510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
ASSAY ONLY

I Background Information:

A 510(k) Number
K210976

B Applicant
Meridian Bioscience, Inc.

C Proprietary and Established Names
Curian Campy

D Regulatory Information

Product Code(s)	Classification	Regulation Section	Panel
LQP	Class I, reserved	21 CFR 866.3110 - *Campylobacter fetus* Serological Reagents	MI - Microbiology

II Submission/Device Overview:

A Purpose for Submission:
To obtain a substantial equivalence determination for the detection of *Campylobacter jejuni*, *Campylobacter coli*, *Campylobacter lari*, and *Campylobacter upsaliensis* antigens in human stool.

B Measurand:
Campylobacter jejuni, *Campylobacter coli*, *Campylobacter lari*, and *Campylobacter upsaliensis* antigens.

C Type of Test:
Lateral flow fluorescent immunoassay (FIA)

III Intended Use/Indications for Use:

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

B Indication(s) for Use:
Curian Campy, for use with the Curian Analyzer, is a rapid, qualitative fluorescent immunoassay for the detection of a *Campylobacter*-specific antigen in human fecal specimens. Curian Campy is intended to detect *C. jejuni*, *C. coli*, *C. upsaliensis*, and *C. lari* in human stool from patients with signs and symptoms of gastroenteritis. The test is intended for use with unpreserved fecal specimens

or preserved fecal specimens in transport media. Test results are to be used in conjunction with information available from the patient clinical evaluation and other diagnostic procedures. Curian Campy is intended to aid in the diagnosis of *Campylobacter* infection.

C Special Conditions for Use Statement(s):

- Rx - For Prescription Use Only
- The Curian Campy was evaluated using only fresh fecal samples and fecal samples stored in Cary Blair media or C&S media. The performance of fecal samples stored in other transport media (e.g., formalin, polyvinyl alcohol) has not been evaluated and therefore, should not be used.
- No data exists on the effects of colonic washes, barium enemas, laxatives, or bowel preparations on the performance of the Curian Campy. All of these procedures can result in extensive dilution or the presence of additives that may affect test performance.
- The fluorescence signal obtained with this assay is invisible to the unaided eye. The test results can only be obtained with the propose use of the Curian Analyzer.

D Special Instrument Requirements:

The Curian Campy assay can only be run on the Curian Analyzer.

IV Device/System Characteristics:

A Device Description:

Curian Campy, for use with the Curian Analyzer, is a rapid, qualitative, fluorescent immunoassay for the detection of *Campylobacter* spp. (*C. jejuni/C. coli/C. upsaliensis/C. lari*) in human stool, where stool may be either unpreserved or preserved in C&S or Cary-Blair transport media. The Curian Campy assay consists of a test strip enclosed in a plastic frame (test card), positive control reagent, and an assay specific Aioprep sample preparation device. Curian Campy is a lateral flow-based immunoassay for the direct detection of *Campylobacter* antigens in human stool. Curian Campy utilizes monoclonal antibodies, specific for an antigen common to *C. jejuni*, *C. coli, C. lari* and *C. upsaliensis*, as the capture and detector antibodies.

The Aioprep is pre-filled with blue tinted Sample Diluent and contains a filter and a sample metering device. A sample of the patient's stool specimen is transferred from the collection container to the Aioprep, using either the included transfer pipette (for preserved or unpreserved, liquid/semi-solid specimens) or the assay specific sample collection brush (for preserved or unpreserved, formed/solid specimens) which is available separately as an accessory (not required for use). When using the transfer pipette, the sample is added directly into the Sample Diluent within the Aioprep. When using the sample collection brush, the brush with sample is inserted through the metering device to remove excess stool and then is pushed directly into the Sample Diluent within the Aioprep sample preparation device.

The diluted sample is mixed and dispensed dropwise into the sample port of the Curian Campy test card. If present, the *Campylobacter* antigen binds to the monoclonal detector antibody conjugated to fluorescent particles, forming a complex. As the sample moves through the test strip, the anti-*Campylobacter* capture antibody, bound to the assay membrane at the test position of the strip, binds the complex and yields a test line. When antigen is not present, a complex is not formed, and a test line will not occur. As the sample continues to move further up the test strip, the polyclonal capture antibody, bound to the assay membrane at the control position of the strip, binds the conjugated antibody and yields a control line. A line at the control position of the test strip should be present

each time a sample or external control is tested. If the control line is not generated, adequate sample flow has not occurred, and the Curian Analyzer will consider the test invalid.

The Curian Analyzer can be run in either "Incubate and Analyze" mode or "Analyze Now" mode. If operating the Curian Analyzer in the "Incubate and Analyze" mode, the test card is inserted into the Curian Analyzer, after which all further steps are automated. If operating the analyzer in "Analyze Now" mode, the test card is incubated at 19-27ºC on the benchtop for 20 minutes before insertion into the Curian Analyzer. If a patient specimen cannot be tested immediately/as soon as possible after collection, unpreserved and preserved specimens (in Meridian Para-Pak C&S media) may be held for up to 7-days at 2-8ºC. Alternatively, unpreserved or preserved specimens (in Meridian Para-Pak C&S media) may be frozen for up to 59 days at ≤-20ºC prior to testing.

B Principle of Operation:
See **Section IV.A** above.

V Substantial Equivalence Information:

A Predicate Device Name(s):
CAMPYLOBACTER QUIK CHEK

B Predicate 510(k) Number(s):
K191456

C Comparison with Predicate(s):

Similarities		
Item	DEVICE Curian Campy K210976	PREDICATE *CAMPYLOBACTER QUIK CHEK* K191456
Indications For Use	Curian Campy, for use with the Curian Analyzer, is a rapid, qualitative fluorescent immunoassay for the detection of a *Campylobacter*-specific antigen in human fecal specimens. Curian Campy is intended to detect *C. jejuni*, *C. coli*, *C. upsaliensis*, and *C. lari* in human stool from patients with signs and symptoms of gastroenteritis. The test is intended for use with unpreserved fecal specimens or preserved fecal specimens in transport media. Test results are to be used in conjunction with information available from the patient clinical evaluation and other diagnostic procedures. Curian Campy is intended to aid in the diagnosis of *Campylobacter* infection.	The *CAMPYLOBACTER QUIK CHEK* test is a rapid membrane enzyme-linked immunosorbent assay for the qualitative detection of a *Campylobacter*-specific antigen in human fecal specimens. The *CAMPYLOBACTER QUIK CHEK* test is designed to detect *C. jejuni*, *C. coli*, *C. lari,* and *C. upsaliensis* from patients with signs and symtpoms of gastroenteritis. The test is intended for use with preserved fecal specimens in transport media and unpreserved fecal specimens. Test results sholud be considered in conjuction with clinical findings and patient history.

Classification	Class I	Same
Product Code	LQP	Same
Regulation	21 CFR 866.3110	Same
Measured Analyte	*Campylobacter*-specific antigen	Same
Antibody Format	Monoclonal/Polyclonal	Same
Type of Test	Qualitative	Same
Sample Matrix	Human fecal specimen	Same
Specimen Type	Unpreserved fecal specimens and fecal specimens in Cary-Blair and C&S transport media	Same
Controls	Positive and negative control included in the kit. Internal control line	Same
Species Detected	*C. jejuni*, *C. coli*, *C. lari*, and *C. upsaliensis*	Same
Read Result Time	< 30 minutes	Same
Format	Single use cassette	Same
Kit Storage	Refrigerated (2-8˚C)	Same
Differences		
Item	DEVICE Curian Campy K210976	PREDICATE *CAMPYLOBACTER QUIK CHEK* K191456
Technology	Lateral flow fluorescent immunoassay (FIA)	Membrane Enzyme Linked Immunosorbent Assay (ELISA)
Result Interpretation Method	Result interpretation automated by Curian Analyzer	Visually Read

VI Standards/Guidance Documents Referenced:

- BS EN ISO 23640:2015 In vitro diagnostic medical devices - Evaluation of stability of in vitro diagnostic reagents
- ISO 14971 Third edition. 2019-12 Medical devices – Application of risk management to medical devices

VII Performance Characteristics (if/when applicable):

A Analytical Performance:

All analytical studies were conducted in "Analyze Now" mode. The primary difference between these modes is that in "Analyze Now" mode, the operator is responsible for the incubation time; in the "Incubate and Analyze" mode, the instrument will wait to read the strip until the specified development time has passed. A validation study was conducted to demonstrate that the "Analyze Now" mode does not impact the results of the analytical studies in the conditions tested. See section **VII.A.3."Analyze Now" vs. "Incubate and Analyze" Read Mode Study** for more information and the results of this study.

1. Precision/Reproducibility:
Reproducibility of the Curian Campy assay was assessed across three testing sites, one of which was internal. Two sample panels, one consisting of unpreserved (raw) stool and one consisting of preserved stool (in C&S transport media) were evaluated. Panels were created by spiking *C. jejuni* (strain ATCC #BAA-1234) whole organism into unpreserved and preserved pooled stool negative matrix at the following concentrations: negative, high negative (just below C_5), low positive (~C_{95}), and moderate positive (3x higher than the C_{95}). Ten blinded sample panels per stool matrix (i.e., unpreserved or preserved), each consisting of 16 samples per panel (1 negative, 5 high negatives, 5 low positives, and 5 moderate positives) were provided to each site for a total of 160 unpreserved stool samples and 160 preserved stool samples per site. Testing was conducted at each site twice a day over 5 non-consecutive days by two operators per day/site and included three different kit lots (2 lots per site). Positive and negative controls were run with each panel of masked samples. The results for unpreserved and preserved stool are show in in **Table 1**.

Table 1. Reproducibility Study Results

Unpreserved Stool					
Panel Member	**Percent Agreement with Expected Results**				
	Site 1	**Site 2**	**Site 3**	**Total**	**95% CI**
Moderate Positive	100% (50/50)	100% (50/50)	100% (50/50)	100% (150/150)	97.5, 100%
Low Positive	100% (50/50)	82% (41/50)	66% (33/50)	82.7% (124/150)	75.8, 87.9%
High Negative	96% (48/50)	100% (50/50)	100% (50/50)	98.7% (148/150)	95.3, 99.6%
Negative	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	88.7, 100%
Preserved (C&S) Stool					
Panel Member	**Site 1**	**Site 2**	**Site 3**	**Total**	**95% CI**
Moderate Positive	100% (50/50)	100% (50/50)	100% (50/50)	100% (150/150)	97.5, 100%
Low Positive	100% (50/50)	100% (50/50)	100% (50/50)	100% (150/150)	97.5, 100%
High Negative	90% (45/50)	98.0% (48/49)[1]	98% (49/50)	95.3% (142/149)	90.6, 97.7%
Negative	100% (10/10)	100% (10/10)	100% (10/10)	100% (30/30)	88.7, 100%

[1]A single replicate was not performed because the Curian Analyzer inadvertently shut down and there was insufficient volume for a repeat test.

For the unpreserved low positive panel member, a low Percent Agreement (PA) with expected results was observed (82.7%). Upon review of the study information, it was determined that the PA for the unpreserved low positive sample was due to operator under-sampling with the Curian Campy transfer pipette. To mitigate the risk presented by under-sampling, the package insert instructions were revised to provide additional clarity regarding unpreserved specimen handling/processing instructions.

2. Linearity:
Not applicable

3. Analytical Specificity/Interference:

Cross-Reactivity and Microbial Interference

The Curian Campy assay was evaluated for cross-reactivity with the bacteria, fungi, and viruses listed in **Table 2** below. Bacteria and fungi were tested at $\geq 1.2x10^7$ CFU/mL while all viruses, except Norovirus, were tested at $\geq 1.0x10^5$ $TCID_{50}$/mL. For Norovirus, five positive preserved clinical stool specimens were evaluated for cross-reactivity. Norovirus cross-reactivity testing was not performed with unpreserved stool. Testing for all other microorganisms was performed with both unpreserved and preserved (in C&S transport media) stool matrices. Each non-target microorganism was tested in triplicate.

For microbial interference testing, *C. jejuni* (strain ATCC #BAA-1234) whole organism was spiked at 2x LoD in both unpreserved and preserved (C&S) stool matrix containing non-target microorganisms (see **Table 2**). For Norovirus, unpreserved stool matrix was not evaluated; rather, the preserved clinical stool specimens described above were tested in the presence of *C. jejuni* at 2x LoD. Testing was performed in triplicate.

Table 2. Microorganisms Evaluated for Cross-Reactivity

Bacteria/Fungi	
Acinetobacter baumannii	*Klebsiella pneumoniae*
Aeromonas hydrophila	*Lactobacillus acidophilus*
Bacillus cereus	*Lactococcus lactis*
Bacillus subtilis	*Listeria monocytogenes*
Bacteroides fragilis	*Peptostreptococcus anaerobius*
Campylobacter concisus	*Plesiomonas shigelloides*
Campylobacter fetus	*Porphyromonas asaccharolytica*
Campylobacter helveticus	*Prevotella melaninogenica*
Campylobacter hyointestinalis	*Proteus vulgaris*
Candida albicans	*Pseudomonas aeruginosa*
Citrobacter freundii	*Pseudomonas fluorescens*
Clostridium bifermentans	*Salmonella enterica subs. enterica serovar* Hilversum
Clostridiodes difficile	*Salmonella enterica subs. enterica serovar* Typhimurium
Clostridium perfringens	*Salmonella enterica subs. enterica serovar* Minnesota
Edwardsiella tarda	*Serratia marcescens*
Enterobacter cloacae	*Shigella dysenteriae*
Enterococcus faecalis	*Shigella flexneri*
Escherichia coli	*Shigella sonnei*
Escherichia coli EIEC	*Staphylococcus aureus*
Escherichia coli EPEC	*Staphylococcus aureus (Cowan's)*
Escherichia coli ETEC	*Streptococcus agalactiae*
Escherichia coli O157:H7 (non-toxigenic)	*Staphylococcus epidermidis*
Escherichia coli O157:H7 (toxigenic)	*Steptococcus dysgalactiae subsp. Equisimilis*

Bacteria/Fungi	
Escherichia fergusonii	*Vibrio parahaemolyticus*
Escherichia hermannii	*Yersinia enterolitica*
Helicobacter pylori	
Viruses	
Adenovirus Type 1	Echovirus 11
Adenovirus Type 2	Echovirus 18
Adenovirus Type 3	Enterovirus 68
Adenovirus Type 5	Enterovirus 69
Adenovirus Type 40	Enterovirus 70
Adenovirus Type 41	Enterovirus 71
Coxsackie virus B2	Human coronavirus OC43
Coxsackie virus B3	Human Rotavirus
Coxsackie virus B4	Norovirus[1]
Coxsackie virus B5	Paraechovirus 1 (formerly Echovirus 22)
Echovirus 9	

[1]Five Norovirus positive preserved stool clinical specimens were evaluated.

C. helveticus (strain ATCC 51209) was cross-reactive at concentrations greater than $3.75x10^6$ CFU/mL for unpreserved stool and $7.50x10^6$ CFU/mL for preserved stool. None of the other microorganisms evaluated in this study were cross-reactive with the Curian Campy assay.

Interfering Substances Study

The Curian Campy test was evaluated for interfering substances with the substances and concentrations listed in **Table 3**. Testing was performed with both unpreserved and preserved (C&S) stool matrices. None of the substances were shown to interfere with the performance of the Curian Campy test.

Table 3. Interfering Substance Panel

Barium sulfate (5% w/v)	Mylanta (4.2 mg/mL)
Benzalkonium chloride (moist towelettes) (1% w/v)	Naproxen sodium (5% w/v)
Ciprofloxacin (0.25% w/v)	Nonoxynol-9 (1% w/v)
Ethanol (1% w/v)	Nystatin (1% w/v)
Hog gastric mucin (3.5% w/v)	Palmitic acid (fecal fat) (40% w/v)
Human whole blood (40% v/v)	Pepto-Bismol (5% v/v)
Human hemoglobin (10% w/v)	Phenylephrine (1% w/v)
Human urine (5% v/v)	Polyethylene glycol 3350 (10% w/v)
Hydrocortisone (1% w/v)	Prilosec OTC (5 ug/mL)
Imodium AD (5% v/v)	Sennosides (1% w/v)
Kaopectate (5% v/v)	Simethicone (10% w/v)
Leukocytes (0.05% v/v)	Stearic acid (fecal fat) (40% w/v)
Mesalazine (10% w/v)	Tagament (5 ug/mL)
Metronidazole (0.25% w/v)	TUMS (50 ug/mL)
Mineral Oil (10% w/v)	Vancomycin (0.25% w/v)

Prozone Study
The purpose of this study was to demonstrate that a high concentration of *Campylobacter* (antigen) does not interference with a positive reaction in the Curian Campy test. High positive samples were prepared by spiking a negative fecal pool with 1.73×10^8 whole organisms of *C. jejuni* (strain ATCC #BAA-1234). Both unpreserved and preserved (C&S) samples were tested. A total of 7 different dilutions were prepared and evaluated for both unpreserved and preserved stool matrices. Testing was performed according to the Package Insert instructions in replicates of five for each dilution. The results demonstrated that were was no overall hook affect, and that elevated levels of whole organism did not affect the detection of *Campylobacter*.

"Analyze Now" and "Incubate and Analyze" Read Mode Study
To demonstrate that performance of the Curian Campy is not influenced by operating the device in "Analyze Now" mode under the conditions used for analytical studies, a comparison study was conducted with contrived positive samples prepared by spiking a negative fecal pool with *C. jejuni* (strain ATCC BAA-1234) at 2-3x LoD. Negative samples and positive clinical specimens were also included in the study. Each sample was tested on the Curian analyzer in "Analyze Now" mode and "Incubate and Analyze" mode.

There was 100% agreement between the expected and observed results for all positive and negative samples. These results demonstrate that there is no notable difference in performance between "Analyze Now" and "Incubate and Analyze" modes in the analytical testing setting. These study results are acceptable and support performing analytical testing solely in "Analyze now" mode.

4. Assay Reportable Range:
Not applicable

5. Traceability, Stability, Expected Values (Controls, Calibrators, or Methods):

Specimen Stability and Freeze/Thaw Stability
The effect of specimen storage on antigen stability was evaluated for both unpreserved and preserved stool samples. For this analysis, a sample panel consisting of 2 clinical negative specimens (1 unpreserved and 1 preserved) and 4 contrived positive samples (2 unpreserved and 2 preserved) were evaluated. Contrived positive samples were generated by spiking *C. jejuni* (strain ATCC BAA-1234) whole organism at 2x LoD. After baseline testing was performed, stool samples were stored under the conditions outlined in **Table 4** and tested according to the schedule described in the same table.

Table 4. Specimen Stability and Freeze/Thaw Stability Studies - Testing Schedule

Specimen Stability		
Stool Matrix	**Storage Temperature**	**Time Interval**
Preserved Stool	Room temperature (19-27°C)	0, 49, 73, and 97-hours
Unpreserved and Preserved Stool[1]	Refrigerated (2-8°C)	0, 49, 97, and 192-hours
Unpreserved and Preserved Stool[2]	Frozen (-20°C and -80°C)	0, 30, 45, and 60-days
Freeze/Thaw Stability		
Stool Matrix	**Storage Temperature**	**# of Freeze/Thaw Cycles Evaluated**
Unpreserved stool and Preserved Stool[2]	Frozen (-20°C and -80°C)	4 and 6 cycles

[1]Only Meridian Para-Pak C&S medium was evaluated for refrigerated specimen stability. Other C&S and Cary Blair transport media containing patient stool should be stored according to the recommendations outlined in the respective transport media package insert.
[2]Only Meridian Para-Pak C&S medium was evaluated for frozen specimen stability and freeze/thaw stability. Other C&S and Cary Blair transport media containing patient stool should be stored according to the recommendations outlined in the respective transport media package insert.

Positive samples remained positive and negative samples remained negative throughout the study. Based on these results, the recommended storage conditions and timeframes are as follows:

Unpreserved stool

- Up to 168-hours (7-days) refrigerated (2-8°C)
- Up to 59-days frozen (-20°C or -80°C)
- Up to 5 freeze/thaw cycles when stored frozen (-20°C or -80°C)

Preserved stool

- Up to 96-hours (4-days) at room temperature (19-27°C)
- Up to 168-hours (7-days) refrigerated (2-8°C) for stool in Meridian Par-Pak C&S medium
- Up to 59-days frozen (-20°C or -80°C) for stool in Meridian Para-Pak C&S medium
- Up to 5 freeze/thaw cycles when stored frozen (-20°C or -80°C) in Meridian Para-Pak C&S medium

Diluted Specimen Hold Time Study
This study was performed to determine storage conditions the Curian Campy Aioprep Sample Preparation Device containing stool, prior to testing with the Curian Campy assay. For this study, the sample panel evaluated during the specimen stability study was analyzed. After baseline testing was performed, samples were stored at room temperature (19-27˚C) or refrigerated (2-8˚C). For samples stored at room temperature, testing was performed at 5, 9, and 25-hours following storage, while refrigerated samples were tested at 25-hours post-storage. All positive samples were positive, and all negative samples were negative. These results support that stool specimens in the Aioprep may be stored up to 8-hours at room temperature or up to 24-hours refrigerated prior to testing with the Curian Campy assay.

6. Detection Limit:

Limit of Detection Study
The limit of detection (LoD) for the Curian Campy test was determined using whole organisms of *C. jejuni*, *C. coli*, *C. lari*, and *C. upsaliensis* spiked into unpreserved (raw) stool and preserved stool in Cary Blair and C&S transport media. Three lots of the Curian Campy assay were evaluated in the study. The concentrations were calculated in colony forming units per milliliter (CFU/mL) and their equivalent in CFU/test by factoring in the dilutions and the final volume used in the assay. The LoD is the microorganism concentration that yields a positive result 95% of the time and a negative result 5% of the time. The LoD for each *Campylobacter* species and stool type are presented in **Table 5**.

Table 5. LoD Study Results

***C. jejuni* (ATCC #BAA-1234)**		***C. coli* (ATCC #43484)**		***C. upsaliensis* (ATCC #49816)**		***C. lari* (ATCC #43675)**	
CFU/mL	CFU/test	CFU/mL	CFU/test	CFU/mL	CFU/test	CFU/mL	CFU/test
Unpreserved Stool Matrix							
$4.00x10^5$	1818	$3.00x10^6$	13636	$1.62x10^6$	7386	$5.00x10^6$	22727
Preserved (C&S) Stool Matrix							
$7.25x10^5$	2266	$1.57x10^7$	49063	$1.18x10^6$	3681	$1.16x10^7$	36250
Preserved (Cary Blair) Stool Matrix							
$7.25x10^5$	2266	$1.57x10^7$	49063	$2.36x10^6$	7375	$1.16x10^7$	36250

Inclusivity Study

The reactivity of the Curian Campy was established using the strains listed in **Table 6**.

For *C. upsaliensis* and *C. lari* reactivity testing, a subset of all isolates were clinical isolates obtained from patients with symptoms of gastroenteritis that were isolated at the *Centre National de Reference des Campylobacters et Helicobacters* – Universite de Bordeaux between 2013 and 2018. For reactivity testing, each strain was spiked into negative fecal matrix or preserved stool (C&S) at 2-4x the LoD of the corresponding species reference strain used to determine the LoD in **Table 5** above, and then tested with the Curian Campy assay. Any strain which did not produce 100% positive results at 2-4x LoD was tested at sequentially higher concentrations until 100% positive results were obtained. All *C. jejuni* and *C. coli* strains were detected at 2-4x LoD in both unpreserved and preserved stool. All *C. upsaliensis* and C. *lari* strains were detected at 2-4x LoD in unpreserved and preserved stool, except for those denoted in **Table 7**, where a higher concentration relative to the LoD of the original reference strain was required. The reason for the elevated reactivity levels is unknown but may reflect biological variation among the strains.

Table 6. Strains Evaluated for Reactivity with the Curian Campy Assay

C. jejuni	***C. coli***	***C. upsaliensis***	***C. lari***
Zeptometrix Z086	ATCC 43482	ATCC BAA-1059	ATCC BAA-1060
ATCC 33292	ATCC 43476	ATCC 49815	ATCC 35222
ATCC 49350	ATCC 43478	2017/0506H	ATCC 35223
ATCC 43442	ATCC 43485	2016/1950	2013/0823H
ATCC 33560	ATCC BAA-1061	ATCC 43954	2015/0814
		ATCC 43953	2015/2983
		2016/2697	2016/0235
		2018/0319H	2015/0519
		2016/1931	2015/1582
		ATCC 700558	2015/2189

Table 7. *Campylobacter* Strains Detected at Elevated Concentrations

Species	**Strain**	**Reactivity Level in Unpreserved Stool**	**Reactivity Level in Stool Preserved in C&S**
C. upsaliensis	2016/1950	4x	8x
	ATCC 43953	2x	8x
	2016/2697	56x	78x
	2018/0319H	40x	55x
	ATCC 700558	24x	33x

C. lari	2013/0823H	8x	4x
	2015/0814	8x	4x
	2016/0235	8x	10x
	ATCC 35222	8x	10x
	ATCC 35223	24x	10x

7. Assay Cut-Off:
   To determine the preliminary cut-off the Curian Campy assay read on the Curian Analyzer, a panel of clinical negative and contrived positive (near LoD) stool samples were evaluated. The initial cut-off was validated during the prospective clinical study by testing a population of 1464 specimens, of which 18 were positive and 1425 were negative by the Curian Campy assay. The results of the cut-off study were acceptable.

B Comparison Studies:

1. Method Comparison with Predicate Device:
   Not applicable

2. Matrix Comparison:
   Not applicable

C Clinical Studies:

1. Clinical Sensitivity:

   Prospectively Collected Specimens Study
   The performance of the Curian Campy test was assessed with specimens prospectively collected from patients with signs and symptoms of gastroenteritis. Specimens were collected from five independent clinical sites. The sensitivity and specificity for the Curian Campy test was calculated by comparing directly to culture and speciation results performed at the sites. Prospective testing consisted of 1474 stool specimens tested in clinical microbiology laboratories at Medical College of Wisconsin, Medfusion, Cincinnati Children's Hospital Medical Center, Indiana University, and Tricore Reference Laboratories. Both "Analyze Now" and "Incubate and Analyze" modes were used for specimen testing. The vast majority of stool specimens were pipettable and were sampled using the transfer pipette provided in the Curian Campy kit. A small subset were non-pipettable and thus were sampled with the Curian Campy Stool Collection Brush (sold separately by Meridian).

   The ages of patients ranged from less than 1 year to 99 years with 15.7% of the specimens coming from patients that were ≤18 years of age. Of the 1474 patients tested, 60.8% were female and 39.2% were male. No difference in test performance was observed based on patient age or gender. **Table 8** shows a summary of the clinical performance of the Curian Campy for all sites, combined.

Table 8. Clinical Performance of the Curian Campy with Prospective Specimens

		Culture and Speciation		
		Positive	**Negative**	**Total**
Curian Campy	**Positive**	18	28**	46
	Negative	3*	1425	1428
	Total	21	1453	1474
Sensitivity		85.7% (18/21), 95% CI: (65.4, 95.0%)		
Specificity		98.1% (1425/1453), 95% CI: (97.2, 98.7%)		

*The Standard of Care (SoC) testing of two of the three false negative specimens by a high sensitivity, FDA-cleared nucleic acid amplification (NAAT) assay showed that one of the specimens produced a negative *Campylobacter* result, whereas one of the specimens produced a positive *Campylobacter* result; the third specimen was not subjected to NAAT testing as part of the SoC.
**Of the 28 false positive specimens, 10 were subjected to SoC testing by a high sensitivity, FDA-cleared NAAT assay. Two of these 10 specimens produced a positive *Campylobacter* result, whereas eight produced a negative *Campylobacter* result. Eighteen specimens were not subjected to NAAT testing as part of the SoC.

The results of the study show that the Curian Campy exhibited a sensitivity of 85.7% and a specificity of 98.1% compared to culture and speciation. The sensitivity point estimate and lower bound of the two-sided 95% confidence interval for the sensitivity point estimate were slightly lower than expectations for this type of assay. However, the sensitivity results were deemed acceptable without the need to conduct additional clinical specimen testing for the following reasons: (1) Challenges with performing prospective clinical studies during the COVID-19 pandemic, (2) One of the three specimens with a false negative Curian Campy result was negative by a high sensitivity FDA-cleared nucleic acid amplification (NAAT) assay. This result suggests that the Curian Campy sensitivity is likely higher than the 85.7%-point estimate and, (3) The prospective study was supplemented with archived positive specimens (see section **VII.C.Archived Study**, below).

Archived Specimens Study
Additional testing with the Curian Campy was performed at five clinical sites using 290 archived specimens, of which 29 were positive and 261 were negative by *Campylobacter* spp. culture and speciation. The patient ages ranged from <1 year to 93 years. Compared to culture and speciation, the sensitivity and specificity point estimates for the Curian Campy were 96.6% and 98.1%, respectively. The results of the archived study are illustrated in **Table 9**. These results are acceptable.

Table 9. Clinical Performance of the Curian Campy with Archived Specimens

		Culture and Speciation		
		Positive	**Negative**	**Total**
Curian Campy	**Positive**	28	5	33
	Negative	1	256	257
	Total	29	261	290
Sensitivity		96.6% (28/29), 95% CI: (82.8, 99.4%)		
Specificity		98.1% (256/261), 95% CI: (95.6, 99.2%)		

Contrived Study
The performance of the Curian Campy was further evaluated by testing a panel consisting of *C. coli*, *C. lari*, and *C. upsaliensis* isolates. All isolates, which were obtained from humans, were procured from ATCC. Samples were prepared by spiking negative, pooled fecal matrix with

whole organism at 2x and 8x the LoD of the reference strain, which was used to confirm the LoD. Both unpreserved stool and preserved stool (in C&S transport media) were evaluated during the study. For each *Campylobacter* species, 25 samples were prepared in both unpreserved stool and preserved stool, for a total of 50 positive samples/species. Sixty negatives were included for blinding and randomization purposes. A subset of the panel was provided to each of the five clinical testing sites for evaluation. Each site was provided both positive and negative samples. Testing was performed over a period of several days at each site. The results of this study demonstrated 100% positive percent agreement (PPA) with expected results for all *C. coli*, *C. lari*, and *C. upsaliensis* isolates, regardless of stool matrix. These results are acceptable.

2. Clinical Specificity:
   See section **VII.C.1.Prospective Study** above.

3. Other Clinical Supportive Data (When 1. and 2. Are Not Applicable):

   Brush Bridging Study
   The Curian Campy assay is for use with unpreserved human stool specimens and human stool specimens preserved in Cary-Blair and C&S transport media. Most specimens are easily sampled using the transfer pipette provided in the kit; however, some unpreserved stool specimens are non-pipettable and require use of a specific brush (i.e., Curian Campy Stool Collection Brush, sold separately by Meridian) to adequately collect the sample for analysis in the Curian Campy assay. Fifty-three non-pipettable stool specimens (5 *Campylobacter* positives and 48 negatives) were processed with the brush during the prospective and archived clinical studies, combined.

   To further support use of the brush with the Curian Campy assay, an analytical bridging study was performed that evaluated a panel consisting of contrived positive and negative samples collected/processed with the brush. Contrived positive samples were generated by spiking *C. jejuni* (strain ATCC #BAA-1234) into negative, non-pipettable stool samples. Ten samples were prepared at 3x LoD and 25 samples were prepared at 5x LoD. Twenty-five negative samples were also tested. Three non-expert operators tested each sample at one internal site. All positive samples gave the expected positive results, and all negative samples were negative. These results indicate that non-pipettable stool specimens can be collected with the brush prior to testing with the Curian Campy assay.

D Clinical Cut-Off:
Not applicable

E Expected Values/Reference Range:
Not applicable

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.