April 8, 2024

Zhejiang GENE SCIENCE Co., Ltd.
C/O Olivia Meng
Regulatory Affairs Manager
Guangzhou Osmunda Medical Device Technical Services Co.,Ltd.
8-9th Floor, R&D Building, No.26 Qinglan Street, Panyu District
Guangzhou, Guangdong 510006, China

Re: K212878
Trade/Device Name: Sample preservation solution
Regulation Number: 21 CFR 866.2950
Regulation Name: Microbial Nucleic Acid Storage And Stabilization Device
Regulatory Class: Class II
Product Code: QBD
Dated: September 3, 2021
Received: September 9, 2021

Dear Olivia Meng:

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 (the 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 available 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.

Additional information about changes that may require a new premarket notification are provided in the FDA guidance documents entitled "Deciding When to Submit a 510(k) for a Change to an Existing Device" (https://www.fda.gov/media/99812/download) and "Deciding When to Submit a 510(k) for a Software Change to an Existing Device" (https://www.fda.gov/media/99785/download).

Your device is also subject to, among other requirements, the Quality System (QS) regulation (21 CFR Part 820), which includes, but is not limited to, 21 CFR 820.30, Design controls; 21 CFR 820.90, Nonconforming product; and 21 CFR 820.100, Corrective and preventive action. Please note that regardless of whether a change requires premarket review, the QS regulation requires device manufacturers to review and approve changes to device design and production (21 CFR 820.30 and 21 CFR 820.70) and document changes and approvals in the device master record (21 CFR 820.181).

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 Part 803) for devices or postmarketing safety reporting (21 CFR Part 4, Subpart B) for combination products (see https://www.fda.gov/combination-products/guidance-regulatory-information/postmarketing-safety-reporting-combination-products); 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 Part 4, Subpart A) for combination products; and, if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR Parts 1000-1050.

Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to https://www.fda.gov/medical-devices/medical-device-safety/medical-device-reporting-mdr-how-report-medical-device-problems.

For comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance) and CDRH Learn (https://www.fda.gov/training-and-continuing-education/cdrh-learn). 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 (https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance/contact-us-division-industry-and-consumer-education-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

Ribhi Shawar, Ph.D. (ABMM)
Chief
General Bacteriology and Antimicrobial Susceptibility Branch
Division of Microbiology Devices
OHT7: Office of In Vitro Diagnostics
Office of Product Evaluation and Quality
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: 06/30/2023
See PRA Statement below.

510(k) Number *(if known)*
K212878

Device Name
Sample Preservation Solution

Indications for Use *(Describe)*

The Zhejiang GENE SCIENCE Co., Ltd.'s Sample Preservation Solution is intended for the collection, inactivation, preservation/stabilization, and transport of unprocessed upper respiratory clinical specimens from individuals suspected of influenza A infection by their healthcare provider. Specimens collected with the Sample Preservation Solution can be stored and transported at 4 ºC or at room temperature (20-25ºC) for preservation of microbial nucleic acid until the sample is processed and used with compatible molecular diagnostic assays.

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.

The burden time for this collection of information is estimated to average 79 hours per response, including the time to review instructions, search existing data sources, gather and maintain the data needed and complete and review the collection of information. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden, to:

Department of Health and Human Services
Food and Drug Administration
Office of Chief Information Officer
Paperwork Reduction Act (PRA) Staff
PRAStaff@fda.hhs.gov

"An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB number."

510(k) Summary – K212878

April 8, 2024

The following information is provided in accordance with 21 CFR 807.92 for the Premarket 510(k) Summary:

Submitted by:	Zhejiang GENE SCIENCE Co., Ltd No.2 workshop, Pharmaceutical Industrial Park, No.11 Shengxing Road, Shangyu Economic and Technological Development zone Hangzhou Bay, Zhejiang Province, China Tel: +86-575-82586086 E-mail: support@gene-science-tech.com Website: http://www.gene-science-tech.com/
Contact Person:	Olivia Meng Zhejiang GENE SCIENCE Co., Ltd. Tel: +86-188-25133860, Email: hui.meng@osmundacn.com
Name of Device:	Sample Preservation Solution
Classification Name:	Microbial Nucleic Acid Storage and Stabilization Device
Regulatory Class:	Class II
Product Code:	QBD
Regulation:	21 CFR 866.2950
Predicate Device:	Copan eNAT Molecular Collection and Preservation Medium (K201849) Manufacturer: Copan Diagnostics Inc.

1. Intended Use/Indication for Use

The Zhejiang GENE SCIENCE Co., Ltd.'s Sample Preservation Solution is intended for the collection, inactivation, preservation/stabilization, and transport of unprocessed upper respiratory clinical specimens from individuals suspected of influenza A infection by their healthcare provider. Specimens collected with the Sample Preservation Solution can be stored and transported at 4 ºC or at room temperature (20-25ºC) for preservation of microbial nucleic acid until the sample is processed and used with compatible molecular diagnostic assays.

2. Device Description

The Zhejiang GENE SCIENCE Co., Ltd.'s Sample Preservation Solution consists of a plastic, polypropylene screw-cap collection tube filled with non-sterile sample preservation medium. The tubes are pre-filled with either 2 mL (suitable for swabs with flocking length of 20-24 mm) or 3 mL (suitable for swabs with flocking length of 24-30 mm) of solution. The device is non-sterile, for single use. Swabs are not included.

The Zhejiang GENE SCIENCE Co., Ltd.'s Sample Preservation Solution is offered in the following configurations**:**

SKU or Catalog Number	Device Description	Pack Size
YA-02	2.0 mL/tube	100pcs/Tray, 15 Trays/Box
YA-03	3.0 mL/tube	100pcs/Tray, 15 Trays/Box

Media Formulation:

- Guanidine isothiocyanate
- EDTA
- Tris-HCl
- Yeast RNA
- TWEEN-20
- Phenol red
- In vitro grade water

3. Principles of Operation

The Zhejiang GENE SCIENCE Co., Ltd.'s Sample Preservation Solution consists of the following: Guanidine isothiocyanate, EDTA, Tris-HCl, Yeast RNA, TWEEN-20, Phenol red and in vitro diagnostic grade water. The guanidine isothiocyanate lyses cells, denatures proteins, and inhibits nuclease activity, thereby stabilizes nucleic acids. EDTA is a chelating agent that deactivates RNAse and stabilizes RNA. Tris-HCl is a pH buffer system to maintain reagent pH. Yeast RNA serves as a blocking agent, protects RNA, helps coprecipitating microbial nucleic acid. TWEEN-20 is a detergent that disrupts membranes and denatures proteins. Phenol red is a pH indicator which serves as a visual quality control mechanism. The *in vitro* diagnostic grade water serves as a diluent to adjust molarity of the buffer/preservation medium.

4. Substantial Equivalence

The Zhejiang GENE SCIENCE Co., Ltd. Sample Preservation Solution is compared with the predicate device, Copan eNAT Molecular Collection and Preservation Medium (K201849). , in intended use, medium formulation, product configuration, shelf life, packaging and volume, etc. The safety and effectiveness of the Zhejiang GENE SCIENCE Co., Ltd. Sample Preservation Solution is adequately supported by the substantial equivalence information and testing results provided. Below is a summary of comparison table between Zhejiang GENE SCIENCE Co., Ltd.'s Sample Preservation Solution and predicate device K201849:

Device & Predicate Device(s):	Subject Device: K212878	Predicate: K201849
Device Trade Name	Sample Preservation Solution	Copan eNAT Molecular Collection and Preservation Medium
General Device Characteristic Similarities		

Indications For Use	The Zhejiang GENE SCIENCE Co., Ltd.'s Sample Preservation Solution is intended for the collection, inactivation, preservation/stabilization, and transport of unprocessed upper respiratory clinical specimens from individuals suspected of influenza A infection by their healthcare provider. Specimens collected with the Sample Preservation Solution can be stored and transported at 4ºC or at room temperature (20-25ºC) for preservation of microbial nucleic acid until the sample is processed and used with compatible molecular diagnostic assays.	Copan eNAT is intended for the collection, inactivation and transport of clinical specimens containing influenza A viruses from the collection site to the testing laboratory. eNAT can be processed and used with compatible molecular assays that require stabilization of nucleic acids from influenza A viruses.
Microorganism nucleic acids preserved	Influenza A virus	Same
Specimen Type	Upper respiratory specimens	Same
General Device Characteristic Differences		
Specimen stability	Preserves influenza A RNA for up to 6 days at 4-25 ºC	Preserves influenza A RNA for up to 28 days at 2-25°C

Ingredients	Guanidine isothiocyanate EDTA Tris-HCl Yeast RNA TWEEN-20 Phenol red In Vitro Diagnostic grade water	Tris-EDTA Guanidine thiocyanate Detergent HEPES Distilled water
Inactivation of Flu A	>6.2 log reduction in concentration at 5 minutes	>4.0 log reduction in concentration at 10 seconds
Configurations of device	2mL or 3mL	2mL with either no swab, regular sized tip nylon flocked swab or minitip nylon flocked swab.
Shelf-life	24 months	18 months

5. **Shelf-life Stability**

The shelf-life of the Zhejiang GENE SCIENCE Co., Ltd.'s Sample Preservation Solution was determined to be 24 months from the date of manufacture when stored at 20-25 ºC.

Three lots of the product were assessed for functionality and physical characteristics using real time ageing studies. In the real time study, the Zhejiang GENE SCIENCE Co., Ltd.'s Sample Preservation Solutions were held at 20-25 ºC for 24 months (T= 0, 1, 3, 6, 12, 15, 18, 21, and 24). At each time point, appearance, pH and loading volume were assessed for each product lot in triplicate.

a) Appearance
   To evaluate appearance, the different lots of the Zhejiang GENE SCIENCE Co., Ltd.'s Sample Preservation Solution were visually examined. The appearance of the product was examined for a good seal of the packaging, no damage, leakage, or deformation; the label was clean, clear, and complete; the color of the reagent was consistent with no precipitation or impurities. All lots tested at each time point passed the criteria for appearance when held at 20-25°C.

b) pH Stability
   The pH of the media was used as one of the indicators to support product stability. For all the tubes at each time point and each lot, the pH was within the targeted range of 7.3±0.2 when held at 20-25°C.

c) Evaporation
To evaluate evaporation, the loading volume for the different lots of the Zhejiang GENE SCIENCE Co., Ltd.'s Sample Preservation Solution were measured. All lots tested at each time point passed the criteria for evaporation (up to ≥97% of loading volume) when held at 20-25°C.

The Zhejiang GENE SCIENCE Co., Ltd.'s Sample Preservation Solution results after 24 months of storage showed that the actual volume was no less than 97% of the theoretical volume, the appearance was acceptable, and the pH was 7.3+ 0.2. There was no leakage or deformation, showing that the product met quality standards.

6. Performance Data

Limit of Detection (LoD) Study:
The limit of detection (LoD) for the Zhejiang GENE SCIENCE Co., Ltd.'s Sample Preservation Solution (3mL/tube) was determined by spiking Influenza A virus (National Institutes for Food and Drug Control; Catalog numbers: 370051-201801) at a starting concentration of ≥ 1 x 10^7 copies/mL into upper respiratory matrix and inoculated into Sample Preservation Solution for a final concentration of 1 x 10^6 copies/mL. The spiked sample was then serially diluted in negative upper respiratory matrix to create five (5) concentrations (10^5, 10^4, 10^3, 10^2 and 10 copies/mL). Each concentration was tested in four (4) replicates. Samples were extracted with the Qiagen RNeasy Mini Kit and RT-PCR was performed using the Invitrogen SuperScript III Platinum One-Step Quantitative Kit on the ThermoFisher ABI 7500 Instrument. The preliminary LoD was determined to be 10^2 copies/mL and confirmed by performing 20 replicates with a 100% agreement, average Ct value was 30.9 with a SD of 0.94. (**Table 1-2**).

Table 1: Preliminary LoD Determination

ThermoFisher ABI 7500 Instrument	**Concentration (cp/mL) (Ct <40)**				
	10^5	10^4	10^3	10^2	10^1
1	27	28	31	33	40
2	24	28	31	32	40
3	25	27	32	37	42
4	24	29	31	35	39
Total Positive	4/4	4/4	4/4	4/4	1/4

Table 2: Confirmation of LoD

ThermoFisher ABI 7500 Instrument	**Influenza A (Ct<40)**	**Interpretation**	**Total Positive/Tested**

(10^2 copies/mL)			
1	31	Positive	20/20
2	32	Positive	
3	31	Positive	
4	31	Positive	
5	31	Positive	
6	30	Positive	
7	31	Positive	
8	30	Positive	
9	31	Positive	
10	30	Positive	
11	31	Positive	
12	32	Positive	
13	31	Positive	
14	31	Positive	
15	32	Positive	
16	31	Positive	
17	31	Positive	
18	29	Positive	
19	29	Positive	
20	33	Positive	
Mean	30.9		
SD	0.94		

Nucleic Acid Stability Testing:

To determine nucleic acid stability of the Zhejiang GENE SCIENCE Co., Ltd.'s Sample Preservation Solution, three (3) lots of varying ages were examined. Triplicate samples of each lot were created by immersing upper respiratory samples into the Zhejiang GENE SCIENCE Co., Ltd. Sample Preservation Solution then spiking with influenza A virus to produce a concentration of 3 x LoD. Spiked samples were stored at 4±1°C and room temperature (20-25°C) for 1, 3, and 6 days. Samples were then extracted with the Qiagen RNeasy Mini Kit and RT-PCR testing was performed using the Invitrogen SuperScript III Platinum One-Step Quantitative Kit on the ThermoFisher ABI 7500 Instrument. Average Ct values were calculated per lot at each time point. Comparison of values obtained at each time point to the average T_0 values indicated similar results regardless of the lot age. Overall, when results of all lots were combined a decrease in the Ct values of 0.43 and of 2.76 Ct was observed for the samples stored at 4±1°C for 3 and 6 days, respectively (**Table-3**). For the samples stored at room temperature (20-25°C), an increase in the Ct values of 0.57 and 0.44 was observed for the samples stored for 3 and 6 days, respectively, meeting the pre-defined acceptance criteria of (+/-) 3.0 Ct from the initial time zero value (**Table-3**).

Table 3: Influenza A nucleic acid Stability in Sample Preservation Solution*

Time	4 °C		Room temperature (20-25 °C)	
	Average Ct (Mean ± SD)	Average Δ Ct from T_0	Average Ct (Mean ± SD)	Average Δ Ct from T_0
0	35.43 ± 0.38	N/A	35.43 ± 0.75	N/A
3 Day	35.0 ± 0	-0.43	36.0 ± 0.73	0.57
6 Day	32.67 ± 0.35	-2.76	35.87± 1.8	0.44

* Data for all age lots were combined since no differences were noted.

Overall, the study results support the Influenza A nucleic acid stability claim of the Zhejiang GENE SCIENCE Co., Ltd.'s Sample Preservation Solution for up to 6 days at 4°C and at room temperature (20-25°C).

Viral Inactivation:
A viral inactivation study was conducted to test the ability of GENE SCIENCE Co., Ltd.'s Sample Preservation Solution to inactivate Influenza A virus.

a. **Cytotoxicity:** To determine cytotoxicity of the Zhejiang GENE SCIENCE Co., Ltd. Sample Preservation Solution, three (3) lots at varying ages were examined. Each sample preservation solution was serially diluted with diluent to create 2, 4, 8, 16, 32, 64, and 128-fold dilutions. Each dilution was inoculated to cell monolayers in triplicate and examined for Cytopathic Effect (CPE). The lowest dilution to indicate normal cell growth was determined to be the 64-fold dilution.

b. **Viral Inactivation:** To determine the degree of viral inactivation produced by the Zhejiang GENE SCIENCE Co., Ltd. Sample Preservation Solution, three (3) lots of varying ages were examined. Upper respiratory matrix in saline was spiked with $\geq 10^7$ copies per mL of influenza A virus (A/PR/8/34 H1N1) in a 1:1 suspension to create spiked upper respiratory swab samples for the following three groups.

   i. **Test Group (C_t):** Using a new swab, spiked upper respiratory swab samples (~0.08 mL) were inserted into the collection device with 3mL of Sample Preservation Solution. They were then exposed for 0, 5, and 10 minutes. At the end of the exposure, samples were diluted 1:64 which was determined not to be toxic to the cell culture monolayer, inoculated onto the host cell monolayers, incubated 7 days, observed daily for CPE. The remaining infectivity (log $TCID_{50}$) was calculated and corrected using a dilution factor to account for the 1:64 dilution of Sample Preservation Solution to the diluent Medium to avoid cytotoxicity (dilution factor is 1.81 log) and the initial dilution of 0.08 ml into 3.08 ml (dilution factor is 1.58 log).

   ii. **Positive Control Group (C_0):** Using a new swab, spiked upper respiratory samples (~0.08 mL) were inserted into a collection tube containing 3 mL of diluent (0.85% saline). They were then exposed for 0, 5, and 10 minutes. At the

end of the exposure, samples were diluted 1:64 which was determined not to be toxic to the cell culture monolayer, inoculated onto the host cell monolayers, incubated 7 days, and observed daily for CPE. Log $TCID_{50}$ was calculated and corrected using the dilution factors described above.

iii. **Negative Control Group (C_n):** Upper respiratory swab samples (~0.08 mL) were inserted into the collection device with 3 mL Sample Preservation Solution and exposed for 0, 5, and 10 minutes. At the end of the exposure, samples were diluted 1:64 which was determined not to be toxic to the cell culture monolayer, inoculated onto the host cell monolayers, incubated 7 days, observed daily for CPE. No CPE was observed, confirming that he 1:64 dilution eliminated the cell toxicity produced by the Sample Preservation Solution.

Using the Inactivation (log reduction) formula below, Influenza A viral inactivation rate of Zhejiang GENE SCIENCE Co., Ltd's. Sample Preservation Solution was determined to be >6.2 log reduction at 5 minutes which was equivalent to greater than 99.99% inactivation of Influenza A virus (**Table 4**).

Inactivation (log reduction): Mv = log (C0/Ct) = log(C0)-log (Ct)

Table 4: Influenza A Viral Inactivation in Sample Preservation Solution

Time (min)	Inactivation (log reduction, Mv)		
	Lot#1	Lot#2	Lot#3
0	>6.97	>6.97	3.28
5	>6.20	>6.20	>6.20
10	>6.75	>6.75	>6.75

Conclusion:
Zhejiang GENE SCIENCE Co., Ltd's. Sample Preservation Solution inactivates Influenza A virus when incubated for at least 5 minutes.

7. Final Conclusion

Based on the indications for use, technological characteristics, safety, and performance testing, the subject device, the Zhejiang GENE SCIENCE Co., Ltd.'s Sample Preservation Solution, meets the requirements that are considered essential for its intended use and is substantially equivalent to the legally marketed predicate device, Copan eNAT Molecular Collection and Preservation Medium, K201849.