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

A. 510(k) Number:

K143312

B. Purpose for Submission:

To obtain a substantial equivalence determination for the Portrait™ GBS Assay

C. Measurand:

cfb gene of *Streptococcus agalactiae* (Group B *Streptococcus*, GBS)

D. Type of Test:

Polymerase Chain Reaction (PCR) coupled with chip based detection

E. Applicant:

Great Basin Corporation

F. Proprietary and Established Names:

Portrait™ GBS Assay

G. Regulatory Information:

1. Regulation section:

   21 CFR 866.3740—Streptococcal spp. serological reagents

2. Classification:

   Class I

3. Product code:

   NJR-Nucleic Acid Amplification Assay System, Group B *Streptococcus*, Direct Specimen

   NSU-Instrumentation for Clinical Multiplex Test Systems

4. Panel:

   83, Microbiology

H. Intended Use:

1. Intended use(s):

   The Great Basin Portrait™ GBS Assay, performed on the PA500 Portrait™ Analyzer System, is a qualitative *in vitro* diagnostic test (IVD) for the detection of Group B *Streptococcus* (GBS) DNA from vaginal/rectal swabs from antepartum women following enrichment in LIM Broth for 18-29 hours. The assay utilizes automated sample preparation and polymerase chain reaction (PCR) to amplify a *cfb* gene sequence specific to the *Streptococcus agalactiae* (GBS) genome which is detected by hybridization probes immobilized on a silica chip surface.

   Results from the Portrait™ GBS Assay can be used as an aid in determining colonization status in antepartum women. The Portrait™ GBS Assay does not provide susceptibility results. Cultured isolates are needed for performing susceptibility testing as recommended for penicillin-allergic women.

   The Portrait™ GBS Assay is intended for use in clinical laboratory, hospital laboratory, and reference laboratory settings. The Portrait™ GBS Assay is not intended for point of care use.

2. Indication(s) for use:

   Same as the Intended Use.

3. Special conditions for use statement(s):

   - Prescription Use Only
   - The performance of this device has not been evaluated for specimen types other than LIM broth culture specimens from antepartum women

4. Special instrument requirements:

   The assay is to be used with the PA500 Portrait Analyzer System.

I. Device Description:

The Portrait GBS Assay is an automated *in vitro* diagnostic DNA test for the qualitative detection of Group B *Streptococcus* (GBS, *S. agalactiae*) DNA from enriched LIM broth cultures previously inoculated with vaginal/rectal swab specimens from antepartum women (35-37 weeks gestation). As part of the PA500 Portrait Analyzer System, the Portrait GBS Assay utilizes automated hot-start PCR technology to amplify target nucleic acid sequences

which are then detected with species-specific *S. agalactiae* DNA hybridization probes immobilized on a modified silicon chip surface. The full system includes the Portrait Analyzer, single-use Portrait GBS Assay Test Cartridge, control device (e.g. Laptop PC or Touchscreen), the Portrait data analysis software, and an optional barcode reader for data entry. The PA500 Portrait Analyzer System is designed to perform automated sample preparation, PCR, and optical chip-based detection with integrated data analysis in approximately 90 minutes.

J. Substantial Equivalence Information:

1. Predicate device name(s):

   illumigene® Group B *Streptococcus* (GBS) DNA Amplification Assay

2. Predicate 510(k) number(s):

   K112125

3. Comparison with predicate:

Similarities		
Item	Portrait GBS Assay	Predicate (K112125)
Intended Use	The Great Basin Portrait™ GBS Assay, performed on the PA500 Portrait™ Analyzer System, is a qualitative *in vitro* diagnostic test (IVD) for the detection of Group B *Streptococcus* (GBS) DNA from vaginal/rectal swabs from antepartum women following enrichment in LIM Broth for 18-29 hours. The assay utilizes automated sample preparation and polymerase chain reaction (PCR) to amplify a *cfb* gene sequence specific to the *Streptococcus agalactiae* (GBS) genome which is detected by hybridization probes immobilized on a silica chip surface. Results from the Portrait™ GBS Assay can be used as an aid in determining colonization status in antepartum women. The Portrait™ GBS Assay does not provide susceptibility results. Cultured isolates are needed for performing	The ***illumi***gene Group B *Streptococcus* (GBS) assay, performed on the ***illumi***pro-10, is a qualitative *in vitro* diagnostic for the detection of *Streptococcus agalactiae* in enriched cultures obtained from vaginal/rectal swab specimens from antepartum women. Enriched cultures are obtained by 18-24 hour incubation of vaginal/rectal swab specimens in selective broth medium, either Lim Broth or TransVag Broth. The ***illumi***gene GBS assay utilizes loop-mediated isothermal DNA amplification (LAMP) technology to detect *Streptococcus agalactiae* by targeting a segment of the *Streptococcus agalactiae* genome. Results from the ***illumi***gene GBS assay can be used as an aid in establishing the GBS colonization status of antepartum women. This assay does not diagnose or monitor

Similarities		
Item	Portrait GBS Assay	Predicate (K112125)
	susceptibility testing as recommended for penicillin-allergic women. The Portrait™ GBS Assay is intended for use in clinical laboratory, hospital laboratory, and reference laboratory settings. The Portrait™ GBS Assay is not intended for point of care use.	treatment for GBS infections. The ***illumi***gene GBS assay does not provide susceptibility results. Culture isolates are needed for performing susceptibility testing as recommended for penicillin-allergic women. ***illumi***gene Group B *Streptococcus* is intended for use in hospital, reference or state laboratory settings. The device is not intended for point-of-care use.
Qualitative/Quantitative	Qualitative	Same
Single-Use Test	Disposable, single-use test cartridge	Same
Automated	Yes	Same
Test Principle	DNA Amplification Assay	Same
Sample Type	Vaginal/rectal swabs enriched in LIM broth	Same
Organism Detection	Group B *Streptococcus* (*S. agalactiae*)	Same
Calibration	Not Required	Same

Differences		
Item	Portrait GBS Assay	Predicate
Sample Type Enrichment Culture	LIM broth culture	LIM broth and TransVag broth cultures
Assay Platform	PA500 Portrait Analyzer	***illumi***pro-10 Automated Isothermal Amplification and Detection System
DNA Amplification Technology	Polymerase chain reaction (PCR)	Loop-mediated isothermal DNA amplification (LAMP)
Target Sequence Detected	Unique sequence region of the *S. agalactiae cfb* gene	213 base pair sequence residing in the 593-805 base pair region of *S. agalactiae* genome Segment 3
Reagents	Each test cartridge pouch with integrated reaction buffers contains: Dilution Buffer, Sample extraction buffer, Wash Solution, Hybridization Buffer, Conjugate, Substrate, SPC, Amplification Reagents, chip with spotted probes.	***illumi***gene Control Reagent ***illumi***gene Reaction Buffer ***illumi***gene GBS Test Device ***illumi***gene Heat Treatment Tubes
Time to Result	90 minutes	60 minutes
Detection Method	Colorimetric (precipitate), optical	Visible light transmission

Differences		
Item	Portrait GBS Assay	Predicate
	reader, automated software for built-in result interpretation	(precipitate); automated software with built-in result interpretation
Clinical Sensitivity	97.9% [95% CI: 92.7-99.4%]	97.4% [95% CI: 91.9-99.0%]
Clinical Specificity	96.0% [95% CI: 93.5-97.6%]	92.3% [95% CI: 90.0%-94.1%]

K. Standard/Guidance Document Referenced (if applicable):

1. Guidance for the Content of PreMarket Submissions for Software Contained in Medical Devices, FDA May 11, 2005

2. Guidance on Informed Consent for In Vitro Diagnostic Device Studies Using Leftover Human Specimens that are Not Individually Identifiable, FDA April 25, 2006

3. ISO 14971—Application of risk management to medical devices

4. ISO 13485—Quality Management Systems—Requirements for regulatory purposes: Section 7:2003

5. EN 61010-1: 2010—Electrical Equipment for Measurement, Control, & Laboratory Use. Part 1: General Requirements.

6. EN 61326-1: 2006—Electrical Equipment for Measurement, Control, & Laboratory Use. EMC Requirements. General Requirements.

L. Test Principle:

The PA500 Portrait Analyzer automates and integrates sample lysis, genomic DNA extraction, amplification, and detection of target sequence using PCR technology. An aliquot of the enriched media culture is placed into the sample port of the Test Cartridge for processing. Multiple fluidic channels are used to move reagents through chambers where reagent mixing and sample processing occur.

Briefly, genomic DNA is extracted from microbial cells and diluted to reduce potential inhibitors of the PCR reaction. In a duplex PCR, biotin-labeled primers enable amplification of specific nucleic acid sequences within the *cfb* gene for identification of *S. agalactiae* species and to an additional sample processing control (SPC) bacterial construct. Following PCR, biotin-labeled, amplified target DNA sequences are hybridized to sequence specific capture probes immobilized on the silicon chip surface, then incubated with anti-biotin antibody conjugated to the horseradish peroxidase enzyme. The unbound conjugate is removed by washing, and tetramethylbenzidine (TMB) is added to produce a colored precipitate at the location of the probe/target sequence complex. The resulting signal is detected by the automated Portrait Optical Reader within the PA500 Portrait Analyzer System. A self-contained waste chamber within the Test Cartridge collects and stores reagent waste. All reagents are contained within the assay test cartridge.

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. Precision/Reproducibility:

A panel of five samples with varying concentrations of two different GBS strains [ATCC BAA1177 (GBS serotype Ia) and ATCC 12403 (GBS serotype III)] were tested by 2 operators each in triplicate on 5 non-consecutive days at 3 sites for a total of 90 replicates (30 at each site) tested for each sample. Eight different GBS Assay cartridge lots were used across the three testing sites.

Moderate positive (2-3X LoD) and low positive (1-2X LoD) concentrations of GBS strains were made by spiking the respective cultures into a negative clinical LIM broth matrix. True Negative samples consisted of only a negative clinical LIM broth matrix. The negative clinical LIM broth matrix was defined as clinical specimens made up of LIM broth matrix previously inoculated with vaginal/rectal swabs and determined to be GBS negative. All study participants were blinded to the identity and expected result for each sample. The results are summarized in Table 1.

Table 1. Summary of the Reproducibility Results.[a]

Specimen ID	In-House	Site 1 (external)	Site 2 (external)	% Total Agreement by Sample
GBS ATCC 12403 Moderate Positive	100% (30/30)	100% (30/30)	100% (30/30)	100% (90/90)
GBS ATCC 12403 Low Positive	90% (27/30)	96.7% (29/30)	100% (30/30)	95.6% (86/90)
GBS ATCC BAA 1177 Moderate Positive	100% (30/30)	100% (30/30)	100% (30/30)	100% (90/90)
GBS ATCC BAA 1177 Low Positive	96.7% (29/30)	100% (30/30)	100% (30/30)	98.9% (89/90)
True Negative (Clinical Matrix Only)	100% (30/30)	86.7% (26/30)	100% (29/29)[b]	95.5% (85/89)

[a]7 invalid results and 5 aborts were recorded upon initial testing of samples across all sites. Upon re-testing, 11 samples were resolved and gave expected results. One sample was not re-run.

[b]This reflects 29 runs out of 30 because one 'Invalid' run was not re-run.

The results for the reproducibility of the Portrait GBS Assay were within the expected percent agreement across all three sites.

b. Linearity/assay reportable range:

Not Applicable, The Portrait GBS Assay is a qualitative assay.

c. Traceability, Stability, Expected values (controls, calibrators, or methods):

Controls

Sample Processing Control (SPC): The SPC controls for all analytical steps in the procedure for each cartridge tested. The SPC is a strain of protein-stabilized *Bacillus* cells lyophilized within the Portrait GBS Test Cartridge. The SPC is enzymatically lysed concurrently with the sample specimen. A region of the SPC is targeted for amplification by the PCR and detected by target-specific capture probes on the chip surface. The SPC may not amplify in a high-positive specimen, and in this case will not be required during the diagnostic calling of a GBS Positive. If the SPC fails in the absence of GBS target detection, the test result will be INVALID and the test should be repeated.

Fiducial Controls: Establish orientation of the silicon chip for image analysis.

Hybridization Detection Control (HC): The HC consists of a biotinylated oligonucleotide that is complementary to a capture probe attached to the silicon chip surface. The HC confirms the integrity of all reagents after PCR and steps leading to signal generation and detection. Failure of HC detection results in an INVALID call, which indicates the test should be repeated.

LIM Broth Stability

The stability of LIM broth cultures was evaluated at room temperature for up to 16 hours and 2-8°C for up to 5 days. Two strains of GBS (ATCC BAA1177 and ATCC 12403) were spiked into negative clinical LIM broth matrix at 2X and 10X LoD and held across the claimed storage times. Under conditions of this study, all samples were identified correctly with no difference in performance at any time point tested.

d. Detection limit (LoD):

A study was performed to determine the limit of detection (LoD) of the Portrait GBS Assay with two different strains of GBS—ATCC strain 12403 (serotype III) and ATCC strain BAA1177 (serotype Ia). The strains tested were serially diluted into clinical LIM broth matrix previously inoculated with vaginal/rectal swabs and determined to be GBS negative. The initial analytical sensitivity was determined using 4-5 serial dilutions for each strain as shown in Table 2. The LoD was then established with 20 replicates of each strain. All concentrations were verified by colony counting (CFU/ml). The LoD is defined as the lowest concentration of GBS at which a minimum of 19 of 20 replicates were positive. The LoD results are shown in Table 3.

Table 2. Performance of the Portrait GBS Assay on serial dilutions of two GBS strains for initial analytical sensitivity study (CFU/ml and CFU/test)

GBS strains	Serotype	CFU/ml	CFU/test	GBS Positive Call
ATCC BAA1177	Ia	330	0.2	1/4
		1000	0.5	3/3*
		3,300	1.6	3/3*
		10,000	5.0	4/4
ATCC 12403	III	170	0.1	2/4
		860	0.4	3/4
		2,700	1.3	3/4
		8,600	4.2	4/4
		27,000	13.1	4/4

*This was a 4 run series but had one incomplete run (abort).

Table 3. Performance of the Portrait GBS Assay with 20 replicates of two GBS strains for establishing LoD (CFU/ml and CFU/test)

GBS strains	Serotype	CFU/ml	CFU/test	GBS Positive Call
ATCC BAA1177	Ia	5,000	2.4	20/20
ATCC 12403	III	8,000	3.9	20/20

e. Analytical Reactivity (Inclusivity)

Fourteen GBS isolates spanning 11 serotypes were tested in replicates of three at approximately $1.6x10^4$ CFU/ml in negative clinical LIM broth matrix. All GBS strains were correctly identified as positive by the Portrait GBS Assay. The results are shown in Table 4.

Table 4. GBS strains tested during Inclusivity Studies with the Portrait GBS Assay

GBS strain	Serotype	GBS Positive Call
CDC 62587	Ia	3/3
ATCC 12401	Ib	3/3*
ATCC 27591	Ic	3/3
ATCC BAA1175	II	3/3
ATCC BAA22	III	3/3
ATCC 49446	IV	3/3
ATCC BAA611	V	3/3
CDC 49282	VI	3/3
CDC 61303	VII	3/3
CDC 43587	VIII	3/3
CDC 62706	IX	3/3
ATCC 9993	Untyped	3/3
ATCC 13813	Non-hemolytic	3/3

GBS strain	Serotype	GBS Positive Call
NCIMB 701348	Untyped	3/3

*this set of runs contained one 'invalid' run that was repeated and confirmed as positive.

f. Analytical Specificity:

Cross-Reactivity

The Analytical Specificity of the Portrait GBS Assay was determined using a total of 60 strains representing: 8 *Streptococci* and 52 species encompassing strains phylogenetically related to *S. agalactiae*, as well as other microflora (bacteria, yeast, and viral stock strains) commonly found as part of the vaginal/rectal flora. All strains were spiked in negative clinical LIM broth matrix and tested in replicates of three. Bacteria and fungi were tested at concentrations $\geq 10^6$ CFU/ml and viruses at $\geq 10^{4.15}$ TCID50/ml. Human genomic DNA was tested at 1.2×10^6 copies/ml. No cross-reactivity was observed with tested organisms. The cross-reactivity test panel is shown in Table 5.

Table 5. Exclusivity Panel (Bacteria, Yeast, Viruses, human DNA)

Bacteria (ATCC strain)			
Acinetobacter baumannii	*19606*	*Morganella morganii*	*25829*
Aeromonas hydrophilia	*35654*	*Neisseria gonorrhoeae*	*19424*
Bacillus cereus	*14579*	*Peptostreptococcus anaerobius*	*27337*
Bacteroides fragilis	*23745*	*Prevotella melaninogenica*	*25845*
Camphylobacter jejuni	*49943*	*Propinionibacterium acnes*	*11827*
Citrobacter freundii	*8090*	*Proteus mirabilis*	*25933*
Clostridium difficile	*43598*	*Proteus vulgaris*	*6896*
Clostridium perfringins	*13124*	*Pseudomonas aeruginosa*	*10146*
Corynebacterium, urealyticum	*43044*	*Pseudomonas fluorescens*	*49838*
Enterobacter aerogenes	*15038*	*Serratia marcescens*	*13880*
Enterobacter cloacae	*13047*	*Shigella flexneri*	*25929*
Enterococcus durans	*6056*	*Shigella sonnei*	*25931*
Enterococcus faecalis	*29212*	*Staphylococcus aureus*	*11632*
Enterococcus faecium	*19434*	*Staphylococcus epidermidis*	*700562*
Escherichia coli	*PTA-3421*	*Staphylococcus haemolyticus*	*29968*
Gardnerella vaginalis	*14018*	*Staphylococcus lugdunensis*	*49576*
Klebsiella oxytoca	*13182*	*Streptococcus anginosus*	*33397*
Klebsiella pneumonia	*BAA-1705*	*Streptococcus bovis*	*33317*
Lactobacillus acidophilus	*4356*	*Streptococcus dysgalactiae*	*35666*
Lactobacillus casei	*393*	*Streptococcus equi subsp. equi*	*9528*
Lactobacillus delbrueckii lactis	*11061*	*Streptococcus mitis*	*NCIMB 13770*
Lactoballilus fermentum	*9338*	*Streptococcus oralis*	*6249*
Lactococcus lactis	*49032*	*Streptococcus pneumoniae*	*6303*
Listeria monocytogenes	*15313*	*Streptococcus pyogenes*	*4543*
Micrococcus luteus	*4698*	*Yersinia enterocolitica*	*9610*
Moraxella catarrhalis	*8176*		

Yeasts (ATCC strains)			
Candida albicans	*18804*	*Candida parapsilosis*	*14054*
Candida glabrata	*2001*	*Candida tropicalis*	*14056*
Candida krusei	*24210*		
Viruses (Zeptometrix part #)			
CMV	*0810003CF*	*Norovirus*	*0810086CF*
HPV-16	*0810171CF*	*VZV*	*810232*
DNA			
Human genomic DNA			

g. Interference:

Microbial Interference

The Portrait GBS Assay was evaluated for microbial interference using the same panel of human DNA and non-target microflora (bacteria, yeast, viral stock strains) tested in the Cross-Reactivity Study. Concentrations of potentially interfering DNA and microorganisms were similar to levels stated in the Cross-Reactivity Study. Strains were spiked into negative clinical LIM broth matrix containing GBS at a low positive concentration of 1-2X LoD. Studies assessed the detection of two GBS strains—ATCC BAA1177 (serotype Ia) and ATCC 12403 (serotype III). A minimum of three replicates for each target/non-target suspension was tested with the Portrait GBS Assay. Out of the test panel, only *Enterococcus durans* interfered with the detection of GBS. When GBS strain ATCC 12403 was spiked into culture negative LIM broth at a concentration of 1-2X LoD, 4/10 runs in the presence of *Enterococcus durans* yielded a GBS "negative" call. However, when the concentration of ATCC 12403 was increased to 3X LoD, no interference was observed with *Enterococcus durans* in 6/6 runs. A statement reporting *Enterococcus duran*s interference with GBS detection was added to the package insert. Three 'Invalid' calls were recorded during the microbial interference study; however, when all three invalids were re-run, the correct call was observed.

Interfering Substances

The potentially inhibiting substances listed in the table below were tested with the Portrait GBS Assay in triplicate. Results of the study yielded no inhibitory effects for GBS positive specimens in the presence of any of the interfering substances. All replicates of positive specimens using ATCC BAA1177 (serotype Ia) and ATCC 12403 (serotype III) were correctly reported as 'GBS positive' at 1-2X LoD concentration with the assay. Only one 'Invalid' run was reported with contraceptive gel and strain ATCC 12403. The list of potentially interfering substances is shown in Table 6.

Table 6. Potentially Interfering Substances with the Portrait GBS Assay

Category	Substance/Supplier	Concentration in Sample Matrix
Exogenous Substances		
Anti-Diarrheal Medication	Immodium AD	2% v/v

Category	Substance/Supplier	Concentration in Sample Matrix
Body Oil	Neutrogena Body Oil	2% v/v
Body Powder	Gold Bond Body Powder	1% w/v
Contraceptive Foam	VCF Contraceptive Foam	1 swab/5ml broth
Contraceptive Gel	Options Gynol II Vaginal Contraceptive Gel	2% of swab
Deodorant Spray	Summer's Eve Island Splash	2% v/v
Enema Solution	Walgreens Enema Saline Laxative	0.25% v/v
Hemorrhoid Cream	Preparation H Cream Max Strength	1 swab/5ml broth
Lubricating Gel	KY Ultragel	1 swab/5ml broth
Moisturizing Lotion	Jergens Body Lotion	1 swab/5ml broth
Oral Laxative	Dulcolax Laxative Tablets	1% w/v
Stool Softener	Equate Stool Softener Plus stimulant Laxative	0.0016% w/v
Vaginal Anti-fungal Med	Monostat 1 Tiococnazole Ointment 6.5%	1 swab/5ml broth
Vaginal Anti-itch Cream	Vagisil Medicated Anti-itch Créme	1 swab/5ml broth
Endogenous Substances		
Human Amniotic Fluid	LEE Biosciences	2% v/v
Human DNA	Roche Human Genomic DNA	$1.2x10^6$ copies/ml
Human Feces	In-house	2% v/v
Human Meconium	LEE Biosciences	2% w/v
Human Urine	In-house	2% v/v
Human Whole Blood	In-house	2% v/v
Mucous	Mucin, Sigma M2378	0.05% w/v

Carry-over/Cross-contamination Study

A Carry-over/Cross-contamination Study was conducted for the Portrait GBS Assay by alternatively testing high titered GBS samples (>10^7 CFU/ml) followed by true negative samples. Six runs were performed on each of six Portrait GBS analyzers (6 instruments x 6 runs = 36 total runs). Samples were prepared in negative clinical LIM broth matrix. All results yielded the expected results with no cross-contamination events reported.

h. Assay cut-off:

Not Applicable.

2. Comparison studies:

a. Method comparison with predicate device:

Not Applicable. Performance of the assay was evaluated in comparison to the gold standard/reference method (LIM broth culture).

b. Matrix comparison:

Not Applicable.

3. Clinical studies:

a. Clinical Sensitivity:

Performance characteristics of the Portrait GBS Assay were evaluated at 3 institutions in the U.S. using the PA500 Portrait Analyzer System. Subjects included individuals whose standard of care screening called for the collection of vaginal/rectal swab specimens for GBS testing. Specimens for the clinical study consisted of excess leftover de-identified LIM broth cultures from pregnant women at 35 – 37 weeks of gestation. These specimens were initially collected using a standard double swab (vaginal and rectal) for GBS testing, placed into transport media, and then inoculated into LIM broth for an overnight incubation (18-29 hours) at 35°C (+/- 2°C). An aliquot of leftover LIM broth was used for testing by the Portrait GBS Assay, reference culture method, and comparator molecular methods.

Over the course of the Clinical Study, 518 samples were collected from all three sites. 70 samples did not meet the inclusion/exclusion criteria (incubation between 18-29 hours) and, therefore, were not included for the purpose of performance evaluation. The remaining 448 clinical specimens were used to evaluate the performance of the Portrait GBS Assay in comparison to the reference culture method. Enriched LIM broths were subcultured to 5% sheep blood agar plates and incubated at 24 hours at 35°C (+/-2°C) with 5% CO_2. If no growth was observed, then plates were incubated for an additional 24 hours. Suspected GBS colonies (both hemolytic and non-hemolytic) were gram stained and tested with catalase reagent. Gram-positive, catalase negative colonies were confirmed as GBS by latex agglutination testing.

The Portrait GBS Assay demonstrated an overall sensitivity and specificity for detection of GBS colonization of 97.9% and 96.0%, respectively, relative to the reference culture method. The initial invalid rate for the Portrait GBS Assay was 2.01% (9/448) across all three sites. After re-testing, all invalids were resolved yielding a final invalid rate of 0% for the Portrait GBS Assay. Table 7 and Table 8 show performance of the Portrait GBS Assay across all sites and for each site, respectively.

Table 7. Portrait GBS Assay Overall Performance Compared to Reference Culture Method

	Reference Culture Method-LIM broth Culture			
Portrait GBS Assay (All Sites)		Pos	Neg	Total
	Pos	93	14	107
	Neg	2	339	341
	Total	95	353	448
	Sensitivity:	97.9% (95% CI: 92.7-99.4)		
	Specificity:	96.0% (95% CI: 93.5-97.6)		
	PPV:	86.9% (95% CI: 79.2-92.0)		
	NPV:	99.4% (95% CI: 97.9-99.8)		

Table 8. Site-by-Site Performance of the Portrait GBS Assay in Comparison to the Reference Culture Method

Clinical Sites	Number of Specimens	Sensitivity	Specificity
Site 1	120	31/31(100%) [95% CI: 89-100]	85/89 (95.5%) [95% CI: 89.0-98.2]
Site 2	187	37/39 (94.9%) [95% CI: 83.1-98.6]	144/148 (97.3%) [95% CI: 93.3-98.9]
Site 3	141	25/25 (100%) [95% CI: 86.7-100]	110/116 (94.8%) [95% CI: 89.2-97.6]

*b. Clinical specificity**:***

Refer to 3a above

c. Other clinical supportive data (when a. and b. are not applicable):

4. Clinical cut-off**:**

Not Applicable.

5. Expected values/Reference range:

Approximately 10-30% of pregnant women may be colonized with GBS in the vagina or rectum. Culture screening for GBS in pregnant women at 35-37 weeks gestation is used as an indicator of women who may be colonized with GBS at the time of delivery. During clinical evaluation for the assay, 23.9% (107/448) of women were reported as positive for GBS DNA by the Portrait GBS Assay. 21.2% (95/448) of women were colonized with GBS according to the reference culture method.

N. Instrument Name:

PA500 Portrait Analyzer System

O. System Descriptions:

1. Modes of Operation:

Does the applicant's device contain the ability to transmit data to a computer, webserver, or mobile device?

Yes ____X___ or No _____

Does the applicant's device transmit data to a computer, webserver, or mobile device using wireless transmission?

Yes _____ or No ___X_____

2. Software:

   FDA has reviewed applicant's Hazard Analysis and software development processes for this line of product types:

   Yes ____X____ or No _____

3. Specimen Identification:

   To perform a test, the user prepares and loads the cartridge according to instructions in the Package Insert. The required specimen and test information is entered into the computer before starting the test. The specimen ID is associated with the test results and is shown in the Results Report.

4. Specimen Sampling and Handling:

   Enriched LIM broth cultures should be collected, processed, and stored following standard laboratory procedures.

5. Calibration:

   All adjustments and calibration requirements are completed at the factory prior to shipment of each analyzer. There are no calibration requirements for instruments in the field; the user is not responsible for calibration activity.

6. Quality Control:

   The integrity of the system is verified and controlled by specific hardware/software checks during the cartridge load process and during the assay run. These checks, along with assay internal controls, are employed to monitor the performance of the system during operation and to alert the user of any out of specification conditions. See section M(1)(c) for a description of controls associated with the Portrait GBS Assay. Additional controls may be assayed according to quality control guidelines established by the laboratory, and applicable requirements of local, state and/or federal regulations or accrediting organizations. External positive and negative controls are also recommended.

P. Proposed Labeling:

The labeling is sufficient and it satisfies the requirements of 21 CFR Part 809.10.

Q. Conclusion:

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