Wuxi Nest Biotechnology Co., Ltd.
℅ Giselle Zhang
Regulatory Consultant
Emergo Global Consulting, LLC
2500 Bee Cave Road 1
Suite 300
Austin, Texas 78746

September 20, 2021

Re: K210440
Trade/Device Name: Disposable Sampler Inactivated Transport Media, Nest ITM
Regulation Number: 21 CFR 866.2950
Regulation Name: Microbial Nucleic Acid Storage And Stabilization Device
Regulatory Class: Class II
Product Code: QBD
Dated: February 10, 2021
Received: February 12, 2021

Dear Giselle Zhang:

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/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 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 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,

Kristian Roth, Ph.D.
Branch Chief
Bacterial Respiratory and Medical Counter Measures
Division of Microbiology Devices
OHT7: Office of In Vitro Diagnostics
and Radiological Health
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)*

Device Name

Disposable Sampler Inactivated Transport Media

Indications for Use *(Describe)*

NEST ITM is an enclosed system intended for the collection, inactivation stabilization and transportation of pharyngeal and nasal swabs suspected of containing adenovirus, influenza A virus or parainfluenza virus 2 from the collection site to the testing laboratory. The specimen transported in NEST ITM can be used for molecular detection in the laboratory.

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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5. 510(k) Summary

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

5.1 Submitter Information

Company:	Cheng Zhiwei RA Manager Wuxi NEST Biotechnology Co., Ltd. No.530 Xida Road, New District Wuxi, Jiangsu 214012 China Telephone: 86+510-68006788 Fax: N/A project01@nest-wuxi.com
Contact:	Giselle Zhang Regulatory Consultant Emergo Global Consulting, LLC 2500 Bee Cave Road, Building 1, Suite 300 Austin, Texas 78746 USA Telephone: (512) 327-9997 Fax: (512) 327-9998 LST.AUS.ProjectManagement@ul.com
Date Summary Prepared:	May 7, 2021

5.2 Name of the Device

Trade Name:	Disposable Sampler Inactivated Transport Media
Common Name:	Microbial nucleic acid storage and stabilization device
Classification Name:	Microbiology
Review Panel:	Microbiology (MI)
Regulation:	866.2950
Class:	Class II
Product Code:	QBD

5.3 Equivalence Claimed to Predicate Device

The Disposable Sampler Inactivated Transport Media is equivalent to the PrimeStore MTM (DEN170029), manufactured by Longhorn Vaccines and Diagnostics, LLC.

5.4 Device Description

The NEST ITM is a medical-grade Polypropylene preservation tube (5 mL and 10 mL) filled with 2.5 mL ITM Inactivated Transport Media for 5 mL tube or 3 mL Inactive Transport Media for 10 mL tube, with or without the sterile swabs. NEST ITM is composed of Guanidine isothiocyanate, TCEP, sodium acetate, PEG-6000, Tris, Hcl, purified water in order to inactivate infectious unprocessed oropharyngeal and nasopharyngeal samples which are suspected of containing adenovirus, influenza A virus or parainfluenza virus 2 from human samples. For both oropharyngeal and nasopharyngeal swabs, the swab head is made of flocked nylon fiber, and the rod is made of ABS (acrylonitrile butadiene styrene).

5.5 Indication for Use Statement

NEST ITM is an enclosed system intended for the collection, inactivation stabilization and transportation of pharyngeal and nasal swabs suspected of containing adenovirus, influenza A virus or parainfluenza virus 2 from the collection site to the testing laboratory. The specimen transported in NEST ITM can be used for molecular detection in the laboratory.

5.6 Substantial Equivalence Discussion

The following table compares the Disposable Sampler Inactivated Transport Media to the predicate device with respect to indications for use, principles of operation, technological characteristics, materials, and performance, and forms the basis for the determination of substantial equivalence. The subject device does not raise any new questions of safety or effectiveness as compared to the predicate device.

Device & Predicate Device(s):	**K210440**	**DEN170029**
Device Trade Name	Nest ITM	PrimeStore MTM
General Device Characteristic Similarities	**K210440**	**DEN170029**
Intended Use/Indications for Use	NEST ITM is an enclosed system intended for the collection, inactivation stabilization and transportation of pharyngeal and nasal swabs suspected of containing adenovirus, influenza A virus or parainfluenza virus 2 from the collection site to the testing laboratory. The specimen transported in NEST ITM can be used for molecular detection in the laboratory.	PrimeStore MTM is intended for the stabilization, transportation and inactivation of infectious unprocessed nasal washes suspected of containing Influenza A virus RNA. PrimeStore MTM is also intended for the stabilization, transportation and inactivation of infectious unprocessed sputum samples suspected of containing *Mycobacterium*

		tuberculosis DNA from human samples.
Inactivation tested	>4.0 log reduction in concentration at 10 seconds	Same
Storage temperatures	2-8 ºC up to 25ºC	Same
General Device Characteristic Differences	**K210440**	**DEN170029**
Specimen stability	NEST ITM preserves Adenovirus, Influenza A virus or Parainfluenza for 15 days at 2-8 ºC and 25ºC	Primestore MTM medium preserves influenza A RNA for up to 8 days at 27°C and 29 days at 4°C
Specimen Type	Nasopharyngeal or Oropharyngeal Swab	Nasal washes and sputum samples
Analyte	Nasopharyngeal or Oropharyngeal swab suspected of containing Adenovirus, Influenza A virus or Parainfluenza virus 2.	Nasal wash suspected of containing Influenza A virus. Sputum samples suspected of containing MTB.

5.7 Non-Clinical Performance Data

To demonstrate safety and effectiveness of Disposable Sampler Inactivated Transport Media and to show substantial equivalence to the predicate device, Wuxi Nest completed the following non-clinical tests. Results confirm that the design inputs and performance specifications for the device are met. The Disposable Sampler Inactivated Transport Media passed the testing in accordance with internal requirements, national standards, and international standards shown below, supporting its safety and effectiveness, and its substantial equivalence to the predicate device:

1. FDA Recognized Consensus Standards:

- ASTM F1980-2016, Standard Guide for Accelerated Aging of Sterile Barrier Systems for Medical Devices -Passed
- ASTM D4169-2016, Standard practice for performance testing of shipping containers and systems - Passed
- ISO 11607-1:2019, Packaging for terminally sterilized medical devices -- Part 1: Requirements for materials, sterile barrier systems and packaging systems - Passed
- ISO 11607-2:2019, Packaging for terminally sterilized medical devices-Part 2: Validation requirements for forming, sealing and assembly processes - Passed

- ISO 15223-1:2016, Medical devices-Symbols to be used with medical device labels, labelling and information to be supplied-Part 1: General requirement - Full Compliance with.
- ISO 14971:2019, Medical devices-Application of risk management to medical devices - Full Compliance with.

2. Non-FDA Recognized Consensus Standard:

- CLSI MM13-A (Replaces MM13-P) Collection, Transport, Preparation, and Storage of Specimens for Molecular Methods; Approved Guideline - Full Compliance with.
  Justification: The standard is not recognized by FDA, but Wuxi Nest believes that the standard is applicable to the type of device to ensure the safety and performance of the device.

3. Shelf life:

The shelf life for the NEST ITM is 12 months after the date of manufacture. The stability of the NEST ITM was performed using Realtime and Accelerated stability on a total of three (3) lots. Stability looked for bacterial and fungal growth in the media along with properties of the media, appearance, pH, and then confirmed with viral stabilization at room temperature to the claimed 15 days demonstrating the stability of nucleic acids was not diminished with the age of media.

4. Sterilization:

The DNA/RNA Shield Collection tube with media are not sold as sterile nor are they intended to be sterilized by the user. These vials are single use devices that do not require cleaning by the operator. The Swabs are individually packages and sold as sterile.

5. Detection Limit:

LoD testing was conducted to determine the lowest concentration of analyte that can be detected with a greater than 95% detection rate. The LoD studies for Adenovirus, Influenza A, and Parainfluenza virus 2 were designed using validated assays to establish a concentration of organisms used for additional testing noted below.

LoD testing was initially performed by spiking multiple concentrations of Adenovirus, Influenza A, and Parainfluenza 2 virus into contrived matrix and spiking it onto a swab. Adenovirus, Influenza A, and Parainfluenza 2 virus were spike at a final concertation range of $1.0x10^4$, $1.0x10^3$, $5.0x10^2$, and $1.0x10^2$. copies/mL into the NEST ITM with a swab. A validated PCR assay was use to detemine the LoD to be $5.0x10^2$ for each of the three viruses. Table 1 below shows the results of preliminary LoD for Adenovirus, influenza A, and Parainfluenza virus 2.

Table 1. Preliminary Limit of Detection

Concentration (copies/mL)	Adenovirus, 5 Reps Average (C_t)	SD (C_t)	Influenza A, 5 Rep Average (C_t)	SD (C_t)	Parainfluenza virus 2, 5 Rep Average (C_t)	SD (C_t)
$1.0x10^4$	29.3	0.18	32.04	1.08%	31.07	1.08%

$1.0x10^3$	32.0	0.26	34.75	2.11%	34.28	2.18%
$5.0x10^2$	34.3	0.95	35.48	1.97%	36.89	2.98%
$1.0x10^2$	>40	-	>40	-	>40	-

Confirmatory LoD testing was provided at a concentration of $5.0x10^2$ copies/mL with 20 replicates. The validated assay had an LoD with an acceptance criteria of virus detection at a concentration range $5.0x10^2$ copies/mL. The same detection range was replicated with the NEST ITM and further determine by the concentration that yielded at least a 95% of the replicates were recoverable within this range. At a concentration of $5.0x10^2$ copies/mL, 20 of 20 replicates had recoverable concentrations. Viral nuclic acids were extracted using a nucleic acid (DNA/RNA) extraction and purification kits (spin column) (SC903-50) (Wuxi TechstarTechnology Co., Ltd.) and amplified using the respective kits on the ABI 7500. The average Ct values for each virus are listed below in Table. 2.

Table 2 Average C_t Values for Each Virus

Replicates	C_t Value		
	Adenovirus	Influenza A	Parainfluenza virus 2
1	36.2	32.0	38.0
2	37.0	32.4	38.2
3	38.1	35.4	37.8
4	38.1	35.2	36.7
5	36.8	35.4	36.4
6	36.9	37.0	38.4
7	35.5	35.8	37.3
8	36.1	35.0	35.2
9	37.2	35.4	35.9
10	35.8	35.7	36.5
11	37.7	35.8	36.2
12	36.3	35.8	36.2
13	36.4	35.3	34.2
14	37.5	36.2	35.3
15	36.7	34.1	36.1
16	35.7	35.6	35.1
17	37.0	35.9	36.6
18	37.0	35.7	35.8
19	36.8	36.2	37.5
20	37.1	35.0	36.3
AVG:	36.8	35.2	36.3
SD:	0.73	1.2	1.1

LoD testing at $5.0x10^2$ copies/mL resulted in all 20 replicates for the concentration meeting the pre-defined acceptance criteria.

6. Viral Stability

The stability of Adenovirus, Influenza A, and Parainfluenza 2 virus at 1 x LoD ($5.0x10^2$ copies/mL) was evalutaed by spiking virus into simulated matrix incubated in the NEST ITM at refridgerated temperature (4°C, 39°F) for 15 days (see Table 3), and ambient temperature (25°C, 77° F) for 15 days (see Table 4). Validated PCR assays was used to determine stability of Adenovirus, Influenza A, and Parainfluenza 2 virus in the NEST ITM. The stability study analyzed a total of three lots near the manufacturer claimed 12-month stability. Testing used at least 20 replicates for each virus, time point and stoage condition. An initial time point designated as Day 0 was included as the initial C_t average for each of the two temperature ranges tested. Testing at three time points was performed at Day 0, 9 and 15 for refrigerated temperature (2-8°C, 36-39°F), and three time points, Day 0, 9, and 15, for ambient temperature (25°C, 77°F).

The validated PCR assays were run with all applicalbe controls to valid and confirm the detection of the target virus, Adenovirus, Influenza A, and Parainfluenza virus 2. A pre-defined acceptance criteria of (+/-) 3.0 C_t from the initial time zero value was the acceptance criteria.

Table 3. Adenovirus, Influenza A, and Parainfluenza 2 virus ($5.0x10^2$ copies/mL) stability at 4°C

	Day 0	Day 9	Day 15
Adenovirus AVG (C_t):	36.0	36.7	36.9
CV (C_t):	2.15%	1.8%	2.0%
Influenza A AVG (C_t):	35.4	35.4	35.7
CV (C_t):	2.0%	2.3%	2.5%
Parainfluenza 2 AVG (C_t):	36.1	37.0	37.0
CV (C_t):	2.0%	2.0%	2.4%

Table 4. Adenovirus, Influenza A, and Parainfluenza 2 virus ($5.0x10^2$ copies/mL) stability 25°C

	Day 0	**Day 9**	**Day 15**
Adenovirus AVG (C_t):	36.1	37.0	36.9
CV (C_t):	2.0%	2.4%	2.0%
Influenza A AVG (C_t):	35.3	36.1	35.3
CV (C_t):	2.4%	2.6%	2.1%
Parainfluenza 2 AVG (C_t):	36.2	36.9	37.0
CV (C_t):	2.3%	2.6%	2.1%

Stability testing of RNA from whole Adenovirus, Influenza A, and Parainfluenza 2 virus were spiked into matrix and stored in NEST ITM, resulted in a maximum average variation of 0.8 C_t over 15 days at 25°C and a maximum variation of 0.9 Ct over 15 days at 2-8°C.

7. Inactivation

Adenovirus, Influenza A, and Parainfluenza 2 virus at a concentration of 1.0×10^7 $TCID_{50}$/ml was incubated with NEST ITM for 10 seconds. Each virus only and NEST ITM were also incubated accordingly to serve as controls. Adenovirus, Influenza A, and Parainfluenza 2 virus (virus alone), Virus and NEST ITM, or NEST ITM alone was then inculated on to cell cultures after incubation. Four days after inoculation, the cells were fixed and stained with 0.06% crystal violet in 1% glutaraldeyde. Cells that did not take up the stain were considered evidence of a viral cytopathic effect (CPE) and as

a result were considered a measure of viral viability. The titer of the virus CPE was calcuated and recorded as the $TCID_{50}$.

Inactivation time:

The NEST ITM showed no cytotoxicity on MDCK cells at a 1:1,000 dilution factor and greater; therefore at least a 1:1,000 dilution factor is needed to avoid a direct cytotoxic effect of the NEST ITM. Adenovirus, Influenza A, and Parainfluenza 2 virus were then exposed to NEST ITM for 10 seconds prior to serial 10 fold dilutions and incubations (final concentration $<10^3$ $TCID_{50}$/mL), while Influenza Adenovirus, Influenza A, and Parainfluenza 2 virus only samples had viral loads of greater than 1.0×10^6 $TCID_{50}$ of virus and NEST ITM alone was diluted 1:1000 to see no CPE. The NEST ITM rapidly inactivated all viruses tested with a >4.0 log reduction at a 1:10 specimen to media concentration at 10 seconds. Viral CPE could not be observed at < 3.0 logs due to cellular destruction by NEST ITM See Table 5 below.

Table 5 Adenovirus, Influenza A, and Parainfluenza 2 virus inactivation in NEST ITM

10s incubation	Adenovirus $TCID_{50}$ (log)	Influenza A $TCID_{50}$ (log)	Influenza A $TCID_{50}$ (log)
Virus only	6.14	6.75	6.63
Virus and NEST ITM	< 3.0	< 3.0	< 3.0
NEST ITM only*	$\leq$ 3.0	$\leq$ 3.0	$\leq$ 3.0

* NEST ITM shows cytotoxicity on MDCK cells when diluted to 1:1,000.

NEST ITM must be used at a ratio of at least 1:10 at a minimum of 10 seconds exposure time to demonstrate inactivation of Adenovirus, Influenza A, and Parainfluenza 2 virus. Measuring Adenovirus, Influenza A, and Parainfluenza 2 virus inactivation below 1×10^3 $TCID_{50}$ was not possible because of the cytotoxic affects NEST ITM has on the cell culture based assay.

5.8 Statement of Substantial Equivalence

The Disposable Sampler Inactivated Transport Media has the same intended use as the PrimeStore MTM predicate device, and the same or similar technological characteristics. The differences in technological characteristics do not raise new or different questions of safety and effectiveness. Performance testing has demonstrated the Disposable Sampler Inactivated Transport Media is as safe and effective as the predicate device. Therefore, the Disposable Sampler Inactivated Transport Media is substantially equivalent to the predicate device.