May 2, 2018

Alere Scarborough, Inc.
Danielle Briggeman
Regulatory Affairs Specialist
10 Southgate Road
Scarborough, Maine 04074

Re: K173653
Trade/Device Name: Alere i Strep A 2, Alere i instrument, Alere i Strep A 2 Control Swab Kit
Regulation Number: 21 CFR 866.2680
Regulation Name: *Streptococcus* spp. nucleic acid-based assay
Regulatory Class: Class II
Product Code: PGX, OOI
Dated: November 21, 2017
Received: November 28, 2017

Dear Danielle Briggeman:

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 the CDRH's Office of Surveillance and Biometrics/Division of Postmarket Surveillance.

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)*
K173653

Device Name
Alere i Strep A 2

Indications for Use *(Describe)*
Alere i Strep A 2 is a rapid, instrument-based, molecular in vitro diagnostic test utilizing isothermal nucleic acid amplification technology for the qualitative detection of Streptococcus pyogenes, Group A Streptococcus bacterial nucleic acid in throat swab specimens obtained from patients with signs and symptoms of pharyngitis. It is intended to aid in the rapid diagnosis of Group A Streptococcus bacterial infections.

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.

This section applies only to requirements of the Paperwork Reduction Act of 1995.

DO NOT SEND YOUR COMPLETED FORM TO THE PRA STAFF EMAIL ADDRESS BELOW.

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510(K) SUMMARY

This summary of 510(k) safety and effectiveness information is being submitted in accordance with the requirements of SMDA 1990 and 21 CFR 807.92.

The assigned 510(k) number is: K173653

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DATE PREPARED
May 1, 2018

TRADE NAME
Alere™ i Strep A 2
Alere™ i Instrument
Alere™ i Strep A 2 Control Swab Kit

COMMON NAME
Alere™ i Strep 2, Alere™ i

CLASSIFICATION NAME
21 CFR 866.2680 – Streptococcus spp. Nucleic Acid-Based Assay

CLASSIFICATION
Class II

PRODUCT CODES
PGX, OOI

PANEL
Microbiology (83)

PREDICATE DEVICE
Alere i Strep A, K141757

DEVICE DESCRIPTION

Alere™ i Strep A 2 is a rapid, instrument-based isothermal test for the qualitative detection of *Streptococcus pyogenes* Group A Strep from throat swab specimens. The Alere™ i Strep A 2 System utilizes isothermal nucleic acid amplification technology and is comprised of:

- Sample Receiver – single use, disposable containing the elution buffer
- Test Base – single use, disposable comprising two sealed reaction tubes, each containing a lyophilized pellet
- Transfer Cartridge – single use, disposable for transfer of the eluted sample to the Test Base, and
- Alere™ i Instrument – repeat use reader

The reaction tubes in the Test Base contain the reagents required for *Streptococcus pyogenes* Group A Strep bacterial lysis and the subsequent amplification of the target nucleic acid and an internal control. Alere™ i Strep A 2 utilizes a pair of templates (similar to primers) for the specific amplification of DNA from *Streptococcus pyogenes,* Group A Strep and fluorescently labeled molecular beacons designed to specifically identify the amplified nucleic acid targets. Alere™ i Strep A 2 is performed within the confinement of the Test Base, and no other part of the Alere™ i Instrument has contact with the sample during the amplification process. This reduces the risk of instrument contamination and sample carry-over between measurements.

To perform the assay, the Sample Receiver and Test Base are inserted into the Alere™ i Instrument. The sample is added to the Sample Receiver and transferred via the Transfer Cartridge to the Test Base, resuspending the lyophilized pellets contained within the Test Base and initiating bacterial lysis and target amplification. Heating, mixing and detection by fluorescence is provided by the instrument, with results automatically reported.

Results are displayed by the Alere™ i Instrument and are also stored in an on-board archive and are assigned to a sample ID that has been entered into the Alere™ i Instrument by the operator, and the date/time the test was performed. Data can be retrieved and downloaded by the operator at any time after testing. An external Alere™ Universal Printer can be attached via USB to the Alere™ i Instrument to print test results.

INTENDED USE

Alere™ i Strep A 2 is a rapid, instrument-based, molecular *in vitro* diagnostic test utilizing isothermal nucleic acid amplification technology for the qualitative detection of *Streptococcus pyogenes,* Group A *Streptococcus* bacterial nucleic acid in throat swab specimens obtained from patients with signs and symptoms of pharyngitis. It is intended to aid in the rapid diagnosis of Group A Strep bacterial infections.

TECHNOLOGICAL CHARACTERISTICS

Alere™ i Strep A 2 and the predicate device, Alere™ i Strep A, have the same intended use, indications for use, and utilize similar basic principles of operation. They are both molecular tests for the qualitative detection of *Streptococcus pyogenes,* Group A Strep nucleic acid.

DEVICE COMPARISON

Alere™ i Strep A 2 was compared to the legally marketed predicate device, the Alere™ i Strep A assay.

Parameter	Alere™ i Strep A 2	Alere ™ i Strep A (K141757)
FDA Product Code	PGX, OOI	Same
Assay Target	*Streptococcus pyogenes* (Group A)	Same
Intended Use	Alere™ i Strep A 2 is a rapid, instrument-based, molecular *in vitro* diagnostic test utilizing isothermal nucleic acid amplification technology for the qualitative detection of *Streptococcus pyogenes,* Group A *Streptococcus* bacterial nucleic acid in throat swab specimens obtained from	Alere i Strep A is a rapid, instrument-based, molecular *in vitro* diagnostic test utilizing isothermal nucleic acid amplification technology for the qualitative detection of *Streptococcus pyogenes*, Group A *Streptococcus* bacterial nucleic acid in throat swab specimens obtained from patients with signs and symptoms of pharyngitis. It is intended to aid in the rapid diagnosis of Group A Streptococcus

Parameter	Alere™ i Strep A 2	Alere ™ i Strep A (K141757)
	patients with signs and symptoms of pharyngitis. It is intended to aid in the rapid diagnosis of Group A *Streptococcus* bacterial infections.	bacterial infections. All negative test results should be confirmed by bacterial culture because negative results do not preclude infection with Group A *Streptococcus* and should not be used as the sole basis for treatment.
Intended Environment for Use	Professional use, in a medical laboratory or point-of-care	Same
Instrumentation	Alere™ i Instrument	Same
Self-Contained System	Integrated PC, Software and Touch Screen Display	Same
Semi-Automated Assay	Sample preparation, amplification, detection and result interpretation are automated; sample transfer is performed manually	Same
Assay Information		
Sample Type	Throat Swab	Same
Strep A Target	*Streptococcus pyogenes*	Same
Technology	Isothermal nucleic acid amplification for detecting the presence/absence of bacterial DNA in clinical specimens	Same
Internal Control	Yes	Same
Result Interpretation	Automated	Same
Assay Result	Qualitative	Same
Time to Result	< 6 minutes	< 8 minutes

PERFORMANCE SUMMARY

CLINICAL STUDY

The clinical performance of Alere™ i Strep A 2 was established in a multi-center, prospective clinical study conducted at nine (9) US trial sites in 2017.

A total of 981 evaluable throat swab specimens, collected from patients of all ages presenting with symptoms of pharyngitis, were evaluated with Alere™ i Strep A 2, in comparison to bacterial culture.

The study population included 582 (59.3%) female patients and 399 (40.7%) male patients. No performance differences were noted based on age.

In this study, two (2) throat swabs were collected from each of a total of 981 evaluable patients. One throat swab from each patient was tested with Alere™ i Strep A 2. The other throat swab was sent to a central laboratory for bacterial culture.

Alere™ i Strep A 2 performance, including 95% confidence intervals, versus bacterial culture is provided below.

Alere™ i Strep A 2 Performance vs. Culture (All Age Groups Combined)

	Culture +	Culture -	
Alere™ i +	195	52[a]	247
Alere™ i -	3[b]	731	734
	198	783	981

Sensitivity: 195/198 = 98.5% (95% CI = 95.6%, 99.5%)
Specificity: 731/783 = 93.4% (95% CI = 91.4%, 94.9%)
Positive Predictive Value: 195/247 = 78.9% (95% CI = 74.3%, 83.6%)
Negative Predictive Value: 731/734 = 99.6 (95% CI = 98.3%, 99.9%)
Prevalence: 198/981 =20.2% (95% CI = 17.8%, 22.8%)

[a] Of the 52 samples positive by Alere™ i Strep A 2 and negative by bacterial culture, 38 were also positive for Group A Strep by a laboratory developed real-time PCR assay and

[b] of the 3 samples negative by Alere™ i Strep A 2 and positive by bacterial culture, 1 sample was also negative for Group A Strep by a laboratory developed real-time PCR assay.

During the prospective clinical study, the initial invalid rate (before repeat testing per the product instructions) was 0.9% (9/985) (95% CI: 0.5%, 1.7%). After repeat testing per the product instructions, the invalid rate was 0.4% (4/985) (95% CI: 0.2%, 1.0%).

ANALYTICAL STUDIES

ANALYTICAL SENSITIVITY

Alere™ i Strep A 2 limit of detection (LOD or C_{95}), defined as the concentration of Group A Strep that produces positive Alere™ i Strep A 2 results approximately 95% of the time, was identified by evaluating different concentrations of *Group A* Strep in Alere™ i Strep A 2. The concentrations identified as the LOD (or C_{95}) level for each strain tested are listed below.

Group A Strep Strain	Concentration (cells/mL of Elution Buffer) [1]	% Detected
ATCC 12344	147	100%
ATCC 19615	25	95%

[1] As determined by correlation of optical density of cell stocks with microscopy chamber counts

REACTIVITY TESTING

The following Group A Strep strains were tested and produced positive reactions at or near the stated assay limit of detection of the Alere™ i Strep A 2 test: ATCC8135, ATCC12384, ATCC12202, ATCC12203, ATCC12204, ATCC12365, ATCC14289, ATCC49399, ATCC51339, ATCC700294, ATCC12357, ATCC12385 Loomis, ATCC 12385 Type 4, and Z018.

ANALYTICAL SPECIFICITY (CROSS-REACTIVITY)

To determine the analytical specificity of Alere™ i Strep A 2, thirty-four (34) commensal and pathogenic microorganisms (33 bacteria and 1 yeast) that may be present in the throat were tested. All of the following microorganisms and yeast produced negative when tested at a minimum concentration of 2.00×10^6 cells/mL of elution buffer.

Bacteria
Arcanobacterium haemolyticum

Yeast
Candida albicans

Bacillus cereus
Bordetella pertussis
Burkholderia cepacia
Campylobacter rectus
Corynebacterium diphtheriae
Enterococcus faecalis
Escherichia coli
Fusobacterium necrophorum
Haemophilus influenzae
Klebsiella pneumoniae
Lactobacillus acidophilus
Moraxella catarrhalis
Neisseria gonorrhoeae
Peptostreptococcaceae
Prevotella oralis
Pseudomonas aeruginosa
Staphylococcus aureus
Staphylococcus epidermidis
Streptococcus agalactiae
Streptococcus anginosus
Streptococcus canis
Streptococcus constellatus subsp. pharyngis
Streptococcus dysgalactiae subsp equisimilis
Streptococcus gallolyticus
Streptococcus intermedius
Streptococcus mitis
Streptococcus mutans
Streptococcus pneumoniae
Streptococcus salivarius
Streptococcus sanguinis
Treponema denticola
Veillonella parvula

In addition, *in silico* analysis was performed to determine whether there is any significant homology between Alere™ i Strep A 2 target nucleic acid sequence and the genomes of the following upper respiratory tract microorganism. None of the organisms maintained genomic sequence that was significantly similar to the Alere™ i Strep A 2 target sequences.

Bacteria
Candida spp.
Enterococcus spp.
Klebsiella spp.
Lactococcus lactis
Legionella spp.
Mycoplasma pneumoniae
Pseudomonas spp.
Saccharomyces cerevisiae
Stenotrophomonas maltophilia

Viruses
Adenovirus Type 1
Adenovirus Type 7
Human influenza virus A
Human influenza virus B
Human parainfluenza
Human metapneumovirus
Respiratory syncytial virus Type B
Rhinovirus

INTERFERING SUBSTANCES

The following substances, naturally present in throat swab specimens or that may be artificially introduced into the throat, were evaluated with Alere™ i Strep A 2 at the concentrations listed below and were found not to affect test performance.

Substance	Concentration
Whole Blood	5.0% (v/v)
Mucin	1.0% (w/v) [1]
Human Saliva	5.0% (v/v) [2]
Ibuprophen	20 mg/mL
Acetaminophen	60.4 mg/mL
Acetylsalicylic acid	0.65 mg/mL
Albuterol	0.40 mg/mL
Diphenhydramine HCL	1.0 mg/mL
Cepacol® Sore Throat Lozenges	20% (w/v)
Sucrets® Sore Throat & Cough	20% (w/v)
Halls Plus®	20% (w/v)
ACT® Total Care	20% (v/v)
Cepacol® Mouthwash	20% (v/v)
Listerine® Antiseptic Mouthwash	10% (v/v) [3]
Crest® Complete Multi-Benefit Whitening + Deep Clean Toothpaste	20% (w/v)
Zicam® Oral Mist	20% (v/v)
Chloraseptic® Max Sore Throat Relief + Coating Action	20% (v/v)
Contact Cold & Flu Tablets	20% (w/v)
Robitussin® Maximum Strength Nighttime Cough DM	20% (v/v)
Tylenol® Cold Multi-Symptom Liquid	20% (v/v)
Children's Dimetapp® Cough & Cold	20% (v/v)

[1] 1/3 replicates at 2% w/v mucin produced a false-negative result
[2] 1/3 replicates at 10% v/v saliva produced a false-negative result
[3] 1/3 replicates at 20% v/v Listerine Antiseptic Mouthwash produced a false-positive result

REPRODUCIBILITY

A reproducibility study of Alere™ i Strep A 2 was conducted by operators from 3 sites using panels of blind coded specimens containing negative, low positive (~2X the limit of detection), and moderate positive (~3X the limit of detection) Group A Strep bacterial samples. Participants tested multiple samples of each panel member on 5 different days. The percent agreement with expected results for the Group A Strep moderate positive and low positive samples were both 100% (90/90). All of the negative samples (90) generated negative test results. There were no significant differences within run (replicates tested by one operator), between run (five different days), between sites (three sites), or between operators (nine operators).

CONCLUSION

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