March 14, 2019

Panion & BF Biotech Inc.
% Kazem Kazempour
CEO & President
Amarex Clinical Research, LLC
20201 Century Blvd, Fourth Floor
Germantown, Maryland 20874

Re: K183573
Trade/Device Name: Vstrip H. pylori Antigen Rapid Test
Regulation Number: 21 CFR 866.3110
Regulation Name: *Campylobacter fetus* serological reagents
Regulatory Class: Class I
Product Code: LYR
Dated: December 19, 2018
Received: December 21, 2018

Dear Kazem Kazempour:

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. Although this letter refers to your product as a device, please be aware that some cleared products may instead be combination products. The 510(k) Premarket Notification Database located at https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn.cfm identifies combination product submissions. 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) for devices or postmarketing safety reporting (21 CFR 4, Subpart B) for combination products (see https://www.fda.gov/CombinationProducts/GuidanceRegulatoryInformation/ucm597488.htm); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820) for devices or current good manufacturing practices (21 CFR 4, Subpart A) for combination products; 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,

Steven R. Gitterman -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)*

K183573

Device Name

Vstrip® H.pylori Antigen Rapid Test

Indications for Use *(Describe)*

Vstrip® H.pylori Antigen Rapid Test is a single use immunochromatographic assay for the qualitative detection of *H. pylori* antigen in unpreserved human stool specimens. Test results are intended to aid in the initial diagnosis and treatment of *H. pylori* infection. Test results should be taken into consideration by the physician in conjunction with the patient history and symptoms.

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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510(K) SUMMARY

1. Date of Preparation: March 13, 2019

2. Owner Information

This Premarket Notification is submitted by:

Panion & BF Biotech Inc.
1F, No.308-8, Sec. 1
Datong Rd., Xizhi Dist.
New Taipei City 22146, Taiwan

Contact Information:

Kazem Kazempour, CEO
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3. Device

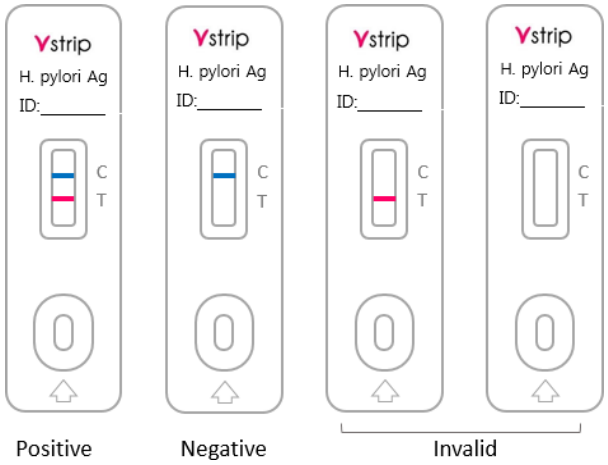
Name of Device:	Vstrip® H. pylori Antigen Rapid Test
Common Name:	*Helicobacter pylori* antigen assay
Classification Name:	*Campylobacter fetus* serological reagents (21 CFR 866.3110)
Regulatory Class:	Class I
Product Code:	LYR
Predicate Device:	ImmunoCard STAT!® HpSA® [K032222]

4. Device Description

The Vstrip® H.pylori Antigen Rapid Test (Vstrip®) is a *Helicobacter pylori* (*H. pylori*) antigen rapid test. It is a lateral flow immunochromatographic assay which employs antibody-coated latex beads to detect *H. pylori* antigens in stool specimens from patients suspected of *H. pylori* infection. This test is an *in vitro* diagnostic device to be used for the qualitative detection of *H. pylori* antigen in human

stool samples, and test results are intended to aid in the diagnosis and treatment of *H. pylori* infection. This test utilizes a pair of *H. pylori*-specific monoclonal antibodies that are capable of detecting *H.pylori* antigens in human stool. The assay kit includes a foil pouch containing test cassette which houses a strip incorporated with a pair of *H. pylori*-specific monoclonal antibodies, sample preparation tubes that contain sample diluent buffer for dilution of stool samples with a sampler tool attached to the underside of the tube cap and a dispenser tool attached to the top of the tube, positive control reagent containing inactivated *H.pylori*, and the package insert and instructions. Each diagnostic strip is enclosed in a plastic frame with a window to display the results. To perform the test, a diluted stool sample which is first prepared by a sample preparation tube is added to the Test Cassette. If the sample contains *H.pylori* antigen, a pink-red test line (next to the letter T) along with a blue control line (next to the letter C) will be visible in the rectangle "Result Window", as depicted in Figure 1. A blue control line is a line to show that adequate flow of the sample has occurred and active components have been employed during a test run. The presence of the blue line at the control position on the device confirms that the device is working properly. If *H. pylori* antigen is absent or below the level of detection, no pink-red line will appear in the rectangle "Result Window" of the cassette next to the letter T, but a distinct blue line shows next to the letter C, as depicted in Figure 1. For invalid result, no visible blue line in the rectangle "Result Window" of the cassette next to the letter C, with or without a visually detectable pink-red line, as depicted in Figure 1. It may occur with the deteriorated materials, but an excess of stool sample and incorrect procedure is mostly the main reason for control line failure. When an invalid result appears, review the test procedure and re- test same specimen. If the test fails again, repeat the test with different specimens. If the problem persists, the use of concerned test kit lot should be discontinued.

Figure 1: Schematic Diagram of Device with all possible outcomes



5. Principle of the Test and Assay Procedures

Vstrip® H.pylori Antigen Rapid Test is a rapid immunochromatographic assay that utilizes a pair of

H. pylori-specific monoclonal antibodies to detect the presence of fecal *H. pylori* antigens indicated by a pink-red color line.
To perform the test, a diluted stool sample which is first prepared by a sample preparation tube is added to the Test Cassette and read the result at 10 minutes. All stool specimens and assay procedures must be handled at room temperature and on a flat surface.

6. Rationale of Antibody Selection and Information of Selective H. pylori Strains

In literature, the flagella part of *H.pylori* has been studied extensively and demonstrated the key role of their colonization in bacteria, inflammation, and immune evasion. Filament, a copolymer of the flagellin subunits, is an important subunit of *H.pylori* flagella and plays an important role in motility. As motility is essential for *H. pylori* colonization in the human gastric mucosa, anti- *H.pylori* monoclonal antibody (Ab) against flagellin was utilized to develop Vstrip® H.pylori Antigen Rapid Test.

7. Intended Use

Vstrip® H.pylori Antigen Rapid Test is a single use immunochromatographic assay for the qualitative detection of *H. pylori* antigen in unpreserved human stool specimens. Test results are intended to aid in the initial diagnosis and treatment of *H. pylori* infection. Test results should be taken into consideration by the physician in conjunction with the patient history and symptoms.

8. Indications of Use

Same as Intended Use

9. Comparison of Vstrip® H.pylori Antigen Rapid Test with the Predicate Device

The comparison of assay methods between Vstrip® H. pylori Antigen Rapid Test and ImmunoCard STAT! ® HpSA® is shown in Table 1. Panion & BF Biotech Inc. (PBF) believes that Vstrip® H.pylori Antigen Rapid Test employs the same technological characteristics for the same intended use as the predicate.

Table 1: Comparison with Predicate

Characteristic	Device: Vstrip® H. pylori Antigen Rapid Test	Predicate: ImmunoCard STAT!® HpSA® K032222
Intended Use/Indication for Use	Vstrip® H.pylori Antigen Rapid Test is a single use immunochromatographic assay for the qualitative detection of *H. pylori* antigen in unpreserved human stool specimens. Test results are intended to aid in the initial diagnosis and treatment of *H. pylori* infection. Test results should be taken into consideration by the physician in conjunction with the patient history and symptoms.	The ImmunoCard STAT! HpSA is a rapid in vitro qualitative procedure for the detection of *H pylori* antigens in human stool. The stool antigen detection is intended to aid in the diagnosis of *H. pylori* infection and to demonstrate loss of *H.pylori* stool antigen following treatment. Conventional medical practice recommends that testing by any method to confirm loss of antigen be done at least four weeks following completion of therapy.
Product Code	LYR	Same
Test Type	Qualitative	Same
Specimen Required	Formed stool, semi-solid stool,	Same
Technology	Lateral flow chromatography	Same
Capture Antibody	Monoclonal anti-*H. pylori*	Same
Conjugate	Red-latex conjugated anti-*H. pylori*	Same
Assay Steps	• Dilute specimen in provided sample diluents • Add diluted specimen to test port • Incubate for room temperature for 10 minutes • Read results visually	• Dilute specimen in provided sample diluents • Add diluted specimen to test port • Incubate for room temperature for 5 minutes • Read results visually
End point	Visual color bands	Same
Interpretation of test results	NEGATIVE = Only Blue band at control line close to letter "C". POSITIVE = Blue line at control line plus Pink-red band at the test line close to letter "T".	Same
Differences		
Level of skill required	Laboratory setting	Untrained Users
Kit Storage temperature	15-30°C	2-8°C
Time to read	10 min	5 min
Acceptable sample-Liquid stool	No	Yes

10. Performance Data

Comparison Study

A multi-center study including sites from USA and Taiwan was conducted to evaluate the performance of the study test device (Vstrip® H.pylori Antigen Rapid Test) for detecting *H. pylori* stool antigen (HpSA) in human stool from patients suspected of *H. pylori* infection. Test results were compared to results from an FDA cleared *H. pylori* stool antigen ELISA that was previously evaluated relative to the endoscopy biopsy composite reference method (i.e., culture, histology, and RUT) for initial *H. pylori* diagnosis with a demonstrated sensitivity and specificity greater than or equal to 95% and a lower bound of the two-sided 95% confidence interval (CI) greater than 89%.

A total of 333 fresh fecal specimens from the intended use population (150 fresh fecal samples collected in the USA and 183 fresh fecal samples collected in Taiwan) along with test device and comparator kits were provided by the Sponsor to the selected study laboratories. Trained laboratory operators were recruited for this study and were blinded to the samples designations.

Positive, negative and overall percent agreement were determined between Vstrip® H.pylori Antigen Rapid Test and the comparator ELISA in detecting the *H. pylori* antigen in human stool. No invalid results were observed for the investigational test or the comparator ELISA. The Vstrip H.pylori Antigen Rapid Test demonstrated a positive percent agreement of 96.67% [58/60; 95% CI 88.64% - 99.08%] and a negative percent agreement of 98.17% [268/273; 95% CI 95.79% - 99.22%] with the comparator ELISA. The study acceptance criteria were met.

Reproducibility Study

A study was conducted to evaluate the reproducibility of Vstrip® H.pylori Antigen Rapid Test results in detecting *H.pylori* antigen in human stool, as performed by different operators in multiple laboratories.

Five (5) panels of 12 frozen fecal samples each with random distributions of medium positive (4xLOD), low positive (1-2xLOD, near C_{95} concentration), high negative (near C_5 concentration) and negative samples) were analyzed using the Vstrip® H.pylori Antigen Rapid Test by each operator at each site over five (5) days (one (1) panel per day per operator).

Across all sites and operators, agreement with the expected result was 97.8% (88/90) for the moderate positive panel member, 97.8% (88/90) for the low positive panel member, 98.9% (89/90) for the high negative panel member, and 100% (90/90) for the true negative panel member. The reproducibility study analyses demonstrated that results of the Vstrip® H.pylori Antigen Rapid Test are reproducible by different operators in multiple locations.

Analytical Sensitivity

A study was done to establish the limit of detection (LOD) for the Vstrip® H.pylori Antigen Rapid test. The LOD testing was conducted in a stool matrix background comprised from three negative stool samples spiked with serial dilutions of two strains of cultured *H. pylori* (ATCC 43504 and ATCC 51653). Each dilution was tested with the Vstrip® H.pylori Antigen Rapid test 10 times each by four operators (a total of 40 replicates). The LOD value for Vstrip® H.pylori Antigen Rapid Test was defined as the concentration producing a positive result at least 95% of the time. The LOD value for Vstrip® H.pylori Antigen Rapid Test based on 95% positive results was $8.5X10^5$ CFU/mL

for *H.pylori* strain ATCC 43504 and 1.9 $X10^5$ CFU/mL for *H.pylori* strain ATCC 51653.

Inclusivity

An additional three *H. pylori* strains produced a positive result at least 95% of the time with the Vstrip® H.pylori Antigen Rapid Test when tested at the following concentrations: ATCC700392 (3.8×10^5 CFU/mL), ATCC 51110 (1.9×10^5 CFU/mL), and BCRC 17132 (3.8×10^6 CFU/mL).

Analytical Specificity

A study was done to determine analytical specificity (cross reactivity) of the Vstrip® H.pylori Antigen Rapid Test with panels of viruses and bacteria. The test was performed on positive and negative samples containing high levels of non-target microorganisms (bacteria spiked at $\geq 1x10^7$ CFU/mL, viruses spiked at $\geq 1x10^5$ $TCID_{50}$/mL). Testing included thirty seven (37) bacteria and seven (7) virus types. Various strains of viruses and bacteria panels were diluted and tested with the Vstrip® H.pylori Antigen Rapid Test to detect any potential cross-reactivity. Results were recorded at 10 minutes interval. Each condition was run in triplicate. None of the microorganisms tested produced false positive or false negative results.

Interfering Substances

A study was conducted to determine if various over-the-counter medications or endogenous substances could interfere with the assay results. Fifteen potentially interfering substances were spiked in both positive and negative samples tested in triplicate with the Vstrip® H.pylori Antigen Rapid Test. None of substances with the indicated concentrations interfered with the performance of Vstrip® H.pylori Antigen Rapid Test.

Sample Stability

Studies were conducted to examine the stability of stool samples when stored refrigerated at 2-8^o C or frozen at -20^o C. The study results supported the recommendations that stool samples can be stored up to seven days refrigerated at 2-8^o C, up to 20 days frozen at -20^o C, and that samples can undergo up to three freeze/thaw cycles.

Dose-Hook Effect Study

A dose hook effect (prozone) study was carried out to examine whether high concentrations of *H. pylori* antigen negatively affects the performance of the Vstrip®. The hook effect or the prozone effect is a type of interference which produces false negatives or inaccurately low results in the presence of high analyte concentrations. Five *H pylori* strains were tested in triplicate at 10^6-10^7 CFU/mL (10 – 100X LoD) concentration range with the Vstrip® H.pylori Antigen Rapid Test. No dose hook effect was observed at the tested concentrations.

11. Conclusions

The conclusions drawn from the nonclinical and clinical studies demonstrate that the Vstrip® H.pylori Antigen Rapid Test is safe and effective and substantially equivalent to the predicate device in performance.