June 26, 2018

NeuMoDx Molecular, Inc.
% Kay Fuller
Principal Consultant and Official Correspondent
Medical Device Regulatory Solutions, LLC
230 Collingwood Dr.
Suite 260
Ann Arbor, Michigan 48103

Re: K173725
Trade/Device Name: NeuMoDx GBS Assay
Regulation Number: 21 CFR 866.3740
Regulation Name: *Streptococcus* spp. serological reagents
Regulatory Class: Class I
Product Code: NJR, OOI
Dated: March 23, 2018
Received: March 29, 2018

Dear Kay Fuller:

We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration. Please note: CDRH does not evaluate information related to contract liability warranties. We remind you, however, that device labeling must be truthful and not misleading.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to additional controls. Existing major regulations affecting your device can be found in the Code of Federal Regulations, Title 21, Parts 800 to 898. In addition, FDA may publish further announcements concerning your device in the Federal Register.

Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal statutes and regulations administered by other Federal agencies. You must comply with all the Act's requirements, including, but not limited to: registration and listing (21 CFR Part 807); labeling (21 CFR Part 801 and Part 809); medical device reporting (reporting of medical device-related adverse events) (21 CFR

803); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820); and if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR Part 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to http://www.fda.gov/MedicalDevices/Safety/ReportaProblem/default.htm.

For comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (https://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/) and CDRH Learn (http://www.fda.gov/Training/CDRHLearn). Additionally, you may contact the Division of Industry and Consumer Education (DICE) to ask a question about a specific regulatory topic. See the DICE website (http://www.fda.gov/DICE) for more information or contact DICE by email (DICE@fda.hhs.gov) or phone (1-800-638-2041 or 301-796-7100).

Sincerely,

Ribhi Shawar -S For

Uwe Scherf, M.Sc., Ph.D.
Director
Division of Microbiology Devices
Office of In Vitro Diagnostics
and Radiological Health
Center for Devices and Radiological Health

Enclosure

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Food and Drug Administration

Indications for Use

Form Approved: OMB No. 0910-0120
Expiration Date: 06/30/2020
See PRA Statement below.

510(k) Number *(if known)*
K173725

Device Name
NeuMoDx™ GBS Assay

Indications for Use *(Describe)*
The NeuMoDx™ GBS Assay as implemented on the NeuMoDx™ 288 Molecular System is a qualitative in vitro diagnostic test designed to detect Group B Streptococcus (GBS) DNA from 18-24 hour Lim broth enrichments of vaginal/rectal swabs from pregnant women. The test incorporates automated DNA extraction to isolate the target nucleic acid from the specimen and real-time polymerase chain reaction (PCR) to detect an 88 bp region of the pcsB gene sequence in the Streptococcus agalactiae chromosome. Results from the NeuMoDx™ GBS Assay can be used as an aid in determining colonization status in antepartum women.

The NeuMoDx™ GBS Assay does not provide susceptibility results. Cultured isolates are needed for performing susceptibility testing as recommended for penicillin-allergic women.

Type of Use *(Select one or both, as applicable)*

☒ Prescription Use (Part 21 CFR 801 Subpart D) ☐ Over-The-Counter Use (21 CFR 801 Subpart C)

CONTINUE ON A SEPARATE PAGE IF NEEDED.

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14. 510(k) SUMMARY

NeuMoDx Molecular, Inc.

NeuMoDx™ GBS Assay

June 25, 2018

1. GENERAL INFORMATION

Submitter Information:

NeuMoDx Molecular, Inc.
1250 Eisenhower Place
Ann Arbor, MI 48108 USA

Contact Information:

Primary Contact:

Kay Fuller, RAC
Principal Regulatory Consultant
Medical Device Regulatory Solutions, LLC
734-846-7852

Secondary Contact:

Dawn Ross
Sr. Director Quality Assurance
NeuMoDx Molecular, Inc.

2. DEVICE INFORMATION

Device Name: GBS Assay

Proprietary Name: NeuMoDx™ GBS Assay

Common Name: Group B Strep Assay

Classification Name: Nucleic Acid Amplification Assay System, Group B Streptococcus, Direct Specimen Test

Classification Code: NJR - Primary
OOI - Secondary

Classification: Class I

FDA Review Panel: 83 - Microbiology

Regulation Number: 21 CFR §866.3740

3. PREDICATE DEVICE

BD Max™ GBS Assay (K090191)

4. DEVICE DESCRIPTION

The NeuMoDx™ GBS Assay (Subject Device) as implemented on the NeuMoDx™ 288 Molecular System is an automated, qualitative, in vitro diagnostic test for the detection of group B *Streptococcus* (GBS), also

known as *Streptococcus agalactiae* from vaginal/rectal swabs collected from pregnant women at 35 - 37 weeks of gestation and enriched in a commercially available Lim broth medium. An aliquot of an overnight Lim broth culture added to the NeuMoDx™ GBS Assay is used for the testing. All further specimen handling is automated.

The GBS Assay test strip, in combination with required NeuMoDx buffers, extraction reagents, wash and release solutions, as well as the microfluidic cartridge (non-active,) and the fully automated NeuMoDx™ 288 Molecular System (a real time nucleic acid amplification system), utilizes real-time polymerase chain reaction (PCR) for the amplification of GBS DNA and fluorogenic target-specific TaqMan® probes for the detection of the amplified GBS DNA. General use components and the System are packaged and provided separately by NeuMoDx.

After the test is processed, a determination of the presence/absence of GBS DNA in the specimen is automatically made based on the amplification status of GBS and the Sample Process Control using pre-established decision criteria. The test results will be reported as Negative, Positive, Indeterminate or Unresolved based on the amplification status of the target and sample processing control. Results are reported based on the decision algorithm noted in Table 1.

Table 1

Result	GBS C_t	Sample Process Control (SPC1) C_t
Positive	9 < **C_t** < 37 And EP > 3000	N/A
Negative	N/A **OR** C_t < 9 **OR** > 37	25 < **C_t** < 35 **And** EP > 2000
Indeterminate	N/A SYSTEM ERROR NOTED	N/A SYSTEM ERROR NOTED
Unresolved	Not detected	Not detected

EP = End Point Fluorescence (after baseline correction)

External controls are not provided by NeuMoDx but are recommended to be performed as required by the laboratory's internal procedures.

Standards/Guidance Documents Referenced

CLSI Guideline EP25-A, Evaluation of Stability of In Vitro Diagnostic Reagents; Approved Guideline.

Test Principle - Summary

The amplified targets are detected in real time using hydrolysis probe chemistry (commonly referred to as TaqMan® chemistry) using fluorogenic oligonucleotide probe molecules specific to the amplicons for their respective targets.

TaqMan® probes consist of a fluorophore covalently attached to the 5'-end of the oligonucleotide probe and a quencher at the 3'-end. While the probe

is intact, the fluorophore and the quencher are in proximity, resulting in the quencher molecule quenching the fluorescence emitted by the fluorophore via FRET (Förster Resonance Energy Transfer).

TaqMan® probes are designed such that they anneal within a DNA region amplified by a specific set of primers. As the Taq DNA polymerase extends

the primer and synthesizes the new strand, the 5' to 3' exonuclease activity of the Taq DNA polymerase degrades the probe that has annealed to the template. Degradation of the probe releases the fluorophore from it and breaks the close proximity to the quencher, thereby overcoming the quenching effect due to FRET and allowing detecting fluorescence of the fluorophore. The resulting fluorescence signal detected in the quantitative PCR thermal cycler is directly proportional to the fluorophore released and can be correlated to the amount of target DNA present in PCR.

A TaqMan® probe labeled with a fluorophore (Excitation: 490 nm & Emission: 521 nm) at the 5’ end, and a dark quencher at the 3’ end, is used to detect GBS DNA. For detection of the Sample Process Control, the TaqMan® probe is labeled with an alternate fluorescent dye (Excitation: 535 nm & Emission: 556 nm) at the 5’ end, and a dark quencher at the 3’ end. The NeuMoDx™ 288 Molecular System monitors the fluorescent signal emitted by the TaqMan® probes at the end of each amplification cycle and presents the test result.

5. INDICATIONS FOR USE

The NeuMoDx™ GBS Assay as implemented on the NeuMoDx™ 288 Molecular System is a qualitative in vitro diagnostic test designed to detect Group B *Streptococcus* (GBS) DNA from 18-24 hour Lim broth enrichments of vaginal/rectal swabs from pregnant women. The test incorporates automated DNA extraction to isolate the target nucleic acid from the specimen and real-time polymerase chain reaction (PCR) to detect an 88 bp region of the *pcsB* gene sequence in the *Streptococcus agalactiae* chromosome. Results from the NeuMoDx™ GBS Assay can be used as an aid in determining colonization status in antepartum women.

The NeuMoDx™ GBS Assay does not provide susceptibility results. Cultured isolates are needed for performing susceptibility testing as recommended for penicillin-allergic women.

6. COMPARISON OF TECHNOLOGICAL CHARACTERISTICS

The NeuMoDx™ GBS Assay's fundamental technological characteristics are similar to those of the predicate device. The NeuMoDx™ GBS Assay (subject device) is substantially equivalent to the BD Max™ GBS Assay device (predicate device), noted herein. Both the subject device and predicate device assays detect Group B *Streptococcus* (GBS) DNA from enriched vaginal/rectal swab specimens. Both subject and predicate

assays determine the presence of the target organisms through real-time PCR amplification and fluorogenic target-specific hybridization detection and utilize a similar instrumentation format.

Substantial Equivalence Summary

Feature Comparison Criteria	Subject Device NeuMoDx™ GBS Assay K173725	Predicate Device BD MAX™ GBS Assay K090191	Subject Device SE to K090191?
21 CFR Reg #, Product Code & Classification	21 CFR §866.3740 NJR Class I	21 CFR §866.3740 NJR Class I	Yes
Regulation Name	Nucleic Acid Amplification Assay System, Group B Streptococcus, Direct Specimen Test	Nucleic Acid Amplification Assay System, Group B Streptococcus, Direct Specimen Test	Yes
Prescription Device - Rx Only	Yes	Yes	Yes
Indications for Use	The *NeuMoDx™ GBS Assay* as implemented on the NeuMoDx™ 288 Molecular System is a qualitative in vitro diagnostic test designed to detect Group B *Streptococcus* (GBS) DNA from 18-24 hour Lim broth enrichments of vaginal/rectal swabs from pregnant women. The test incorporates automated DNA extraction to isolate the target nucleic acid from the specimen and real-time polymerase chain reaction (PCR) to detect an 88 bp region of the *PcsB* gene sequence in the *Streptococcus agalactiae* chromosome. Results from the *NeuMoDx™ GBS Assay* can be used as an aid in determining colonization status in antepartum women. The *NeuMoDx™ GBS Assay* does not provide susceptibility results. Cultured isolates are needed for performing susceptibility testing as recommended for penicillin-allergic women.	The BD MAX™ GBS Assay as implemented on the BD MAX™ System is a qualitative in vitro diagnostic test designed to detect Group B Streptococcus (GBS) DNA in Lim Broth cultures after incubation for greater than or equal to (>)18 hours, obtained from vaginal and rectal swab specimens from antepartum pregnant women. The test incorporates automated DNA extraction to isolate the target nucleic acid from the specimen and real-time polymerase chain reaction (PCR) to detect a 124 bp region of the *cfb* gene sequence of the *Streptococcus agalactiae* chromosome. Results from the BD MAX™ GBS Assay can be used as an aid in determining colonization status in antepartum women. The BD MAX™ GBS Assay does not provide susceptibility results.Cultured isolates are needed for performing susceptibility testing as recommended for penicillin-allergic women. Subculture to solidmedia for additional testing when indicated.	Yes
Analyte	Group B *Streptococcus* DNA	Group B *Streptococcus* DNA	Yes
Specimen Type	Vaginal-rectal swab (Enriched Lim broth 18-24 hrs)	Vaginal-rectal swab (Enriched Lim broth ≥ 18 hrs)	Yes
Specimen Collection Media Type	Amies or Stuart	Amies or Stuart	Yes
Sample Preparation Method	Sample Preparation for Nucleic Acid Extraction is automated on NeuMoDx™ 288 Molecular System	Sample Preparation for Nucleic Acid Extraction is automated on BD MAX System	Yes
Sample Matrix	Enriched in overnight LIM	Enriched in overnight LIM	Yes
Test Reference Comparison Method	CDC GBS 2010 Guidelines of Culture Processing/Identification Procedure	CDC GBS 2002 Guidelines of Culture Processing/Identification Procedure	Yes
Platform	NeuMoDx™ 288 Molecular System (random access)	BD MAX System (random access)	Yes
Assay Format	Amplification: Real Time PCR Detection: Fluorogenic	Real Time Fluorogenic Detection of PCR amplification	Yes
DNA Target Sequence	88 bp region of the *PcsB* gene sequence in the *Streptococcus agalactiae* chromosome	124 bp region of the cfb gene sequence of the *Streptococcus agalactiae* chromosome	Yes
Probes	TaqMan®	Scorpion	Yes
Single Use	Yes	Yes	Yes
User / skill required	Moderate Complexity • Rx only - Qualified Laboratory Personnel • Built in protocol • No data interpretation required	Moderate Complexity • No special skills required • Built in protocol • No data interpretation required	Yes
Automatic Assay	Yes – Built-in Result Interpretation	Yes – Built-in Result Interpretation	Yes
Internal Process Control	Sample process control is extracted and amplified with each sample as a process monitor	Extraction and PCR internal process control is a process monitor	Yes
External Control	Not provided by NeuMoDx; commercial materials available. Not required to perform testing. Appropriate controls and testing intervals must be determined by the laboratory	Materials available commercially but not required to run the test	Yes

7. NON-CLINICAL TESTING SUMMARY

Analytical Performance

a. Precision/Reproducibility

Precision

Qualitative testing was performed on the NeuMoDx™ 288 Molecular System using the NeuMoDx™ GBS Test Strip where 2 runs per day were performed across 3 systems over a period of 12 non-consecutive days. This within-lab precision testing included 2 reagent lots and was performed by 2 operators.

A run was defined as three replicates tested for each of the five different levels shown in Table 2 (True Negative, Low Negative, Moderate Negative, Low Positive and Moderate Positive) for a total of 15 specimens per run per system. Specimens were prepared by spiking cultured GBS into pooled, screened negative clinical remnant Lim broth. For each run performed, a positive and a negative external control were processed in addition to the 15 specimens. A total of 72 runs and 1224 tests were performed in this study, including the external controls. Table 3 shows comparison across instruments. Table 4 shows precision across operators.

Table 2: Within Lab Precision Panel

Panel Member	Level Tested	GBS (CFU/mL)
Moderate Positive (MP)	3-4x LoD	1600
Low Positive (LP)	1-2x LoD	600
Moderate Negative (MN)	>10-fold dilution of 1x LoD	40
Low Negative (LN)	>100-fold dilution of 1x LoD	4
True (Blank) Negative (TN)	0	0

Table 3: Qualitative Results from Within-Lab Precision Study (Across Instruments)

Level	Instrument 1	Instrument 2	Instrument 3	Overall
	Percent Positive	Percent Positive	Percent Positive	Percent Positive
MP	100% (72/72)	100%(72/72)	100%(72/72)	100% (216/216)
LP	100% (72/72)	95.8% (69/72)	97.2% (70/72)	97.7% (211/216)
	Percent Negative	Percent Negative	Percent Negative	Percent Negative
MN	77.7% (56/72)	86.1% (62/72)	83.3% (60/72)	82% (178/216)
LN	97.2% (70/72)	100% (72/72)	98.6% (71/72)	98.6% (213/216)
TN	100% (72/72)	100% (72/72)	100% (72/72)	100% (216/216)

Table 4: Quantitative GBS Parameter Analysis from Within Lab Precision (Across Operators)

Level	First Operator					Second Operator					Combined Data Set				
	Detected Pos/Total	% Positive	Ave Ct	Std Dev	% CV*	Detected Pos/Total	% Positive	Ave Ct	Std Dev	% CV	Detected Pos/Total	% Positive	Ave Ct	Std Dev	% CV
MP	108/108	100.0%	31.61	0.54	1.7%	108/108	100.0%	32.22	0.51	1.6%	216/216	100.0%	31.91	0.61	1.9%
LP	106/108	98.1%	34.16	0.68	2.0%	105/108	97.2%	34.39	0.72	2.1%	211/216	97.7%	34.27	0.71	2.1%
MN	20/108	18.5%	35.00	0.53	1.5%	18/108	16.7%	35.28	0.40	1.1%	38/216	17.6%	35.10	0.49	1.4%
LN	2/108	1.9%	35.49	0.12	0.3%	1/108	0.9%	35.03	N/A		3/216	1.4%	35.33	0.28	0.8%
TN	0/108	0.0%	N/A			0/108	0.0%	N/A			0/216	0.0%	N/A		

%CV: The coefficient of variation, 100* standard deviation/Ave Ct.

Reproducibility

Inter-Lab Reproducibility

The reproducibility of the NeuMoDx™ GBS Assay as implemented on the NeuMoDx™ 288 Molecular System using the NeuMoDx™ GBS Test Strip was evaluated at 3 different testing sites by testing 5 replicates of a 4-member panel over 5 days, which generated a total of 75 replicates per panel member. Panel samples were prepared by spiking cultured GBS into pooled, negative clinical Lim broth to create Low Negative, Low Positive and

Moderate Positive panel members, whereas the True (Blank) Negative samples contained no GBS. Concentrations of the panel members correspond to the same levels listed in Table 8 above used for Precision (minus the Moderate Negative sample). A positive and a negative external control were also processed on each day of testing.

Overall, there were 4 invalid results obtained during the Reproducibility study – one replicate of each of the 4 concentrations yielded an "Indeterminate" and all occurred on the same day of testing (Day 2) at Site B. Upon repeat testing, 2 of the 4 samples yielded a valid, correct result; the remaining two samples yielded an "Indeterminate" result a second time before yielding a valid, correct result. The percent agreement with the expected result for the panel members for all sites combined is presented in Table 5.

Table 5: Inter-Lab Reproducibility Performance Summary of the NeuMoDx™ GBS Assay

Panel Member Concentration	Site 1 (A)	Site 2 (B)	Site 3 (D)	Total Agreement *(CI 95%)* [a]
Moderate Positive	25/25	25/25	25/25	***100% (75/75) (95.1 – 100)***
Low Positive	24/25	25/25	24/25	***97.3% (73/75) (90.8 – 99.3)***
Low Negative	25/25	25/25	24/25 [b]	***98.7% (74/75) (92.8 – 99.8)***
Blank Negative	25/25	25/25	25/25	***100% (75/75) (95.1 – 100)***

[a] The lower and upper limits of the presented 95% confidence interval (CI) were calculated using the 95% score confidence interval method.

[b] The Low Negative sample concentration is anticipated to be detected as positive ~5% of the time.

b. Linearity/Assay Reportable Range

Not applicable. The NeuMoDx™ GBS Assay is a qualitative test

c. Traceability, Stability, Expected Values

Traceability

Traceability to a certified control or calibrator is not applicable as there are no certified external controls or calibrators available for use with GBS assays. NeuMoDx developed internal sample processing controls, included in the assay reagents, to assure test methods were properly executed. The NeuMoDx™ GBS Assay Instructions for Use (IFU) contains a recommendation for external controls.

Product Lot and Serial Number traceability has been implemented through the use of Unique Device Identifier (UDI) and GS1 compatible 2D and 1D barcodes within the unit labeling. The GBS Test Strip as used for the GBS Assay contains a (device) serial number for each unit/piece.

Stability

Stability studies were performed to assess the in-use stability of the reagents and the shelf-life stability of the packaged NeuMoDx™ GBS Test Strip and the Lysis Buffer 4.

d. Detection Limit

The Analytical Sensitivity of the NeuMoDx™ GBS Assay using the NeuMoDx™ GBS Test Strip was characterized by testing five different levels of GBS (ATCC BAA-611 serotype V) prepared from five independent clinical negative pools on the NeuMoDx™ 288 Molecular System.

The study was performed over non-consecutive days across multiple systems with each system processing ten replicates at each level per day. A unique lot of each of the following: NeuMoDx™ GBS Test Strip, NeuMoDx™ Extraction Plate and NeuMoDx™ Lysis Buffer 4 was tested on each System. Detection rates are depicted in the following table. The LoD was determined to be 500 CFU/mL.

Positive percent detection rates for samples used to determine LoD of the NeuMoDx™ GBS Assay

GBS CFU/mL	Number of Valid Tests	Number of Positives	Number of Negatives	Detection Rate
1000	60	60	0	100%
500*	60	60	0	100%
200	60	53	7	88%
100	60	35	25	58%
0	60	0	60	0%

*equivalent to 20 CFU/test

e. Analytical Reactivity (Inclusivity)

The NeuMoDx™ GBS Assay as implemented using the NeuMoDx™ GBS Test Strip detected all major serotypes of group B S*treptococcus,* including the four most clinically relevant. The twelve different strains of GBS bacteria spanning the serotypes that were tested using the NeuMoDx™ GBS Test Strip are shown in Table 6.

Table 6: GBS Serotypes Tested

GBS Serotype	GBS Strain	ATCC/BEI#	Concentration (CFU/mL) with 100% Detection
Ia	A909	ATCC: BAA-1138	1500
Ib	H36b	ATCC: BAA-1174	1000
II	MNZ933	BEI: NR-43896	400
III	MNZ938	BEI: NR-43897	400
Ic	CDC SS700	ATCC: 27591	800
IV	2011201884	ATCC: BAA-2673	800
VI	2010228816	ATCC: BAA-2671	800
VII	4832-06	ATCC: BAA-2670	800
VIII	5030-08	ATCC: BAA-2669	800
IX	7509-07	ATCC: BAA-2668	800
Non-hemolytic	NCTC 8181	ATCC: 13813	800
TX Clinical Isolate 2012	SGBS030	BEI: NR-44144	800

f. Analytical Specificity (Exclusivity)

Analytical Specificity and Cross-reactivity

Analytical specificity was demonstrated by screening 136 organisms common to the urogenital and digestive tract, as well as species phylogenetically related to GBS for cross-reactivity on the NeuMoDx™ 288 Molecular System using the NeuMoDx™ GBS Test Strip. Organisms were prepared in pools of 5-6 and tested at a high concentration (bacteria 6 – $9x10^6$ CFU/mL; viruses $1x10^6$–$1x10^7$ copies/mL).

None of the organisms screened demonstrated cross-reactivity when implementing the NeuMoDx™ GBS Assay. The organisms tested are shown in Table 7.

Table 7: Pathogens Used to Demonstrate Analytical Specificity

Bacteria, Yeast and Parasites		
Streptococcus pyogenes	*Salmonella enterica* (serovar Minnesota)	*Cryptococcus neoformans*
Streptococcus salivarius	*Alcaligenes faecalis*	*Candida glabrata*
Streptococcus sanguinis	*Staphylococcus saprophyticus*	*Achromobacter xerosis*
*Moraxella (*Branhamella) *catarrhalis*	*Eikenella corrodens*	*Rhodospirillum rubrum*
Neisseria gonorrhoeae	*Enterococcus avium*	*Neisseria subflava*
Streptococcus pyogenes	*Micrococcus luteus*	*Pseudomonas putida*
Streptococcus mitis	*Citrobacter freundii*	*Bacillus subtilis*
Lactococcus lactis;	*Gemella haemolysans*	*Corynebacterium xerosis*
Listeria monocytogenes	*Kingella kingae*	*Mycobacterium smegmatis*
Morganella morganii	*Rahnella aquatilis*	*Legionella pneumophila*
Plesiomonas shigelloides	*Bacillus cereus*	*Moraxella lacunata*
Proteus vulgaris	*Aeromonas hydrophila*	*Streptomyces griseus*
Salmonella enterica (serovar Typhi)	*Enterobacter cloacae*	*Gardnerella vaginalis*
Staphylococcus aureus	*Brevibacterium linens*	*Clostridium perfringens*
Staphylococcus epidermidis	*Candida parapsilosis*	*Peptostreptococcus anaerobius*
Streptococcus mutans	*Lactobacillus brevis*	*Bifidobacterium adolescentis*
Yersinia enterocolitica	*Deinococcus radiodurans*	*Derxia gummosa*
Providencia stuartii	*Pseudomonas protegens*	*Veillonella parvula*
Pseudomonas aeruginosa	*Acinetobacter calcoaceticus*	*Mycoplasma pneumoniae*
Acinetobacter lwoffii	*Lactobacillus acidophilus*	*Bacteroides fragilis*
Proteus mirabilis	*Vibrio parahaemolyticus*	*Acinetobacter baumannii*
Klebsiella pneumoniae	*Corynebacterium genitalium*	*Corynebacterium,*strain HFH0082
Aerococcus viridans	*Enterococcus faecalis*	*Enterobacter aerogenes*
Enterococcus faecium	*Salmonella enterica*	*Klebsiella oxytoca*
Neisseria lactamica	*Lactobacillus jensenii*	*Escherichia coli*
Neisseria meningitidis	*Lactobacillus delbrueckii*	*Streptococcus canis*
Streptococcus pneumoniae	*Serratia marcescens*	*Streptococcus dysgalactiae*
Kingella denitrificans	*Candida albicans*	*Streptococcus oralis*
Haemophilus influenzae	*Candida tropicalis*	*Streptococcus uberis*
Neisseria perflava	*Chromobacterium violaceum*	*Streptococcus suis*
Moraxella osloensis	*Candida krusei*	
Neisseria meningitidis Sero C	*Saccharomyces cerevisiae*	
Neisseria meningitidis Sero A	*Corynebacterium urealyticum*	**Viruses**
Streptococcus anginosus (Grp C)	MRSA	CMV*
Streptococcus bovis	*Chlamydia trachomatis*	EBV (HHV-4)
Streptococcus intermedius	*Bifidobacterium breve*	HSV1*
Neisseria meningitidis M158 group D	*Mobiluncus mulieris**	HSV2*
Neisseria flavescens	*Propionibacterium acnes*	VZV (HHV 3)*
Streptococcus parasanguinis	*Campylobacter jejuni*	HPV-16*
Lactobacillus casei	*Haemophilus ducreyi*	JC virus*
Lactobacillus lactis	*Mycoplasma hominis*	BK virus
Haemophilus influenzae type B	*Mycoplasma genitalium*	HHV-6A
Salmonella newport	*Trichomonas vaginalis*	HHV-6B
Shigella flexneri	*Pseudomonas fluorescens*	HHV-7
Shigella sonnei	*Enterococcus dispar*	HHV-8
Enterococcus durans	*Ureaplasma urealyticum*	
Enterococcus sp. *(ATCC® 202155™)*	*Chlamydia pneumoniae**	

*Tested at 10 ng/ml

g. Interference with Non-Target Organisms

The NeuMoDx™ GBS Assay was tested for interference in the presence of non-target organisms (co-habiting in the urogenital tract) by evaluating the performance of the assay at low levels of GBS on the NeuMoDx™ 288 Molecular System. The same panel of 136 organisms (Table 6) used for assessing cross-reactivity was used for this study. The organisms were pooled into groups of 5-6 in clinical negative Lim broth and spiked with 1200 CFU/mL cultured GBS. Testing validated detection of group B *streptococcus* in all of the pools tested. No interference due to commensal organisms was observed.

h. Interference with Exogenous and Endogenous Substances

The performance of the NeuMoDx™ GBS Assay was assessed on the NeuMoDx™ 288 Molecular System in the presence of exogenous and endogenous interfering substances which may typically be encountered in GBS clinical specimens. Each of the endogenous and exogenous substances listed, in Table 8, were added to pooled clinical negative Lim broth samples containing GBS at 1200 CFU/mL or 4000 CFU/mL. The 20 exogenous and 6 endogenous substances that were tested for interference using the NeuMoDx™ GBS Test Strip resulted in no adverse effect on detection of GBS at either level tested further demonstrating the robustness of the NeuMoDx™ GBS Assay.

Table 8: Exogenous and Endogenous Interfering Agents tested

Exogenous Substances			Endogenous Substances
Monistat® Cream	Dulcolax® Suppositories	K-Y™ Jelly	Human Amniotic Fluid
Yeast Gard Advanced™ (Douche)	Fleet® Enema	McKesson Gel	Human Whole Blood
Metamucil® Fiber Supplement	Preparation H® Cream	Contraceptive Foam	Human Urine
Ex-lax® (Chocolate Pieces)	Vagisil™ Powder	Moisturizing Lotion	Human Fecal Sample
Phillips'® Milk of Magnesia	Norforms® Suppositories	Neutrogena® Body oil	Mucus
Pepto-Bismol™	FDS® Deodorant Spray	Gold Bond® Powder	Human Genomic DNA
Kaopectate®	New Mama Bottom Spray		

i. Carry-Over and Cross-Contamination Studies

Potential sample carry-over and cross-contamination studies were performed on the NeuMoDx™ 288 Molecular System using the NeuMoDx™ GBS Test Strip. The two-part study first evaluated the impact on GBS negative samples by being interspersed with samples containing high GBS target (at $1x10^7$ CFU/mL). The positive and negative samples were loaded such that each negative sample was adjacent to a high positive sample. The second part of this study processed all negative samples immediately following a run which had processed all high GBS concentration samples.

No contamination was seen in negative samples integrated with high level samples, or in negative samples that followed samples with high concentrations of GBS demonstrating the lack of any carry over and / or cross-contamination.

8. COMPARISON STUDIES

a. Method Comparison with Predicate Device
Not Applicable

b. Matrix Comparison
Not Applicable

9. CLINICAL PERFORMANCE SUMMARY

Clinical Performance

Performance characteristics were determined during a prospective clinical method comparison study conducted at three (3) geographically diverse laboratory locations to evaluate the comparative performance of the of the NeuMoDx™ GBS Assay as implemented on the NeuMoDx™ 288 Molecular System compared to conventional culture methods recommended by the Center for Disease Control (CDC) to identify GBS from subcultures of enriched Lim broth. Specimens eligible for enrollment were collected from pregnant women by health care providers for routine standard of care screening purposes recommended by the CDC between 35-37 weeks gestation.

The collected vaginal / rectal swab specimens were transported to the various laboratories in appropriate transport medium and then inoculated into a selective Lim broth medium by laboratory personnel in preparation to undergo an 18 – 24 hour incubation period. Following the incubation period and routine care testing, the residual Lim broth samples were sub-cultured to a sheep blood agar plate as recommended by the 2010 published CDC procedures for processing clinical specimens for culture of GBS. The agar plates were incubated for up to 48 hours and inspected for organisms suggestive of GBS. Suspected colonies were Gram-stained and the Gram-positive cocci colonies were tested for catalase production; Gram positive cocci colonies that tested negative for catalase production were worked-up for further identification by a streptococcal grouping latex agglutination test to determine the presence of GBS. Clinical performance is based on 1193 specimens with complete, valid, and compliant results included in the study and summarized in the tables below. The lower and upper limits of the presented 95% confidence interval (CI) were calculated using the 95% score confidence interval method.

NeuMoDx™ GBS Assay Clinical Performance Summary

Clinical Site Summary		Culture / Reference Method			
		Positive	**Negative**	***Total***	
NeuMoDx ™ GBS	Positive	253	37	*290*	Sensitivity = 96.9% 95% CI (94.1 – 98.4)
	Negative	8	895	*903*	Specificity = 96.0% 95% CI (94.6-97.1)
	Total	*261*	*932*	*1193*	

Site Specific Clinical Performance of the NeuMoDx™ GBS Assay

Site	n	Sensitivity (95% CI) [a]	Specificity (95% CI) [a]	Prevalence [b] (95% CI) [a]
A	351	92.4% 73/79 (84.4-96.5)	96.7% 263/272 (93.8-98.3)	22.5% 79/351 (15.1-22.2)
B	400	98.4% 62/63 (91.5-99.7)	94.4% 318/337 (91.4-96.4)	15.8% 63/400 (10.8-17.0)
C	*442*	99.2% 118/119 (95.4-99.9)	97.2% 314/323 (94.8-98.5)	26.9% 119/442 (18.2-24.7)
Total	*1193*	*96.9%* *253/261* *(94.1-98.4)*	*96.0%* *895/932* *(94.6-97.1)*	*21.9%* *261/1193* *(19.6-24.3)*

[a] The lower and upper limits of the presented 95% confidence interval (CI) were calculated using the 95% score confidence interval method.

[b] Prevalence calculations based on reference method results obtained by following the CDC-recommended procedures for processing clinical specimens for culture of group B *Streptococcus*. (Published 2010)

9. INSTRUMENT NAME

NeuMoDx™ 288 Molecular System

10. SYSTEM SOFTWARE

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

Yes X No __

11. CONCLUSIONS DRAWN FROM NON-CLINICAL AND CLINICAL TESTS

The subject device and the predicate device are substantially equivalent, with respect to intended use, instructions for use, design features, technological characteristics, manufacturing methods, performance criteria, special controls, and safety and effectiveness. The subject device is substantially equivalent to the predicate device (K090191).

12. CONCLUSION

Based on the information contained herein, we conclude the NeuMoDx™ GBS Assay (subject device) when implemented on the NeuMoDx™ 288 Molecular System is substantially equivalent to the legally marketed predicate device (K090191), and is safe and effective for its labeled intended use.