BD Respiratory Viral Panel for BD MAX™ System

REF **445215**

For Emergency Use Authorization (EUA) only
For In Vitro Diagnostic Use
For Prescription Use Only
For use with the BD MAX™ System

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IVD Rx Only 25 °C 2 °C bd.com/e-labeling

INTENDED USE

BD Respiratory Viral Panel for BD MAX™ System is an automated multiplexed real-time RT-PCR test intended for the simultaneous qualitative detection and differentiation of nucleic acid from SARS-CoV-2, influenza A, influenza B, and/or respiratory syncytial virus (RSV) in nasopharyngeal and anterior nasal swab specimens collected from individuals with signs and symptoms of respiratory tract infection consistent with COVID-19. The BD Respiratory Viral Panel for BD MAX™ System is intended as an aid in the diagnosis of SARS-CoV-2, influenza A, influenza B, and RSV infections in conjunction with clinical and epidemiological risk factors. Testing is limited to laboratories certified under the Clinical Laboratory Improvement Amendments of 1988 (CLIA), 42 U.S.C. §263a, that meet requirements to perform moderate or high complexity tests.

Results are for the detection and differentiation of SARS-CoV-2, influenza A, influenza B, and RSV RNA in clinical specimens. This test is not intended to detect influenza C virus. SARS-CoV-2, influenza A, influenza B, and RSV RNA are generally detectable in nasopharyngeal and anterior nasal swab specimens during the acute phase of infection.

Positive results are indicative of nucleic acid but do not rule out bacterial infection or co-infection with other pathogens not detected by the test. Clinical correlation with patient history and other diagnostic information is necessary to determine patient infection status. The agent detected may not be the definitive cause of disease. Laboratories within the United States and its territories are required to report all SARS-CoV-2 results to the appropriate public health authorities.

Negative results do not preclude SARS-CoV-2, influenza A, influenza B, and/or RSV infection and should not be used as the sole basis for patient management decisions. Negative results must be combined with clinical observations, patient history, and/or epidemiological information.

BD Respiratory Viral Panel for BD MAX™ System is intended for use by qualified laboratory personnel specifically instructed and trained in the techniques of real-time PCR, in vitro diagnostic procedures, and use of the BD MAX™ System. BD Respiratory Viral Panel for BD MAX™ System is only for use under the Food and Drug Administration's Emergency Use Authorization.

EXPLANATION OF THE TEST

Total nucleic acid (TNA) is isolated and purified using BD Respiratory Viral Panel for BD MAX™ System from nasopharyngeal or anterior nasal swabs collected in BD Universal Viral Transport System (UVT) or Copan Universal Transport Media System (UTM). Patient sample is transferred to the BD Molecular RVP Sample Buffer Tube provided with the BD Respiratory Viral Panel for BD MAX™ System and placed in the BD MAX™ System. The BD RVP Unitized Reagent Strip contains a combination of lytic and extraction reagents designed to perform cell lysis and TNA extraction. Eluted TNA is transferred to the Respiratory Viral Panel master mix. The final rehydrated master mix is transferred to a PCR cartridge for rRT-PCR.

The BD Respiratory Viral Panel for BD MAX™ System utilizes multiplexed primers and probes targeting RNA from the nucleocapsid phosphoprotein gene (N1 and N2 regions) of the SARS-CoV-2, a conserved region of the matrix protein M1 gene for influenza A, conserved regions of the matrix protein M1 gene and HA gene for influenza B, conserved regions of the N and M genes for RSV, and the human RNase P gene. The primer and probe sets for SARS-CoV-2 are based on the United States Centers for Disease Control and Prevention (US CDC) assay for specific detection of SARS-CoV-2 by amplifying two unique regions of the N gene (i.e., N1 and N2). SARS-CoV-2 targets, N1 and N2, are indistinguishable as they are detected in the same optical channel. Influenza B targets, M1 and HA, are also indistinguishable and are detected in the same optical channel. RSV targets, N and M, are indistinguishable as they are detected in the same optical channel.

An internal control targeting the human RNase P gene will be co-amplified along with SARS-CoV-2, influenza A, influenza B, and RSV gene targets (if present) and will serve as an endogenous nucleic acid extraction control present in all properly collected patient samples. This control serves as both an extraction control and an internal amplification control.

PRINCIPLES OF THE PROCEDURE

A combination of lytic and extraction reagents is used to perform cell lysis and TNA extraction. Nucleic acids released from the target organisms are captured on magnetic affinity beads. The beads, together with the bound nucleic acids, are washed and the nucleic acids are eluted by a combination of heat and pH variation. Eluted TNA is added to neutralization buffer, mixed, and transferred to BD Respiratory Viral Panel master mix for rehydration. After reconstitution, the BD MAX™ System dispenses a fixed volume of RT-PCR-ready solution containing extracted nucleic acids into the PCR Cartridge. Microvalves on the cartridge are sealed by the system prior to initiating PCR in order to contain the amplification mixture and thus prevent evaporation and contamination.

The amplified cDNA targets are detected using hydrolysis (TaqMan®) probes, labeled at one end with a fluorescent reporter dye (fluorophore), and at the other end, with a quencher moiety. Probes labeled with different fluorophores are used to detect the target analytes in different optical channels of the BD MAX™ System. When the probes are in their native state, the fluorescence of the fluorophore is quenched due to its proximity to the quencher. However, in the presence of target cDNA, the probes hybridize to their complementary sequences and are hydrolyzed by the 5'–3' exonuclease activity of the DNA polymerase as it synthesizes the nascent strand along the cDNA template. As a result, the fluorophores are separated from the quencher molecules and fluorescence is emitted. The amount of fluorescence detected in the optical channels is directly proportional to the quantity of the corresponding probe that is hydrolyzed. The BD MAX™ System monitors these signals at each cycle of the PCR and interprets the data at the end of the reaction to provide qualitative test results for each analyte.

REAGENTS AND MATERIALS

REF	Contents	Quantity
445215	**BD Respiratory Viral Panel for BD MAX™ System Master Mix (F4)** *Dried PCR Master Mix containing nucleotides and specific molecular probes (0.007% w/v) and primers (0.015% w/v) along with PCR enzyme (0.008% w/v).*	24 (2 x 12 tubes)
	BD RVP for BD MAX™ System Extraction Tube (D4) *Dried extraction reagent containing DNA/RNA magnetic affinity beads (6.41% w/v) and Proteinase K (6.7% w/v).*	24 (2 x 12 tubes)
	BD RVP for BD MAX™ System Unitized Reagent Strip *Unitized Reagent Strip containing wash buffer with 0.004% v/v Tween® 20 (0.75 mL), elution buffer with 0.004% v/v Tween® 20 (0.75 mL), and neutralization buffer with 0.004% v/v Tween® 20 (0.75 mL) reagents and disposable pipette tips necessary for sample processing and TNA extraction.*	24 tests
	BD Molecular RVP Sample Buffer Tubes *(4.5% Triton® X-100 Reduced)*	24 (2 x 12 tubes)

EQUIPMENT AND MATERIALS REQUIRED BUT NOT PROVIDED

- BD MAX™ System with Software Version 5.14 or later (BD Catalog Number 441916)
- BD MAX™ Sample Rack (BD Catalog Number 444807 or 444808)
- BD PCR Cartridges (BD Catalog Number 437519)
- Copan Universal Transport Medium (UTM®) (Copan Catalog Number 305C, 306C)
- BD Universal Viral Transport System (BD Catalog Number 220528, 220531)
- Healthlink Inc. Transport Medium (UTM®) System (Healthlink Catalog Number 3C036N.HL, 3C038N.HL)
- Vortex Genie 2 (VWR Catalog Number 58815-235 or equivalent)
- Multi-Tube Vortex Mixer (VWR Catalog Number 58816-115 or equivalent)
- Rack compatible with a multi-tube vortexer (e.g., Cryogenic Vial Holder or equivalent)
- Variable Volume Calibrated Pipettor (750 µL volume capable)
- Aerosol resistant micropipette tips
- Disposable gloves, powderless
- BD Pierceable Caps (BD Catalog Number 440295)

WARNINGS AND PRECAUTIONS

Master Mix

Danger

H350: May cause cancer. **H360D:** May damage the unborn child. **P201:** Obtain special instructions before use. **P202:** Do not handle until all safety precautions have been read and understood. **P280:** Wear protective gloves/protective clothing/eye protection/face protection. **P308+P313:** IF exposed or concerned: Get medical advice/attention. **P405:** Store locked up. **P501:** Dispose of contents/ container to an approved facility in accordance with local, regional, national and international regulations.

Sample Buffer

Warning

H315: Causes skin irritation. **H319:** Causes serious eye irritation. **P264:** Wash face, hands and any exposed skin thoroughly after handling. **P280:** Wear protective gloves/protective clothing/eye protection/face protection. **P302+P352:** IF ON SKIN: Wash with plenty of soap and water. **P362+P364:** Take off contaminated clothing and wash it before reuse. **P305+P351+P338:** IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. **P337+P313:** If eye irritation persists: Get medical advice/attention.

Extraction Tubes

Danger

H312: Harmful in contact with skin. **H315:** Causes skin irritation. **H319:** Causes serious eye irritation. **H334:** May cause allergy or asthma symptoms or breathing difficulties if inhaled. **H335:** May cause respiratory irritation. **H401:** Toxic to aquatic life. **H412:** Harmful to aquatic life with long lasting effects. **P261:** Avoid breathing dust/fume/gas/mist/vapors/spray. **P264:** Wash face, hands and any exposed skin thoroughly after handling. **P271:** Use only outdoors or in a well-ventilated area. **P273:** Avoid release to the environment. **P280:** Wear protective gloves/protective clothing/eye protection/face protection. **P284:** [In case of inadequate ventilation] wear respiratory protection. **P302+P352:** IF ON SKIN: Wash with plenty of soap and water. **P362+P364:** Take off contaminated clothing and wash it before reuse. **P312:** Call a POISON CENTER or doctor/physician if you feel unwell. **P304+P340:** IF INHALED: Remove person to fresh air and keep comfortable for breathing. **P342+P311:** If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician. **P305+P351+P338:** IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. **P337+P313:** If eye irritation persists: Get medical advice/ attention. **P403+P233:** Store in a well-ventilated place. Keep container tightly closed. **P501:** Dispose of contents/container to an approved facility in accordance with local, regional, national and international regulations.

- For in vitro diagnostic use.
- For use under Emergency Use Authorization (EUA) Only.
- For Prescription Use Only.
- This product has not been FDA cleared or approved, but has been authorized for emergency use by FDA under EUA for use by authorized laboratories.
- This product has been authorized only for the detection and differentiation of nucleic acid from SARS-CoV-2, influenza A, influenza B, and respiratory syncytial virus, not for any other viruses or pathogens.
- This emergency use of this product is only authorized for the duration of the declaration that circumstances exist justifying the authorization of emergency use of in vitro diagnostics for detection and/or diagnosis of COVID-19 under Section 564(b)(1) of the Act, 21 U.S.C. § 360bbb-3(b)(1), unless the declaration is terminated or authorization is revoked sooner.
- This product is for use in laboratories certified under the Clinical Laboratory Improvement Amendments (CLIA) of 1988, 42 U.S.C. §263a, that meet requirements to perform high and moderate complexity tests.
- Positive results are indicative of the presence of SARS-CoV-2, influenza A, influenza B, and/or RSV RNA.
- All patient samples should be handled as if infectious, using good laboratory procedures as outlined in the CLSI Document M29[1] and in Biosafety in Microbiological and Biomedical Laboratories.[2] Only personnel proficient in handling infectious materials and the use of BD Respiratory Viral Panel and BD MAX™ System should perform this procedure.
- The stability of nasopharyngeal and anterior nasal swab samples in BD Universal Viral Transport System (UVT) is unaffected for up to 2 cycles of freeze and thaw from -70 °C.
- All human-sourced materials should be considered potentially infectious and should be handled with universal precautions. If spillage occurs, follow appropriate site procedures.

- Closely follow procedures and guidelines provided to ensure that the test is performed correctly. Any deviation from the procedures and guidelines may affect optimal test performance.
- Do not use expired reagents and/or materials.
- Do not use the kit if the label that seals the outer box is broken upon arrival.
- Do not use reagents if the protective pouches are open or broken upon arrival.
- Do not use reagents if desiccant is not present or broken inside reagent pouches.
- Do not remove desiccant from reagent pouches.
- Close protective pouches of reagents promptly with the zip seal after each use. Remove any excess air in the pouches prior to sealing.
- Protect reagents against heat and humidity. Prolonged exposure to humidity may affect product performance.
- Do not use reagents if the foil has been broken or damaged.
- Do not mix reagents from different pouches and/or kits and/or lots.
- Do not interchange caps, as contamination may occur and compromise test results.
- Check Unitized Reagent Strips for proper liquid fills (ensure that the liquids are at the bottom of the tubes).
- Check Unitized Reagent Strips to ensure that all pipette tips are present.
- Proceed with caution when using chemical solutions, as Extraction Tube barcode readability may be altered.
- Good laboratory technique is essential to the proper performance of this assay. Extreme care should be taken to preserve the purity of all materials and reagents.
- In cases where other PCR tests are conducted in the same general area of the laboratory, care must be taken to ensure that the BD Respiratory Viral Panel components, any additional reagents required for testing, and the BD MAX™ System are not contaminated. Avoid microbial and ribonuclease (RNase)/deoxyribonuclease (DNase) contamination of reagents at all times. The use of sterile RNase/DNase-free disposable aerosol resistant or positive displacement pipette tips is recommended. Use a new tip for each specimen. Gloves must be changed before manipulating reagents and cartridges.
- To avoid contamination of the environment by amplicons, do not break apart the BD PCR Cartridge after use. The seals of the BD PCR Cartridges are designed to prevent contamination.
- The laboratory should routinely perform environmental monitoring to minimize the risk of cross-contamination.
- Wear protective clothing and disposable gloves while handling all reagents.
- Wash hands thoroughly after performing the test.
- Do not pipette by mouth.
- Do not smoke, drink, chew or eat in areas where specimens or kit reagents are being handled.
- Dispose of all used reagents and any other contaminated disposable materials following procedures for infectious or potentially infectious waste. It is the responsibility of each laboratory to handle solid and liquid waste according to their nature and degree of hazardousness and to treat and dispose of them (or have them treated and disposed of) in accordance with any applicable regulations.
- Consult the BD MAX™ System User's Manual[3] for additional warnings, precautions and procedures.

STORAGE AND STABILITY

- BD Respiratory Viral Panel for BD MAX™ System components are stable at 2–25 °C to the stated expiration date on the product label. Do not use expired components.
  NOTE: The reagents are considered unusable by the BD MAX™ System on the expiration date printed on the product label.
- The BD Respiratory Viral Panel Master Mix and RVP Extraction Tubes are provided in sealed pouches. To protect from humidity, immediately re-seal after opening.
- Reagent tubes are stable for up to 14 days at 2–25 °C after initial opening and re-sealing of the pouch.
- Refer to Table 1 for sample stability conditions.

Table 1: BD Respiratory Viral Panel Assay for BD MAX™ System Specimen Stability

Specimen Stability	Temperature	Duration
In UVT/UTM	25 ± 2 °C	12 hours
	2–8 °C	72 hours
In BD Molecular RVP Sample Buffer Tube	25 ± 2 °C	24 hours
	2–8 °C	48 hours

INSTRUCTIONS FOR USE

Swab Specimen Collection/Transport in Universal Viral Transport (UVT) or Universal Transport Medium (UTM)

NOTE: Wear gloves when handling specimens. If gloves come in contact with the specimen, immediately change them to prevent contamination of other specimens.

1. Nasopharyngeal or anterior nasal swab specimens should be collected and expressed directly into the BD Universal Viral Transport System or the Copan Universal Transport Media System according to their respective package insert instructions.
2. After collection, specimens can be stored in accordance to the Storage and Stability section.
3. If delivery and processing of samples exceeds specified time period, specimens should be transported in dry ice and once in laboratory frozen at -70 °C or colder.[4]

BD Molecular RVP Sample Buffer Tube Preparation for use with nasopharyngeal or anterior nasal swab specimens in Universal Viral Transport (UVT) or Universal Transport Media (UTM)

NOTE: Wear gloves when handling specimens. If gloves come in contact with the specimen, immediately change them to prevent contamination of other specimens.

NOTE: If frozen, allow Universal Viral Transport (UVT) or Universal Transport Media (UTM) specimen to come to room temperature before proceeding.

1. For each UVT/UTM specimen, vortex briefly (5–10 seconds) or invert 8–10 times.
2. Uncap the BD Molecular RVP Sample Buffer Tube and transfer (using a calibrated, variable pipette) 750 µL from the UVT/UTM specimen directly into the BD Molecular RVP Sample Buffer Tube.
3. Recap the tube with a pierceable cap and vortex or mix by inversion 8–10 times.

   NOTE: Bubbles may be seen upon recapping. To reduce the chance of bubbles extruding from the tube, the user may discard the cap removed in Step 2 and replace with a new pierceable cap.
4. Label the BD Molecular RVP Sample Buffer Tube with patient information.

   NOTE: Do not obscure the barcodes on the tube. Obscuring the barcode may result in BD MAX™ System catalog failure and inability to test the sample.
5. After transfer, samples must be processed within the duration of the Storage and Stability section.
6. Repeat Steps 1 to 3 for each UVT/UTM sample that will be tested on the BD MAX™ System.
7. Proceed directly with the BD MAX™ System Operation.

BD MAX™ System Operation

NOTE: Refer to the BD MAX™ System User's Manual[3] for detailed instructions (Operation section).

1. Power on the BD MAX™ System (if not already done) and log in by entering <user name> and <password>.
2. Gloves must be changed before manipulating reagents and cartridges.
3. Remove the required number of Unitized Reagent Strips from the BD Respiratory Viral Panel for BD MAX™ System kit. Gently tap each Unitized Reagent Strip onto a hard surface to ensure that all the liquids are at the bottom of the tubes.
4. Remove from the protective pouches the required number of Extraction Tube(s) and Master Mix Tube(s) from the BD Respiratory Viral Panel for BD MAX™ System kit.
5. Remove excess air, and close pouches with the zip seal.
6. For each sample to be tested, place one (1) Unitized Reagent Strip on the BD MAX™ System Rack, starting with Position 1 of Rack A.
7. Snap one (1) Extraction Tube (D4) (white foil) into each Unitized Reagent Strip in Position 1 as shown in Figure 1.
8. Snap one (1) BD Respiratory Viral Panel for BD MAX™ System Master Mix Tube (F4) (green foil) into each Unitized Reagent Strip in Position 2 as shown in Figure 1.

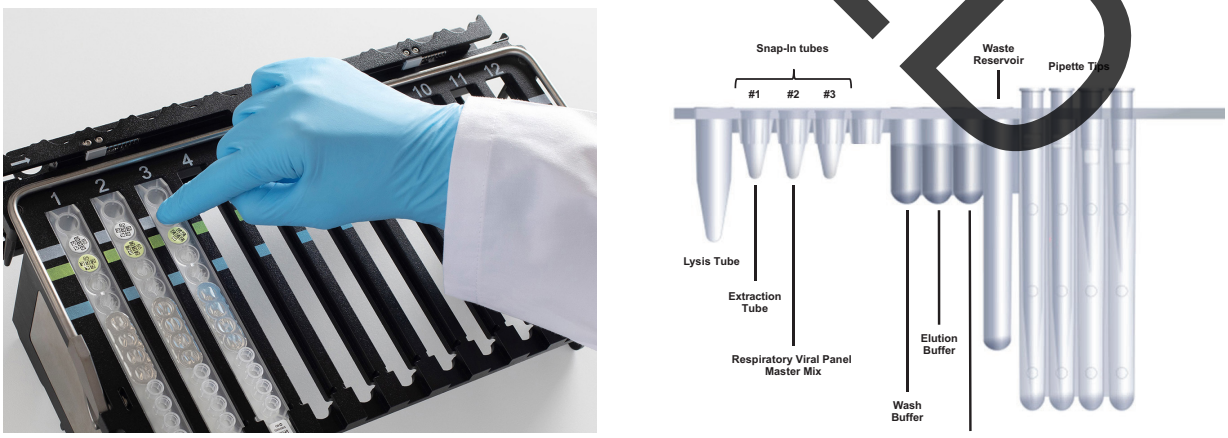

Figure 1: Snap Extraction Tubes and Master Mix Tubes into Unitized Reagent Strips

9. Click on the Run Tab and then the Inventory subtab. Enter the kit lot number for the BD Respiratory Viral Panel kit (for lot traceability) by either scanning the barcode with the scanner or by manual entry.

   NOTE: Repeat step 9 each time a new kit lot is used.

10. Navigate to the Worklist. Using the pull-down menu select <BD RESP VIR 75>.
11. Select the appropriate kit lot number (found on the outer box of the BD Respiratory Viral Panel kit) from the pull-down menu.
12. Enter the BD Molecular RVP Sample Buffer Tube ID, Patient ID and Accession Number (if applicable) into the Worklist, either by scanning the barcode with the scanner or by manual entry.
13. Repeat step 12 for all remaining Sample Buffer Tubes.
14. Place the Sample Buffer Tubes in the BD MAX™ System Rack(s) corresponding to the Unitized Reagent Strips assembled in steps 6 to 8.
15. Place the required number of BD PCR Cartridge(s) into the BD MAX™ System (refer to Figure 2).
    - Each BD PCR Cartridge accommodates 1 run of up to 12 samples for a total of 12 samples.
    - The BD MAX™ System will automatically select the position and row on the BD PCR Cartridge for each run.
    - BD PCR Cartridges are used on a per-run AND rack basis (1 run per cartridge and 1 cartridge per rack).
    - To maximize use of BD PCR Cartridges, using 2000 Sample Mode, select Run Wizard under the Worklist tab for lane assignments.
    - Consult the BD MAX™ System User's Manual[3] for more details.

Figure 2: Load BD PCR Cartridges

16. Load rack(s) into the BD MAX™ System (refer to Figure 3).

Figure 3: Load Rack(s) onto the BD MAX™ System

17. Close the BD MAX™ System lid and click the **<Start>** to begin processing.

NOTE: When an Indeterminate (IND), Unresolved (UNR), or Incomplete (INC) result is obtained, or when an External Control failure occurs, repeat test from the Sample Buffer Tube or primary sample (refer to Repeat Test Procedure section).

QUALITY CONTROL

Quality control procedures monitor the performance of the assay. Laboratories must establish the number, type and frequency of testing control materials according to guidelines or requirements of local, provincial, state, federal, and/or country regulations or accreditation organizations in order to monitor the effectiveness of the entire analytical process. For general Quality Control guidance, the user may wish to refer to Clinical Laboratory Standards Institute documents MM3[5] and EP12.[6]

1. External Control materials are not provided by BD. External Positive and Negative Controls are not used by the BD MAX™ System software for the purpose of sample test result interpretation. External Controls are treated as if they were patient samples. (Refer to Table 2 for the interpretation of External Control assay results.)
2. One (1) External Positive Control and one (1) External Negative Control should be run at least daily until adequate process validation is achieved on the BD MAX™ System in each laboratory setting. Reduced frequency of control testing should be in accordance with applicable regulations.
3. The External Positive Control is intended to monitor for substantial reagent failure. The External Negative Control is intended to detect reagent or environmental contamination (or carryover) by target nucleic acids.
4. Various types of External Controls are recommended to allow the user to select the most appropriate for their laboratory quality control program.
   a. External Negative Control (ENC): Commercially available control material, such as Microbiologics® Helix Elite™ Inactivated Standard Negative Cellularity Control (refer to Table 2). BD recommends that the External Negative Control be prepared prior to the External Positive Control in order to reduce the potential for contamination as a result of control preparation.
   b. External Positive Control (EPC): Commercially available control materials, such as the Microbiologics® Helix Elite™ standards listed below (refer to Table 2).

Table 2: Commercially Available Standards for External Controls

Commercially Available Standards	Part Number
Microbiologics® Helix Elite™ Synthetic Standard SARS-CoV-2 Synthetic RNA (N gene Targets)	HE0060S
Microbiologics® Helix Elite™ Inactivated SARS-CoV-2 Whole Virus (Pellet)	HE0065N
Microbiologics® Helix Elite™ Inactivated Standard Inactivated Influenza A/B and Respiratory Syncytial Virus	HE0044N
Microbiologics® Helix Elite™ Inactivated SARS-CoV-2 Whole Virus (Swab)	HE0066NS
Microbiologics® Helix Elite™ Flu/RSV/SARS-CoV-2 Control Panel (Inactivated Swab)	8246
Microbiologics® Helix Elite™ Inactivated Standard Negative Cellularity Control	HE0058N
Microbiologics® Helix Elite™ Inactivated Standard Negative Cellularity Control (Swab)	HE0067NS

5. Suggested procedure for preparing an EPC or ENC using Microbiologics® Helix Elite™ Standards (see below) has been verified by BD. However, the choice of EPC and ENC for the BD Respiratory Viral Panel for BD MAX™ System is ultimately the decision of the laboratory, in accordance with applicable local, state, and/or federal regulations, accreditation requirements, and the laboratory's standard Quality Control (QC) procedures.
6. Preparation of External Negative Control Standards including:

   Microbiologics® Helix Elite™ Inactivated Standard Negative Cellularity Control (Pellet) (HE0058N)

   a. Add 750 µL of nuclease-free water into a BD Molecular RVP Sample Buffer Tube.
   b. Rehydrate the Microbiologics® Negative Cellularity Control Standard with 100 µL of nuclease free water.
   c. Dilute the rehydrated standard 1:10 in nuclease free water (10 µL standard to 90 µL nuclease free water).
   d. Spike 75 µL of the diluted standard into the Sample Buffer Tube.
   e. Cap the External Negative Control Sample Buffer Tube and vortex for 10–30 seconds or invert 8–10 times. Process on the BD MAX™ System.

   Microbiologics® Helix Elite™ Inactivated Standard Negative Cellularity Control (Swab) (HE0067NS)

   a. Add 750 µL of nuclease free water into a BD Molecular RVP Sample Buffer Tube.
   b. Place a Microbiologics® Helix Elite™ Inactivated Standard Negative Cellularity Control (Swab) directly into the BD Molecular RVP Sample Buffer Tube.
   c. Express the swab thoroughly.
   d. Discard the expressed swab.
   e. Cap the External Negative Control Sample Buffer Tube and vortex for 10–30 seconds or invert 8–10 times. Process on the BD MAX™ System.

7. Preparation of External Positive Control Standards including:

Microbiologics® Helix Elite™ Standard SARS-CoV-2 Synthetic RNA (HE0060S)

a. Add 750 µL of nuclease-free water into a BD Molecular RVP Sample Buffer Tube.
b. Rehydrate the Microbiologics® Negative Cellularity Control Standard (HE0058N), Microbiologics® SARS-CoV-2 Synthetic RNA Standard (HE0060S), and Microbiologics® Inactivated Influenza A/B and Respiratory Syncytial Virus Standard (HE0044N) each with 100 µL of nuclease free water.
c. Dilute the Microbiologics® Negative Cellularity Control Standard and Microbiologics® Inactivated Influenza A/B and Respiratory Syncytial Virus Standard 1:10 in nuclease free water (10 µL standard to 90 µL nuclease free water).
d. Dilute the Microbiologics® SARS-CoV-2 Synthetic RNA Standard 1:100 in nuclease free water (10 µL standard to 990 µL nuclease free water).
e. Spike 75 µL of the diluted Microbiologics® Negative Cellularity Control Standard, 50 µL of the diluted Microbiologics® SARS-CoV-2 Synthetic RNA Standard, and 50 µL of the diluted Microbiologics® Inactivated Influenza A/B and Respiratory Syncytial Virus Standard into the Sample Buffer Tube.
f. Cap the External Positive Control Sample Buffer Tube and vortex for 10–30 seconds or invert 8–10 times. Process on the BD MAX™ System.

Microbiologics® Helix Elite™ Inactivated SARS-CoV-2 Whole Virus (Pellet) (HE0065N)

a. Add 500 µL of nuclease-free water into a BD Molecular RVP Sample Buffer Tube.
b. Rehydrate Microbiologics® Inactivated Influenza A/B and Respiratory Syncytial Virus Standard (HE0044N) with 100 µL of nuclease free water.
c. Dilute the Microbiologics® Inactivated Influenza A/B and Respiratory Syncytial Virus Standard 1:10 in nuclease free water (10 µL standard in 90 µL nuclease free water).
d. Rehydrate the Microbiologics® SARS-CoV-2 Positive Control (HE0065N) by tipping the lyophilized pellet into the provided 1.5 mL vial of hydrating fluid or obtain a rehydrated aliquot from 4 °C storage.
e. Vortex or vigorously shake the vial until the pellet is fully dissolved.
f. Spike 250 µL of the rehydrated SARS-CoV-2 pellet into the Sample Buffer Tube.
g. Spike 50 µL of the diluted Microbiologics® Inactivated Influenza A/B and Respiratory Syncytial Virus Standard into the Sample Buffer Tube.
h. Cap the External Positive Control Sample Buffer Tube and vortex for 10–30 seconds or invert 8–10 times. Process on the BD MAX™ System.

Microbiologics® Helix Elite™ Inactivated SARS-CoV-2 Whole Virus (Swab) (HE0066NS)

a. Add 750 µL of nuclease-free water into a BD Molecular RVP Sample Buffer Tube.
b. Rehydrate Microbiologics® Inactivated Influenza A/B and Respiratory Syncytial Virus Standard (HE0044N) with 100 µL of nuclease free water.
c. Dilute the Microbiologics® Inactivated Influenza A/B and Respiratory Syncytial Virus Standard 1:10 in nuclease free water (10 µL standard in 90 µL nuclease free water).
d. Spike 50 µL of the diluted Microbiologics® Inactivated Influenza A/B and Respiratory Syncytial Virus Standard into the Sample Buffer Tube.
e. Place a Microbiologics® Helix Elite™ Inactivated SARS-CoV-2 Whole Virus (Swab) (HE0066NS) directly into the BD Molecular RVP Sample Buffer Tube.
f. Express the swab thoroughly.
g. Discard the expressed swab.
h. Cap the External Positive Control Sample Buffer Tube and vortex for 10–30 seconds or invert 8–10 times. Process on the BD MAX™ System.

Microbiologics® Helix Elite™ Flu/RSV/SARS-CoV-2 Control Panel (Inactivated Swab) (8246)

a. Add 750 µL of nuclease free water into a BD Molecular RVP Sample Buffer Tube.
b. Place a Negative Control Panel swab directly into the BD Molecular RVP Sample Buffer Tube.
c. Express the swab thoroughly.
d. Discard the expressed swab.
e. Cap the External Negative Control Sample Buffer Tube and vortex for 10–30 seconds or invert 8–10 times.
f. Add 750 µL of nuclease free water into another BD Molecular RVP Sample Buffer Tube.
g. Place a Microbiologics® Helix Elite™ Flu/RSV/SARS-CoV-2 Control Panel (Inactivated Swab) directly into the BD Molecular RVP Sample Buffer Tube.
h. Express the swab thoroughly.
i. Discard the expressed swab.
j. Cap the External Positive Control Sample Buffer Tube and vortex for 10–30 seconds or invert 8–10 times. Process on the BD MAX™ System.

8. All test controls should be examined prior to interpretation of patient results. All External Controls should yield the expected results (Table 3) with no failed external controls (Unresolved, Indeterminate, Incomplete results). If the controls are not valid, the patient results cannot be interpreted.

Table 3: BD Respiratory Viral Panel External Control Expected Results

Control Type	Catalog Number	Control	Used to Monitor	Expected Result			
				SARS-CoV-2	Flu A	Flu B	RSV
Negative External Control Options	HE0058N HE0067NS 8246	Microbiologics® Negative External Control	Reagent and/or environmental contamination	NEG	NEG	NEG	NEG
Positive External Control Options	HE0060S + HE0044N HE0065N + HE0044N HE0066NS + HE0044N 8246	Microbiologics® Positive External Control	Substantial reagent failure including primer and probe integrity	POS	POS	POS	POS

9. An External Negative Control that yields a positive test result is indicative of a specimen handling and/or contamination event. Review the specimen handling technique to avoid mix-up and/or contamination. An External Positive Control that yields a negative result is indicative of a specimen handling/preparation problem. Review the specimen handling/preparation technique.
10. An External Control that yields an Unresolved, Indeterminate, or Incomplete test result is indicative of a reagent or a BD MAX™ System failure. Check the BD MAX™ System monitor for any error messages. Refer to the Troubleshooting section of the BD MAX™ System User's Manual[3] for interpretation of warning and error codes. If the problem persists, use reagents from an unopened pouch or use a new BD Respiratory Viral Panel for BD MAX™ System kit.
11. The RNase P gene serves as both an Extraction and Internal Amplification Control. In the event that SARS-CoV-2, influenza A, influenza B, and RSV are negative, an RNase P result must be positive for the SARS-CoV-2, influenza A, influenza B, and RSV results to be valid negative results. When either SARS-CoV-2, influenza A, influenza B, and/or RSV target results are positive, the RNase P result is ignored. An Unresolved (UNR) result is indicative of specimen-associated inhibition or reagent failure. Repeat any sample reported as Unresolved according to the Repeat Test Procedure section below.

RESULT INTERPRETATION

Results are available on the **<Results>** tab in the **<Results>** window on the BD MAX™ System monitor. The BD MAX™ System software automatically interprets test results. Results are reported for each of the analytes. A test result may be called as NEG (negative), POS (positive) or UNR (unresolved) based on the amplification status of the target and the Extraction and Internal Amplification Control, RNase P. IND (Indeterminate) or INC (Incomplete) results are due to BD MAX™ System failure.
BD Respiratory Viral Panel for BD MAX™ System results interpretation is described below in Table 4.

Table 4: BD Respiratory Viral Panel Result Interpretation

Result Displayed[a]	Explanation	Actions
POS[b]	The assay(s) for the indicated organism were POSITIVE	Report indicated organism as: Detected
NEG[c]	The assay(s) for the indicated organism were NEGATIVE	Report indicated organism as: Not Detected
UNR	The specimen is Unresolved (i.e., RNAse P target was not detected, and 0 targets were detected for any organism)	Repeat Test[d]
IND With Warning or Error Codes[e]	The specimen is Indeterminate (i.e., RNAse P target was not detected, 0 targets were detected for all of the organisms, and the BD MAX™ System failed)	Repeat Test[d]
INC With Warning or Error Codes[e]	The specimen is Incomplete (i.e., RNAse P target was not detected, 0 targets were detected for all of the organisms, and the BD MAX™ System could not complete the run)	Repeat Test[d]

[a] Laboratories should report their diagnostic as appropriate and in compliance with their reporting system.

[b] When either SARS-CoV-2, influenza A, influenza B, and/or RSV target results are positive, the RNAse P result is ignored.

[c] In the event that SARS-CoV-2, influenza A, influenza B, and RSV are negative, an RNase P result must be positive for the SARS-CoV-2, influenza A, influenza B, and RSV results to be valid negative results.

[d] Repeat the test from the Sample Buffer Tube or primary sample.

[e] Refer to the Troubleshooting section of the BD MAX™ System User's Manual[3] for interpretation of warning and error codes.

REPEAT TEST PROCEDURE

NOTE: Sufficient volume is available for one repeat test from the BD Molecular RVP Sample Buffer Tube. Refer to the Storage and Stability section for appropriate storage conditions and durations.

NOTE: New samples may be tested in the same run with repeat samples.

UNRESOLVED, INDETERMINATE, INCOMPLETE RESULTS, AND EXTERNAL CONTROL FAILURES

When an Indeterminate (IND), Unresolved (UNR), or Incomplete (INC) result is obtained, a repeat test from the Sample Buffer Tube or primary sample must be performed. If an External Control fails, repeat testing of all affected specimens using freshly prepared External Controls (see Quality Control).

Unresolved Result

Unresolved results may be obtained in the event that specimen-associated inhibition or reagent failure prevents proper target or RNase P amplification. Sample(s) can be repeated from the Sample Buffer Tube or primary sample. Uncap a new BD Molecular RVP Sample Buffer Tube and transfer (using a calibrated, variable pipette) 750 µL from the UVT/UTM specimen directly into the BD Molecular RVP Sample Buffer Tube. Restart from the BD MAX™ System Operation section.

Indeterminate Result

Indeterminate results may be obtained in the event that a System failure occurs. Sample(s) can be repeated from the Sample Buffer Tube or primary sample. Uncap a new BD Molecular RVP Sample Buffer Tube and transfer (using a calibrated, variable pipette) 750 µL from the UVT/UTM specimen directly into the BD Molecular RVP Sample Buffer Tube. Restart from the BD MAX™ System Operation section.

Incomplete Result

Incomplete results may be obtained in the event that Specimen Preparation or the PCR did not reach its expected time points. Sample(s) can be repeated from the Sample Buffer Tube or primary sample. Uncap a new BD Molecular RVP Sample Buffer Tube and transfer (using a calibrated, variable pipette) 750 µL from the UVT/UTM specimen directly into the BD Molecular RVP Sample Buffer Tube. Restart from the BD MAX™ System Operation section.

External Control Failure

External Controls should yield expected results when tested. If samples have to be repeated due to an incorrect External Control result, the samples should be repeated from the Sample Buffer Tube or primary sample along with freshly prepared External Controls. Restart from the BD MAX™ System Operation section.

LIMITATIONS OF THE PROCEDURE

- BD Respiratory Viral Panel for BD MAX™ System has been evaluated only for use on the BD MAX™ System.
- Reliable results depend on proper sample collection, storage, and handling procedures.
- Clinical performance of BD Respiratory Viral Panel for BD MAX™ System has only been established in nasopharyngeal swab specimens.
- Use of BD Respiratory Viral Panel for BD MAX™ System with other clinical specimen types has not been assessed and performance characteristics are unknown.
- The performance of this test was established based on the evaluation of a limited number of clinical specimens. Clinical performance has not been established with all circulating variants but is anticipated to be reflective of the prevalent variants in circulation at the time and location of the clinical evaluation. Performance at the time of testing may vary depending on the variants circulating, including newly emerging strains of SARS-CoV-2 and their prevalence, which changes over time.
- Detection of SARS-CoV-2, influenza A, influenza B, and/or RSV RNA may be affected by sample collection methods, patient factors (e.g., presence of symptoms), and/or stage of infection.
- As with any molecular test, mutations within the target regions of the BD Respiratory Viral Panel for BD MAX™ System test could affect primer and/or probe binding resulting in failure to detect the presence of virus.
- Due to inherent differences between technologies, it is recommended that, prior to switching from one technology to the next, users perform method correlation studies in their laboratory to qualify technology differences. One hundred percent agreement between the results should not be expected due to aforementioned differences between technologies. Users should follow their own specific policies/procedures.
- False negative or invalid results may occur due to interference. The RNase P endogenous control is included to help identify the specimens containing substances that may interfere with nucleic acid isolation and PCR amplification.
- Good laboratory practices and careful adherence to the procedures specified in this Instructions For Use document are necessary to avoid contamination of reagents.
- The effect of interfering substances has only been evaluated for those listed in this labeling. Potential interference has not been evaluated for substances other than those described in the Interfering Substances section below. Interference by substances other than those described in the Interfering Substances section below could lead to erroneous results.
- Human blood was found to interfere with BD Respiratory Viral Panel for BD MAX™ System at concentrations greater than 0.2% v/v in nasopharyngeal specimens.
- Human blood, Flonase, Zicam and tobramycin were found to interfere with BD SARS-CoV-2 for BD MAX™ System and BD SARS-CoV-2/Flu for BD MAX™ System at concentrations greater than 0.2% v/v, 1.7% v/v, 0.5% v/v and 0.4 µg/mL in UVT, respectively.
- BD Respiratory Viral Panel for BD MAX™ System has not been evaluated for patients receiving intranasally administered influenza vaccine.

- The performance of this device has not been assessed in a population vaccinated against COVID-19.
- The test is not intended to differentiate influenza A subtypes or influenza B lineages. If differentiation of specific influenza subtypes and lineages is needed, additional testing, in consultation with state or local public health departments, is required.

CONDITIONS OF AUTHORIZATION FOR THE LABORATORY

The BD Respiratory Viral Panel for BD MAX™ System Letter of Authorization, along with the authorized Fact Sheet for Healthcare Providers, the authorized Fact Sheet for Patients, and authorized labeling are available on the FDA website: https://www.fda.gov/medical-devices/coronavirus-disease-2019-covid-19-emergency-use-authorizations-medical-devices/in-vitro-diagnostics-euas. To assist laboratories using the BD Respiratory Viral Panel for BD MAX™ System, the relevant Conditions of Authorization are listed below:

A. Authorized laboratories* using your product must include with test result reports, all authorized Fact Sheets. Under exigent circumstances, other appropriate methods for disseminating these Fact Sheets may be used, which may include mass media.
B. Authorized laboratories using your product must use your product as outlined in the authorized labeling. Deviations from the authorized procedures, including the authorized instruments, authorized extraction methods, authorized clinical specimen types, authorized control materials, authorized other ancillary reagents and authorized materials required to use your product are not permitted.
C. Authorized laboratories that receive your product must notify the relevant public health authorities of their intent to run your product prior to initiating testing.
D. Authorized laboratories using your product must have a process in place for reporting test results to healthcare providers and relevant public health authorities, as appropriate.
E. Authorized laboratories must collect information on the performance of your product and report to DMD/OHT7/OPEQ/CDRH (via email: CDRH-EUA-Reporting@fda.hhs.gov) and Becton, Dickinson and Company (via email:productcomplaints@BD.com) any suspected occurrence of false positive or false negative results and significant deviations from the established performance characteristics of your product of which they become aware.
F. All laboratory personnel using your product must be appropriately trained in RT-PCR techniques and use appropriate laboratory and personal protective equipment when handling this kit and use your product in accordance with the authorized labeling.
G. Authorized distributor(s) and authorized laboratories using your product must ensure that any records associated with this EUA are maintained until otherwise notified by FDA. Such records must be made available to FDA for inspection upon request.

*The letter of authorization refers to, "Laboratories certified under the Clinical Laboratory Improvement Amendments of 1988 (CLIA), 42 U.S.C. §263a, to perform moderate or high complexity tests" as "authorized laboratories."

Limit of Detection (LoD)

The analytical sensitivity of the BD Respiratory Panel for BD MAX™ System was assessed in both nasopharyngeal and nasal clinical matrix across seven respiratory viruses. LoD studies determine the lowest detectable concentration of virus at which approximately 95% of all (true positive) replicates test positive. Analysis of SARS-CoV-2 was completed with a Probit statistical methodology. Analysis of two strains of influenza A (H1N1/Brisbane and H3N2/Kansas), influenza B (Colorado and Phuket/3073/13), RSV A and RSV B was completed with a limiting dilution with 3-fold serial dilutions between each level. A minimum of five determination levels and one negative level across three (3) reagent lots were tested. Confirmation of the estimated LoD was performed with one reagent lot in replicates of 20 prepared in nasopharyngeal and nasal matrix and are reported in Table 5. To confirm that the co-spiking of analytes does not impact analytical sensitivity, the LoD was also confirmed with one strain per analyte.

Table 5: BD Respiratory Viral Panel for BD MAX™ System Limit of Detection

Strain	LoD Concentration (in UVT)	
	Nasopharyngeal	Nasal
SARS-CoV-2 (USA-WA1/2020)	700 copies/mL	700 copies/mL
Influenza A/H1N1/Brisbane/59/07	5.6E-03 $TCID_{50}$/mL	5.6E-03 $TCID_{50}$/mL
Influenza A/H3N2/Kansas/14/17	2.8E-01 $TCID_{50}$/mL	2.8E-01 $TCID_{50}$/mL
Influenza B/Colorado/6/17	6.8E-03 $TCID_{50}$/mL	6.8E-03 $TCID_{50}$/mL
Influenza B/Phuket/3073/13	2.9E-02 $TCID_{50}$/mL	9.6E-03 $TCID_{50}$/mL
RSV A 2006 Isolate	3.1E-02 $TCID_{50}$/mL	3.1E-02 $TCID_{50}$/mL
RSV B CH93(18)-18	1.7E-02 $TCID_{50}$/mL	5.6E-03 $TCID_{50}$/mL

Cross-Reactivity

An *in silico* analysis was performed to evaluate the potential for all primers and probes contained within the BD Respiratory Viral Panel for BD MAX™ System master mix to amplify and detect unintended organisms. Each primer was 'BLAST' against the full nt database and alignments were kept if there were no more than three (3) base pair mismatches across the length of the primer, the 3' end of the primer matched the subject sequence, and no gaps were introduced to "force" an alignment. The plus/minus orientation between the primer (query) and the subject (database sequence) was determined, and all two-primer combinations (including each primer with itself) were identified where one primer matched the plus strand and the other matched the minus, representing potential amplicons. Amplicons were kept if the minus strand primer was downstream of the plus strand primer and the resulting amplicons were less than or equal to 3,000 base pairs long.

SARS-CoV-2: All identified hits are either SARS-CoV-2 or a closely related coronavirus from non-human species. No relevant cross-reactivity was discovered.

Influenza A: No relevant cross-reactivity was discovered.

Influenza B: No relevant cross-reactivity was discovered.

Respiratory syncytial virus: No relevant cross-reactivity was discovered.

Additionally, fifty-two (52) organisms and one (1) nasopharyngeal pool were evaluated for cross-reactivity with the BD Respiratory Viral Panel for BD MAX™ System. The bacterial cells, yeasts, and viruses were tested in the BD Molecular RVP Sample Buffer Tube. All organisms tested produced negative results when tested at the concentrations in Table 6.

Table 6: BD Respiratory Viral Panel for the BD MAX™ System Cross-reactivity Results

Organism	Source	Concentration Tested	Negative Results Obtained (Negative Result/Total)
Adenovirus - Type 1	ZeptoMetrix® 0810050CF	1.00E+05 $TCID_{50}$/mL	3/3
Adenovirus - Type 4	ZeptoMetrix® 0810070CF	1.00E+05 $TCID_{50}$/mL	3/3
Adenovirus - Type 7	ZeptoMetrix® 0810021CF	1.00E+05 $TCID_{50}$/mL	3/3
Aspergillus flavus	ATCC® 16883	1.94E+02 CFU/mL	3/3
Aspergillus fumigatus	ATCC® 1022	6.19E+04 CFU/mL	3/3
Aspergillus terreus	ATCC® 1012	3.10E+04 CFU/mL	3/3
Aspergillus niger	ATCC® 16888	1.94E+02 CFU/mL	3/3
Bordetella pertussis	ZeptoMetrix® 0801459	1.00E+06 CFU/mL	3/3
Bordetella parapertussis	ZeptoMetrix® 08001461	1.00E+06 CFU/mL	3/3
Candida albicans	ATCC® 18804	1.00E+06 CFU/mL	3/3
Chlamydophila pneumoniae	ATCC® 53592	1.00E+06 IFU/mL	3/3
Corynebacterium diphtheriae	ZeptoMetrix® 0801882	1.00E+06 CFU/mL	3/3
Cytomegalovirus	ZeptoMetrix® 0810003CF	1.00E+05 copies/mL	3/3
Enterovirus B (Echovirus 6)	ZeptoMetrix® 0810076CF	1.00E+05 units/mL	3/3
Enterovirus C (Coxsackievirus A16)	ZeptoMetrix® 0810107CF	1.00E+05 $TCID_{50}$/mL	3/3
Enterovirus D68	ZeptoMetrix® 0810237CF	1.00E+05 $TCID_{50}$/mL	3/3
Epstein Barr virus	ZeptoMetrix® 0810008CF	1.00E+05 copies/mL	3/3
Escherichia coli	ATCC® 35401	1.00E+06 CFU/mL	3/3
Fusobacterium necrophorum	ATCC® 25286	1.00E+06 CFU/mL	3/3
Haemophilus influenzae	ZeptoMetrix® 0801679	1.00E+06 CFU/mL	3/3
Herpes simplex virus Type 1	ZeptoMetrix® 0810005CF	1.36E+04 units/mL	3/3
Herpes simplex virus Type 2	ZeptoMetrix® 0810006CF	1.36E+04 $TCID_{50}$/mL	3/3
Human coronavirus 229E	ZeptoMetrix® 0810229CF	4.96E+03 $TCID_{50}$/mL	3/3
Human coronavirus HKU1[a]	ATCC® VR-3262SD	1.00E+05 GC/mL	3/3
Human coronavirus NL63	ZeptoMetrix® 0810228CF	1.24E+04 $TCID_{50}$/mL	3/3
Human coronavirus OC43	ZeptoMetrix® 0810024CF	1.00E+05 $TCID_{50}$/mL	3/3
Human Metapneumovirus	ZeptoMetrix® 0810161CF	1.00E+05 $TCID_{50}$/mL	3/3
Lactobacillus acidophilus	ATCC® 4356	1.00E+06 CFU/mL	3/3
Legionella pneumophila	ATCC® 33152	8.71E+04 CFU/mL	3/3
Measles	ZeptoMetrix® 0810025CF	1.00E+05 $TCID_{50}$/mL	3/3

Organism	Source	Concentration Tested	Negative Results Obtained (Negative Result/Total)
MERS-coronavirus	ZeptoMetrix® NATMERS-ST	3.68E+04 $TCID_{50}$/mL	3/3
Moraxella catarrhalis	ZeptoMetrix® 0801509	1.00E+06 CFU/mL	3/3
Mumps	ZeptoMetrix® 0810079CF	1.00E+05 $TCID_{50}$/mL	3/3
Mycobacterium tuberculosis[a]	ATCC® 25177DQ	1.00E+06 copies/mL	3/3
Mycoplasma genitalium	ATCC® 33530	1.00E+06 cells/mL	3/3
Mycoplasma pneumoniae	ATCC® 15531-TTR	1.00E+06 CFU/mL	3/3
Neisseria meningitidis	ATCC® 53417	4.84E+03 CFU/mL	3/3
Neisseria gonnorrhoeae	ATCC® 19424	1.00E+06 CFU/mL	3/3
Parainfluenza virus 1	ZeptoMetrix® 0810014CF	4.85E+03 $TCID_{50}$/mL	3/3
Parainfluenza virus 2	ZeptoMetrix® 0810504CF	2.12E+05 $TCID_{50}$/mL	3/3
Parainfluenza virus 3	ZeptoMetrix® 0810016CF	1.00E+05 $TCID_{50}$/mL	3/3
Parainfluenza virus 4	ZeptoMetrix® 0810060BCF	1.00E+05 $TCID_{50}$/mL	3/3
Pneumocystis jirovecii	ATCC® PRA-159	1.00E+06 cells/mL	3/3
Expressed and pooled human nasopharyngeal swab matrix	Internal	N/A	3/3
Pseudomonas aeruginosa	ATCC® 10145	1.00E+06 CFU/mL	3/3
Rhinovirus	ZeptoMetrix® 0810012CFN	4.04E+04 $TCID_{50}$/mL	3/3
SARS-Coronavirus[a]	ATCC® VR-3280SD	1.00E+05 GE/mL	3/3
Staphylococcus aureus	ATCC® 43300	1.00E+06 CFU/mL	3/3
Staphylococcus epidermidis	ATCC® 12228	1.00E+06 CFU/mL	3/3
Streptococcus pneumoniae	ATCC® 6303	2.13E+05 CFU/mL	3/3
Streptococcus pyogenes	ATCC® 49399	1.00E+06 CFU/mL	3/3
Streptococcus salivarius	ATCC® BA-1024	4.84E+03 CFU/mL	3/3
Varicella-zoster virus	ZeptoMetrix® 0810167CF	1.00E+05 copies/mL	3/3

[a]Genomic DNA or RNA tested.

Microbial Interference

Fifty-two (52) organisms and one (1) nasopharyngeal pool were evaluated for potential interference with the BD Respiratory Viral Panel for BD MAX™ System. Organisms were tested at high concentration (≥10^9 CFU/mL, cells/mL, genome equivalents/mL, ≥10^5 IFU/mL or $TCID_{50}$/mL, or highest concentration available) in the presence of assay analytes (SARS-CoV-2, influenza A, influenza B, and RSV) co-spiked at 3x LoD.

Table 7: Microbial Interference Testing Results for the BD Respiratory Viral Panel for the BD MAX™ System

Organism	Source	Concentration Tested	Positive / Total			
			SARS-CoV-2	Flu A	Flu B	RSV
Adenovirus - Type 1	ZeptoMetrix® 0810050CF	1.00E+05 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
Adenovirus - Type 4	ZeptoMetrix® 0810070CF	1.00E+05 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
Adenovirus - Type 7	ZeptoMetrix® 0810021CF	1.00E+05 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
Aspergillus flavus	ATCC® 16883	1.94E+02 CFU/mL	3/3	3/3	3/3	3/3
Aspergillus fumigatus	ATCC® 1022	6.19E+04 CFU/mL	3/3	3/3	3/3	3/3
Aspergillus terreus	ATCC® 1012	3.10E+04 CFU/mL	3/3	3/3	3/3	3/3
Aspergillus niger	ATCC® 16888	1.94E+02 CFU/mL	3/3	3/3	3/3	3/3
Bordetella pertussis	ZeptoMetrix® 0801459	1.00E+06 CFU/mL	3/3	3/3	3/3	3/3
Bordetella parapertussis	ZeptoMetrix® 0801461	1.00E+06 CFU/mL	3/3	3/3	3/3	3/3
Candida albicans	ATCC® 18804	1.00E+06 CFU/mL	3/3	3/3	3/3	3/3
Chlamydophila pneumoniae	ATCC® 53592	1.00E+06 IFU/mL	3/3	3/3	3/3	3/3

Organism	Source	Concentration Tested	Positive / Total			
			SARS-CoV-2	Flu A	Flu B	RSV
Corynebacterium diphtheriae	ZeptoMetrix® 0801882	1.00E+06 CFU/mL	3/3	3/3	3/3	3/3
Cytomegalovirus	ZeptoMetrix® 0810003CF	1.00E+05 copies/mL	3/3	3/3	3/3	3/3
Enterovirus B (Echovirus 6)	ZeptoMetrix® 0810076CF	1.00E+05 units/mL	3/3	3/3	3/3	3/3
Enterovirus C (Coxsackievirus A16)	ZeptoMetrix® 0810107CF	1.00E+05 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
Enterovirus D68	ZeptoMetrix® 0810237CF	1.00E+05 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
Epstein Barr virus	ZeptoMetrix® 0810008CF	1.00E+05 copies/mL	3/3	3/3	3/3	3/3
Escherichia coli	ATCC® 35401	1.00E+06 CFU/mL	3/3	3/3	3/3	3/3
Fusobacterium necrophorum	ATCC® 25286	1.00E+06 CFU/mL	3/3	3/3	3/3	3/3
Haemophilus influenzae	ZeptoMetrix® 0801679	1.00E+06 CFU/mL	3/3	3/3	3/3	3/3
Herpes simplex virus Type 1	ZeptoMetrix® 0810005CF	1.36E+04 units/mL	3/3	3/3	3/3	3/3
Herpes simplex virus Type 2	ZeptoMetrix® 0810006CF	1.36E+04 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
Human coronavirus 229E	ZeptoMetrix® 0810229CF	4.96E+03 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
Human coronavirus[a] HKU1	ATCC® VR-3262SD	1.00E+05 GC/mL	3/3	3/3	3/3	3/3
Human coronavirus NL63	ZeptoMetrix® 0810228CF	1.24E+04 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
Human coronavirus OC43	ZeptoMetrix® 0810024CF	1.00E+05 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
Human Metapneumovirus	ZeptoMetrix® 0810161CF	1.00E+05 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
Lactobacillus acidophilus	ATCC® 4356	1.00E+06 CFU/mL	3/3	3/3	3/3	3/3
Legionella pneumophila	ATCC® 33152	8.71E+04 CFU/mL	3/3	3/3	3/3	3/3
Measles	ZeptoMetrix® 0810025CF	1.00E+05 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
MERS-coronavirus	ZeptoMetrix® NATMERS-ST	3.68E+04 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
Moraxella catarrhalis	ZeptoMetrix® 0801509	1.00E+06 CFU/mL	3/3	3/3	3/3	3/3
Mumps	ZeptoMetrix® 0810079CF	1.00E+05 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
Mycobacterium tuberculosis[a]	ATCC® 25177DQ	1.00E+06 copies/mL	3/3	3/3	3/3	3/3
Mycoplasma genitalium	ATCC® 33530	1.00E+06 cells/mL	3/3	3/3	3/3	3/3
Mycoplasma pneumoniae	ATCC® 15531-TTR	1.00E+06 CFU/mL	3/3	3/3	3/3	3/3
Neisseria meningitidis	ATCC® 53417	4.84E+03 CFU/mL	3/3	3/3	3/3	3/3
Neisseria gonnorrhoeae	ATCC® 19424	1.00E+06 CFU/mL	3/3	3/3	3/3	3/3
Parainfluenza virus 1	ZeptoMetrix® 0810014CF	4.85E+03 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
Parainfluenza virus 2	ZeptoMetrix® 0810504CF	2.12E+05 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
Parainfluenza virus 3	ZeptoMetrix® 0810016CF	1.00E+05 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
Parainfluenza virus 4	ZeptoMetrix® 0810060BCF	1.00E+05 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
Pneumocystis jirovecii	ATCC® PRA-159	1.00E+06 cells/mL	3/3	3/3	3/3	3/3

Organism	Source	Concentration Tested	Positive / Total			
			SARS-CoV-2	Flu A	Flu B	RSV
Pooled human expressed nasopharyngeal swab matrix	Internal	N/A	3/3	3/3	3/3	3/3
Pseudomonas aeruginosa	ATCC® 10145	1.00E+06 CFU/mL	3/3	3/3	3/3	3/3
Rhinovirus	ZeptoMetrix® 0810012CFN	4.04E+04 $TCID_{50}$/mL	3/3	3/3	3/3	3/3
SARS-Coronavirus[a]	ATCC® VR-3280SD	1.00E+05 GE /mL	3/3	3/3	3/3	3/3
Staphylococcus aureus	ATCC® 43300	1.00E+06 CFU/mL	3/3	3/3	3/3	3/3
Staphylococcus epidermidis	ATCC® 12228	1.00E+06 CFU/mL	3/3	3/3	3/3	3/3
Streptococcus pneumoniae	ATCC® 6303	2.13E+05 CFU/mL	3/3	3/3	3/3	3/3
Streptococcus pyogenes	ATCC® 49399	1.00E+06 CFU/mL	3/3	3/3	3/3	3/3
Streptococcus salivarius	ATCC® BA-1024	4.84E+03 CFU/mL	3/3	3/3	3/3	3/3
Varicella-zoster virus	ZeptoMetrix® 0810167CF	1.00E+05 copies/mL	3/3	3/3	3/3	3/3

[a] Genomic DNA or RNA tested

Reactivity/Inclusivity

An *in silico* alignment of the BD Respiratory Viral Panel primers and probes demonstrated that the performance of the BD Respiratory Viral Panel reagents for the BD MAX™ System is not likely to be directly impacted by the presence of mutations in known SARS-CoV-2 viral variants. As of October 01, 2022, BD continues to monitor all lineages and sublineages for the following WHO labeled Variants of Concern, Alpha, Beta, Gamma, Delta, and Mu. In all cases greater than 99% of the sequenced isolates are a perfect match to all primers and probes in either the N1 or N2 set. Given similar performance from both the N1 and N2 channel, either will back up the other in the event of performance degradation through genetic drift. Additionally, BD continues to monitor all lineages of the WHO Omicron label, including sublineages within BA.1, BA.2, BA.2.12.1, BA.3, BA.4, and BA.5. All Omicron genomes contain a mutation that affects the N1 probe 3 bases from the 5' end. (Mutation C28311T). Each Omicron sublineage has a percentage of sequences that are a perfect match to either the N1 or N2 primer-set as follows: BA.1 at 99.46%, BA.2 at 98.73%, BA.2.12.1 at 99.21%, BA.3 at 100%, BA.4 at 98.04% and BA.5 at 98.80%.

An *in silico* comparison of the influenza A primer set was performed using all available high quality Influenza A M1 (matrix protein) gene sequences submitted to the NCBI Genbank database as of January 02, 2022 (n=44,468).[7] Multiple alignment of the matrix gene showed that 90.3% of sequences are a perfect match to the primer/probe set while an additional 9.5% of sequences have a single base mismatch in the 5' end of a single primer. Multiple mismatches to the primers and probe occurred in only 0.2% of sequences.

An *in silico* comparison of the influenza B primer sets was performed using all available high quality Influenza B M1 gene and HA gene sequences submitted to the NCBI Genbank database as of January 02, 2022. A total of 11,683 matrix and 18,559 HA sequences were used in this analysis. Multiple alignment of the M1 gene showed that 97.1% of sequences are a perfect match to the primer/probe set and 76.7% of HA sequences are a perfect match.

An *in silico* comparison of the RSV primer sets was performed using all available high quality RSV M gene and N gene sequences submitted to the NCBI Genbank database as of January 02, 2022 (N=3,443). Alignments against the M and N gene showed that the primer/probe sets are a perfect match to 83.0% of sequences in the database, 92.3% of the sequences were a perfect match to the M primer/probe set, and 90.1% were a perfect match to the N primer/probe set region. In total, 99.4% are a perfect match to either the M gene or the N gene primer sets.

BD Respiratory Viral Panel for BD MAX™ System was evaluated against multiple strains of SARS-CoV-2, Influenza A H1N1 and H3N2, influenza B including both the Yamagata and Victoria lineages, and RSV including both A and B. A total of 11 SARS-CoV-2, 31 influenza A, 10 influenza B, and 5 RSV strains were evaluated at levels near the analytical LoD. Three replicates were tested for each strain.

Table 8: Analytical Reactivity/Inclusivity for the BD Respiratory Viral Panel for the BD MAX™ System

Virus	Strain	Source	Concentration Detected	Relative LoD	Positive Results/ Total
SARS-CoV-2	Hong Kong/VM200001061/2020	ZeptoMetrix® 0810590CFHI	2,100 copies/mL	3x LoD	3/3
	Italy-INMI1	ZeptoMetrix® 0810589CFHI	2,100 copies/mL	3x LoD	3/3
	Alpha, (B.1.1.7) USA/ CA_CDC_5574/2020	ZeptoMetrix® 0810612CFHI	2,100 copies/mL	3x LoD	3/3
	Alpha, (B.1.1.7) England/204820464/2020	ZeptoMetrix® 0810614CFHI	2,100 copies/mL	3x LoD	3/3
	Beta, (B.1.351) South Africa/ KRISP-K005325/2020	ZeptoMetrix® 0810613CFHI	2,100 copies/mL	3x LoD	3/3
	Kappa, (B.1.617.1) USA/ CA-Stanford-15_S02/2021	ZeptoMetrix® 0810623CFHI	2,100 copies/mL	3x LoD	3/3
	Gamma, (P1) Japan/ TY7-503/2021	ZeptoMetrix® 0810616CFHI	2,100 copies/mL	3x LoD	3/3
	Delta, (B.1.617.2) USA/ PHC658/2021	ZeptoMetrix® 0810624CFHI	2,100 copies/mL	3x LoD	3/3
	Iota, (B.1.526_2021) NY-Wadsworth-21025952-01/2021	ZeptoMetrix® 0810619CFHI	2,100 copies/mL	3x LoD	3/3
	Zeta, (P2_2021) NY-Wadsworth-21006055-01/2021	ZeptoMetrix® 0810618CFHI	2,100 copies/mL	3x LoD	3/3
	Omicron (BA.1) USA/ GA-EHC-2811C/2021	ATCC® VR-3347HK	2,100 copies/mL	3x LoD	3/3

Virus	Strain	Source	Concentration Detected	Relative LoD	Positive Results/ Total
Influenza A	A/H1N1(pdm09)/ Bangladesh/3002/2015	IRR FR-1456	3.78E+02 $CEID_{50}$/mL	3x LoD	3/3
	A/ H1N1(pdm09)/Idaho/07/2018	IRR FR-1688	2.93E-01 $TCID_{50}$/mL	3x LoD	3/3
	A/H1N1(pdm09)/Iowa/53/2015	IRR FR-1509	8.57E+00 $TCID_{50}$/mL	3x LoD	3/3
	A/H1N1(pdm09)/ Michigan/272/2017	IRR FR-1615	7.70E+00 $TCID_{50}$/mL	3x LoD	3/3
	A/H1N1(pdm09)/ Michigan/45/2015	IRR FR-1483	6.88E+02 $CEID_{50}$/mL	3x LoD	3/3
	A/H1N1(pdm09)/ St. Petersburg/61/2015	IRR FR-1556	5.60E+02 $CEID_{50}$/mL	3x LoD	3/3
	A/H1N1(pdm09)/ Wisconsin/505/2018	IRR FR-1690	5.99E+00 $TCID_{50}$/mL	3x LoD	3/3
	A/H1N1(pdm09)/ Wisconsin/588/2019	IRR FR-1758	1.22E+01 FFU/mL	3x LoD	3/3
	A/H1N1(pdm09)AVR/ Louisiana/08/2013	IRR FR-1440	7.59E+01 $TCID_{50}$/mL	3x LoD	3/3
	A/H1N1(pdm09)AVR/ Maryland/08/2013	IRR FR-1439	9.49E+01 $TCID_{50}$/mL	3x LoD	3/3
	A/H1N1(pdm09)AVR/ New York/18/2009	IRR FR-456	1.48E+00 $TCID_{50}$/mL	3x LoD	3/3
	A/H1N1(pdm09)AVR/ North Carolina/04/2014	IRR FR-1374	5.49E+02 $CEID_{50}$/mL	3x LoD	3/3
	A/H1N1/Guangdong-Maonan/ SWL 1536/19	0810610CF	1.50E+00 $TCID_{50}$/mL	3x LoD	3/3
	A/H3N2/Alaska/232/2015	IRR FR-1483	1.73E+02 $CEID_{50}$/mL	3x LoD	3/3
	A/H3N2/Arizona/45/2018	IRR FR-1699	1.66E+01 FFU/mL	3x LoD	3/3
	A/H3N2/California/02/2014	IRR FR-1353	5.27E-01 $TCID_{50}$/mL	3x LoD	3/3
	A/H3N2/Hong Kong/2671/19	ZeptoMetrix® 0810609CF	2.81E+00 $TCID_{50}$/mL	3x LoD	3/3
	A/H3N2/Norway/466/14	ZeptoMetrix® 0810514CF	2.29E-02 $TCID_{50}$/mL	3x LoD	3/3
	A/H3N2/Perth/16/09	ZeptoMetrix® 0810251CF	2.11E-01 $TCID_{50}$/mL	3x LoD	3/3
	A/H3N2/Singapore/ INFIMH-16-0019/2016	IRR FR-1590	4.02E+02 $CEID_{50}$/mL	3x LoD	3/3
	A/H3N2/South Australia/55/14	ZeptoMetrix® 0810512CF	4.02E-02 $TCID_{50}$/mL	3x LoD	3/3
	A/H3N2/Stockholm/6/14	ZeptoMetrix® 0810513CF	8.96E-03 $TCID_{50}$/mL	3x LoD	3/3
	A/H3N2/Texas/71/2017	IRR FR-1622	4.60E+00 FFU/mL	3x LoD	3/3
	A/H3N2/Victoria/361/11	ZeptoMetrix® 0810240CF	2.00E-01 $TCID_{50}$/mL	3x LoD	3/3
	A/H3N2/Wisconsin/04/2018	IRR FR-1653	2.19E+02 $CEID_{50}$/mL	3x LoD	3/3
	A/H5N1/common magpie/ Hong Kong/645/2006	IRR FR-269	1,500 copies/mL	3x LoD	3/3
	A/H5N2/pheasant/ New Jersey/1355/1998	IRR FR-883	1,500 copies/mL	3x LoD	3/3
	A/H7N2/turkey/ Virginia/4529/2002	IRR FR-894	1,500 copies/mL	3x LoD	3/3
	A/H7N7/mallard/ Netherlands/12/2000	IRR FR-884	3,000 copies/mL	6x LoD	3/3
	A/H7N9/Anhui/1/2013	IRR FR-884	3,000 copies/mL	6x LoD	3/3
	A/H9N2/chicken/Hong Kong/ G9/1997	IRR FR-1249	1.42E+03 $CEID_{50}$/mL	6x LoD	3/3

Virus	Strain	Source	Concentration Detected	Relative LoD	Positive Results/ Total
Influenza B	B/Colorado/6/2017	IRR FR-1588	4.80E+02 $CEID_{50}$/mL	3x LoD	3/3
	B/Hawaii/01/2018	IRR FR-1661	8.11E+01 $TCID_{50}$/mL	3x LoD	3/3
	B/Hong Kong/286/2017	IRR FR-1619	2.16E-01 $TCID_{50}$/mL	3x LoD	3/3
	B/Missouri/12/2018	IRR FR-1664	2.15E+02 $TCID_{50}$/mL	3x LoD	3/3
	B/Nevada/3/2011	IRR FR-1028	3.17E+02 $CEID_{50}$/mL	3x LoD	3/3
	B/Guangdong-Liwan/1133/2014	IRR FR-1370	2.29E+03 $CEID_{50}$/mL	3x LoD	3/3
	B/Indiana/17/2017	IRR FR-1662	7.75E+02 $TCID_{50}$/mL	3x LoD	3/3
	B/Oklahoma/10/2018	IRR FR-1660	1.69E+02 $TCID_{50}$/mL	3x LoD	3/3
	B/Utah/9/2014	IRR FR-1372	1.15E+03 $CEID_{50}$/mL	3x LoD	3/3
	B/Wisconsin/10/2016	IRR FR-1663	9.60E+03 $TCID_{50}$/mL	3x LoD	3/3
RSV	RSV-A Strain: 12/2014	ZeptoMetrix® 0810452CF	5.41E-03 $TCID_{50}$/mL	3x LoD	3/3
	RSV-A Strain: 2/2015	ZeptoMetrix® 0810474CF	1.64E-01 $TCID_{50}$/mL	3x LoD	3/3
	RSV-A Strain: 4/2015	ZeptoMetrix® 0810481CF	6.88E-02 $TCID_{50}$/mL	3x LoD	3/3
	RSV-B Strain: 12/2014	ZeptoMetrix® 0810450CF	1.78E-02 $TCID_{50}$/mL	3x LoD	3/3
	RSV-B Strain: 3/2015	ZeptoMetrix® 0810479CF	1.09E-01 $TCID_{50}$/mL	3x LoD	3/3

Interfering Substances

Twenty-three (23) biological and chemical substances that may be present in nasopharyngeal or anterior nasal swab specimens were evaluated for potential interference with the BD Respiratory Viral Panel for BD MAX™ System in the absence and presence of assay analytes (SARS-CoV-2, influenza A, influenza B, and RSV). Whole blood (human) was found to interfere at levels above 0.2% volume/volume. Results demonstrated no reportable interference from any other substance at the concentrations tested (refer to Table 9).

Table 9: Endogenous and Commercial Exogenous Substances Tested with BD Respiratory Viral Panel for the BD MAX™ System

Substance	Active Ingredient	Concentration Tested	Positive Testing (Positive/Total)				Negative Testing (Negative/ Total)	Result
			SARS-CoV-2	Influenza A	Influenza B	RSV		
Oral anesthetic and analgesic	Benzocaine	0.8 mg/mL	3/3	3/3	3/3	3/3	3/3	NI
	Menthol							
Biologicals	Purified Mucin	60 µg/mL	3/3	3/3	3/3	3/3	3/3	NI
	Whole Blood (human)	2% v/v	1/3	3/3	3/3	3/3	3/3	I
		0.2% v/v	3/3	3/3	3/3	3/3	3/3	NI
	Leukocytes	2% v/v	3/3	3/3	3/3	3/3	3/3	NI
Nasal Sprays/ Drops	Zinc	1 mg/mL	3/3	3/3	3/3	3/3	3/3	NI
	Phenylephrine	5% v/v	3/3	3/3	3/3	3/3	3/3	NI
	Oxymetazoline	5% v/v	3/3	3/3	3/3	3/3	3/3	NI
	Sodium Chloride with preservatives	5% v/v	3/3	3/3	3/3	3/3	3/3	NI
Corticosteroids	Beclomethasone	17% v/v	3/3	3/3	3/3	3/3	3/3	NI
	Dexamethasone	17% v/v	3/3	3/3	3/3	3/3	3/3	NI
	Flunisolide	17% v/v	3/3	3/3	3/3	3/3	3/3	NI
	Triamcinolone	17% v/v	3/3	3/3	3/3	3/3	3/3	NI
	Budesonide	17% v/v	3/3	3/3	3/3	3/3	3/3	NI
	Mometasone	17% v/v	3/3	3/3	3/3	3/3	3/3	NI
	Fluticasone	17% v/v	3/3	3/3	3/3	3/3	3/3	NI

Substance	Active Ingredient	Concentration Tested	Positive Testing (Positive/Total)				Negative Testing (Negative/ Total)	Result
			SARS-CoV-2	Influenza A	Influenza B	RSV		
Nasal Gel	Luffa opperculata	5% v/v	3/3	3/3	3/3	3/3	3/3	NI
	Sulfur							
Homeopathic Allergy Relief	Galphimia glauca							
	Histaminum hydrocloricum							
Antiviral Drug	Zanamivir	3.3 mg/mL	3/3	3/3	3/3	3/3	3/3	NI
Antibiotic	Mupirocin	10 mg/mL	3/3	3/3	3/3	3/3	3/3	NI
Antibacterial	Tobramycin	4 µg/mL	3/3	3/3	3/3	3/3	3/3	NI

Mixed Infection/Competitive Interference

To assess potential competitive interference between SARS-CoV-2, influenza A, influenza B, and RSV samples were tested in replicates of twenty (20) where low (approximately 2x their respective LoD) concentration of three analytes were mixed with high (approximately 1.00E+06 genome copies/mL in UVT) concentration of the other analyte. None of the analytes present at a very high concentration interfered with the detection of low levels of the other three analytes.

Table 10: Mixed Infection Results for the BD Respiratory Viral Panel for the BD MAX™ System

Condition	High Virus (1.00E+06 copies/mL)	Low Virus (~2x LoD)	Positive / Total			
			SARS-CoV-2	Flu A	Flu B	RSV
1	SARS-CoV-2	Flu A / Flu B / RSV	20/20	20/20	20/20	20/20
2	Flu A	SARS-CoV-2 / Flu B / RSV	20/20	20/20	20/20	20/20
3	Flu B	SARS-CoV-2 / Flu A / RSV	20/20	19/20	20/20	20/20
4	RSV	SARS-CoV-2 / Flu A / Flu B	19/20	19/20	19/20	20/20

CLINICAL EVALUATION

The performance of the BD Respiratory Viral Panel for BD MAX™ System was evaluated in comparison to a composite method of two out of three highly sensitive molecular assays (NAATs) that are FDA authorized under EUA for SARS-CoV-2. Any specimen that tested positive by two EUA assays was considered positive for SARS-CoV-2, whereas any specimen that tested negative by two EUA assays was considered negative. For influenza A, influenza B, and RSV, the performance of the BD Respiratory Viral Panel for BD MAX™ System was evaluated in comparison to an FDA-cleared high sensitivity RT-PCR assay. The same comparators were performed for Prospective Study I and Study II.

Prospective Clinical Evaluation (Study I)

Clinical performance characteristics of the BD Respiratory Viral Panel for BD MAX™ System were established during a multi-center study conducted at six geographically distinct U.S. study sites in January and April 2022. A total of 256 nasopharyngeal and anterior nasal specimens in UVT/UTM were acquired for the prospective study. In January 2022, specimens were prospectively collected and immediately frozen (N=115) for later testing. In April 2022, specimens were prospectively collected and tested fresh (N=141).

The BD Respiratory Viral Panel for BD MAX™ System prospective nasopharyngeal swab specimens testing performance data against comparator methods are provided in Table 11 by analyte.

Table 11: BD Respiratory Viral Panel for BD MAX™ System Clinical Performance Summary in Prospectively Collected Nasopharyngeal Swab Specimens

Analyte		Positive Percent Agreement			Negative Percent Agreement		
		TP/ (TP + FN)	%	95% CI	TN/ (TN + FP)	%	95% CI
SARS-CoV-2	Fresh	34/34	100	89.8–100	103/103	100	96.4–100
	Frozen	50/51	98.0	89.7–99.7	61/64	95.3	87.1–98.4
	Overall	84/85[a]	98.8	93.6–99.8	164/167[b]	98.2	94.9–99.4

Analyte		Positive Percent Agreement			Negative Percent Agreement		
		TP/ (TP + FN)	%	95% CI	TN/ (TN + FP)	%	95% CI
Flu A	Fresh	6/6	100	61.0–100	130/131	99.2	95.8–99.9
	Frozen	N/A	N/A	N/A	115/115	100	96.8–100
	Overall	6/6	100	61.0–100	245/246[c]	99.6	97.7–99.9
Flu B	Fresh	N/A	N/A	N/A	137/137	100	97.3–100
	Frozen	N/A	N/A	N/A	115/115	100	96.8–100
	Overall	N/A	N/A	N/A	252/252	100	98.5–100
RSV	Fresh	N/A	N/A	N/A	137/137	100	97.3–100
	Frozen	N/A	N/A	N/A	115/115	100	96.8–100
	Overall	N/A	N/A	N/A	252/252	100	98.5–100

[a] SARS-CoV-2 was detected in the single FN specimen with two comparator methods out of three.

[b] SARS-CoV-2 was detected in 1/3 FP specimens with only one of the three composite comparator methods. SARS-CoV-2 was not detected in 2/3 FP by any of the three composite comparator methods.

[c] Influenza A was detected by another NAAT used as discrepancy method.

The BD Respiratory Viral Panel for BD MAX™ System prospective anterior nasal swab specimens testing performance data against comparator methods are provided in Table 12 by analyte.

Table 12: BD Respiratory Viral Panel for BD MAX™ System Clinical Performance Summary in Prospectively Collected Anterior Nasal Swab Specimens

Analyte		Positive Percent Agreement			Negative Percent Agreement		
		TP/ (TP + FN)	%	95% CI	TN/ (TN + FP)	%	95% CI
SARS-CoV-2	Fresh	30/30	100	88.8–100	109/110	99.1	95.0–99.8
	Frozen	49/50	98.0	89.5–99.6	62/64	96.9	89.3–99.1
	Overall	79/80[a]	98.8	93.3–99.8	171/174[b]	98.3	95.1–99.4
Flu A	Fresh	6/6	100	61.0–100	133/134	99.3	95.9–99.9
	Frozen	N/A	N/A	N/A	114/114	100	96.7–100
	Overall	6/6	100	61.0–100	247/248[c]	99.6	97.8–99.9
Flu B	Fresh	N/A	N/A	N/A	140/140	100	97.3–100
	Frozen	N/A	N/A	N/A	114/114	100	96.7–100
	Overall	N/A	N/A	N/A	254/254	100	98.5–100
RSV	Fresh	N/A	N/A	N/A	140/140	100	97.3–100
	Frozen	N/A	N/A	N/A	114/114	100	96.7–100
	Overall	N/A	N/A	N/A	254/254	100	98.5–100

[a] SARS-CoV-2 was detected in the single FN specimen with two comparator methods out of three.

[b] SARS-CoV-2 was detected in 1/3 FP specimens with only one of the three composite comparator methods. SARS-CoV-2 was not detected in 2/3 FP by any of the three composite comparator methods.

[c] Influenza A was detected by another NAAT used as discrepancy method.

Prospective Clinical Evaluation (Study II)

Clinical performance characteristics of the BD Respiratory Viral Panel for BD MAX™ System were established during a multi-center study where subjects were prospectively enrolled at six geographically distinct U.S. study sites and two geographically distinct sites in Europe from January up to August 2022. For consented adult or pediatric subjects presenting with symptoms of respiratory viral infection, one nasopharyngeal swab and/or one nasal swab were collected. From a total of 2,005 subjects enrolled, 1,645 subjects were compliant. Between January and beginning of April 2022, specimens were prospectively collected from all comers meeting the study eligibility criteria and immediately frozen for later testing as prospective archived/frozen specimens. Between mid-April up to August 2022, specimens were prospectively collected from all comers meeting the eligibility criteria and tested fresh as prospective fresh. For nasopharyngeal specimens, the numbers of compliant specimens with reportable comparator and BD Respiratory Viral Panel for BD MAX™ System were 1,545 for SARS-CoV-2 and 1,562 for influenza A, influenza B, and RSV. For nasal specimens, the numbers of compliant specimens with reportable comparator and BD Respiratory Viral Panel for BD MAX™ System were 1,561 for SARS-CoV-2 and 1,564 for influenza A, influenza B, and RSV. Table 13 provides a summary of demographic information for the 1,645 compliant subjects.

Table 13: Demographic Summary for Prospective BD Respiratory Viral Panel for BD MAX™ System Clinical Evaluation

Demographics and Vaccination	Characteristics	Total (N=1,645)
Gender	Female	61.8% (1,016/1,645)
	Male	38.2% (629/1,645)
Age Group	0–5 years	1.2% (20/1,645)
	6–21 years	10.3% (170/1,645)
	22–59 years	58.2% (957/1,645)
	>59 years	30.3% (498/1,645)
Patient Population	Outpatient	95.9% (1,578/1,645)
	Hospitalized	3.0% (49/1,645)
	Emergency	1.0% (17/1,645)
	Unknown	0.1% (1/1,645)

The BD Respiratory Viral Panel for BD MAX™ System prospective nasopharyngeal swab specimens testing performance data against comparator methods are provided in Table 14 by analyte.

Table 14: BD Respiratory Viral Panel for BD MAX™ System Clinical Performance Summary in Prospectively Collected Nasopharyngeal Swab Specimens

		Positive Percent Agreement		Negative Percent Agreement	
Analyte	**Sample Type**	**% (TP/(TP + FN))**	**95% CI**	**% (TN/(TN + FP))**	**95% CI**
SARS-CoV-2[a]	Fresh	99.5% (370/372)	(98.1%, 99.9%)	98.8% (641/649)	(97.6%, 99.4%)
	Frozen	97.4% (147/151)	(93.4%, 99.0%)	96.0% (358/373)	(93.5%, 97.5%)
	Overall	98.9% (517/523)	(97.5%, 99.5%)	97.7% (999/1,022)	(96.6%, 98.5%)
Flu A[b]	Fresh	96.7% (58/60)	(88.6%, 99.1%)	99.3% (955/962)	(98.5%, 99.6%)
	Frozen	100.0% (1/1)	(20.7%, 100.0%)	100.0% (539/539)	(99.3%, 100.0%)
	Overall	96.7% (59/61)	(88.8%, 99.1%)	99.5% (1,494/1,501)	(99.0%, 99.8%)
Flu B[c]	Fresh	No data for PPA rate calculation		99.9% (1,021/1,022)	(99.4%, 100.0%)
	Frozen	No data for PPA rate calculation		100.0% (540/540)	(99.3%, 100.0%)
	Overall	No data for PPA rate calculation		99.9% (1,561/1,562)	(99.6%, 100.0%)
RSV	Fresh	100.0% (11/11)	(74.1%, 100.0%)	100.0% (1,011/1,011)	(99.6%, 100.0%)
	Frozen	100.0% (1/1)	(20.7%, 100.0%)	100.0% (539/539)	(99.3%, 100.0%)
	Overall	100.0% (12/12)	(75.8%, 100.0%)	100.0% (1,550/1,550)	(99.8%, 100.0%)

[a] SARS-CoV-2 was detected in 3/6 FN specimens with all three composite comparator methods. SARS-CoV-2 was detected in 15/23 FP specimens with one of the three composite comparator methods.

[b] Flu A was detected in both FN specimens when tested with an independent molecular method. Flu A was detected in 3/7 FP specimens when tested with an independent molecular method. Flu A was Equivocal in 1/7 FP specimens when tested with an independent method.

[c] Flu B was not detected in the single FP specimen when tested with an independent molecular method.

The BD Respiratory Viral Panel for BD MAX™ System prospective anterior nasal swab specimens testing performance data against comparator methods are provided in Table 15 by analyte.

Table 15: BD Respiratory Viral Panel for BD MAX™ System Clinical Performance Summary in Prospectively Collected Anterior Nasal Swab Specimens

		Positive Percent Agreement		Negative Percent Agreement	
Analyte	**Sample Type**	**% (TP/(TP + FN))**	**95% CI**	**% (TN/(TN + FP))**	**95% CI**
SARS-CoV-2[a]	Fresh	98.8% (340/344)	(97.0%, 99.5%)	98.2% (665/677)	(96.9%, 99.0%)
	Frozen	97.2% (138/142)	(93.0%, 98.9%)	96.7% (385/398)	(94.5%, 98.1%)
	Overall	98.4% (478/486)	(96.8%, 99.2%)	97.7% (1,050/1,075)	(96.6%, 98.4%)
Flu A[b]	Fresh	96.8% (61/63)	(89.1%, 99.1%)	99.6% (958/962)	(98.9%, 99.8%)
	Frozen	100.0% (1/1)	(20.7%, 100.0%)	100.0% (538/538)	(99.3%, 100.0%)
	Overall	96.9% (62/64)	(89.3%, 99.1%)	99.7% (1,496/1,500)	(99.3%, 99.9%)
Flu B	Fresh	No data for PPA rate calculation		100.0% (1,025/1,025)	(99.6%, 100.0%)
	Frozen	No data for PPA rate calculation		100.0% (539/539)	(99.3%, 100.0%)
	Overall	No data for PPA rate calculation		100.0% (1,564/1,564)	(99.8%, 100.0%)
RSV[c]	Fresh	100.0% (11/11)	(74.1%, 100.0%)	99.9% (1,013/1,014)	(99.4%, 100.0%)
	Frozen	0.0% (0/1)	(0.0%, 79.3%)	100.0% (538/538)	(99.3%, 100.0%)
	Overall	91.7% (11/12)	(64.6%, 98.5%)	99.9% (1,551/1,552)	(99.6%, 100.0%)

[a] SARS-CoV-2 was detected in 2/8 FN specimens with all three composite comparator methods. SARS-CoV-2 was detected in 17/25 FP specimens with one of the three composite comparator methods.

[b] Flu A was not detected in both FN specimens when tested with an independent molecular method. Flu A was detected in 1/4 FP specimens when tested with an independent molecular method.

[c] RSV was detected in the single FN specimen when tested with an independent molecular method. RSV was detected in the single FP specimen when tested with an independent molecular method.

Retrospective Clinical Evaluation

Clinical performance characteristics of the BD Respiratory Viral Panel for BD MAX™ System were determined from a total of 240 frozen retrospective nasopharyngeal swabs in UVT/UTM obtained from two (2) external sources with historical positive or negative results for either influenza A, influenza B, or RSV. The specimens were collected as part of routine patient care between December 2019 and January 2022. All the specimens were tested in a blinded and randomized fashion with the BD Respiratory Viral Panel for BD MAX™ System at three different testing sites and reference method (RM) at one testing site. The RM for influenza A, influenza B, and RSV was an FDA-cleared high sensitivity RT-PCR assay. Table 16 provides a summary of demographic information for the 240 retrospective samples.

Table 16: Demographic Summary for Retrospective BD Respiratory Viral Panel for BD MAX™ System Clinical Evaluation

Demographics	Characteristics	Total (N=240)
Gender	Female	37.5% (90/240)
	Male	37.5% (90/240)
	Unknown	25.0% (60/240)
Age Group	0–5 years	26.7% (64/240)
	6–21 years	20.8% (50/240)
	22–59 years	32.5% (78/240)
	>59 years	20.0% (48/240)

Table 17 describes the performance characteristics of the BD Respiratory Viral Panel for BD MAX™ System that were observed during the clinical evaluation.

Table 17: BD Respiratory Viral Panel for BD MAX™ System Clinical Performance Summary in Retrospective Nasopharyngeal Swab Specimens

Analyte		Positive Percent Agreement			Negative Percent Agreement		
		TP/ (TP + FN)	%	95% CI	TN/ (TN + FP)	%	95% CI
Flu A	Overall	57/57	100	93.7–100	181/183[a]	98.9	96.1–99.7
Flu B	Overall	58/58	100	93.8–100	180/182[b]	98.9	96.1–99.7
RSV	Overall	62/63[c]	98.4	91.5–99.7	177/177	100	97.9–100

[a] Influenza A was detected in 2/2 FP by another NAAT used as discrepancy method.
[b] Influenza B was detected in 1/2 FP by another NAAT used as discrepancy method.
[c] RSV was detected in the single FN by another NAAT used as discrepancy method.

Non-Reportable Rate

Of all the specimens initially evaluated with the BD Respiratory Viral Panel for BD MAX™ System Clinical, the initial total rates of non-reportable results were 0.9% and 1.1% for nasopharyngeal and nasal specimens, respectively. Following a valid repeat, 0.1% remained non-reportable for both specimen types. Results are shown in Table 18.

Table 18: Non-Reportable Rates

Sample Type	Unresolved (UNR) Rate		Indeterminate (IND) Rate		Incomplete (INC) Rate		Total Non-Reportable Rate (UNR+IND+INC)	
	Initial (95% CI)	Valid Repeat (95% CI)	Initial (95% CI)	Valid Repeat (95% CI)	Initial (95% CI)	Valid Repeat (95% CI)	Initial (95% CI)	Valid Repeat (95% CI)
Nasopharyngeal	0.1% (1/1,563) (0.0%, 0.4%)	0.1% (1/1,563) (0.0%, 0.4%)	0.0% (0/1,563) (0.0%, 0.2%)	0.0% (0/1,563) (0.0%, 0.2%)	0.8% (13/1,563) (0.5%, 1.4%)	0.0% (0/1,563) (0.0%, 0.2%)	0.9% (14/1,563) (0.5%, 1.5%)	0.1% (1/1,563) (0.0%, 0.4%)
Nasal	0.1% (2/1,568) (0.0%, 0.5%)	0.1% (2/1,568) (0.0%, 0.5%)	0.1% (2/1,568) (0.0%, 0.5%)	0.0% (0/1,568) (0.0%, 0.2%)	0.8% (13/1,568) (0.5%, 1.4%)	0.0% (0/1,568) (0.0%, 0.2%)	1.1% (17/1,568) (0.7%, 1.7%)	0.1% (2/1,568) (0.0%, 0.5%)

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Change History

Revision	Date	Change Summary
(01)	2023-02	Initial release.
(02)	2023-07	Added option to recap tube after manually adding a sample in order to prevent potential bubbles around the cap. Clarified Repeat Test could be from Sample Buffer Tube or primary sample. Updated inclusivity data. Added demographic data. Added post market clinical evaluation data. Updated EHS information. Typographical and formatting updates. Updated Symbols Glossary.

SYMBOLS GLOSSARY

Please refer to product labeling for applicable symbols.

Symbol	Meaning
	Manufacturer
EC REP	Authorized representative in the European Community
CH REP	Authorised representative in Switzerland
	Date of manufacture
	Use-by date
LOT	Batch code
REF	Catalogue number
SN	Serial number
STERILE	Sterile
STERILE A	Sterilized using aseptic processing techniques
STERILE EO	Sterilized using ethylene oxide
STERILE R	Sterilized using irradiation
STERILE	Sterilized using steam or dry heat
	Do not resterilize
NON STERILE	Non-sterile
	Do not use if package is damaged and consult *instructions for use*
STERILE	Sterile fluid path
STERILE EO	Sterile fluid path (ethylene oxide)
STERILE R	Sterile fluid path (irradiation)
	Fragile, handle with care
	Keep away from sunlight
	Keep dry
	Lower limit of temperature
	Upper limit of temperature
	Temperature limit
	Humidity limitation
	Biological risks
	Do not re-use
	Consult *instructions for use* or consult electronic *instructions for use*
	Caution
LATEX	Contains or presence of natural rubber latex
IVD	In vitro diagnostic medical device
CONTROL -	Negative control
CONTROL +	Positive control
Σ	Contains sufficient for <*n*> tests
	For IVD performance evaluation only
	Non-pyrogenic
#	Patient number
	This way
	Do not stack

Symbol	Meaning
	Single sterile barrier system
PHT DEHP BBP	Contains or presence of phthalate: combination of bis(2-ethylhexyl) phthalate (DEHP) and benzyl butyl phthalate (BBP)
	Collect separately Indicates separate collection for waste of electrical and electronic equipment required.
CE	CE marking; Signifies European technical conformity
	Device for near-patient testing
	Device for self-testing
Rx Only	This only applies to US: "Caution: Federal Law restricts this device to sale by or on the order of a licensed practitioner."
CC	Country of manufacture "CC" shall be replaced by either the two letter or the three letter country code.
	Collection time
	Cut
	Peel here
	Collection date
	Keep away from light
H_2	Hydrogen gas is generated
	Perforation
	Start panel sequence number
	End panel sequence number
	Internal sequence number
/	<Box #> / <Total Boxes>
MD	Medical device
	Contains hazardous substances
	Ukrainian conformity mark
FC	Meets FCC requirements per 21 CFR Part 15
c UL us	UL product certification for US and Canada
UDI	Unique device identifier
	Importer
	Place patient label in framed area only
MR	Magnetic resonance (MR) safe
MR	Magnetic resonance (MR) conditional
MR	Magnetic resonance (MR) unsafe
For use with	For use with
This Product Contains Dry Natural Rubber	This Product Contains Dry Natural Rubber
For Export Only	For Export Only
Instruments	Instruments

Note: Text layout in symbols is determined by label design.

Becton, Dickinson and Company
7 Loveton Circle
Sparks, Maryland 21152 USA

BD Respiratory Viral Panel for BD MAX™ System

REF **445215**
P0279(01)

CE IVD bd.com/e-labeling R_x Only

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- This product has not been FDA cleared or approved, but has been authorized for emergency use by FDA under EUA for use by authorized laboratories;
- This product has been authorized only for the detection and differentiation of nucleic acid of SARS-CoV-2, influenza A, influenza B, and respiratory syncytial virus, not for any other viruses or pathogens.
- The emergency use of this product is only authorized for the duration of the declaration that circumstances exist justifying the authorization of emergency use of in vitro diagnostics for detection and/or diagnosis of COVID-19 under Section 564(b)(1) of the Federal Food, Drug, and Cosmetic Act, 21 U.S.C. § 360bbb- 3(b)(1), unless the declaration is terminated or authorization is revoked sooner.

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