   | Genemedi GMP-V-2019nCoV-Nab002 | Meridian Life Science 9547 | - | - | - | - | 392 |
| 634   | Genemedi GMP-V-2019nCoV-Nab002 | Meridian Life Science 9548 | - | - | - | - | 427.5 |
| 635   | Genemedi GMP-V-2019nCoV-Nab002 | MyBiosource MBSS69937 | - | - | - | - | 237.5 |
| Index | Capture antibody | Detector antibody | round 1 | round 2 | round 3 | round 4 | round 5 | Average rank |
|-------|------------------|------------------|---------|---------|---------|---------|---------|--------------|
| 663   | Leinco LT7000    | MyBiosource      | -       | -       | -       | -       | -       | 112          |
| 664   | Leinco LT7000    | MyBiosource      | -       | -       | -       | -       | -       | 100.5        |
| 665   | Leinco LT7000    | Sino Biological  | -       | -       | -       | -       | -       | 214.5        |
| 666   | Leinco LT7000    | Sino Biological  | -       | -       | -       | -       | -       | 564          |
| 667   | Leinco LT7000    | Sino Biological  | -       | -       | -       | -       | -       | 624.5        |
| 668   | Leinco LT7000    | Sino Biological  | -       | -       | -       | -       | -       | 306.5        |
| 669   | Meridian Life Science | Bioss bsm-41411M | -       | -       | -       | -       | -       | 564          |
| 670   | Meridian Life Science | Bioss bsm-41412M | -       | -       | -       | -       | -       | 68.5         |
| 671   | Meridian Life Science | Bioss bsm-41413M | -       | -       | -       | -       | -       | 552.5        |
| 672   | Meridian Life Science | Bioss bsm-41414M | -       | -       | -       | -       | -       | 55.5         |
| 673   | Meridian Life Science | Bioss bsm-41415M | -       | -       | -       | -       | -       | 170.5        |
| 674   | Meridian Life Science | Creative Diagnostics | -       | -       | -       | -       | -       | 63.5         |
| 675   | Meridian Life Science | Creative Diagnostics | -       | -       | -       | -       | -       | 75.5         |
| 676   | Meridian Life Science | Fitzgerald 10-2853 | -       | -       | -       | -       | -       | 116          |
| 677   | Meridian Life Science | Fitzgerald 10-2854 | -       | -       | -       | -       | -       | 270          |
| 678   | Meridian Life Science | Fitzgerald 10-2856 | -       | -       | -       | -       | -       | 499.5        |
| 679   | Meridian Life Science | Fitzgerald 10-2857 | -       | -       | -       | -       | -       | 533          |
| 680   | Meridian Life Science | Fitzgerald 10-2860 | -       | -       | -       | -       | -       | 465          |
| 681   | Meridian Life Science | Fitzgerald 10-2861 | -       | -       | -       | -       | -       | 593.5        |
| 682   | Meridian Life Science | Genemedi GMP-V-2019nCoV-Nab001 | -       | -       | -       | -       | -       | 660          |
| 683   | Meridian Life Science | Genemedi GMP-V-2019nCoV-Nab002 | -       | -       | -       | -       | -       | 89           |
| 684   | Meridian Life Science | Leinco LT7000    | -       | -       | -       | -       | -       | 609          |
| 685   | Meridian Life Science | Meridian Life Science | -       | -       | -       | -       | -       | 170          |

| Index | Capture antibody | Detector antibody | round 1 | round 2 | round 3 | round 4 | round 5 | Average rank |
|-------|------------------|------------------|---------|---------|---------|---------|---------|--------------|
| 686   | Meridian Life Science | Meridian Life Science | -       | -       | -       | -       | -       | 8           |
| 687   | Meridian Life Science | MyBiosource      | -       | -       | -       | -       | -       | 153.5        |
| 688   | Meridian Life Science | MyBiosource      | -       | -       | -       | -       | -       | 513.5        |
| 689   | Meridian Life Science | MyBiosource      | -       | -       | -       | -       | -       | 11.5         |
| 690   | Meridian Life Science | MyBiosource      | -       | -       | -       | -       | -       | 150          |
| 691   | Meridian Life Science | Sino Biological  | -       | -       | -       | -       | -       | 30           |
| 692   | Meridian Life Science | Sino Biological  | -       | -       | -       | -       | -       | 460          |
| 693   | Meridian Life Science | Sino Biological  | -       | -       | -       | -       | -       | 40           |
| 694   | Meridian Life Science | Sino Biological  | -       | -       | -       | -       | -       | 558.5        |
| 695   | Meridian Life Science | Bioss bsm-41411M | -       | -       | -       | -       | -       | 617.5        |
| 696   | Meridian Life Science | Bioss bsm-41412M | -       | -       | -       | -       | -       | 95.5         |
| 697   | Meridian Life Science | Bioss bsm-41413M | -       | -       | -       | -       | -       | 448          |
| 698   | Meridian Life Science | Bioss bsm-41414M | -       | -       | -       | -       | -       | 487.5        |
| 699   | Meridian Life Science | Bioss bsm-41415M | -       | -       | -       | -       | -       | 207.5        |
| 700   | Meridian Life Science | Creative Diagnostics | -       | -       | -       | -       | -       | 394          |
| 701   | Meridian Life Science | Creative Diagnostics | -       | -       | -       | -       | -       | 143          |
| 702   | Meridian Life Science | Fitzgerald 10-2853 | -       | -       | -       | -       | -       | 249.5        |
| 703   | Meridian Life Science | Fitzgerald 10-2854 | -       | -       | -       | -       | -       | 358.5        |
| 704   | Meridian Life Science | Fitzgerald 10-2856 | -       | -       | -       | -       | -       | 192          |
| 705   | Meridian Life Science | Fitzgerald 10-2857 | -       | -       | -       | -       | -       | 235          |
| 706   | Meridian Life Science | Fitzgerald 10-2860 | -       | -       | -       | -       | -       | 473.5        |
| 707   | Meridian Life Science | Fitzgerald 10-2861 | -       | -       | -       | -       | -       | 487.5        |
| 708   | Meridian Life Science | Genemedi GMP-V-2019nCoV-Nab001 | -       | -       | -       | -       | -       | 18           |
| Index | Capture antibody | Detector antibody              | Average rank | round 1 | round 2 | round 3 | round 4 | round 5 |
|-------|------------------|--------------------------------|--------------|---------|---------|---------|---------|---------|
| 709   | Meridian Life Science 9548 | Genemedi GMP-V-2019nCoV-Nab002 |              | -       | -       | -       | -       | 125.5   |
| 710   | Meridian Life Science 9548 | Leinco LT7000               |              | -       | -       | -       | -       | 469     |
| 711   | Meridian Life Science 9548 | Meridian Life Science 9547   |              | -       | -       | -       | -       | 583.5   |
| 712   | Meridian Life Science 9548 | Meridian Life Science 9548   |              | -       | -       | -       | -       | 492.5   |
| 713   | Meridian Life Science 9548 | MyBiosource MBS569939       |              | -       | -       | -       | -       | 347.5   |
| 714   | Meridian Life Science 9548 | MyBiosource MBS569939       |              | -       | -       | -       | -       | 372     |
| 715   | Meridian Life Science 9548 | MyBiosource MBS569939       |              | -       | -       | -       | -       | 50      |
| 716   | Meridian Life Science 9548 | MyBiosource MBS569961       |              | -       | -       | -       | -       | 190     |
| 717   | Meridian Life Science 9548 | Sino Biological 40143-MM05  |              | -       | -       | -       | -       | 142.5   |
| 718   | Meridian Life Science 9548 | Sino Biological 40143-MM08  |              | -       | -       | -       | -       | 416     |
| 719   | Meridian Life Science 9548 | Sino Biological 40143-R001  |              | -       | -       | -       | -       | 217.5   |
| 720   | Meridian Life Science 9548 | Sino Biological 40143-R004  |              | -       | -       | -       | -       | 82.5    |
| 721   | MyBiosource MBS569937 | Bios bsm-41411M             |              | -       | -       | -       | -       | 224     |
| 722   | MyBiosource MBS569937 | Bios bsm-41412M             |              | -       | -       | -       | -       | 8       |
| 723   | MyBiosource MBS569937 | Bios bsm-41413M             |              | -       | -       | -       | -       | 413.5   |
| 724   | MyBiosource MBS569937 | Bios bsm-41414M             |              | -       | -       | -       | -       | 374     |
| 725   | MyBiosource MBS569937 | Bios bsm-41415M             |              | -       | -       | -       | -       | 540     |
| 726   | MyBiosource MBS569937 | Creative Diagnostics CABT-CS037 |              | -       | -       | -       | -       | 83      |
| 727   | MyBiosource MBS569937 | Creative Diagnostics DCABH-4693 |              | -       | -       | -       | -       | 322.5   |
| 728   | MyBiosource MBS569937 | Fitzgerald 10-2853          |              | -       | -       | -       | -       | 606     |
| 729   | MyBiosource MBS569937 | Fitzgerald 10-2854          |              | -       | -       | -       | -       | 653.5   |
| 730   | MyBiosource MBS569937 | Fitzgerald 10-2856          |              | -       | -       | -       | -       | 506.5   |
| 731   | MyBiosource MBS569937 | Fitzgerald 10-2857          |              | -       | -       | -       | -       | 478     |
| Index | Capture antibody | Detector antibody     | round 1 | round 2 | round 3 | round 4 | round 5 | Average rank |
|-------|-----------------|----------------------|--------|--------|--------|--------|--------|--------------|
| 755   | MyBiosource     | Fitzgerald 10-2854   | -      | -      | -      | -      | 15     |              |
| 756   | MyBiosource     | Fitzgerald 10-2856   | - 95   | -      | -      | -      | 256    |              |
| 757   | MyBiosource     | Fitzgerald 10-2857   | - 135  | -      | -      | -      | 350.5  |              |
| 758   | MyBiosource     | Fitzgerald 10-2860   | -      | -      | -      | -      | 645    |              |
| 759   | MyBiosource     | Fitzgerald 10-2861   | -      | -      | -      | -      | 647    |              |
| 760   | MyBiosource     | Genemedi GMP-V-2019nCoV-Nab001 | -      | -      | -      | -      | 512    |              |
| 761   | MyBiosource     | Genemedi GMP-V-2019nCoV-Nab002 | -      | -      | -      | -      | 91.5   |              |
| 762   | MyBiosource     | Leinco LT7000        | -      | -      | -      | -      | 180    |              |
| 763   | MyBiosource     | Meridian Life Science 9547 | -      | -      | -      | -      | 262    |              |
| 764   | MyBiosource     | Meridian Life Science 9548 | -      | -      | -      | -      | 257    |              |
| 765   | MyBiosource     | MyBiosource MBS569937 | -      | -      | -      | -      | 365    |              |
| 766   | MyBiosource     | MyBiosource MBS569939 | -      | -      | -      | -      | 541.5  |              |
| 767   | MyBiosource     | MyBiosource MBS569951 | - 101.5 | -      | -      | -      | 148    |              |
| 768   | MyBiosource     | MyBiosource MBS569961 | -      | -      | -      | -      | 582    |              |
| 769   | MyBiosource     | Sino Biological 40143-MM05 | - 95.5 | -      | -      | -      | 477    |              |
| 770   | MyBiosource     | Sino Biological 40143-MM08 | - 64.5 | -      | -      | -      | 71.5   |              |
| 771   | MyBiosource     | Sino Biological 40143-RO01 | -      | -      | -      | -      | 426    |              |
| 772   | MyBiosource     | Sino Biological 40143-RO04 | - 69.5 | -      | -      | -      | 469.5  |              |
| 773   | MyBiosource     | Bioss bsm-41411M     | -      | -      | -      | -      | 162    |              |
| 774   | MyBiosource     | Bioss bsm-41412M     | -      | -      | -      | -      | 662    |              |
| 775   | MyBiosource     | Bioss bsm-41413M     | -      | -      | -      | -      | 595.5  |              |
| 776   | MyBiosource     | Bioss bsm-41414M     | -      | -      | -      | -      | 426    |              |
| 777   | MyBiosource     | Bioss bsm-41415M     | -      | -      | -      | -      | 206.5  |              |

| Index | Capture antibody | Detector antibody     | round 1 | round 2 | round 3 | round 4 | round 5 | Average rank |
|-------|-----------------|----------------------|--------|--------|--------|--------|--------|--------------|
| 778   | MyBiosource     | Creative Diagnostics CABS-CS037 | -      | -      | -      | -      | 105.5  |              |
| 779   | MyBiosource     | Creative Diagnostics CABS-RM320 | -      | -      | -      | -      | 107.5  |              |
| 780   | MyBiosource     | Creative Diagnostics DCABH-4693 | -    | -      | -      | -      | 103    |              |
| 781   | MyBiosource     | Fitzgerald 10-2853   | -      | -      | -      | -      | 311.5  |              |
| 782   | MyBiosource     | Fitzgerald 10-2854   | -      | -      | -      | -      | 337    |              |
| 783   | MyBiosource     | Fitzgerald 10-2856   | -      | -      | -      | -      | 496.5  |              |
| 784   | MyBiosource     | Fitzgerald 10-2857   | -      | -      | -      | -      | 463.5  |              |
| 785   | MyBiosource     | Fitzgerald 10-2860   | -      | -      | -      | -      | 311.5  |              |
| 786   | MyBiosource     | Fitzgerald 10-2861   | -      | -      | -      | -      | 427.5  |              |
| 787   | MyBiosource     | Genemedi GMP-V-2019nCoV-Nab001 | -      | -      | -      | -      | 37.5   |              |
| 788   | MyBiosource     | Genemedi GMP-V-2019nCoV-Nab002 | -      | -      | -      | -      | 80.5   |              |
| 789   | MyBiosource     | Leinco LT7000        | -      | -      | -      | -      | 510    |              |
| 790   | MyBiosource     | Meridian Life Science 9547 | -      | -      | -      | -      | 565    |              |
| 791   | MyBiosource     | Meridian Life Science 9548 | -      | -      | -      | -      | 520    |              |
| 792   | MyBiosource     | MyBiosource MBS569937 | -      | -      | -      | -      | 239    |              |
| 793   | MyBiosource     | MyBiosource MBS569939 | -      | -      | -      | -      | 549.5  |              |
| 794   | MyBiosource     | MyBiosource MBS569951 | -      | -      | -      | -      | 522    |              |
| 795   | MyBiosource     | MyBiosource MBS569961 | -      | -      | -      | -      | 289.5  |              |
| 796   | MyBiosource     | Sino Biological 40143-MM05 | -      | -      | -      | -      | 532    |              |
| 797   | MyBiosource     | Sino Biological 40143-MM08 | -      | -      | -      | -      | 224.5  |              |
| 798   | MyBiosource     | Sino Biological 40143-RO01 | -      | -      | -      | -      | 240    |              |
| 799   | MyBiosource     | Sino Biological 40143-RO04 | -      | -      | -      | -      | 213    |              |
| 800   | MyBiosource     | Bioss bsm-41411M     | -      | 145    | 144    | -      | 55.5   |              |
| Index | Capture antibody | Detector antibody | round 1 | round 2 | round 3 | round 4 | round 5 | Average rank |
|-------|------------------|------------------|---------|---------|---------|---------|---------|--------------|
| 801   | MyBiosource MB569961 | Bioss bsm-41412M | -       | -       | 131.5   | -       | 600.5   | 821          |
| 802   | MyBiosource MB569961 | Bioss bsm-41413M | -       | -       | 109.5   | -       | 291     | 819          |
| 803   | MyBiosource MB569961 | Bioss bsm-41414M | -       | -       | 78.5    | -       | 461.5   | 816          |
| 804   | MyBiosource MB569961 | Bioss bsm-41415M | -       | -       | -       | -       | 288     | 815          |
| 805   | MyBiosource MB569961 | Creative Diagnostics CABT-CS037 | - | - | 85.5 | - | 186 | 812 |
| 806   | MyBiosource MB569961 | Creative Diagnostics DCABH-4693 | - | - | - | - | 293 | 812 |
| 807   | MyBiosource MB569961 | Fitzgerald 10-2853 | - | - | - | - | 7.5 | 807 |
| 808   | MyBiosource MB569961 | Fitzgerald 10-2854 | - | - | - | - | 534.5 | 808 |
| 809   | MyBiosource MB569961 | Fitzgerald 10-2856 | - | - | - | - | 344.5 | 809 |
| 810   | MyBiosource MB569961 | Fitzgerald 10-2857 | - | 148 | - | - | 563.5 | 810 |
| 811   | MyBiosource MB569961 | Fitzgerald 10-2860 | - | - | - | - | 490 | 811 |
| 812   | MyBiosource MB569961 | Fitzgerald 10-2861 | - | - | 138 | - | 243.5 | 812 |
| 813   | MyBiosource MB569961 | Genemedi GMP-V-2019nCoV-Nab001 | - | - | 133 | - | 653.5 | 813 |
| 814   | MyBiosource MB569961 | Genemedi GMP-V-2019nCoV-Nab002 | - | - | 94.5 | - | 625 | 814 |
| 815   | MyBiosource MB569961 | Leinco LT7000 | - | - | - | - | 18 | 815 |
| 816   | MyBiosource MB569961 | Meridian Life Science 9547 | - | - | - | - | 382.5 | 816 |
| 817   | MyBiosource MB569961 | Meridian Life Science 9548 | - | - | - | - | 317.5 | 817 |
| 818   | MyBiosource MB569961 | MyBiosource MB569937 | - | - | - | - | 591 | 818 |
| 819   | MyBiosource MB569961 | MyBiosource MB569939 | - | - | - | - | 102.5 | 819 |
| 820   | MyBiosource MB569961 | MyBiosource MB569951 | - | 118.5 | - | - | 439.5 | 820 |
| 821   | MyBiosource MB569961 | MyBiosource MB569961 | - | - | 112.5 | - | 325 | 821 |
| 822   | MyBiosource MB569961 | Sino Biological 40143-MM05 | - | 55 | 102.5 | - | 379 | 822 |
| 823   | MyBiosource MB569961 | Sino Biological 40143-MM08 | - | - | 116.5 | - | 379 | 823 |

| Index | Capture antibody | Detector antibody | round 1 | round 2 | round 3 | round 4 | round 5 | Average rank |
|-------|------------------|------------------|---------|---------|---------|---------|---------|--------------|
| 824   | MyBiosource MB569961 | Sino Biological 40143-MM05 | - | - | - | - | 656 | 824 |
| 825   | MyBiosource MB569961 | Sino Biological 40143-MM05 | - | 101 | 82 | - | 87 | 825 |
| 826   | Novus Bio NB100-56683 | Novus Bio NB100-56683 | - | - | - | - | 81 | 826 |
| 827   | Novus Bio NB100-56683 | Novus Biological 40143-MM05 | - | - | - | - | 87 | 827 |
| 828   | Novus Bio NB100-56683 | Novus Biological 40143-MM05 | - | - | - | - | 104.5 | 828 |
| 829   | Novus Bio NB100-56683 | Novus Biological 40143-MM05 | - | - | - | - | 100 | 829 |
| 830   | Novus Bio NB100-56683 | Novus Biological 40143-MM05 | - | - | - | - | 96 | 830 |
| 831   | Novus Bio NB100-56683 | Novus Biological 40588-T62 | - | - | - | - | 100 | 831 |
| 832   | Sino Biological 40143-MM05 | Bioss bsm-41411M | - | - | - | - | 628 | 832 |
| 833   | Sino Biological 40143-MM05 | Bioss bsm-41412M | - | - | - | - | 173.5 | 833 |
| 834   | Sino Biological 40143-MM05 | Bioss bsm-41413M | - | - | - | - | 359.5 | 834 |
| 835   | Sino Biological 40143-MM05 | Bioss bsm-41414M | - | - | - | - | 328.5 | 835 |
| 836   | Sino Biological 40143-MM05 | Bioss bsm-41415M | - | - | - | - | 532.5 | 836 |
| 837   | Sino Biological 40143-MM05 | Creative Diagnostics CABT-CS037 | - | - | - | - | 27.5 | 837 |
| 838   | Sino Biological 40143-MM05 | Creative Diagnostics CABT-RM320 | - | - | - | - | 67.5 | 838 |
| 839   | Sino Biological 40143-MM05 | Creative Diagnostics DCABH-4693 | - | - | - | - | 24.5 | 839 |
| 840   | Sino Biological 40143-MM05 | Fitzgerald 10-2853 | - | - | - | - | 402 | 840 |
| 841   | Sino Biological 40143-MM05 | Fitzgerald 10-2854 | - | - | - | - | 266.5 | 841 |
| 842   | Sino Biological 40143-MM05 | Fitzgerald 10-2856 | - | - | - | - | 232.5 | 842 |
| 843   | Sino Biological 40143-MM05 | Fitzgerald 10-2857 | - | - | - | - | 488 | 843 |
| 844   | Sino Biological 40143-MM05 | Fitzgerald 10-2860 | - | - | - | - | 408.5 | 844 |
| 845   | Sino Biological 40143-MM05 | Fitzgerald 10-2861 | - | - | - | - | 368 | 845 |
| 846   | Sino Biological 40143-MM05 | Genemedi GMP-V-2019nCoV-Nab001 | - | - | - | - | 562.5 | 846 |
| Index  | Capture antibody | Detector antibody | round 1 | round 2 | round 3 | round 4 | round 5 | Average rank |
|--------|------------------|-------------------|---------|---------|---------|---------|---------|--------------|
| 847    | Sino Biological 40143-MM05 | Genemedi GMP-V-2019nCoV-Nab002 | 75      | 60      | 54.5    | 120     | 102.5   | 27.5         |
| 848    | Sino Biological 40143-MM05 | Leinco LT7000     | -       | -       | -       | -       | -       | 605          |
| 849    | Sino Biological 40143-MM05 | Meridian Life Science 9547 | -       | -       | -       | -       | -       | 325          |
| 850    | Sino Biological 40143-MM05 | Meridian Life Science 9548 | -       | -       | -       | -       | -       | 191.5        |
| 851    | Sino Biological 40143-MM05 | MyBiosource MBS69937 | -       | -       | -       | -       | -       | 325          |
| 852    | Sino Biological 40143-MM05 | MyBiosource MBS69939 | -       | -       | -       | -       | -       | 208          |
| 853    | Sino Biological 40143-MM05 | MyBiosource MBS69951 | -       | -       | -       | -       | -       | 225          |
| 854    | Sino Biological 40143-MM05 | MyBiosource MBS69961 | -       | -       | -       | -       | -       | 225          |
| 855    | Sino Biological 40143-MM05 | Novus Bio NB100-56683 | 102.5   | -       | -       | -       | -       | 212.5        |
| 856    | Sino Biological 40143-MM05 | Sino Biological 40143-MM05 | 66.5    | -       | -       | -       | -       | 580          |
| 857    | Sino Biological 40143-MM05 | Sino Biological 40143-MM08 | 30      | -       | -       | -       | -       | 235          |
| 858    | Sino Biological 40143-MM05 | Sino Biological 40143-R001 | 19.5    | -       | -       | -       | -       | 277.5        |
| 859    | Sino Biological 40143-MM05 | Sino Biological 40143-R004 | 29.5    | -       | -       | -       | -       | 277.5        |
| 860    | Sino Biological 40143-MM05 | Sino Biological 40143-R019 | 60      | -       | -       | -       | -       | 277.5        |
| 861    | Sino Biological 40143-MM05 | Sino Biological 40143-R040 | 37.5    | -       | -       | -       | -       | 277.5        |
| 862    | Sino Biological 40143-MM05 | Sino Biological 40588-T62 | 43      | -       | -       | -       | -       | 277.5        |
| 863    | Sino Biological 40143-MM08 | Bioss bsm-41411M | -       | 4.5     | 2.5     | 6       | 8       | 60           |
| 864    | Sino Biological 40143-MM08 | Bioss bsm-41412M | -       | 12.5    | 27      | -       | 6       | 73           |
| 865    | Sino Biological 40143-MM08 | Bioss bsm-41413M | -       | -       | 12      | -       | -       | 56           |
| 866    | Sino Biological 40143-MM08 | Bioss bsm-41414M | -       | -       | 43.5    | -       | 26      | 27           |
| 867    | Sino Biological 40143-MM08 | Bioss bsm-41415M | -       | 40      | -       | -       | -       | 32           |
| 868    | Sino Biological 40143-MM08 | Creative Diagnostics CABT-CS037 | 25.5   | 46      | 47      | 212.5   | 65.5    | 212.5        |
| 869    | Sino Biological 40143-MM08 | Creative Diagnostics CABT-RM320 | 24     | 67.5    | -       | -       | -       | 67.5         |

| Index  | Capture antibody | Detector antibody | round 1 | round 2 | round 3 | round 4 | round 5 | Average rank |
|--------|------------------|-------------------|---------|---------|---------|---------|---------|--------------|
| 870    | Sino Biological 40143-MM08 | Creative Diagnostics DCABH-4693 | 1.5     | 9       | -       | -       | -       | 2.5          |
| 871    | Sino Biological 40143-MM08 | East Coast Bio HM1054 | -       | -       | -       | -       | -       | 41.5         |
| 872    | Sino Biological 40143-MM08 | East Coast Bio HM1055 | -       | -       | -       | -       | -       | 41.5         |
| 873    | Sino Biological 40143-MM08 | East Coast Bio HM1056 | -       | -       | -       | -       | -       | 41.5         |
| 874    | Sino Biological 40143-MM08 | East Coast Bio HM1057 | -       | -       | -       | -       | -       | 41.5         |
| 875    | Sino Biological 40143-MM08 | East Coast Bio HM1058 | -       | -       | -       | -       | -       | 41.5         |
| 876    | Sino Biological 40143-MM08 | East Coast Bio HM1063 | -       | -       | -       | -       | -       | 41.5         |
| 877    | Sino Biological 40143-MM08 | East Coast Bio HM1064 | -       | -       | -       | -       | -       | 41.5         |
| 878    | Sino Biological 40143-MM08 | East Coast Bio HM1065 | -       | -       | -       | -       | -       | 41.5         |
| 879    | Sino Biological 40143-MM08 | East Coast Bio HM1066 | -       | -       | -       | -       | -       | 41.5         |
| 880    | Sino Biological 40143-MM08 | East Coast Bio HM1068 | -       | -       | -       | -       | -       | 41.5         |
| 881    | Sino Biological 40143-MM08 | East Coast Bio HM1069 | -       | -       | -       | -       | -       | 41.5         |
| 882    | Sino Biological 40143-MM08 | Fitzgerald 10-2853 | -       | -       | -       | -       | -       | 41.5         |
| 883    | Sino Biological 40143-MM08 | Fitzgerald 10-2854 | -       | -       | -       | -       | -       | 41.5         |
| 884    | Sino Biological 40143-MM08 | Fitzgerald 10-2856 | -       | -       | -       | -       | -       | 41.5         |
| 885    | Sino Biological 40143-MM08 | Fitzgerald 10-2857 | -       | -       | -       | -       | -       | 41.5         |
| 886    | Sino Biological 40143-MM08 | Fitzgerald 10-2860 | -       | -       | -       | -       | -       | 41.5         |
| 887    | Sino Biological 40143-MM08 | Fitzgerald 10-2861 | -       | -       | -       | -       | -       | 41.5         |
| 888    | Sino Biological 40143-MM08 | Genemedi GMP-V-2019nCoV-Nab001 | -       | -       | -       | -       | -       | 41.5         |
| 889    | Sino Biological 40143-MM08 | Genemedi GMP-V-2019nCoV-Nab002 | -       | -       | -       | -       | -       | 41.5         |
| 890    | Sino Biological 40143-MM08 | Leinco LT7000 | -       | -       | -       | -       | -       | 41.5         |
| 891    | Sino Biological 40143-MM08 | Meridian Life Science 9547 | -       | -       | -       | -       | -       | 41.5         |
| 892    | Sino Biological 40143-MM08 | Meridian Life Science 9548 | -       | -       | -       | -       | -       | 41.5         |
| Index | Capture antibody | Detector antibody | round 1 | round 2 | round 3 | round 4 | round 5 | Average rank |
|-------|------------------|------------------|--------|--------|--------|--------|--------|--------------|
| 893   | Sino Biological 40143-MM08 | MyBiosource MB569937 | 133    | -      | -      | -      | 611.5  |              |
| 894   | Sino Biological 40143-MM08 | MyBiosource MB569939 | 83.5   | -      | -      | -      | 266    |              |
| 895   | Sino Biological 40143-MM08 | MyBiosource MB569951 | 116.5  | -      | -      | -      | 380.5  |              |
| 896   | Sino Biological 40143-MM08 | MyBiosource MB569961 | -      | -      | 104.5  | -      | 73.5   |              |
| 897   | Sino Biological 40143-MM08 | Sino Biological 40143-MM05 | 4      | 21.5   | 14     | 12.5   | 328.5  |              |
| 898   | Sino Biological 40143-MM08 | Sino Biological 40143-MM08 | 35     | 43.5   | 40     | 54     | 461.5  |              |
| 899   | Sino Biological 40143-MM08 | Sino Biological 40143-R001 | 28     | -      | -      | -      | 526.5  |              |
| 900   | Sino Biological 40143-MM08 | Sino Biological 40143-R004 | 2.5    | 25     | 86.5   | -      | 28     |              |
| 901   | Sino Biological 40143-MM08 | Sino Biological 40143-R019 | 51     | -      | -      | -      | -      |              |
| 902   | Sino Biological 40143-MM08 | Sino Biological 40143-R040 | 38.5   | -      | -      | -      | -      |              |
| 903   | Sino Biological 40143-MM08 | Sino Biological 40588-T62 | 26.5   | -      | -      | -      | -      |              |
| 904   | Sino Biological 40143-R001 | Bioss bsm-41411M | -      | 13     | 6      | 22     | 601.5  |              |
| 905   | Sino Biological 40143-R001 | Bioss bsm-41412M | -      | 21     | 30     | -      | 558    |              |
| 906   | Sino Biological 40143-R001 | Bioss bsm-41413M | -      | -      | 72.5   | -      | 83.5   |              |
| 907   | Sino Biological 40143-R001 | Bioss bsm-41414M | -      | -      | 64     | -      | 620    |              |
| 908   | Sino Biological 40143-R001 | Bioss bsm-41415M | -      | 52     | -      | -      | 495.5  |              |
| 909   | Sino Biological 40143-R001 | Creative Diagnostics CABT-CS037 | 8.5    | 23.5   | 14     | 15     | 454.5  |              |
| 910   | Sino Biological 40143-R001 | Creative Diagnostics CABT-RM320 | 93     | 123.5  | -      | -      | -      |              |
| 911   | Sino Biological 40143-R001 | Creative Diagnostics DCABH-4693 | 15     | 29.5   | -      | -      | 534    |              |
| 912   | Sino Biological 40143-R001 | East Coast Bio HM1054 | -      | -      | -      | 28     | -      |              |
| 913   | Sino Biological 40143-R001 | East Coast Bio HM1055 | -      | -      | -      | 50.5   | -      |              |
| 914   | Sino Biological 40143-R001 | East Coast Bio HM1056 | -      | -      | -      | 55     | -      |              |
| 915   | Sino Biological 40143-R001 | East Coast Bio HM1057 | -      | -      | -      | 168    | -      |              |

| Index | Capture antibody | Detector antibody | round 1 | round 2 | round 3 | round 4 | round 5 | Average rank |
|-------|------------------|------------------|--------|--------|--------|--------|--------|--------------|
| 916   | Sino Biological 40143-R001 | East Coast Bio HM1058 | -      | -      | -      | -      | 214.5  |              |
| 917   | Sino Biological 40143-R001 | East Coast Bio HM1063 | -      | -      | -      | -      | 112    |              |
| 918   | Sino Biological 40143-R001 | East Coast Bio HM1064 | -      | -      | -      | -      | 77.5   |              |
| 919   | Sino Biological 40143-R001 | East Coast Bio HM1065 | -      | -      | -      | -      | 236    |              |
| 920   | Sino Biological 40143-R001 | East Coast Bio HM1066 | -      | -      | -      | -      | 153    |              |
| 921   | Sino Biological 40143-R001 | East Coast Bio HM1068 | -      | -      | -      | -      | 102.5  |              |
| 922   | Sino Biological 40143-R001 | East Coast Bio HM1069 | -      | -      | -      | -      | 150.5  |              |
| 923   | Sino Biological 40143-R001 | Fitzgerald 10-2853 | -      | -      | -      | -      | 61     |              |
| 924   | Sino Biological 40143-R001 | Fitzgerald 10-2854 | -      | -      | -      | -      | 108    |              |
| 925   | Sino Biological 40143-R001 | Fitzgerald 10-2856 | -      | -      | -      | -      | 287.5  |              |
| 926   | Sino Biological 40143-R001 | Fitzgerald 10-2857 | -      | -      | -      | -      | 275    |              |
| 927   | Sino Biological 40143-R001 | Fitzgerald 10-2860 | -      | -      | -      | -      | 252    | 337          |
| 928   | Sino Biological 40143-R001 | Fitzgerald 10-2861 | -      | -      | -      | -      | 120.5  | 416          |
| 929   | Sino Biological 40143-R001 | Genemedi GMP-V-2019nCoV-Nab001 | -      | -      | -      | -      | 53.5   | 40           |
| 930   | Sino Biological 40143-R001 | Genemedi GMP-V-2019nCoV-Nab002 | -      | -      | -      | -      | 48     | 570.5        |
| 931   | Sino Biological 40143-R001 | Leinco LT7000 | -      | -      | -      | -      | -      | 636.5        |
| 932   | Sino Biological 40143-R001 | Meridian Life Science 9547 | -      | -      | -      | -      | -      | 382          |
| 933   | Sino Biological 40143-R001 | Meridian Life Science 9548 | -      | -      | -      | -      | -      | 664.5        |
| 934   | Sino Biological 40143-R001 | MyBiosource MB569937 | -      | -      | -      | -      | 134.5  | -            |
| 935   | Sino Biological 40143-R001 | MyBiosource MB569939 | -      | -      | -      | -      | 118    | -            |
| 936   | Sino Biological 40143-R001 | MyBiosource MB569951 | -      | -      | -      | -      | 123.5  | -            |
| 937   | Sino Biological 40143-R001 | MyBiosource MB569961 | -      | -      | -      | -      | 86     | 504          |
| 938   | Sino Biological 40143-R001 | Novus Bio NB100-56683 | -      | -      | -      | -      | 76.5   | -            |
| Index | Capture antibody             | Detector antibody             | Average rank | Average rank |
|-------|-----------------------------|------------------------------|--------------|--------------|
|       |                             |                              | round 1  | round 2  | round 3  | round 4  | round 5  | |       |                             |                              | round 1  | round 2  | round 3  | round 4  | round 5  |
| 939   | Sino Biological 40143-R001  | Sino Biological 40143-MM05   | 7.5       | 13.5     | 19       | 13.5     | -        | | 962   | Sino Biological 40143-R004  | Leinco LT7000                | -        | -        | -        | -        | 413.5    |
| 940   | Sino Biological 40143-R001  | Sino Biological 40143-MM08   | 4         | 17.5     | 25       | 16       | 87       | | 963   | Sino Biological 40143-R004  | Meridian Life Science 9547   | -        | -        | -        | -        | 497      |
| 941   | Sino Biological 40143-R001  | Sino Biological 40143-MM01   | 90.5      | -        | -        | -        | 107      | | 964   | Sino Biological 40143-R004  | Meridian Life Science 9548   | -        | -        | -        | -        | 250      |
| 942   | Sino Biological 40143-R001  | Sino Biological 40143-MM04   | 11.5      | 29.5     | 68.5     | -        | 259.5    | | 965   | Sino Biological 40143-R004  | MyBiosource MB569937          | -        | -        | -        | -        | 351.5    |
| 943   | Sino Biological 40143-R001  | Sino Biological 40143-MM09   | 82        | -        | -        | -        | -        | | 966   | Sino Biological 40143-R004  | MyBiosource MB569939          | -        | -        | -        | -        | 577.5    |
| 944   | Sino Biological 40143-R001  | Sino Biological 40143-MM10   | 100.5     | -        | -        | -        | -        | | 967   | Sino Biological 40143-R004  | MyBiosource MB569951          | -        | -        | -        | -        | 399      |
| 945   | Sino Biological 40143-R001  | Sino Biological 40588-T62    | 43.5      | -        | -        | -        | -        | | 968   | Sino Biological 40143-R004  | MyBiosource MB569961          | -        | -        | 115      | -        | 534.5    |
| 946   | Sino Biological 40143-R004  | Bioss bsm-41411M             | -         | -        | 57.5     | -        | 527      | | 969   | Sino Biological 40143-R004  | Sino Biological 40143-MM05   | 49        | -        | 78.5     | -        | 386.5    |
| 947   | Sino Biological 40143-R004  | Bioss bsm-41412M             | -         | -        | 87.5     | -        | 32       | | 970   | Sino Biological 40143-R004  | Sino Biological 40143-MM08   | 40        | -        | 106.5    | -        | 611.5    |
| 948   | Sino Biological 40143-R004  | Bioss bsm-41413M             | -         | -        | 117.5    | -        | 289      | | 971   | Sino Biological 40143-R004  | Sino Biological 40143-MM01   | 36.5      | -        | -        | -        | 477      |
| 949   | Sino Biological 40143-R004  | Bioss bsm-41414M             | -         | -        | 118.5    | -        | 402      | | 972   | Sino Biological 40143-R004  | Sino Biological 40143-MM04   | 94.5      | -        | 115      | -        | 579.5    |
| 950   | Sino Biological 40143-R004  | Bioss bsm-41415M             | -         | -        | -        | -        | 412      | | 973   | Sino Biological 40143-R004  | Sino Biological 40143-MM19   | 76        | -        | -        | -        | -        |
| 951   | Sino Biological 40143-R004  | Creative Diagnostics CABT-CS037 | 34.5   | -        | 99       | -        | 603.5    | | 974   | Sino Biological 40143-R004  | Sino Biological 40143-MM39   | 34.5      | -        | -        | -        | -        |
| 952   | Sino Biological 40143-R004  | Creative Diagnostics CABT-RM320 | 80.5   | -        | -        | -        | -        | | 975   | Sino Biological 40143-R004  | Sino Biological 40588-T62    | 40        | -        | -        | -        | -        |
| 953   | Sino Biological 40143-R004  | Creative Diagnostics DCABH-4693 | 45      | -        | -        | -        | 121.5    | | 976   | Sino Biological 40143-R019  | Novus Bio NB100-56683        | 78        | -        | -        | -        | -        |
| 954   | Sino Biological 40143-R004  | Fitzgerald 10-2853           | -         | -        | -        | -        | 237.5    | | 977   | Sino Biological 40143-R019  | Sino Biological 40143-MM05   | 67.5      | -        | -        | -        | -        |
| 955   | Sino Biological 40143-R004  | Fitzgerald 10-2854           | -         | -        | -        | -        | 322      | | 978   | Sino Biological 40143-R019  | Sino Biological 40143-MM05   | 94.5      | -        | -        | -        | -        |
| 956   | Sino Biological 40143-R004  | Fitzgerald 10-2856           | -         | -        | -        | -        | 617      | | 979   | Sino Biological 40143-R019  | Sino Biological 40143-MM05   | 101       | -        | -        | -        | -        |
| 957   | Sino Biological 40143-R004  | Fitzgerald 10-2857           | -         | -        | -        | -        | 226.5    | | 980   | Sino Biological 40143-R019  | Sino Biological 40143-MM05   | 55        | -        | -        | -        | -        |
| 958   | Sino Biological 40143-R004  | Fitzgerald 10-2860           | -         | -        | -        | -        | 150      | | 981   | Sino Biological 40143-R019  | Sino Biological 40143-MM05   | 66        | -        | -        | -        | -        |
| 959   | Sino Biological 40143-R004  | Fitzgerald 10-2861           | -         | -        | 133.5    | -        | 387.5    | | 982   | Sino Biological 40143-R040  | Bioss bsm-41411M             | -         | 24        | 20.5     | -        | -        |
| 960   | Sino Biological 40143-R004  | Genemedi GMP-V-2019nCoV-Nab001 | -        | -        | 141      | -        | 599.5    | | 983   | Sino Biological 40143-R040  | Bioss bsm-41412M             | -         | 30.5      | 42       | -        | -        |
| 961   | Sino Biological 40143-R004  | Genemedi GMP-V-2019nCoV-Nab002 | -        | -        | 102.5    | -        | 337.5    | | 984   | Sino Biological 40143-R040  | Bioss bsm-41413M             | -         | -        | 64       | -        | -        |
| Index | Capture antibody | Detector antibody | round 1 | round 2 | round 3 | round 4 | round 5 |
|-------|------------------|------------------|---------|---------|---------|---------|---------|
| 985   | Sino Biological 40143-R040 | Novus Bio NB100-56683 | 87.5 | - | - | - | - |
| 986   | Sino Biological 40143-R040 | Sino Biological 40143-MM05 | 21.5 | 31 | 21.5 | - | - |
| 987   | Sino Biological 40143-R040 | Sino Biological 40143-MM08 | 11.5 | 3.5 | 16.5 | - | - |
| 988   | Sino Biological 40143-R040 | Sino Biological 40143-R001 | 68 | - | - | - | - |
| 989   | Sino Biological 40143-R040 | Sino Biological 40143-R004 | 29 | 38.5 | 88.5 | - | - |
| 990   | Sino Biological 40143-R040 | Fitzgerald 10-2856 | - | 29.5 | - | - | - |
| 991   | Sino Biological 40143-R040 | Fitzgerald 10-2857 | - | 53 | - | - | - |
| 992   | Sino Biological 40143-R040 | Fitzgerald 10-2861 | - | - | 111 | - | - |
| 993   | Sino Biological 40143-R040 | Genemedi GMP-V-2019nCoV-Nab001 | - | - | 56.5 | - | - |
| 994   | Sino Biological 40143-R040 | Genemedi GMP-V-2019nCoV-Nab002 | - | - | 41 | - | - |
| 995   | Sino Biological 40143-R040 | MyBiosource MB5699937 | - | 79 | - | - | - |
| 996   | Sino Biological 40143-R040 | MyBiosource MB5699939 | - | 111 | - | - | - |
| 997   | Sino Biological 40143-R040 | MyBiosource MB5699951 | - | 132 | - | - | - |
| 998   | Sino Biological 40143-R040 | MyBiosource MB569961 | - | 144 | 96.5 | - | - |

| Index | Capture antibody | Detector antibody | round 1 | round 2 | round 3 | round 4 | round 5 |
|-------|------------------|------------------|---------|---------|---------|---------|---------|
| 1000  | Sino Biological 40143-R040 | Sino Biological 40143-MM05 | 21.5 | 31 | 21.5 | - | - |
| 1001  | Sino Biological 40143-R040 | Sino Biological 40143-MM08 | 11.5 | 3.5 | 16.5 | - | - |
| 1002  | Sino Biological 40143-R040 | Sino Biological 40143-R001 | 68 | - | - | - | - |
| 1003  | Sino Biological 40143-R040 | Sino Biological 40143-R004 | 29 | 38.5 | 88.5 | - | - |
Figure S1 | Performance of 523 individual antibody pairs, screened against one or more concentrations of the recombinant nucleocapsid (rNP) analyte from Acro Biosystems, as a function of signal / noise (S/N) and signal – noise (S−N). The number of antibody pairs tested against 50 ng/mL of this rNP analyte was 150, against 25 ng/mL was 144, and against 10 ng/mL was 288. Line intensities are shown as scatter plots for each of the three concentrations of this rNP analyte used against each set. Within each scatter plot, antibody pairs in the top 10 for both S/N and S−N against the corresponding concentration of this rNP analyte were overlaid with a semi-transparent box and numbered by their index (full list in Table 1si).
**Table S3** | Antibody pairs performing in the top 20 by signal / noise (S/N) and signal – noise (S–N) in the clinical pool screen (Round 5). Pairs were ranked by average performance across the S/N and S–N metrics.

| Index | Capture antibody | Detection antibody | Average rank |
|-------|------------------|--------------------|--------------|
| 630   | Genemedi GMP-V-2019nCoV-Nab002 | Genemedi GMP-V-2019nCoV-Nab001 | 1.5          |
| 521   | Fitzgerald 10-2860 | Bioss bsm-41415M | 3.5          |
| 445   | Fitzgerald 10-2854 | MyBiosource MB5569939 | 5.5          |
| 736   | MyBiosource MB5569937 | Leinco LT7000 | 7            |
| 807   | MyBiosource MB5569961 | Fitzgerald 10-2853 | 7.5          |
| 686   | Meridian Life Science 9547 | Meridian Life Science 9548 | 8            |
| 722   | MyBiosource MB5569937 | Bioss bsm-41412M | 8            |
| 608   | Genemedi GMP-V-2019nCoV-Nab001 | Meridian Life Science 9548 | 8.5          |
| 483   | Fitzgerald 10-2856 | MyBiosource MB5569939 | 9.5          |
| 30    | Bioss bsm-41411M | Meridian Life Science 9548 | 11.5         |
| 689   | Meridian Life Science 9547 | MyBiosource MB5569951 | 11.5         |
| 755   | MyBiosource MB5569939 | Fitzgerald 10-2854 | 15           |
| 574   | Fitzgerald 10-2861 | MyBiosource MB5569951 | 16           |
| 581   | Genemedi GMP-V-2019nCoV-Nab001 | Bioss bsm-41412M | 17.5         |
| 548   | Fitzgerald 10-2860 | MyBiosource MB5569951 | 18           |
| 708   | Meridian Life Science 9548 | Genemedi GMP-V-2019nCoV-Nab001 | 18          |
| 815   | MyBiosource MB5569961 | Leinco LT7000 | 18           |
### Table S4 | Antibody pairs selected after round 4—to be tested against selected clinical samples in benchtop experiments—are ranked according to average performance between S-N and S/N in that test. Average rank from all robot screening rounds are also shown.

| Index | Capture antibody | Detection antibody | rd. 1 | rd. 2 | rd. 3 | rd. 4 | rd. 5 |
|-------|------------------|--------------------|-------|-------|-------|-------|-------|
| 900   | Sino Biological 40143-MM08 | Sino Biological 40143-R004 | 1     | 2.5   | 25    | 86.5  | -     | 28    |
| 857   | Sino Biological 40143-MM05  | Sino Biological 40143-MM08  | 2     | 30    | -     | -     | -     | 580   |
| 897   | Sino Biological 40143-MM08  | Sino Biological 40143-MM05  | 3     | 4     | 21.5  | 14    | 12.5  | 328.5 |
| 180   | Creative Diagnostics CABT-CS037 | Sino Biological 40143-R004 | 4.5   | 46.5  | -     | -     | -     | 375   |
| 614   | Genemedi GMP-V-2019nCoV-NAb001 | Sino Biological 40143-MM08  | 5.5   | -     | -     | 8.5   | 2.5   | 491   |
| 6     | Bioss bsm-41411M | Creative Diagnostics CABT-CS037 | 7.5   | -     | 4     | 5.5   | 9     | 341.5 |
| 864   | Sino Biological 40143-MM08  | Bioss bsm-41412M | 7.5   | -     | 12.5  | 27    | -     | 585.5 |
| 452   | Fitzgerald 10-2856 | Bioss bsm-41411M | 8     | -     | 43.5  | 32.5  | 274.5 | 557.5 |
| 65    | Bioss bsm-41413M | Bioss bsm-41411M | 9.5   | -     | -     | 36    | 24.5  | 430   |
| 487   | Fitzgerald 10-2856 | Sino Biological 40143-MM08  | 9.5   | -     | 3.5   | 14    | 13.5  | 593   |
| 987   | Sino Biological 40143-R040 | Creative Diagnostics CABT-CS037 | 10.5  | 14    | 34.5  | 13.5  | -     | -     |
| 36    | Bioss bsm-41411M | Sino Biological 40143-MM08  | 11    | -     | 3     | 5.5   | 3     | 309   |
| 582   | Genemedi GMP-V-2019nCoV-NAb001 | Bioss bsm-41413M | 11.5  | -     | -     | 23    | -     | 399   |
| 827   | Novus Bio NB100-56683 | Sino Biological 40143-MM05  | 14.5  | 87    | -     | -     | -     | -     |
| 1014  | Sino Biological 40588-T62 | Novus Bio NB100-56683 | 14.5  | 100   | -     | -     | -     | -     |
| 100   | Bioss bsm-41413M | Sino Biological 40143-MM08  | 16    | -     | 3     | 3.5   | 400.5 | -     |
Six antibody pairs were striped and capture and/or detectors in a lateral flow assay and screened with six RT-qPCR-confirmed SARS-CoV-2 banked clinical positive samples, three SARS-CoV-2-negative samples, and two potentially cross-reactive samples. Pairs 567 and 564 were chosen as relatively highly ranked pairs. Pairs 527 and 111 were chosen as middle ranked pairs. And, pairs 517 and 666 were chosen as low ranked pairs.
Figure S3 | Combining negative controls across several rounds of robotic screening data, benchtop tests with LFAs, and with diluted clinical negative samples shows that non-specific binding at the test line is predictable in the screening system. The black dotted line is the approximate threshold for test line visibility in an LFA.
