510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
ASSAY AND INSTRUMENT

I Background Information:

A 510(k) Number

K231381

B Applicant

Cepheid

C Proprietary and Established Names

Xpert Xpress MVP; GeneXpert Xpress System

D Regulatory Information

Product Code(s)	Classification	Regulation Section	Panel
PQA	Class II	21 CFR 866.3975 - Device That Detects Nucleic Acid Sequences From Microorganisms Associated With Vaginitis And Bacterial Vaginosis	MI - Microbiology
OUY	Class II	21 CFR 866.3860 - Trichomonas vaginalis nucleic acid assay	MI - Microbiology
OOI	Class II	21 CFR 862.2570 - Instrumentation for clinical multiplex test systems	CH - Clinical Chemistry

II Submission/Device Overview:

A Purpose for Submission:

To obtain a substantial equivalence determination for the Cepheid Xpert Xpress MVP test performed on the GeneXpert Xpress System.

B Measurand:

The Xpert Xpress MVP test detects and identifies nucleic acids from the following organisms:

- Organisms associated with BV (detected organisms not reported individually):
  - *Atopobium* spp. (*A. vaginae*, *Atopobium* novel species CCUG 55226)
  - Bacterial Vaginosis-Associated Bacterium 2 (BVAB2)
  - *Megasphaera*-1
- *Candida* spp. (*C. albicans*, *C. tropicalis*, *C. parapsilosis*, *C. dubliniensis,* species not differentiated)
- *Candida glabrata*/*Candida krusei* (species not differentiated)
- *Trichomonas vaginalis*

C Type of Test:
The Cepheid Xpert Xpress MVP test is a qualitative real-time polymerase chain reaction (PCR) assay that amplifies specific DNA targets from the above-mentioned organisms via fluorogenic target-specific hybridization probes that detect and differentiate targeted DNA.

III Intended Use/Indications for Use:

A Intended Use(s):
See Indications for Use below.

B Indication(s) for Use:
The Xpert Xpress MVP test, performed on the GeneXpert Xpress System, is an automated qualitative *in vitro* diagnostic test for the detection of DNA targets from anaerobic bacteria associated with bacterial vaginosis (BV), *Candida* species associated with vulvovaginal candidiasis, and *Trichomonas vaginalis*. The Xpert Xpress MVP test uses clinician-collected and self-collected vaginal swabs (collected in a clinical setting) from patients who are symptomatic for vaginitis/vaginosis. The Xpert Xpress MVP test utilizes real-time polymerase chain reaction (PCR) for the amplification of specific DNA targets and utilizes fluorogenic target-specific hybridization probes to detect and differentiate DNA from:

- Organisms associated with bacterial vaginosis (detected organisms not reported individually)
  - *Atopobium* spp. (*Atopobium vaginae*, *Atopobium* novel species CCUG 55226)
  - Bacterial Vaginosis-Associated Bacterium 2 (BVAB2)
  - *Megasphaera*-1
- *Candida* spp. (*C. albicans*, *C. tropicalis*, *C. parapsilosis*, *C. dubliniensis*, species not differentiated)
- *Candida glabrata*/*Candida krusei* (species not differentiated)
- *Trichomonas vaginalis*

The Xpert Xpress MVP test is intended to aid in the diagnosis of vaginal infections in women with a clinical presentation consistent with bacterial vaginosis, vulvovaginal candidiasis, or trichomoniasis.

C Special Conditions for Use Statement(s):
Rx - For Prescription Use Only

D Special Instrument Requirements:
GeneXpert Xpress System with Xpress software version 6.2 or higher

IV Device/System Characteristics:

A Device Description:

The Xpert Xpress MVP test is an automated *in vitro* diagnostic test for qualitative detection of DNA targets from anaerobic bacteria associated with bacterial vaginosis (BV), *Candida* species associated with vulvovaginal candidiasis, and *Trichomonas vaginalis*, the agent of trichomoniasis. In the CLIA-waived environment, the Xpert Xpress MVP test is performed on the GeneXpert Xpress System. With this platform, an untrained operator can run the test by performing three simple steps: 1) transfer liquid sample to the cartridge with a transfer pipette (provided in the test kit), 2) run the test on the GeneXpert Xpress System, and 3) read the results.

The Hub configuration of the GeneXpert Xpress System consists of a GeneXpert IV instrument that executes the sample preparation, nucleic acid amplification and real-time fluorescent signal detection for the test, and a GeneXpert Hub with preloaded GeneXpert Xpress software for running the tests and viewing the results. The GeneXpert Hub accessory integrates the computer, touchscreen monitor and barcode scanner. Each of the GeneXpert modules in the GeneXpert IV instrument can perform separate sample preparation and testing. The module contains a syringe drive for dispensing fluids (i.e., the syringe drive activates the plunger that works in concert with the rotary valve in the cartridge to move fluids between chambers), an ultrasonic horn for lysing cells or spores, and a proprietary I-CORE (Intelligent Cooling/Heating Optical Reaction) thermocycler for performing real-time PCR and RT-PCR and detection.

The Xpert Xpress MVP test is a PCR-based nucleic acid amplification test. Each test requires the use of a single-use disposable GeneXpert cartridge that contains all necessary reagents for the detection of DNA from BV organisms, *Candida* species, and *Trichomonas vaginalis*. A Sample Processing Control (SPC) and a Probe Check Control (PCC) are also included in the cartridge serving as internal controls. The SPC is present to control for adequate sample processing, to monitor PCR reaction conditions, the presence of potential inhibitor(s) and possible reagent degradation. The PCC verifies reagent rehydration, PCR tube filling, and confirms that all reaction components are present in the cartridge including monitoring for probe integrity and dye stability.

The Xpert Xpress MVP test is designed for use with the following specimens collected from symptomatic individuals: self-collected vaginal swabs (collected in a clinical setting) and clinician-collected vaginal swabs. The ancillary specimen collection kit for use with the Xpert Xpress MVP test is the Xpert Swab Specimen Collection Kit. The swab transport reagent included in the Xpert Swab Specimen Collection Kit is designed to collect and preserve patient specimens to allow transport to the laboratory prior to analysis with the Xpert Xpress MVP test.

The specimen is briefly mixed by vigorously shaking the collection tube three to four times. Using the supplied transfer pipette, the sample is transferred to the sample chamber of the Xpert Xpress MVP cartridge. The GeneXpert cartridge is loaded onto the GeneXpert Xpress IV instrument, which performs automated sample processing, and real-time PCR for the detection of DNA from targeted organisms. Summary and detailed test results are obtained within 60 minutes and can be displayed in a test report.

Materials Provided:

The Xpert Xpress MVP 10-test kit (XPRSMVP-10) contains sufficient reagents to process 10 specimens or quality control samples and the Xpert Xpress MVP 120-test kit (XPRSMVP-120) contains sufficient reagents to process 120 specimens or quality control samples.

Each kit contains the following:

Materials Included with the Xpert Xpress MVP Test

Component/Reagent	10-Test Kit XPRSMVP-10	120-Test Kit XPRSMVP-120
Xpert Xpress MVP Cartridges (with integrated reaction tubes that contain the reagents listed below)	**10 per kit**	**120 per kit**
• Bead 1 (EZR Bead), • Bead 2 (TSR Bead), • Bead 3 (SPC Bead), • Bead 4 (Salt Bead)	1 of each per cartridge	1 of each per cartridge
• Lysis Reagent (Guanidinium thiocyanate)	1.3 mL per cartridge	1.3 mL per cartridge
• Sodium Hydroxide	0.44 mL per cartridge	0.44 mL per cartridge
• Binding Reagent	1.5 mL per cartridge	1.5 mL per cartridge
• Wash Reagent	0.48 mL per cartridge	0.48 mL per cartridge
• Elution Reagent	2.0 mL per cartridge	2.0 mL per cartridge
Transfer Pipettes	**12 per kit**	**144 per kit**
Instructions for Use CLIA Complexity: Waived (For use with the GeneXpert Xpress System only)	**1 per kit**	**1 per kit**
Quick Reference Instructions CLIA Complexity: Waived (For use with the GeneXpert Xpress System only)	**1 per kit**	**1 per kit**
CD • Assay Definition File (ADF) • Instructions to import ADF into GeneXpert software • Instructions for Use (For use with the GeneXpert Dx and Infinity Systems only)	**1 per kit**	**1 per kit**

Materials Required but Not Provided

Material/Reagent/Instrument	Manufacturer	Catalogue # for Ordering
Xpert Swab Specimen Collection Kit	Cepheid	SWAB/G-50-US
GeneXpert Xpress System: GeneXpert Xpress IV Instrument, GeneXpert Hub with integrated computer running proprietary GeneXpert Xpress software version 6.2 or higher, touchscreen monitor and barcode scanner, external CD drive, *Getting Started Guide*, and *GeneXpert Xpress System User's Guide*	Cepheid	• GeneXpert Xpress IV with 2 modules; GXIV-2-CLIA • GeneXpert Xpress IV with 4 modules; GXIV-4-CLIA
NATtrol Vaginal Negative Control	ZeptoMetrix Corporation	NATVNEG-6C

NATtrol Vaginal Positive Control	ZeptoMetrix Corporation	NATVPOS-6C

B Principle of Operation:

The Xpert Xpress MVP test is a PCR-based nucleic acid amplification test. Each test requires the use of a single-use disposable GeneXpert cartridge that contains all necessary reagents for the detection of DNA from BV organisms, *Candida* species, and *Trichomonas vaginalis*. After addition of the specimen to the sample chamber of the Xpert Xpress MVP cartridge, the cartridge is loaded onto the GeneXpert Xpress System platform. The instrument then performs automated sample processing including DNA extraction followed by amplification, detection, and reporting of results. The results are interpreted automatically by the GeneXpert Xpress System from measured fluorescent signals and embedded calculation algorithms. The GeneXpert Xpress System displays results in the View Results window. It also reports if the test has encountered an instrument error or produces no result and needs to be repeated. Potential results and interpretation are presented in Table 1. The Xpert Xpress MVP test uses an algorithm that includes three BV-associated organism targets. The BV results algorithm is presented in Table 2.

Table 1. Xpert Xpress MVP Results and Interpretation

Result	Interpretation
BV NEGATIVE	Negative test for Bacterial Vaginosis (BV). Indicator DNA targets related to BV organisms are not detected.
Candida group NOT DETECTED	Candida group (*C. albicans* and/or *C. tropicalis* and/or *C. parapsilosis* and/or *C. dubliniensis*) target DNA is not detected.
Candida glab-krus NOT DETECTED	*Candida glabrata* and/or *Candida krusei* target DNA is not detected.
TV NOT DETECTED	*Trichomonas vaginalis* (TV) target DNA is not detected.
BV POSITIVE	Positive test for Bacterial Vaginosis (BV). Indicator DNA target(s) related to BV organisms is/are detected in one of the four BV Positive algorithms as shown in Table 2.
Candida group DETECTED	Candida group (*C. albicans* and/or *C. tropicalis* and/or *C. parapsilosis* and/or *C. dubliniensis*) target DNA is detected.
Candida glab-krus DETECTED	*Candida glabrata* and/or *Candida krusei* target DNA is detected.
TV DETECTED	*Trichomonas vaginalis* (TV) target DNA is detected.
NO RESULT - REPEAT TEST	If the result is **NO RESULT - REPEAT TEST**, then retest with a new cartridge using a new transfer pipette.
INSTRUMENT ERROR	Result is an instrument error. Touch **CLEAR ERROR** and follow the on-screen instructions. When the Home screen appears, repeat the test using a new cartridge and a new transfer pipette.

Table 2. BV Results Algorithm[a]

BV Organisms			BV Result
***Atopobium* spp.**[b] (Ct value within the valid Ct range)	***Megasphaera*-1** (Ct value within the valid Ct range)	**BVAB2** (Ct value within the valid Ct range)	
+	**+**	**-**	**BV Positive**
+	**-**	**+**	**BV Positive**

+	**+**	**+**	**BV Positive**
+ (high concentration)	**-**	**-**	**BV Positive**
-	**+/-**	**+/-**	**BV Negative**

[a] Algorithm results are either BV positive or BV negative.
[b] *Atopobium vaginae* and/or *Atopobium* novel species CCUG 55226.

C Instrument Description Information:

1. Instrument Name:
   The GeneXpert Xpress System consists of a GeneXpert IV instrument which performs sample preparation, nucleic acid amplification and real-time fluorescent signal detection, and a GeneXpert Hub with preloaded GeneXpert Xpress software (version 6.2 or higher) for running tests and viewing the results. The GeneXpert Xpress instrument is available in either a 2-module or 4-module configuration within the GeneXpert IV instrument (referred to as GeneXpert GX-IV-2 and GX-IV-4 System). Each of the GeneXpert modules in the GeneXpert IV instrument can perform independent sample preparation and testing. In a 2-module configuration, two of the modules are replaced by blank panels. Operation of the instrument remains identical between the 2- and 4-module designs, except for the number of testing modules available to the user. The GeneXpert Hub accessory integrates a computer, touchscreen monitor, and barcode scanner. With this platform, an untrained operator runs the test by performing three steps: 1) transfer collected sample to the cartridge with a transfer pipette (provided in the test kit), 2) run the test on the GeneXpert Xpress System which performs hands-off automated sample processing and real-time PCR for detection of target DNA, and 3) read the results obtained within 60 minutes for the Xpert Xpress MVP test.

2. Specimen Identification:
   To perform a test, the user touches the 'NEW TEST' icon on the Home Screen. Either patient information must be entered if configured by an administrator or the Sample ID screen appears. If the Patient Information screen appears, manually enter the patient ID or scan the patient ID barcode for the patient's specimen. If the Sample ID screen appears, scan the sample ID barcode or manually enter the Sample ID for the patient specimen. The user is then instructed to scan the cartridge barcode and confirm that the appropriate cartridge for the Xpert Xpress MVP test has been selected. The test cartridge is prepared and loaded into an available instrument module that has a flashing green light which initiates the test.

3. Specimen Sampling and Handling:
   The Xpert Xpress MVP test is designed for use with self-collected vaginal swabs (collected in a clinical setting) and clinician-collected vaginal swab specimens from symptomatic individuals. All vaginal swabs are collected using the Xpert Swab Specimen Collection Kit, an ancillary specimen collection kit that functions to collect and preserve patient specimens to allow transport to the testing site prior to analysis with the Xpert Xpress MVP test.

   At the testing facility, the operator mixes the specimen by vigorously shaking the transport tube with clinical sample four times. A fixed volume, disposable transfer pipette provided with the Xpert Xpress MVP test is used to transfer an aliquot (560 µL) of the specimen into the sample chamber of the test cartridge. After closing the cartridge lid, the operator loads the cartridge onto the GeneXpert Xpress instrument for testing.

4. Calibration:

Cepheid performs all necessary optical and thermal calibrations of the GeneXpert Xpress instrument at the time of manufacture, prior to customer installation and therefore, calibration of the instrument is not required during initial system startup. Cepheid recommends that the system be checked for proper calibration on an annual basis from the point of initial use. A GeneXpert operator or Cepheid Field Service Engineer with Administrator user permissions can perform calibration checks during annual maintenance.

5. Quality Control:

Internal Controls

The test cartridge for the Xpert Xpress MVP test includes two internal controls: a Sample Processing Control (SPC) and a Probe Check Control (PCC).

- Sample Processing Control (SPC) - The SPC is comprised of DNA from a non-targeted microorganism that is processed along with the sample to verify that sample processing is adequate. Additionally, this control detects sample-associated inhibition of the real-time PCR assay, ensures that the PCR reaction conditions (temperature and time) are appropriate for the amplification reaction, and that the PCR reagents are performing as anticipated (e.g., no reagent degradation). The SPC should be positive in a negative sample and can be negative or positive in a positive sample. The SPC passes if it meets the validated acceptance criteria.

  If the sample is negative for all targeted analytes and the SPC fails (negative?), the result will be NO RESULT-REPEAT TEST.

- Probe Check Control (PCC) - Before the start of the PCR, the GeneXpert Xpress System measures the fluorescence signal from the probes to monitor bead rehydration, reaction tube filling, probe integrity, and dye stability. The PCC passes if it meets the validated acceptance criteria.

  If the PCC fails, the result will be NO RESULT-REPEAT TEST.

External Controls

External controls are not provided with the Xpert Xpress MVP test. External control materials must be used in accordance with local, state, federal regulations, and accreditation requirements. The external controls that have been validated for use with the Xpert Xpress MVP test include the following:

- NATtrol Vaginal Negative Control (ZeptoMetrix Corporation, NATVNEG-6C)
- NATtrol Vaginal Positive Control (ZeptoMetrix Corporation, NATVPOS-6C)

V Substantial Equivalence Information:

A Predicate Device Name(s):

Xpert Xpress MVP, GeneXpert Dx System, GeneXpert Infinity System

B Predicate 510(k) Number(s):

K221160

C Comparison with Predicate(s):

Device & Predicate Device(s):	K231381	K221160
Device Trade Name	Xpert Xpress MVP, GeneXpert Xpress System	Xpert Xpress MVP, GeneXpert Dx System, GeneXpert Infinity System
General Device Characteristic Similarities		
Intended Use/ Indications For Use	The Xpert Xpress MVP test, performed on the GeneXpert Xpress System, is an automated qualitative *in vitro* diagnostic test for the detection of DNA targets from anaerobic bacteria associated with bacterial vaginosis (BV), *Candida* species associated with vulvovaginal candidiasis, and *Trichomonas vaginalis*. The Xpert Xpress MVP test uses clinician-collected and self-collected vaginal swabs (collected in a clinical setting) from patients who are symptomatic for vaginitis/vaginosis. The Xpert Xpress MVP test utilizes real-time polymerase chain reaction (PCR) for the amplification of specific DNA targets and utilizes fluorogenic target-specific hybridization probes to detect and differentiate DNA from: • Organisms associated with bacterial vaginosis (detected organisms not reported individually) o *Atopobium* spp. (*Atopobium vaginae*, *Atopobium* novel species CCUG 55226) o Bacterial Vaginosis-Associated Bacterium 2 (BVAB2) o *Megasphaera*-1 • *Candida* spp. (*C. albicans*, *C. tropicalis*, *C. parapsilosis*, *C. dubliniensis*, species not differentiated) • *Candida glabrata*/*Candida krusei* (species not differentiated) • *Trichomonas vaginalis* The Xpert Xpress MVP test is intended to aid in the diagnosis of vaginal infections in women with a clinical presentation consistent with bacterial vaginosis, vulvovaginal candidiasis, or trichomoniasis.	The Xpert Xpress MVP test, performed on the GeneXpert Instrument Systems, is an automated qualitative *in vitro* diagnostic test for the detection of DNA targets from anaerobic bacteria associated with bacterial vaginosis (BV), *Candida* species associated with vulvovaginal candidiasis, and *Trichomonas vaginalis*. The Xpert Xpress MVP test uses clinician-collected and self-collected vaginal swabs (collected in a clinical setting) from patients who are symptomatic for vaginitis/vaginosis. The Xpert Xpress MVP test utilizes real-time polymerase chain reaction (PCR) for the amplification of specific DNA targets and utilizes fluorogenic target-specific hybridization probes to detect and differentiate DNA from: • Organisms associated with bacterial vaginosis (detected organisms not reported individually) o *Atopobium* spp. (*Atopobium vaginae*, *Atopobium* novel species CCUG 55226) o Bacterial Vaginosis-Associated Bacterium 2 (BVAB2) o *Megasphaera*-1 • *Candida* spp. (*C. albicans*, *C. tropicalis*, *C. parapsilosis*, *C. dubliniensis*, species not differentiated) • *Candida glabrata*/*Candida krusei* (species not differentiated) • *Trichomonas vaginalis* The Xpert Xpress MVP test is intended to aid in the diagnosis of vaginal infections in women with a clinical presentation consistent with bacterial vaginosis, vulvovaginal candidiasis, or trichomoniasis.
Specimen Type	Same	Clinician- and patient-collected vaginal swabs
Organisms Detected	Same	• Organisms associated with bacterial vaginosis (detected

		organisms not reported individually) o *Atopobium* spp. (*Atopobium vaginae*, *Atopobium* novel species CCUG 55226) o Bacterial Vaginosis-Associated Bacterium 2 (BVAB2) o *Megasphaera*-1 • *Candida* spp. (*C. albicans*, *C. tropicalis*, *C. parapsilosis*, *C. dubliniensis*, species not differentiated) • *Candida glabrata*/*Candida krusei* (species not differentiated) • *Trichomonas vaginalis*
Assay Technology	Same	Real-time PCR
Reagents in Cartridge	Same	Cartridge Version 2
Assay Definition File (ADF)	Same	ADF Version 2
Single Use	Same	Yes
Automated Extraction, Detection and Result Interpretation	Same	Yes
Assay Results	Same	Qualitative
Collection Device	Same	Cepheid Xpert Swab Specimen Collection Kit
Time to Result	Same	Within 60 minutes
General Device Characteristic Differences		
Instrumentation	Cepheid GeneXpert Xpress System	Cepheid GeneXpert Instrument Systems (Dx and Infinity)
Software Version	GeneXpert Xpress System –Xpress software version 6.2 or higher	GeneXpert Dx – Dx software version 4.7b or higher GeneXpert Infinity – Xpertise software version 6.4b or higher

VI Standards/Guidance Documents Referenced:

Declarations of Conformity to Voluntary Consensus Standards

FDA FR Recognition Number	Document Number	Title
5-125	ISO 14971:2019	Medical devices — Application of risk management to medical devices.
7-275	CLSI EP07-A3	Interference Testing in Clinical Chemistry; Approved Guideline – Third Edition.

General Use of Consensus Standards

FDA FR Recognition Number	Document Number	Title
7-233	CLSI EP17-A2	Evaluation of Detection Capability for Clinical Laboratory Measurement Procedures; Approved Guideline – Second Edition.
7-251	CLSI EP05-A3	Evaluation of Precision Performance of Quantitative Measurement Methods; Approved Guideline – Third Edition.

7-152	CLSI EP12-A2	User Protocol for Evaluation of Qualitative Test Performance; Approved Guideline - Second Edition.
7-253	CLSI EP15-A3	User Verification of Performance for Precision and Trueness; Approved Guideline – Third Edition.
7-260	CLSI MM03-A3	Molecular Diagnostic Methods for Infectious Disease; Approved Guideline – Third Edition.
7-296	CLSI EP09-A3	Measurement Procedure Comparison and Bias Estimation Using Patient Samples; Approved Guideline – Third Edition.
7-300	CLSI MM13-A2	Collection, Transport, Preparation, and Storage of Specimens for Molecular Methods.
7-235	CLSI EP25-A	Evaluation of Stability of In Vitro Diagnostic Reagents; Approved Guideline.

Guidance Documents

- Guidance for Industry and FDA Staff - Recommendations for Clinical Laboratory Improvement Amendments of 1988 (CLIA) Waiver Applications for Manufacturers of In Vitro Diagnostic Devices, issued February 26, 2020.
- Guidance for Industry and FDA Staff - Format for Traditional and Abbreviated 510(k), issued September 13, 2019.
- Guidance for Industry and FDA Staff - Administrative Procedures for CLIA Categorization, issued October 2, 2017.
- Guidance for Industry and FDA Staff - Recommendations for Dual 510(k) and CLIA Waiver by Application Studies, issued February 26, 2020.
- Guidance for Industry and FDA Staff - General Principles of Software Validation, issued January 11, 2002.
- Guidance for Industry and FDA Staff - Class II Special Controls Guidance Document: Instrumentation for Clinical Multiplex Test Systems, issued on March 10, 2005.
- Guidance for Industry and FDA Staff – Content of Premarket Submissions for Management of Cybersecurity in Medical Devices, issued on October 2, 2014.
- Guidance for Industry and FDA Staff - Guidance for the Content of Premarket Submissions for Software Contained in Medical Devices, issued May 11, 2005.
- Guidance for Industry and FDA Staff - Off-the-Shelf Software Use in Medical Devices; issued September 27, 2019.
- Guidance for Sponsors, Institutional Review Boards, Clinical Investigators and FDA Staff - Guidance on Informed Consent for In Vitro Diagnostic Device Studies Using Leftover Human Specimens that are Not Individually Identifiable, issued April 25, 2006.
- Guidance for Industry - Cybersecurity for Networked Medical Devices Containing Off-the-Shelf (OTS) Software, issued January 14, 2005.
- Guidance for Industry and FDA Staff - Appropriate Use of Voluntary Consensus Standards in Premarket Submissions for Medical Devices, issued September 14, 2018.
- Guidance for Industry and FDA Staff - eCopy Program for Medical Device Submissions, issued April 27, 2020.

VII Performance Characteristics (if/when applicable):

A Analytical Performance:

Analytical studies to support the original clearance of the Xpert Xpress MVP test are described in the public decision summary for K212213. All testing in the current submission (K231381) was performed using the same assay discussed in K212213 (cartridge and ADF version 1).

Analytical data were previously generated with either the GeneXpert Dx instrument with GeneXpert Dx software version 4.7b or the GeneXpert Infinity-80 system with Xpertise software version 6.4b or higher. Analytical study data previously reviewed in K212213 and K221160 were re-analyzed with the GeneXpert Xpress software version 6.4a and yielded acceptable results compared to those original analyses with either the GeneXpert Dx or Xpertise software. Please refer to the published decision summary for K212213 for additional information on each analytical study design and the associated data. A new reproducibility study (using cartridge version 1 and ADF version 1) was performed at CLIA-waived sites with untrained operators and is discussed immediately below.

1. Precision/Reproducibility:

   Precision

   Please refer to the published decision summary for K212213 for study details. Data were re-analyzed using the GeneXpert Xpress software version 6.4 and generated acceptable results.

   Reproducibility

   A multi-center, blinded study was conducted at three external sites representative of the CLIA-waived environment. The reproducibility study used a multi-factor nested design consisting of contrived panel members spanning the relevant limit of detection (LoD) spectrum (or, in the case of BV, the near cut-off concentration spectrum) for the four intended target types.

   A panel of ten members with varying concentrations of the intended target types were tested by three operators at each of the three study sites in duplicate on five different days using one lot of Xpert Xpress MVP test cartridges. The total number of tests (not including controls or required repeats) for each panel member was 90 (3 sites × 5 days × 3 operators × 1 run × 2 replicates). The three concentrations for each intended target type included two positive levels (moderate positives at ~3× LoD/near cut-off concentration, low positives at ~1× LoD/near cut-off concentration) and one negative. For the BV target, a high negative level (<1× near the cut-off concentration) was also included. Each BV panel member contained a mixture of *Atopobium vaginae*, *Megasphaera*-1 plasmid DNA, and BVAB2 plasmid DNA at concentrations of <1×, ~1×, and ~3× near the cut-off concentration for each BV analyte. A list of panel members and the study acceptance criteria for each panel member are presented in Table 3. Panel members were prepared using either cultured material and/or plasmid DNA in simulated vaginal swab matrix. Panel members were shipped refrigerated to the study sites and stored at 2-8°C prior to testing.

Table 3. Panel Members and Acceptance Criteria for the Reproducibility Study

Panel Member	Level	Acceptance Criteria
Negative	Negative	100% negativity
BV*, High Negative	<l× near cut-off concentration	~20-80% positivity
BV*, Low Positive	~l× near cut-off concentration	~95% positivity
BV*, Moderate Positive	~3× near cut-off concentration	100% positivity
C. albicans, Low Positive	~1× LoD	~95% positivity
C. albicans, Moderate Positive	~3× LoD	100% positivity
C. glabrata, Low Positive	~1× LoD	~95% positivity
C. glabrata, Moderate Positive	~3× LoD	100% positivity
TV, Low Positive	~1× LoD	~95% positivity
TV, Moderate Positive	~3× LoD	100% positivity

*BV samples each contain *Atopobium vaginae* cultured material, *Megasphaera*-1 plasmid DNA, and BVAB2 plasmid DNA

Percent agreement for the Xpert Xpress MVP test was analyzed across each of the nine operators and across each of the three study sites. Overall percent agreement for each panel member was calculated, as well as the Wilson Score 95% confidence interval for each proportion of concordance. Of the 1080 samples tested, 1037 yielded valid results on the initial test (96.0%; 1037/1080); therefore, the initial non-determinate (ND) rate was 4.0% (43/1080). The ND cases included 26 NO RESULT-REPEAT TEST results and 17 INSTRUMENT ERROR results. Of the 43 initial ND specimens, 40 were retested (per the assay instruction) of which 35 generated valid results for a final ND rate of 0.7% (8/1080). Three specimens were not retested due to insufficient sample volume. All final ND results were removed from analyses.

During phase I of the study, site 01 had low percent agreement for three panel members. Low positive *C. albicans*, low positive *C. glabrata*, and moderate positive *C. albicans* had a percent agreement of 40% (12/30), 80% (24/30), and 86.7% (26/30), respectively. A root cause analysis showed that the operators at site 01 failed to follow certain transfer steps of the Quick Reference Instructions (QRI) by not vigorously shaking the sample tube and/or adding an excessive amount of sample to the cartridge, which could have contributed to the false negative results (as demonstrated by flex studies) and the observed low percent agreement. Consequently, all reproducibility data from site 01 in phase I were excluded and phase II was conducted on all panel members at an additional fourth site (site 04) with three new untrained operators.

Reproducibility results from sites 02-04 are shown in detail in Table 4.

Table 4. Percent Agreement of Qualitative Results for the Xpert Xpress MVP Test

Panel Member	Phase I								Phase II				Overall Agreement and 95% CI
	Site 02				Site 03				Site 04				
	Op 1	Op 2	Op 3	Site	Op 1	Op 2	Op 3	Site	Op 1	Op 2	Op 3	Site	
Negative	100% (30/30)	100% (30/30)	100% (30/30)	100% (90/90)	100% (30/30)	100% (30/30)	100% (30/30)	100% (90/90)	96.7% (29/30)	100% (30/30)	100% (30/30)	100% (90/90)	99.6% (269/270) 97.4% - 100%
BV, High Neg	90.0% (9/10)	70.0% (7/10)	80.0% (8/10)	80.0% (24/30)	60.0% (6/10)	70.0% (7/10)	40.0% (4/10)	56.7% (17/30)	80.0% (8/10)	87.5% (7/8[a])	60.0% (6/10)	75.0% (21/28)	70.5% (62/88) 60.2% - 79.0%
BV, Low Pos	100% (10/10)	90.0% (9/10)	100% (10/10)	96.7% (29/30)	80.0% (8/10)	100% (10/10)	100% (10/10)	93.3% (28/30)	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	96.7% (87/90) 90.7% - 98.9%
BV, Mod Pos	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	100% (10/10)	100% (9/9[b])	100% (10/10)	100% (29/29)	100% (89/89) 95.9% - 100.0%
C. albicans, Low Pos	100% (10/10)	100% (10/10)	90.0% (9/10)	96.7% (29/30)	100% (9/9[b])	100% (9/9[c])	100% (9/9[c])	100% (27/27)	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	98.9% (86/87) 93.8% - 99.8%
C. albicans, Mod Pos	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	100% (90/90) 95.9% - 100.0%
C. glabrata, Low Pos	100% (10/10)	100% (10/10)	90.0% (9/10)	96.7% (29/30)	100% (10/10)	100% (9/9[c])	100% (10/10)	100% (29/29)	100% (10/10)	100% (9/9[d])	100% (10/10)	100% (29/29)	98.9% (87/88) 93.8% - 99.8%
C. glabrata, Mod Pos	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	100% (90/90) 95.9% - 100.0%
TV, Low Pos	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	100% (90/90) 95.9% - 100.0%
TV, Mod Pos	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	100% (90/90)

Panel Member	Phase I								Phase II				Overall Agreement and 95% CI
	Site 02				Site 03				Site 04				
	Op 1	Op 2	Op 3	Site	Op 1	Op 2	Op 3	Site	Op 1	Op 2	Op 3	Site	
													95.9% - 100.0%

Abbreviations: Mod, moderate; Neg, negative; Op, operator; Pos, positive

[a] Of the total ten samples tested, four yielded ND results on the initial test. Two of four samples were not retested due to insufficient volume, and two were retested and yielded valid results on retest.

[b] Of the total ten samples tested, two yielded ND results on the initial test and were retested. One of the two samples yielded valid results on retest.

[c] Of the total ten samples tested, one yielded ND results on both initial and repeat testing.

[d] Of the total ten samples tested, one yielded ND results on the initial test and was not retested due to insufficient volume.

- A total of 70.5% (62/88) of high negative BV samples were correctly identified, which met the acceptance criterion of 20-80% positivity.
- A total of 96.7%, 98.9%, 98.9%, and 100% of the low positive samples of BV, *C. albicans*, *C. glabrata*, and TV, respectively produced positive results, which met the acceptance criterion of ~95% positivity.
- A total of 100% of the moderate positive samples of BV, *C. albicans*, *C. glabrata*, and TV produced positive results.
- A total of 99.6% (269/270) of all negative samples produced a negative result. One sample that gave a false positive result was due to operator error whereby the negative cartridge was mistakenly loaded with positive sample.

The reproducibility of the Xpert Xpress MVP test was also evaluated in terms of the fluorescence signal expressed in Ct values for each target detected. The mean, standard deviation (SD), and coefficient of variation (CV) between-sites, between-days, between-operators, and within-run for each panel member are presented in Table 5. The total variation for all targets was between 0.3 and 1.9 Ct (1.0-6.1%). The majority of the variation was attributed to within-run variance (i.e., assay noise).

Table 5. Summary of Ct Variance Components Observed in the Reproducibility Study

Panel Member	Analyte	N[a]	Mean Ct	Site		Day		Operator		Within-run		Total	
				SD	CV (%)	SD	CV (%)	SD	CV (%)	SD	CV (%)	SD	CV (%)
Negative	SPC	270	32.4	0.25	0.8	0	0	0.26	0.8	1.02	3.2	1.08	3.3
BV, High Neg	Atop gp	88	32.2	0.04	0.1	0.12	0.4	0.16	0.5	0.26	0.8	0.33	1.0
BV, Low Pos		90	31.4	0	0	0.09	0.3	0.31	1.0	0.43	1.4	0.54	1.7
BV, Mod Pos		89	30.1	0.01	0	0	0	0.22	0.7	0.33	1.1	0.39	1.3
BV, High Neg	Mega1-BVAB2	76[b]	40.4	0	0	0.08	0.2	0.44	1.1	1.23	3.1	1.31	3.3
BV, Low Pos		90	36.3	0.10	0.30	0	0	0.41	1.1	0.71	2.0	0.83	2.3
BV, Mod Pos		89	34.5	0.33	1	0.28	0.8	0	0	0.84	2.4	0.95	2.7
C. albicans, Low Pos	Cgroup	86	36.1	0.18	0.5	0	0	0.20	0.6	0.93	2.6	0.96	2.7
C. albicans, Mod Pos		90	34.2	0.55	1.6	0	0	0.74	2.2	0.74	2.2	1.18	3.5
C. glabrata, Low Pos	Cglab-krus	88	30.5	0.55	1.8	0	0	1.18	3.9	1.33	4.4	1.86	6.1

Panel Member	Analyte	N[a]	Mean Ct	Site		Day		Operator		Within-run		Total	
				SD	CV (%)	SD	CV (%)	SD	CV (%)	SD	CV (%)	SD	CV (%)
C. glabrata, Mod Pos		90	28.5	0.22	0.8	0.	0	0.51	1.8	0.78	2.7	0.96	3.4
TV, Low Pos	TV	90	37.4	0	0	0	0	0.55	1.5	0.92	2.5	1.08	2.9
TV, Mod Pos		90	35.0	0.05	0.1	0.14	0.4	0	0	0.42	1.2	0.45	1.3

Abbreviations: Atop gp, Atopobium group; Cglab-krus, *C. glabrata/C. krusei*; Cgroup, *Candida* spp.; CV, coefficient of variation; Mega1; *Megasphaera*-1; Mod, moderate; Neg, negative; Pos, positive; SD, standard deviation; SPC; sample processing control

[a] Number of samples with non-zero Ct values out of 90.

[b] 12 out of 88 samples with Mega1-BVAB2 Ct=0 were excluded from the ANOVA analysis

Note: The variance estimate from some factors may be numerically negative, which can occur if the variability due to those factors is very small. When this occurs, the variability as measured with SD and CV is set to 0.

The Xpert Xpress MVP test demonstrated acceptable reproducibility across sites (site 02-04), operators, and panel members when testing was performed in a CLIA-waived environment.

2. External Control Lot-to-Lot Testing

The reproducibility of the external positive and negative controls associated with the Xpert Xpress MVP assay was assessed by one untrained operator at one external site in triplicate over six different days using three consecutive lots of external controls. The order of the lots across testing days included all possible permutations of three lots. In addition, three clinical samples were tested on each testing day to simulate a typical working day in a near-patient setting where both patient specimens and controls are tested. If an external control or clinical sample produced a non-determinate (ND) result, it was repeated once. If the repeat test was also an ND result, it was recorded as such. If the repeat test generated a valid result, the valid result was reported.

Reproducibility results of the external controls are shown in Table 6.

Table 6. Percent Agreement of Qualitative Results for the External Controls

External Control Type	Lot	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Overall Agreement with 95% CI
Negative	A	100% (3/3)	100% (3/3)	100% (3/3)	100% (3/3)	100% (3/3)	100% (3/3)	100% (18/18) 82.4 - 100%
	B	100% (3/3)	100% (3/3)	100% (3/3)	100% (3/3)	100% (3/3)	100% (3/3)	100% (18/18) 82.4 - 100%
	C	100% (3/3)	100% (3/3)	100% (3/3)	100% (3/3)	100% (3/3)	100% (3/3)	100% (18/18) 82.4 - 100%
	Total	100% (9/9)	100% (9/9)	100% (9/9)	100% (9/9)	100% (9/9)	100% (9/9)	100% (54/54) 93.4 - 100%
Positive	A	100% (3/3)	100% (3/3)	100% (3/3)	100% (3/3)	100% (3/3)	100% (3/3)	100% (18/18) 82.4 - 100%
	B	100% (3/3)	100% (3/3)	100% (3/3)	100% (3/3)	100% (3/3)	100% (3/3)	100% (18/18) 82.4 - 100%
	C	100%	100%	100%	100%	100%	100%	100%

		(3/3)	(3/3)	(3/3)	(3/3)	(3/3)	(3/3)	(18/18) 82.4 - 100%
	Total	100% (9/9)	100% (9/9)	100% (9/9)	100% (9/9)	100% (9/9)	100% (9/9)	100% (54/54) 93.4 - 100%

Of the 108 external controls and 18 clinical samples that were tested as part of this study, four yielded non-determinate (ND) results ("NO RESULT – REPEAT TEST") on initial testing (2 controls and 2 clinical samples). Upon retesting, all control and clinical samples gave valid results. The initial ND rate for the external controls was 1.9% (2/108) and the final ND rate was 0.0% (0/108). Positive and negative external controls met acceptance criteria, exhibiting 100% positivity and 100% negativity, respectively upon repeat testing. For both positive and negative external controls, there were no statistically significant differences across lots and across testing days (See Table 7). The external controls used with the Xpert Xpress MVP test demonstrated acceptable lot-to-lot reproducibility.

Table 7. Summary of ANOVA with Coefficient of Variation for Each Component

Panel Member	Analyte	N	Mean Ct	Variance Source							
				Lot		Day		Error		Total	
				SD	CV (%)	SD	CV (%)	SD	CV (%)	SD	CV (%)
Negative	SPC	54	31.51	0.03	0.1	0.06	0.2	0.18	0.6	0.19	0.6
Positive	Atop gp	54	28.05	0.28	1.0	0.16	0.6	0.12	0.4	0.35	1.2
	Mega-BVAB2	54	27.21	0.14	0.5	0.22	0.8	0.47	1.7	0.54	2.0
	Cgroup	54	31.89	0.36	1.1	0	0	0.30	1.0	0.47	1.5
	Cglab-krus	54	27.70	0	0	0.17	0.6	0.30	1.1	0.35	1.3
	TV	54	30.14	1.54	5.1	0.19	0.6	0.35	1.2	1.59	5.3

Abbreviations: Atop gp, Atopobium group; Cglab-krus, *Candida glabrata/krusei*; Cgroup, *Candida* spp.; CV, coefficient of variation; Mega1, *Megasphaera*-1; SD, standard deviation; SPC, sample processing control; TV, *Trichomonas vaginalis*

3. Linearity:
   Not applicable. Device reports qualitative results.

4. Analytical Specificity/Interference:
   For analytical specificity/cross-reactivity, microbial interference, interfering substances, and competitive inhibition studies, please refer to the published decision summary for K212213. Interfering substances study data were also reviewed in K221160. Data were re-analyzed using the GeneXpert Xpress software version 6.4a. There were no changes in the data following the re-analyses with the Xpress software.

5. Assay Reportable Range:
   Not applicable. Device reports qualitative results.

6. Traceability, Stability, Expected Values (Controls, Calibrators, or Methods):
   Specimen Stability:
   For specimen stability and cartridge hold time (loaded test cartridge) studies and associated data, please refer to the published decision summary for K212213. Data were re-analyzed using the GeneXpert Xpress software version 6.4a. There were no changes in the data following the re-analyses with the Xpress software.

   Controls:

See section IV.C.(5) above for a description of the SPC and Probe Check Controls.

External quality control materials are not provided with the Xpert Xpress MVP test. The external controls that were validated for use with the Xpert Xpress MVP test include the NATtrol Vaginal Negative Control (*L. acidophilus*, Z048) and the NATtrol Vaginal Positive Control (*A. vaginae*, Z242; recombinant BVAB2; *C. albicans*, Z006; *C. glabrata*, Z007; *T. vaginalis*, Z070) (0.9 mL each, ZeptoMetrix Corporation, Buffalo, NY, USA). The instructions for use recommends that external controls be tested at the frequency noted below:

- Each time a new lot of Xpert Xpress MVP kits is received.
- Each time a new shipment of Xpert Xpress MVP kits is received even if it is the same lot previously received.
- Each time a new operator is performing the test (i.e., operator who has not performed the test recently).
- When problems (e.g., storage, operator, instrument, or other) are suspected or identified.
- If otherwise required by your institution's standard Quality Control (QC) procedures.

In the prospective clinical study, quality control materials (one external positive and one external negative control) were tested prior to testing clinical samples each time one or more of the above-mentioned conditions were met. Of the 120 external control samples tested (59 positive controls and 61 negative controls), 91.7% (110/120) gave valid test results on initial testing with 100% (110/110) concordance with expected results. Of the ten controls with initial non-determinant (ND) results (10/120; 8.3%), four were positive controls (2 "NO RESULT – REPEAT TEST"; 2 "INSTRUMENT ERROR") and six were negative controls (4 "NO RESULT – REPEAT TEST"; 2 "INSTRUMENT ERROR"). According to the instructions for use, if an external control is initially non-determinate or incorrect, the external control should be repeated once. All ten controls were retested and yielded expected results.

7. Detection Limit:
   For limit of detection (LoD) studies, please refer to the published decision summary for K212213. LoD data were also reviewed in K221160. For analytical inclusivity/reactivity studies, please refer to the published decision summary for K212213. LoD and inclusivity data were re-analyzed using the GeneXpert Xpress software version 6.4a. There were no changes in the data following re-analysis with the Xpress software.

8. Assay Cut-Off:
   Please refer to the published decision summary for K212213.

9. Accuracy (Instrument):
   Not applicable.

10. Carry-Over:
    For carry-over/cross-contamination studies, please refer to the published decision summary for K212213. Data were re-analyzed using the GeneXpert Xpress software version 6.4a. There were no changes in the data following re-analysis with the Xpress software.

B Comparison Studies:

1. Method Comparison with Predicate Device:
   Not applicable.

2. Matrix Comparison:
   For comparison of assay performance with natural versus simulated vaginal swab matrices as well as multi-spiked analyte pools versus single target analytes, please refer to the published decision summary for K212213. Data from both studies were re-analyzed using the GeneXpert Xpress software version 6.4a. There were no changes in the data following the re-analyses with the Xpress software.

C Clinical Studies:

A prospective blinded clinical study was conducted to evaluate the performance of the Xpert Xpress MVP test at nine geographically diverse sites in the United States. Subjects included patients ≥ 14 years of age who presented with signs and/or symptoms of vaginosis/vaginitis. For eligible subjects, one self-collected vaginal swab specimen (collected in a clinical setting, SVS) and five clinician-collected vaginal swab (CVS) specimens were obtained for testing with the Xpert Xpress MVP test and reference/comparator testing. Patient management continued at the site per the standard practice, independent of investigational test results.

The prospective clinical study was performed at CLIA-waived sites using the original version of the Xpert Xpress MVP test cleared under K212213 (i.e., cartridge version 1 and ADF version 1) with the GeneXpert Xpress System and previous software versions. The original design of the Xpert Xpress MVP test was determined to be equivalent to the current design, as the analytical sensitivity and the performance with prospectively collected clinician-collected vaginal swab specimens and contrived specimens demonstrated equivalency (reviewed in K221160). The data shown below in Tables 10-28 represents a re-analysis of the original data using the GeneXpert Xpress System with software version 6.4a. The new analyses did not impact clinical results.

The Xpert Xpress MVP test performance was compared to the following reference/comparator methods:

- BV status was determined using an FDA-cleared nucleic acid amplification test (NAAT).
- Candida group and Candida glab-krus status was determined by yeast culture (chromogenic medium and Sabouraud Dextrose Emmons plate culture) followed by mass spectrometry identification using an FDA-cleared MALDI-TOF device.
- *Trichomonas vaginalis* status was determined relative to a patient infected status (PIS) algorithm that included a composite result from two comparator methods including an FDA-cleared NAAT and InPouch TV culture. For TV, a positive PIS was determined by a positive result from either NAAT or culture and a negative PIS was determined by a negative result from both NAAT and culture.

  When applicable, investigation of discordant results for any analyte was performed by testing the specimen with another FDA-cleared NAAT.

Of the 1295 participants who were initially enrolled in the prospective clinical study, 26 CVS specimens (26/1295; 2.01%) and 20 SVS specimens (20/1295; 1.54%) were excluded from the analysis of performance for the reasons listed in Table 8.

Table 8. Summary of Data Exclusions from the Prospective Clinical Study (Symptomatic) Stratified by Specimen Type

Rationale for Exclusion	Number of CVS	Number of SVS
Shipped wrong sample for comparator testing to the respective site	1	1
Xpert Xpress MVP testing not completed		
• Inclusion/exclusion criteria not met	3	3
• Declined participation; ineligible	2	2
• Procedural deviation with Informed Consent Form	1	1
Xpert Xpress MVP testing not performed as instructed per protocol		
• Testing was performed in moderate complexity setting	1	-
• Procedural deviation	16	11
Procedural deviation with specimen collection	2	2
Total Excluded	**26[a]**	**20[b]**
Total Included	**1269**	**1275**

[a] Not included in any CVS related analysis (including CVS ND rate, clinical performance evaluation for BV, TV, CS, CgCk in CVS specimens, positivity for CVS specimens, and co-infection analysis)
[b] Not included in any SVS related analysis (including SVS ND rate, clinical performance evaluation for BV, TV, CS, CgCk in SVS specimens, positivity for SVS specimens, and co-infection analysis)

Of the 2544 specimens collected for testing (CVS + SVS), 1277 eligible participants provided at least one specimen that was included in the final performance analyses (i.e., included in the demographic table and at least one other statistical analysis). The evaluable study population included 1275 patients 18 to ≥ 50 years of age and two individuals between 14-17 years of age (n=1277). The majority of specimens were obtained from patients 18-29 years of age (42.8%), patients who were White (59.5%), and patients who had recurrent vaginosis/vaginitis symptoms (44.6%). See Table 9 for a summary of the demographics of the evaluable study subjects.

Table 9. Demographics of Evaluable Symptomatic Subjects in the Prospective Clinical Evaluation of the Xpert Xpress MVP Test

Demographic	N	% (N=1277)
Age Group (years)		
• 14-17	2	0.2%
• 18-29	547	42.8%
• 30-39	325	25.5%
• 40-49	203	15.9%
• ≥ 50	200	15.7%
Race		
• White	760	59.5%
• Black or African American	456	35.7%
• Asian	20	1.6%
• American Indian or Alaska Native	9	0.7%
• Native Hawaiian or Other Pacific Islander	2	0.2%
• Mixed/Unknown	30	2.3%
Ethnicity		
• Hispanic or Latino	154	12.1%
• Not Hispanic or Latino	1123	87.9%
Baseline Clinical Characteristics[a]		
• Pregnant	104	8.1%
• With menses at enrollment	80	6.3%
• Using anti-fungals in ≤ 24 hours	50*	3.9%

• Using antibiotics in ≤ 24 hours	24*	1.9%
• Using estrogen therapy in ≤ 24 hours	25	2.0%
• With recurrent symptoms	569	44.6%
• With intercourse in ≤ 24 hours	79	6.2%

*Two patients reported both anti-fungal and antibiotic use 24 hours prior to specimen collection

[a] The stratification of clinical characteristics data does not total N=1277. Patients could exhibit multiple characteristics.

Clinical performance of the analytes reported by the Xpert Xpress MVP test performed on the GeneXpert Xpress System by untrained users is presented in Table 10.

Table 10. Clinical Performance of the Xpert Xpress MVP Test

	Clinician-collected (CVS)		**Self-collected (SVS)**	
	Sensitivity/PPA (95% CI)	**Specificity/NPA (95% CI)**	**Sensitivity/PPA (95% CI)**	**Specificity/NPA (95% CI)**
BV	92.9% 429/462[a] (90.1% - 94.9%)	94.5% 719/761[b] (92.6% - 95.9%)	93.5% 434/464[c] (90.9% - 95.4%)	93.6% 711/760[d] (91.6% - 95.1%)
Candida group*	98.1% 360/367[e] (96.1% - 99.1%)	94.9% 820/864[f] (93.2% - 96.2%)	97.8% 359/367[g] (95.8% - 98.9%)	92.9% 804/865[h] (91.0% - 94.5%)
Candida glab-krus Fresh Prospective	94.1% 32/34[i] (80.9% - 98.4%)	99.8% 1195/1197[j] (99.4% - 99.9%)	100% 33/33 (89.6% - 100%)	99.7% 1195/1199[k] (99.1% - 99.9%)
Candida glab-krus Contrived**	99.0% 98/99[l] (94.5% - 99.8%)	96.4% 27/28[m] (82.3% - 99.4%)	N/A	N/A
TV Fresh Prospective	98.0% 48/49[n] (89.3% - 99.6%)	99.6% 1155/1160[o] (99.0% - 99.8%)	97.9% 47/48[p] (89.1% - 99.6%)	99.7% 1159/1162[q] (99.2% - 99.9%)
TV Contrived**	94.4% 84/89[r] (87.5% - 97.6%)	100% 29/29 (88.3% - 100%)	N/A	N/A

PPA: Positive Percent Agreement; NPA: Negative Percent Agreement; 95% CI: 95% score confidence interval; N/A: Not Applicable

*Target includes *C. albicans*, *C. tropicalis*, *C. parapsilosis*, *C. dubliniensis*

**Contrived specimens were prepared using individual negative clinical CVS and SVS specimens. See Table 22 for contrived testing results stratified by *Candida glabrata* and *Candida krusei*. See Table 28 for TV contrived testing results.

[a] 33 CVS specimens were negative for BV by the Xpert Xpress MVP test; testing results with a second FDA-cleared NAAT showed that 15 specimens were negative for BV and 18 specimens were positive for BV

[b] 42 CVS specimens were positive for BV by the Xpert Xpress MVP test; testing results with a second FDA-cleared NAAT showed that 21 specimens were negative for BV and 21 specimens were positive for BV

[c] 30 SVS specimens were negative for BV by the Xpert Xpress MVP test; testing results with a second FDA-cleared NAAT showed that 9 specimens were negative for BV and 21 specimens were positive for BV

[d] 49 SVS specimens were positive for BV by the Xpert Xpress MVP test; testing results with a second FDA-cleared NAAT showed that 20 specimens were positive for BV and 29 specimens were negative for BV

[e] 7 CVS specimens were negative for Candida group species by the Xpert Xpress MVP test; testing results with an FDA-cleared NAAT showed that 5 specimens were negative for Candida group species and 2 specimens were positive for Candida group species

[f] 44 CVS specimens were positive for Candida group species by the Xpert Xpress MVP test; testing results with an FDA-cleared NAAT showed that 25 specimens were positive for Candida group species and 19 specimens were negative for Candida group species

[g] 8 SVS specimens were negative for Candida group species by the Xpert Xpress MVP test; testing results with an FDA-cleared NAAT showed that 4 specimens were negative for Candida group species and 4 specimens were positive for Candida group species

[h] 61 SVS specimens were positive for Candida group species by the Xpert Xpress MVP test; testing results with an FDA-cleared NAAT showed that 30 specimens were positive for Candida group species and 31 specimens were negative for Candida group species

[i] 2 CVS specimens were negative for Candida glab-krus by the Xpert Xpress MVP test; testing results with an FDA-cleared NAAT showed that 1 specimen was negative for Candida glab-krus and 1 specimen was positive for Candida glab-krus

[j] 2 CVS specimens were positive for Candida glab-krus by the Xpert Xpress MVP test; testing results with an FDA-cleared NAAT showed that 2 specimens were negative for Candida glab-krus
[k] 4 SVS specimens were positive for Candida glab-krus by the Xpert Xpress MVP test; testing results with an FDA-cleared NAAT showed that 4 specimens were negative for Candida glab-krus
[l] 1 false negative was a low positive specimen prepared at 1.8× LoD.
[m] 1 false positive was detected at a Ct value of 39.3 which is below the LoD of the Candida glab-krus target.
[n] 1 CVS specimen was negative for TV by the Xpert Xpress MVP test; testing results with a second FDA-cleared NAAT showed that 1 specimen was positive for TV
[o] 5 CVS specimens were positive for TV by the Xpert Xpress MVP test; testing results with a second FDA-cleared NAAT showed that 4 specimens were positive for TV and one specimen had no result
[p] 1 SVS specimen was negative for TV by the Xpert Xpress MVP test; testing results with a second FDA-cleared NAAT showed that 1 specimen was positive for TV
[q] 3 SVS specimens were positive for TV by the Xpert Xpress MVP test; testing with a second FDA-cleared NAAT showed that 3 specimens were positive for TV
[r] 3 false negatives were low positive specimens prepared at 1.7× LoD; 2 false negatives were moderate positive specimens prepared at 8× LoD. These samples may have contained clinical background with more inhibition.

Tables 11, 12, and 13 show BV performance for clinician-collected (CVS) and self-collected (SVS) vaginal swab specimens stratified by age group, race/ethnicity, and patient clinical condition, respectively.

Table 11. BV Performance in Symptomatic Patients Stratified by Age Group

Age Group (Years)	Clinician-collected (CVS)		Self-collected (SVS)	
	PPA (95% CI)	NPA (95% CI)	PPA (95% CI)	NPA (95% CI)
14-17	100% 1/1 (20.7% - 100%)	100% 1/1 (20.7% - 100%)	100% 1/1 (20.7% - 100%)	100% 1/1 (20.7% - 100%)
18-29	94.4% 219/232 (90.7% - 96.7%)	92.0% 263/286 (88.2% - 94.6%)	94.4% 220/233 (90.7% - 96.7%)	91.3% 261/286 (87.4% - 94.0%)
30-39	93.9% 123/131 (88.4% - 96.9%)	96.0% 170/177 (92.1% - 98.1%)	94.7% 126/133 (89.5% - 97.4%)	93.8% 166/177 (89.2% - 96.5%)
40-49	93.0% 66/71 (84.6% - 97.0%)	93.7% 118/126 (88.0% - 96.7%)	94.4% 67/71 (86.4% - 97.8%)	92.9% 118/127 (87.1% - 96.2%)
≥ 50	74.1% 20/27 (55.3% - 86.8%)	97.7% 167/171 (94.1% - 99.1%)	76.9% 20/26 (58.0% - 89.0%)	97.6% 165/169 (94.1% - 99.1%)

Table 12. BV Performance in Symptomatic Patients Stratified by Race/Ethnicity

Race/Ethnicity	Clinician-collected (CVS)		Self-collected (SVS)	
	PPA (95% CI)	NPA (95% CI)	PPA (95% CI)	NPA (95% CI)
White	87.2% 170/195 (81.8% - 91.2%)	95.7% 511/534 (93.6% - 97.1%)	88.3% 174/197 (83.1% - 92.1%)	94.6% 504/533 (92.3% - 96.2%)
Black or African American	97.2% 239/246 (94.2% - 98.6%)	91.2% 176/193 (86.3% - 94.4%)	97.5% 238/244 (94.7% - 98.9%)	91.2% 177/194 (86.4% - 94.5%)
Asian	83.3% 5/6 (43.6% - 97.0%)	91.7% 11/12 (64.6% - 98.5%)	83.3% 5/6 (43.6% - 97.0%)	83.3% 10/12 (55.2% - 95.3%)
American Indian or Alaska Native	100% 3/3	83.3% 5/6	100% 3/3	83.3% 5/6

	(43.9% - 100%)	(43.6% - 97.0%)	(43.9% - 100%)	(43.6% - 97.0%)
Native Hawaiian or Other Pacific Islander	100% 1/1 (20.7% - 100%)	100% 1/1 (20.7% - 100%)	100% 1/1 (20.7% - 100%)	100% 1/1 (20.7% - 100%)
Mixed/Unknown	100% 11/11 (74.1% - 100%)	100% 15/15 (79.6% - 100%)	100% 13/13 (77.2% - 100%)	100% 14/14 (78.5% - 100%)
Hispanic or Latino	92.5% 49/53 (82.1% - 97.0%)	95.7% 88/92 (89.3% - 98.3%)	94.4% 51/54 (84.9% - 98.1%)	95.6% 87/91 (89.2% - 98.3%)

Table 13. BV Performance in Symptomatic Patients Stratified by Clinical Condition

Clinical Condition	Clinician-collected (CVS)		Self-collected (SVS)	
	PPA (95% CI)	NPA (95% CI)	PPA (95% CI)	NPA (95% CI)
Pregnant patients	95.5% 42/44 (84.9% - 98.7%)	87.0% 47/54 (75.6% - 93.6%)	97.7% 43/44 (88.2% - 99.6%)	88.9% 48/54 (77.8% - 94.8%)
Patients with menses at enrollment	97.1% 33/34 (85.1% - 99.5%)	92.7% 38/41 (80.6% - 97.5%)	93.8% 30/32 (79.9% - 98.3%)	88.1% 37/42 (75.0% - 94.8%)
Patients using anti-fungals in ≤ 24 hours*	87.5% 14/16 (64.0% - 96.5%)	100% 33/33 (89.6% - 100%)	82.4% 14/17 (59.0% - 93.8%)	100% 33/33 (89.6% - 100%)
Patients using antibiotics in ≤ 24 hours*	100% 8/8 (67.6% - 100%)	93.3% 14/15 (70.2% - 98.8%)	100% 8/8 (67.6% - 100%)	93.3% 14/15 (70.2% - 98.8%)
Patients using estrogen therapy in ≤ 24 hours	75.0% 3/4 (30.1% - 95.4%)	100% 21/21 (84.5% - 100%)	66.7% 2/3 (20.8% - 93.8%)	100% 21/21 (84.5% - 100%)
Patients with recurrent symptoms	94.1% 255/271 (90.6% - 96.3%)	93.7% 253/270 (90.1% - 96.0%)	94.5% 257/272 (91.1% - 96.6%)	92.2% 249/270 (88.4% - 94.9%)
Patients with intercourse in ≤ 24 hours	89.7% 26/29 (73.6% - 96.4%)	91.1% 41/45 (79.3% - 96.5%)	92.9% 26/28 (77.4% - 98.0%)	95.6% 43/45 (85.2% - 98.8%)

*Two patients reported both anti-fungal and antibiotic use 24 hours prior to specimen collection.

Candida Group Performance

Table 14 below includes overall performance for detection of Candida group (*Candida albicans*, *Candida tropicalis*, *Candida parapsilosis* and/or *Candida dubliniensis*) as observed in the prospective clinical study. Candida group performance is stratified by each applicable *Candida* species identified by the reference method (i.e., yeast culture and MALDI-TOF MS). The sensitivity for *Candida* group detection was 98.1% and 97.8%, for clinician-collected vaginal swabs (CVS) and self-collected vaginal swabs (SVS), respectively.

Table 14. Sensitivity of the Candida Group Target by Species

Species	Sensitivity (95% CI)	
	Clinician-collected (CVS)	Self-collected (SVS)
Candida albicans	98.5% 337/342 (96.6% - 99.4%)	98.0% 335/342 (95.8% - 99.0%)
Co-infection *Candida albicans* and *Candida glabrata*	100% 7/7 (64.6% - 100%)	100% 7/7 (64.6% - 100%)

Co-infection *Candida albicans* and *Candida krusei*	100% 1/1 (20.7% - 100%)	100% 1/1 (20.7% - 100%)
Co-infection *Candida albicans* and other yeast	75.0% 3/4 (30.1% - 95.4%)	75.0% 3/4 (30.1% - 95.4%)
Candida dubliniensis	100% 5/5 (56.6% - 100%)	100% 5/5 (56.6% - 100%)
Candida parapsilosis	80.0% 4/5 (37.6% - 96.4%)	100.0% 5/5 (56.6% - 100%)
Candida tropicalis	100% 3/3 (43.9% - 100%)	100% 3/3 (43.9% - 100%)
Overall	**98.1%** **360/367[a]** **(96.1% - 99.1%)**	**97.8%** **359/367[b]** **(95.8% - 98.9%)**

[a] 7 CVS specimens were negative for Candida group species by the Xpert Xpress MVP test; testing results with an FDA-cleared NAAT showed that 5 specimens were negative for Candida group species and 2 specimens were positive for Candida group species

[b] 8 SVS specimens were negative for Candida group species by the Xpert Xpress MVP test; testing results with an FDA-cleared NAAT showed that 4 specimens were negative for Candida group species and 4 specimens were positive for Candida group species

Clinical performance for the Candida group target stratified by age group, race/ethnicity, and clinical condition is presented in Table 15, 16, and 17 respectively.

Table 15. Candida Group Performance in Symptomatic Patients Stratified by Age Group

Age Group (Years)	Clinician-collected (CVS)		Self-collected (SVS)	
	PPA (95% CI)	**NPA (95% CI)**	**PPA (95% CI)**	**NPA (95% CI)**
14-17	100% 2/2 (34.2% - 100%)	N/A	100% 2/2 (34.2% - 100%)	N/A
18-29	98.1% 208/212 (95.2% - 99.3%)	94.6% 296/313 (91.5% - 96.6%)	97.2% 207/213 (94.0% - 98.7%)	91.7% 287/313 (88.1% - 94.2%)
30-39	97.8% 88/90 (92.3% - 99.4%)	93.7% 207/221 (89.6% - 96.2%)	97.8% 88/90 (92.3% - 99.4%)	92.8% 207/223 (88.7% - 95.5%)
40-49	100% 42/42 (91.6% - 100%)	95.5% 148/155 (91.0% - 97.8%)	100% 42/42 (91.6% - 100%)	93.6% 146/156 (88.6% - 96.5%)
≥ 50	95.2% 20/21 (77.3% - 99.2%)	96.6% 169/175 (92.7% - 98.4%)	100% 20/20 (83.9% - 100%)	94.8% 164/173 (90.4% - 97.2%)

Table 16. Candida Group Performance in Symptomatic Patients Stratified by Race/Ethnicity

Race/Ethnicity	Clinician-collected (CVS)		Self-collected (SVS)	
	PPA (95% CI)	**NPA (95% CI)**	**PPA (95% CI)**	**NPA (95% CI)**
White	98.5% 199/202	96.0% 509/530	98.0% 198/202	93.8% 498/531

	(95.7% - 99.5%)	(94.0% - 97.4%)	(95.0% - 99.2%)	(91.4% - 95.5%)
Black or African American	97.3% 145/149 (93.3% - 99.0%)	93.2% 272/292 (89.7% - 95.5%)	98.0% 147/150 (94.3% - 99.3%)	91.7% 266/290 (88.0% - 94.4%)
Asian	100% 6/6 (61.0% - 100%)	84.6% 11/13 (57.8% - 95.7%)	83.3% 5/6 (43.6% - 97.0%)	84.6% 11/13 (57.8% - 95.7%)
American Indian or Alaska Native	100% 1/1 (20.7% - 100%)	87.5% 7/8 (52.9% - 97.8%)	100% 1/1 (20.7% - 100%)	87.5% 7/8 (52.9% - 97.8%)
Native Hawaiian or Other Pacific Islander	N/A	100% 2/2 (34.2% - 100%)	N/A	100% 2/2 (34.2% - 100%)
Mixed/Unknown	100% 9/9 (70.1% - 100%)	100% 19/19 (83.2% - 100%)	100% 8/8 (67.6% - 100%)	95.2% 20/21 (77.3% - 99.2%)
Hispanic or Latino	100% 46/46 (92.3% - 100%)	95.1% 97/102 (89.0% - 97.9%)	100% 45/45 (92.1% - 100%)	93.2% 96/103 (86.6% - 96.7%)

Table 17. Candida Group Performance in Symptomatic Patients Stratified by Clinical Condition

Clinical Condition	Clinician-collected (CVS)		Self-collected (SVS)	
	PPA (95% CI)	NPA (95% CI)	PPA (95% CI)	NPA (95% CI)
Pregnant patients	100% 48/48 (92.6% - 100%)	96.0% 48/50 (86.5% - 98.9%)	95.8% 46/48 (86.0% - 98.9%)	96.0% 48/50 (86.5% - 98.9%)
Patients with menses at enrollment	94.4% 17/18 (74.2% - 99.0%)	98.3% 57/58 (90.9% - 99.7%)	100% 18/18 (82.4% - 100%)	98.2% 56/57 (90.7% - 99.7%)
Patients using anti-fungals in ≤ 24 hours*	100% 17/17 (81.6% - 100%)	83.9% 26/31 (67.4% - 92.9%)	94.1% 16/17 (73.0% - 99.0%)	84.4% 27/32 (68.2% - 93.1%)
Patients using antibiotics in ≤ 24 hours*	100% 7/7 (64.6% - 100%)	86.7% 13/15 (62.1% - 96.3%)	100% 7/7 (64.6% - 100%)	86.7% 13/15 (62.1% - 96.3%)
Patients using estrogen therapy in ≤ 24 hours	85.7% 6/7 (48.7% - 97.4%)	100% 18/18 (82.4% - 100%)	100% 6/6 (61.0% - 100%)	100% 18/18 (82.4% - 100%)
Patients with recurrent symptoms	97.8% 179/183 (94.5% - 99.1%)	96.7% 357/369 (94.4% - 98.1%)	97.2% 176/181 (93.7% - 98.8%)	93.3% 347/372 (90.3% - 95.4%)
Patients with intercourse in ≤ 24 hours	100% 24/24 (86.2% - 100%)	100% 53/53 (93.2% - 100%)	100% 25/25 (86.7% - 100%)	98.0% 50/51 (89.7% - 99.7%)

*Two patients reported both anti-fungal and antibiotic use 24 hours prior to specimen collection.

Candida glabrata/*Candida krusei* (Candida glab-krus) Performance

As presented in Table 10 above, performance of the Candida glab-krus target was evaluated using fresh CVS and SVS specimens and contrived specimens prepared using either clinician-collected or self-collected negative vaginal swab matrix. Table 18 shows *Candida glabrata*/*Candida krusei* overall performance observed in the prospective clinical study stratified by each species as identified by the reference method (i.e., yeast culture and MALDI-TOF MS). The Xpert Xpress MVP test does not differentiate between *Candida*

glabrata and *Candida krusei* and results are presented as a slash line. The sensitivity of the Candida glab/krus target was 94.1% and 100% for clinician-collected vaginal swabs (CVS) and self-collected vaginal swabs (SVS), respectively as displayed in Table 18.

Table 18. Sensitivity of the Candida glab-krus Target by Species (Fresh Specimens Only)

Species	Sensitivity (95% CI)	
	Clinician-collected (CVS)	Self-collected (SVS)
Candida glabrata	96.7% 29/30 (83.3% - 99.4%)	100% 29/29 (88.3% - 100%)
Candida krusei	75.0% 3/4 (30.1% - 95.4%)	100% 4/4 (51.0% - 100%)
Overall	**94.1%** **32/34[a]** **(80.9% - 98.4%)**	**100.0%** **33/33** **(89.6% - 100%)**

[a] 2 CVS specimens were negative for Candida glab-krus by the Xpert Xpress MVP test; testing results with a second FDA-cleared NAAT showed that 1 specimen was negative for Candida glab-krus and 1 specimen was positive for Candida glab-krus

Clinical performance for the Candida glab-krus target stratified by age group, race/ethnicity, and clinical condition is presented in Table 19, 20, and 21 respectively.

Table 19. Candida glab-krus Performance in Symptomatic Patients Stratified by Age Group

Age Group (Years)	Clinician-collected (CVS)		Self-collected (SVS)	
	Sensitivity (95% CI)	Specificity (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)
14-17	N/A	100% 2/2 (34.2% - 100%)	N/A	100% 2/2 (34.2% - 100%)
18-29	75.0% 6/8 (40.9% - 92.9%)	99.6% 512/514 (98.6% - 99.9%)	100% 7/7 (64.6% - 100%)	100% 519/519 (99.3% - 100%)
30-39	100% 10/10 (72.2% - 100%)	100% 301/301 (98.7% - 100%)	100% 10/10 (72.2% - 100%)	99.0% 300/303 (97.1% - 99.7%)
40-49	100% 7/7 (64.6% - 100%)	100% 190/190 (98.0% - 100%)	100% 7/7 (64.6% - 100%)	99.5% 190/191 (97.1% - 99.9%)
≥ 50	100% 9/9 (70.1% - 100%)	100% 187/187 (98.0% - 100%)	100% 9/9 (70.1% - 100%)	100% 184/184 (98.0% - 100%)

Table 20. Candida glab-krus Performance in Symptomatic Patients Stratified by Race/Ethnicity

Race/Ethnicity	Clinician-collected (CVS)		Self-collected (SVS)	
	PPA (95% CI)	NPA (95% CI)	PPA (95% CI)	NPA (95% CI)
White	90.0% 18/20 (69.9% - 97.2%)	99.7% 710/712 (99.0% - 99.9%)	100% 20/20 (83.9% - 100%)	99.4% 709/713 (98.6% - 99.8%)

Black or African American	100% 13/13 (77.2% - 100%)	100% 428/428 (99.1% - 100%)	100% 12/12 (75.8% - 100%)	100% 428/428 (99.1% - 100%)
Asian	N/A	100% 19/19 (83.2% - 100%)	N/A	100% 19/19 (83.2% - 100%)
American Indian or Alaska Native	N/A	100% 9/9 (70.1% - 100%)	N/A	100% 9/9 (70.1% - 100%)
Native Hawaiian or Other Pacific Islander	N/A	100% 2/2 (34.2% - 100%)	N/A	100% 2/2 (34.2% - 100%)
Mixed/Unknown	100% 1/1 (20.7% - 100%)	100% 27/27 (87.5% - 100%)	100% 1/1 (20.7% - 100%)	100% 28/28 (87.9% - 100%)
Hispanic or Latino	100% 5/5 (56.6% - 100%)	100% 143/143 (97.4% - 100%)	100% 5/5 (56.6% - 100%)	100% 143/143 (97.4% - 100%)

Table 21. Candida glab-krus Performance in Symptomatic Patients Stratified by Clinical Condition

Clinical Condition	Clinician-collected (CVS)		Self-collected (SVS)	
	PPA (95% CI)	NPA (95% CI)	PPA (95% CI)	NPA (95% CI)
Pregnant patients	100% 1/1 (20.7% - 100%)	100% 97/97 (96.2% - 100%)	95.8% 46/48 (86.0% - 98.9%)	96.0% 48/50 (86.5% - 98.9%)
Patients with menses at enrollment	100% 3/3 (43.9% - 100%)	100% 73/73 (95.0% - 100%)	100% 18/18 (82.4% - 100%)	98.2% 56/57 (90.7% - 99.7%)
Patients using anti-fungals in ≤ 24 hours*	N/A	100% 48/48 (92.6% - 100%)	94.1% 16/17 (73.0% - 99.0%)	84.4% 27/32 (68.2% - 93.1%)
Patients using antibiotics in ≤ 24 hours*	100% 1/1 (20.7% - 100%)	100% 21/21 (84.5% - 100%)	100% 7/7 (64.6% - 100%)	86.7% 13/15 (62.1% - 96.3%)
Patients using estrogen therapy in ≤ 24 hours	N/A	100% 25/25 (86.7% - 100%)	100% 6/6 (61.0% - 100%)	100% 18/18 (82.4% - 100%)
Patients with recurrent symptoms	100% 14/14 (78.5% - 100%)	99.6% 536/538 (98.7% - 99.9%)	97.2% 176/181 (93.7% - 98.8%)	93.3% 347/372 (90.3% - 95.4%)
Patients with intercourse in ≤ 24 hours	100% 2/2 (34.2% - 100%)	98.7% 74/75 (92.8% - 99.8%)	100% 25/25 (86.7% - 100%)	98.0% 50/51 (89.7% - 99.7%)

*Two patients reported both anti-fungal and antibiotic use 24 hours prior to specimen collection.

Contrived Specimen Testing for Candida glab-krus Target

To supplement the prospective clinical study for lower prevalence analytes, additional testing of contrived specimens was performed for *Candida glabrata* and *Candida krusei*. Each individual contrived specimen was prepared using a unique negative clinical vaginal swab matrix (either a CVS or SVS specimen matrix) inoculated with quantified preparations of *Candida glabrata* or *Candida krusei* at varying concentrations as shown in Table 22. A total of 100 contrived positive samples spanning different testing concentrations and 30 negative

samples (simulated vaginal swab matrix) were tested. Performance of the Xpert Xpress MVP test for contrived *C. glabrata* and *C. krusei s*pecimens is presented in Table 22.

Table 22. Performance of Contrived *Candida glabrata* and *Candida krusei* Specimens

Contrived Specimen	Testing Concentration (X LoD)	# of Tested Replicates	PPA (95% CI)	NPA (95% CI)
Candida glabrata	<2× Low positive	25	96.0% 24/25* (80.5% - 99.3%)	N/A
	<10× Moderate positive	20	100% 20/20 (83.9% - 100%)	N/A
	<20× High positive	5	100% 5/5 (56.5% - 100%)	N/A
Candida krusei	<2× Low positive	25	100.0% 25/25 (86.7% - 100%)	N/A
	<10× Moderate positive	20	100.0% 20/20 (83.9% - 100%)	N/A
	<20× High positive	5[a]	100.0% 4/4 (51.0% - 100%)	N/A
Negative	N/A	30[b]	N/A	96.4% 27/28** (82.3% - 99.4%)
Total		**130[c]**	**99.0% 98/99 (89.5%-99.6%)**	**96.4% 27/28 (82.3% - 99.4%)**

N/A; Not Applicable

[a] A total of five specimens were tested. Four specimens gave valid results and were included in the calculation. One specimen was not included in the calculation due to a final non-determinate result.

[b] A total of 30 specimens were tested. 28 specimens gave valid results and were included in the calculation. Two specimens were not included in the calculation due to final non-determinate results.

[c] Of the 130 tested contrived specimens, three gave initial non-determinate results. Two of the three (2/3) specimens were retested and generated final non-determinate results. One of the three (1/3) specimens was not retested. Both the initial and final non-determinate rates were 2.3% (3/130).

*One false negative was a low positive specimen prepared at 1.8× LoD.

**One false positive was detected at a Ct value of 39.3 which is below the mean Ct at the LoD of the *Candida* glab-krus target.

Trichomonas vaginalis (TV) Performance

As presented in Table 10, performance of the TV target was evaluated using fresh CVS and SVS specimens and contrived specimens prepared using either clinician-collected or self-collected negative vaginal swab matrix. Table 24 shows TV overall performance observed in the prospective clinical study stratified by collection method as identified by the comparator method of the Patient Infected Status algorithm (i.e., culture and FDA-cleared NAAT). Table 28 includes results for contrived TV specimens.

Table 24. Performance of the TV Target in Fresh Specimens

Organism	PPA (95% CI)	
	Clinician-collected (CVS)	Self-collected (SVS)
	PPA (95% CI)	PPA (95% CI)

Trichomonas vaginalis (TV)	98.0% 48/49[a] (89.3% - 99.6%)	97.9% 47/48[b] (89.1% - 99.6%)

[a] 1 CVS specimen was negative for TV by the Xpert Xpress MVP test; testing results with a second FDA-cleared NAAT showed that 1 specimen was positive for TV

[b] 1 SVS specimen was negative for TV by the Xpert Xpress MVP test; testing results with a second FDA-cleared NAAT showed that 1 specimen was positive for TV

Clinical performance for the TV target stratified by age group, race and ethnicity, and clinical condition is presented in Table 25, 26, and 27 respectively.

Table 25. TV Performance in Symptomatic Patients Stratified by Age Group

Age Group (Years)	Clinician-collected (CVS)		Self-collected (SVS)	
	PPA (95% CI)	NPA (95% CI)	PPA (95% CI)	NPA (95% CI)
14-17	N/A	100% 2/2 (34.2% - 100%)	N/A	100% 2/2 (34.2% - 100%)
18-29	100% 21/21 (84.5% - 100%)	99.8% 488/489 (98.8% - 99.9%)	100% 21/21 (84.5% - 100%)	100% 490/490 (99.2% - 100%)
30-39	100% 15/15 (79.6% - 100%)	99.3% 286/288 (97.5% - 99.8%)	100% 15/15 (79.6% - 100%)	99.3% 288/290 (97.5% - 99.8%)
40-49	90.9% 10/11 (62.3% - 98.4%)	99.5% 185/186 (97.0% - 99.9%)	90.0% 9/10 (59.6% - 98.2%)	100% 188/188 (98.0% - 100%)
≥ 50	100% 2/2 (34.2% - 100%)	99.5% 194/195 (97.2% - 99.9%)	100% 2/2 (34.2% - 100%)	99.5% 191/192 (97.1% - 99.9%)

Table 26. TV Performance in Symptomatic Patients Stratified by Race/Ethnicity

Race/Ethnicity	Clinician-collected (CVS)		Self-collected (SVS)	
	PPA (95% CI)	NPA (95% CI)	PPA (95% CI)	NPA (95% CI)
White	100% 13/13 (77.2% - 100%)	99.9% 706/707 (99.2% - 99.9%)	100% 13/13 (77.2% - 100%)	100% 708/708 (99.5% - 100%)
Black or African American	97.1% 34/35 (85.5% - 99.5%)	99.0% 395/399 (97.5% - 99.6%)	97.1% 33/34 (85.1% - 99.5%)	99.2% 396/399 (97.8% - 99.7%)
Asian	N/A	100% 18/18 (82.4% - 100%)	N/A	100% 18/18 (82.4% - 100%)
American Indian or Alaska Native	100% 1/1 (20.7% - 100%)	100% 8/8 (67.6% - 100%)	100% 1/1 (20.7% - 100%)	100% 8/8 (67.6% - 100%)
Native Hawaiian or Other Pacific Islander	N/A	100% 2/2 (34.2% - 100%)	N/A	100% 2/2 (34.2% - 100%)
Mixed/ Unknown	N/A	100% 26/26 (87.1% - 100%)	N/A	100% 27/27 (87.5% - 100%)
Hispanic or Latino	100% 5/5 (56.6% - 100%)	100% 138/138 (97.3% - 100%)	100% 5/5 (56.6% - 100%)	100% 138/138 (97.3% - 100%)

Table 27. TV Performance in Symptomatic Patients Stratified by Clinical Condition

Clinical Condition	Clinician-collected (CVS)		Self-collected (SVS)	
	PPA (95% CI)	NPA (95% CI)	PPA (95% CI)	NPA (95% CI)
Pregnant patients	100% 4/4 (51.0% - 100%)	100% 89/89 (95.9% - 100%)	100% 4/4 (51.0% - 100%)	100% 89/89 (95.9% - 100%)
Patients with menses at enrollment	80.0% 4/5 (37.6% - 96.4%)	100% 68/68 (94.7% - 100%)	80.0% 4/5 (37.6% - 96.4%)	100% 67/67 (94.6% - 100%)
Patients using anti-fungals in ≤ 24 hours*	100% 2/2 (34.2% - 100%)	97.9% 46/47 (88.9% - 99.6%)	100% 2/2 (34.2% - 100%)	97.9% 47/48 (89.1% - 99.6%)
Patients using antibiotics in ≤ 24 hours*	0% 0/1 (0% - 79.3%)	100% 22/22 (85.1% - 100%)	0% 0/1 (0% - 79.3%)	100% 22/22 (85.1% - 100%)
Patients using estrogen therapy in ≤ 24 hours	100% 1/1 (20.7% - 100%)	100% 24/24 (86.2% - 100%)	100% 1/1 (20.7% - 100%)	100% 23/23 (85.7% - 100%)
Patients with recurrent symptoms	96.4% 27/28 (82.3% - 99.4%)	99.2% 500/504 (98.0% - 99.7%)	96.3% 26/27 (81.7% - 99.3%)	99.4% 503/506 (98.3% - 99.8%)
Patients with intercourse in ≤ 24 hours	100% 3/3 (43.9% - 100%)	100% 71/71 (94.9% - 100%)	100% 3/3 (43.9% - 100%)	100% 70/70 (94.8% - 100%)

*Two patients reported both anti-fungal and antibiotic use 24 hours prior to specimen collection.

Contrived Specimen Testing for TV Target

Additional testing of contrived specimens in the hands of untrained users was performed for TV. Each individual contrived specimen was prepared using a unique negative clinical vaginal swab matrix (either a CVS or SVS specimen matrix) inoculated with a quantified preparation of TV as shown in Table 28. A total of 90 contrived positive samples spanning different testing concentrations and 30 negative samples (simulated vaginal swab matrix) were tested. Performance of the Xpert Xpress MVP test for contrived TV specimens is presented in Table 28.

Table 28. Performance for Contrived TV Specimens

Contrived Specimen	Testing Concentration (X LoD)	# of Tested Replicates	PPA (95% CI)	NPA (95% CI)
Trichomonas vaginalis (TV)	<2× Low positive	45	93.3% 42/45* (82.1%-97.7%)	N/A
	<10× Moderate positive	36	94.4% 34/36** (81.9% - 98.5%)	N/A
	<20× High positive	9[a]	100% 8/8 (67.6% - 100%)	N/A
Negative	N/A	30[b]	N/A	100.0% 29/29 (88.3% - 100%)
Total		**120[c]**	**94.4% 84/89 (87.5% - 97.6%)**	**100% 29/29 (88.3% - 100%)**

N/A; Not Applicable

[a] A total of nine specimens were tested. Eight specimens gave valid results and were included in the calculation. One specimen was not included in the calculation due to a final non-determinate result.
[b] A total of 30 specimens were tested. 29 specimens gave valid results and were included in the calculation. One specimen was not included in the calculation due to a final non-determinate result.
[c] Of the 120 contrived specimens that were tested, four gave initial non-determinate results. Two of the four (2/4) specimens gave valid retest results, and two of the four (2/4) specimens generated non-determinate retest results. The initial non-determinate rate was 3.3% (4/120), and the final non-determinate rate was 1.7% (2/120).
*Three false negatives were low positive specimens prepared at 1.7× LoD
**Two false negatives were moderate positive specimens prepared at 8× LoD. These samples may have contained clinical background with more inhibition.

Multi-Analyte Detection Rates in the Prospective Clinical Study

Rates of multi-target detection for the Xpert Xpress MVP test are presented in Table 29. A total of 16.3% of CVS specimens and 16.8% of SVS specimens resulted in positive results for more than one target in the Xpert Xpress MVP test. The most prevalent multi-target detection in both CVS and SVS specimens was a combination of BV and Candida group (11.3% and 11.8%, respectively), followed by a combination of BV and TV (2.4% and 2.3%, respectively).

Table 29. Rates of Multi-Target Detection by the Xpert Xpress MVP Test

Analytes Detected	Clinician-collected (CVS)	Self-collected (SVS)
BV, Candida group	11.3% 133/1181	11.8% 139/1182
BV, TV	2.4% 28/1181	2.3% 27/1182
BV, Candida group, TV	0.8% 10/1181	0.8% 9/1182
BV, Candida glab-krus	0.5% 6/1181	0.5% 6/1182
Candida group, Candida glab-krus	0.5% 6/1181	0.4% 5/1182
BV, Candida group, Candida glab-krus	0.3% 4/1181	0.7% 7/1182
Candida group, TV	0.4% 5/1181	0.4% 5/1182
Candida group, Candida glab-krus, TV	0.1% 1/1181	N/A
Total	**16.3% 193/1181**	**16.8% 198/1182**

The number of fresh specimens with positive results for more than one target as determined by the Xpert Xpress MVP test or reference/comparator methods are summarized in Table 30. where bolded values indicate concordant results and non-bolded values indicate discordant results. Among 1181 CVS specimens, 147 specimens yielded multi-target concordant results between the Xpert Xpress MVP test and reference/comparator methods. Of the 147 CVS specimens with concordant co-detections, 72.1% (106/147) had concordant BV and Candida group co-infections, and 15.0% (22/147) had concordant BV and TV co-infections. Among 1182 SVS specimens, 143 specimens yielded multi-target concordant results. Of the 143 SVS specimens with concordant co-detections, 71.3% (102/143) had concordant BV and Candida group co-infections, and 14.7% (21/143) had concordant BV and TV co-infections.

Table 30. Summary of the Multi-Target Detections by the Xpert Xpress MVP Test

	Infections	Reference/Comparator Methods (CVS/SVS)											
		BV	BV, Candida group	BV, Candida glab-krus	BV, Candida group, Candida glab-krus	BV, TV	BV, Candida group, TV	Candida group	Candida group, Candida glab-krus	Candida group, TV	Candida glab-krus	TV	Negative
Xpert Xpress MVP Test	BV		2/3	-	-	-	-	1/0	-	-	-	-	19/22
	BV, Candida group	10/18	**106/102**	-	1/0	-	-	14/17	1/0	-	-	-	1/2
	BV, Candida glab-krus	1/1	-	**3/2**	-	-	-	-	-	-	2/3	-	-
	BV, Candida group, Candida glab-krus	-	-	1/2	**3/4**	-	-	-	0/1	-	-	-	-
	BV, TV	2/2	-	-	-	**22/21**	1/1	-	-	-	-	3/3	-
	BV, Candida group, TV	-	-	-	-	2/2	**7/7**	-	-	1/0	-	-	-
	Candida group	1/3	11/12	-	-	-	-		-	-	-	-	22/28
	Candida group, Candida glab-krus	-	-	1/0	-	-	-	-	**3/3**	-	2/2	-	-
	Candida group, TV	-	-	-	-	-	-	1/0	-	**3/4**	-	-	1/1
	Candida group, Candida glab-krus, TV	-	-	-	-	-	-	-	-	-	1/0	-	-
	Candida glab-krus	-	-		-	-	-	-	-	-		-	1/3
	TV	-	-	-	-	-	-	-	-	-	-		-
	Negative	20/15	-	-	-	-	-	3/4	-	-	-	1/1	

Non-Determinate Rate (ND) in the Prospective Clinical Study

When a non-determinate (ND) result was generated (i.e., "INSTRUMENT ERROR" or "NO RESULT – REPEAT TEST"), a single retest of the specimen was performed according to instructions provided in the QRI and Instructions for Use (IFU). If the repeat test result was also ND, it was reported as such. If the repeat test generated a valid result, the valid result was reported. After initial testing of the 2544 eligible vaginal swabs (1269 CVS and 1275 SVS), 4.65% (59/1269) and 5.25% (67/1275) reported ND for clinician and self-collected vaginal swab specimens, respectively. Therefore, the initial ND rate for the Xpert Xpress MVP test was 4.95% (126/2544 = 4.95%). Following retesting, 0.63% (8/1269) and 1.02% (13/1275) remained ND for CVS and SVS specimens, respectively. The final ND rate was 0.82% (21/2544) after retesting as displayed in Table 31 below.

Table 31. ND Rate of Clinical Samples Tested in the Prospective Clinical Study

Collection Type	Non-Determinate (ND) Rate	
	Initial (%)	Final (%)
Clinician-collected (CVS)	4.65 59/1269	0.63 8/1269
Self-collected (SVS)	5.25 67/1275	1.02 13/1275

Total	**4.95** **126/2544**	**0.82** **21/2544**

D Clinical Cut-Off:

Not applicable.

E Expected Values/Reference Range:

Positivity rates in the symptomatic patient population, as observed in the prospective clinical study determined by the Xpert Xpress MVP test, were calculated from clinician-collected vaginal swab (CVS) and self-collected vaginal swab (SVS) specimens and are presented by target and by race/ethnicity in Table 32.

Table 32. Positivity Rates in Symptomatic Patients According to the Xpert Xpress MVP Test

	Target	Overall	Black/African American		White		Asian	Other*
			Hispanic/ Latino	Not Hispanic/ Latino	Hispanic/ Latino	Not Hispanic/ Latino		
CVS	BV	38.6% (476/1232)	55.6% (5/9)	58.6% (253/432)	35.1% (46/131)	24.8% (150/605)	33.3% (6/18)	43.2% (16/37)
	Candida group	32.7% (407/1246)	33.3% (3/9)	37.4% (164/438)	34.6% (46/133)	28.8% (175/608)	42.1% (8/19)	28.2% (11/39)
	Candida glab-krus	2.7% (34/1246)	0% (0/9)	3.0% (13/438)	3.0% (4/133)	2.6% (16/608)	0% (0/19)	2.6% (1/39)
	TV	4.4% (53/1220)	0% (0/9)	8.9% (38/427)	3.9% (5/129)	1.5% (9/600)	0% (0/18)	2.7% (1/37)
SVS	BV	39.5% (488/1234)	55.6% (5/9)	58.5% (252/431)	36.1% (48/133)	26.1% (158/605)	38.9% (7/18)	47.4% (18/38)
	Candida group	33.9% (423/1247)	33.3% (3/9)	38.9% (170/437)	35.1% (47/134)	30.4% (185/608)	36.8% (7/19)	27.5% (11/40)
	Candida glab-krus	3.0% (37/1247)	0% (0/9)	2.7% (12/437)	3.0% (4/134)	3.3% (20/608)	0% (0/19)	2.5% (1/40)
	TV	4.1% (50/1221)	0% (0/9)	8.5% (36/426)	3.8% (5/130)	1.3% (8/600)	0% (0/18)	2.6% (1/38)

*Including: American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, Mixed/Unknown

Although the Xpert Xpress MVP test is not intended for use in an asymptomatic patient population, *Candida* species and BV-associated organisms can be present as colonizing normal flora and could be detected by the assay. Positivity rates were calculated from CVS and SVS specimens collected from asymptomatic patients to assess how often patients who, despite being asymptomatic, had microbial flora associated with vaginosis and/or Candidiasis that could be detected by the Xpert Xpress MVP test. The asymptomatic study population was comprised of patients ≥ 14 years of age who had no signs and/or symptoms of vaginitis/vaginosis. A total of 168 CVS and SVS paired specimens were prospectively collected of which 166 CVS and SVS specimens were tested. Twelve specimens (8 CVS and 4 SVS) were excluded from analyses due to procedural deviations or final non-determinate results. Therefore, 158 and 162 CVS and SVS specimens, respectively were included in the positivity rate calculations which are presented by target and by race/ethnicity (most prevalent ethnic groups enrolled) in Table 33. The Xpert Xpress MVP vaginitis targets from CVS and SVS specimens were detected with rates from 17.1%-19.1% for Candida group to 4.4%-4.9% for Candida glab-krus. Positive BV results from asymptomatic individuals were generated for 32.9% and 31.5% of CVS and SVS specimens, respectively.

Table 33. Positivity Rates in Asymptomatic Patients According to the Xpert Xpress MVP Test

	Target	Overall	Black/African American^	White		Other*
				Hispanic/ Latino	Not Hispanic /Latino	
CVS	BV	32.9% (52/158)	51.0% (26/51)	25.5% (14/55)	19.5% (8/41)	36.4% (4/11)
	Candida group	17.1% (27/158)	25.5% (13/51)	16.4% (9/55)	7.3% (3/41)	18.2% (2/11)
	Candida glab-krus	4.4% (7/158)	2.0% (1/51)	5.5% (3/55)	4.9% (2/41)	9.1% (1/11)
SVS	BV	31.5% (51/162)	49.1% (26/53)	24.1% (13/54)	16.3% (7/43)	41.7% (5/12)
	Candida group	19.1% (31/162)	28.3% (15/53)	18.5% (10/54)	7.0% (3/43)	25.0% (3/12)
	Candida glab-krus	4.9% (8/162)	1.9% (1/53)	7.4% (4/54)	4.7% (2/43)	8.3% (1/12)

^Includes one Black/African American who was of Hispanic or Latino descent for CVS specimens; includes two Black/African Americans who were of Hispanic or Latino descent for SVS specimens.
*Including: American Indian or Alaska Native, Asian, Mixed/Unknown

VIII Proposed Labeling:

The labeling supports the finding of substantial equivalence for this device.

IX Conclusion:

The submitted information in this premarket notification is complete and supports a substantial equivalence decision.