510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
ASSAY ONLY

I Background Information:

A 510(k) Number

K242820

B Applicant

Puritan Medical Products LLC

C Proprietary and Established Names

Puritan PurSafe Plus Collection and Transport System

D Regulatory Information

Product Code(s)	Classification	Regulation Section	Panel
QBD	Class II	21 CFR 866.2950 - Microbial Nucleic Acid Storage And Stabilization Device	MI - Microbiology

II Submission/Device Overview:

A Purpose for Submission:

To obtain a substantial equivalence determination for the Puritan PurSafe Plus Collection and Transport System for use in collection, inactivation, and preservation of upper respiratory specimens suspected of containing SARS-CoV-2.

B Measurand:

Storage and stability of nucleic acids from SARS-CoV-2.

C Type of Test:

Microbial nucleic acid storage and stabilization device

III Intended Use/Indications for Use:

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

B Indication(s) for Use:
Puritan PurSafe Plus Collection and Transport System is an enclosed system intended for the collection, inactivation, and preservation of human upper respiratory specimens suspected of containing SARS-CoV-2. Puritan PurSafe Plus Collection and Transport System can be used for collection, transport, and storage of specimens at 2-4°C and 25-30°C. Specimens collected and stored in the PurSafe Plus Collection and Transport System are suitable for use with legally marketed molecular diagnostic devices.

C Special Conditions for Use Statement(s):
Rx - For Prescription Use Only

D Special Instrument Requirements:
None

IV Device/System Characteristics:

A Device Description:
The Puritan PurSafe Plus Collection and Transport System is comprised of a sterile polyester flock swab applicator with a standard tip for collecting human upper respiratory specimens and a polypropylene vial containing 1 mL PurSafe Plus MK buffer (media) intended for inactivation and preservation of viral nucleic acid present in specimens suspected of containing SARS-CoV-2.

Each Puritan PurSafe Plus Collection and Transport System peel pouch is provided with the following materials:

- One pre-labeled screw-cap polypropylene vial containing 1 mL of MK buffer solution preservative (non-sterile; for single use only).
- One scored sterile HydraFlock flocked swab with a standard tip.

The Puritan PurSafe Plus Collection and Transport System maintains the integrity of SARS-CoV-2 viral nucleic acid when properly stored. Prior to use, the kit reagents should be stored at 2-4°C or 30-35°C for up to 24 months. After collection, the PurSafe Plus MK buffer tube containing the specimen can be stored for up to 28 days at 2-4°C or 25-30°C, for specimen storage and transportation to the laboratory, without a significant loss of RNA integrity.

B Principle of Operation:
The product is intended for use in collection, inactivation, transport, and preservation of SARS-CoV-2 viral nucleic acid from human upper respiratory specimens using the sterile HydraFlock flocked swab applicator with a standard tip included with the kit. After sample collection, the swab is transferred into the pre-labeled screw-cap polypropylene vial containing 1 mL of MK buffer solution preservative. Users then break the swab shaft at the score point leaving the swab tip in the transport tube and screw the lid of the tube tightly.

Puritan MK buffer solution contains the following components: Guanidine thiocyanate, HEPES, Tris Base, Triton X-100, EDTA, and molecular grade water. Puritan MK buffer solution preserves viral nucleic acid present in human upper respiratory specimen for up to 28 days when stored at 2-4°C and 25-30°C. The preserved and stabilized SARS-CoV-2 RNA maintains its integrity for downstream molecular based detection.

V Substantial Equivalence Information:

A Predicate Device Name(s):
DNA/RNA Shield Collection Tube

B Predicate 510(k) Number(s):
K202641

C Comparison with Predicate(s):

Device & Predicate Device(s):	Subject Device: K242820	Predicate: K202641
Device Trade Name	Puritan PurSafe Plus Collection and Transport System	DNA/RNA Shield
General Device Characteristic Similarities		
Intended Use/Indications For Use	Puritan PurSafe Plus Collection and Transport System is an enclosed system intended for the collection, inactivation, and preservation of human upper respiratory specimens suspected of containing SARS-CoV-2. Puritan PurSafe Plus Collection and Transport System can be used for collection, transport, and storage of specimens at 2-4°C and 25-30°C. Specimens collected and stored in the PurSafe Plus Collection and Transport System are suitable for use with legally marketed molecular diagnostic devices.	The DNA/RNA Shield collection tube is intended for the stabilization and inactivation of upper and lower respiratory human specimens suspected of containing SARS-CoV-2. These devices can be used for collection transport and storage of specimens at ambient temperatures (20-25°C). Specimens collected and stored in a DNA/RNA Shield collection tube are suitable for use with legally marketed molecular diagnostic devices.

Single-use Device	Yes	Same
Product Configuration	Medium in vial and cap System including swab.	Same
Swab Tip	Flocked Swab	Same
Analyte	RNA	Same
Inactivation	SARS-CoV-2 virus	Same
General Device Characteristic Differences		
pH	8.3 ± 0.2	5.0-7.0
Specimen type	Upper respiratory specimens	Lower, upper respiratory and saliva specimens
Specimen stability	Up to 28 days at 2-4°C and 25-30°C.	Up to 28 days at 20-25°C.
Shelf-life stability	24 months when refrigerated (2-4°C) or stored at room temperature (30-35°C)	24 months at 20-25°C (ambient temperature)

VI Standards/Guidance Documents Referenced:

Special controls that are applicable to regulation 21 CFR 866.2950.

VII Performance Characteristics (if/when applicable):

A Analytical Performance:

1. Precision/Reproducibility:

   Not applicable (N/A)

2. Linearity:

   N/A

3. Analytical Specificity/Interference:

   N/A

4. Assay Reportable Range:

   N/A

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

Shelf Life

A shelf-life stability study was conducted using three lots of Puritan PurSafe Plus Collection and Transport System. Device lots were stored at 2-4°C (refrigerated) and 30-35°C (RT).
The shelf-life study evaluated multiple time points at each storage temperature condition. To evaluate device shelf-life stability during the study, various parameters like pH measurements, conductivity, and physical characteristics (namely, media appearance, media level, box/case appearance, package seal, print legibility and fading of ink/color) were evaluated. Acceptance criteria included the following parameters used for evaluation, pH range of 8.3 ±0.2, conductivity range 50-100 mS/cm, media level within 5% tolerance of fill volume target, no discoloration or turbidity in media appearance, legible printing with no ink fading, and a sealed package.

For each parameter evaluated in this study, the acceptance criteria were met indicating that Puritan PurSafe Plus Collection and Transport System remains stable when stored at 2-4°C or 30-35°C for up to 24 months from the date of manufacturing.

6. Detection Limit:

Limit of detection (LoD) studies were carried out to assess any impact or interference of the Puritan PurSafe Plus Collection and Transport System on the established performance of an FDA-cleared downstream *in vitro* diagnostic assay. For this study, the Cepheid Xpert Xpress Cov-2/Flu/RSV *plus* assay with an established limit of detection of 64 copies/mL for nasal swab specimens was used on the Cepheid GeneXpert IV system.

A preliminary LoD study was performed with clinically negative nasal matrix spiked with heat-inactivated SARS-CoV-2 (BEI Resources; ATCC # VR-1986HK, Lot # 70037781; initial concentration of 4.2 x10^5 genome copies/µL) at different viral RNA concentrations of 256, 128, 64, 32, 16 and 0 genome copies/µL, covering the pre-established LoD value of the Cepheid Xpert Xpress Cov-2/Flu/RSV *plus* assay (see Table 1 below). Per the assay protocol, 300 µL of the specimen+buffer mix was loaded onto the Cepheid Xpert Xpress CoV-2/Flu/RSV *plus* cartridge. All replicates with SARS-CoV-2 RNA concentrations of 64 genome copies/µL and higher resulted in positive detection in the preliminary LoD study. These results are consistent with the established limit of detection for the Cepheid Xpert Xpress Cov-2/Flu/RSV *plus* assay.

Table 1. Preliminary LoD study results

ID	Lot	Genome copies/mL	SARS-CoV-2 test result	Cepheid Probe Check
P1	Puritan Plus	256	Positive	Pass
P2	Puritan Plus	256	Positive	Pass
P3	Puritan Plus	128	Positive	Pass
P4	Puritan Plus	128	Positive	Pass
P5	Puritan Plus	64	Positive	Pass
P6	Puritan Plus	64	Positive	Pass
P7	Puritan Plus	32	Negative	Pass
P8	Puritan Plus	32	Positive	Pass
P9	Puritan Plus	16	Negative	Pass

P10	Puritan Plus	16	Negative	Pass
P11	Puritan Plus	0	Negative	Pass
P12	Puritan Plus	0	Negative	Pass

To confirm the LoD, 20 additional sample replicates were evaluated at the lowest concentration at which all replicates were positive in the preliminary LoD (i.e., 64 genome copies/mL). Similar to the preliminary LoD study, samples for the confirmatory LoD study were prepared by spiking clinically negative nasal matrix with heat-inactivated SARS-CoV-2 and using three Puritan PurSafe Plus Collection and Transport System lots. The study was conducted over six days (2-8 samples/day). All samples indicated positive detection of SARS-CoV-2 viral RNA. All samples differed by less than two Ct values. The Ct values and results of the confirmatory LoD study for samples using nasal matrix in Puritan PurSafe Plus Collection and Transport System can be seen in Table 2 below. These results demonstrate that the Puritan PurSafe Plus Collection and Transport System does not introduce bias into the downstream assay results and are acceptable.

Table 2. Confirmatory LoD study results

Rep	Assay Day	SARS-CoV-2 test results	Cepheid Probe Check	Ct Values
1	1	Positive	Pass	36.6
2	1	Positive	Pass	36.7
3	1	Positive	Pass	36.9
4	1	Positive	Pass	37.6
5	1	Positive	Pass	37.6
6	1	Positive	Pass	37.1
7	2	Positive	Pass	36.4
8	2	Positive	Pass	37.0
9	2	Positive	Pass	36.5
10	2	Positive	Pass	36.0
11	3	Positive	Pass	37.1
12	3	Positive	Pass	36.9
13	3	Positive	Pass	36.6
14	3	Positive	Pass	36.6
15	3	Positive	Pass	36.6
16	3	Positive	Pass	37.2
17	3	Positive	Pass	36.3
18	3	Positive	Pass	36.3
19	6	Positive	Pass	36.1
20	6	Positive	Pass	36.9
			Min	36.0
			Max	37.6

7. Specimen Stability:

A specimen stability study was conducted to evaluate the preservation of SARS-CoV-2 viral RNA in clinically negative nasal matrix stored in multiple lots of PurSafe Plus Collection and Transport System. Samples prepared with SARS-CoV-2 concentrations corresponding to 2X LoD (i.e., 100 genome copies/mL) were used for the stability studies. Storage conditions (2-4°C and 30-35°C) were evaluated across multiple timepoints including at 0-, 1-, 7-, and 28-days.

Following the assay protocol, 300 µL of the specimen+buffer mix was evaluated using the Cepheid Xpert Xpress CoV-2/Flu/RSV *plus* assay. Two replicates were assayed at each time point and storage temperature (N=72). Results are summarized in Table 3 and 4 below.

Table 3. **Specimen stability results**:

		Lot 1 (240312) New		Lot 2 (230207) Mid		Lot 3 (221109) Exp	
Temperature	**Time (days)**	**Assay results**	**Ct Values**	**Assay results**	**Ct Values**	**Assay results**	**Ct Values**
	0	Positive	36.3	Positive	37.1	Positive	35.8
	0	Positive	36.1	Positive	36.2	Positive	35.4
2-4ºC	1	Positive	35.6	Positive	36.6	Positive	37.1
	1	Positive	35.3	Positive	35.3	Positive	37.5
	7	Positive	36.4	Positive	36.6	Positive	36.7
	7	Positive	35.9	Positive	36.3	Positive	36.4
	28	Positive	36.2	Positive	36.2	Positive	36.9
	28	Positive	36.1	Positive	36.5	Positive	36.6
25-30ºC	1	Positive	33.9	Positive	36.6	Positive	37.4
	1	Positive	37	Positive	36	Positive	36.8
	7	Positive	35.9	Positive	38.3	Positive	37.1
	7	Positive	38.4	Positive	39	Positive	36.2
	28	Positive	37.9	Positive	39.9	Positive	38.3
	28	Positive	37.5	Positive	37.7	Positive	36.8

Table 4. **Specimen stability- difference from baseline**:

		Lot 1 (240312) New		Lot 2 (230207) Mid		Lot 3 (221109) Exp	
Temperature	**Time (days)**	**Mean Ct Values**	**Difference from baseline (Time 0)**	**Mean Ct Values**	**Difference from baseline (Time 0)**	**Mean Ct Values**	**Difference from baseline (Time 0)**
	0	36.2	--	36.6	--	35.6	--
2-4°C	1	35.5	0.75	36.0	0.65	37.3	1.7
	7	36.2	0.05	36.5	0.15	36.6	0.95
	28	36.2	0.05	36.4	0.25	36.8	1.15
25-30°C	1	35.5	0.75	36.3	0.3	37.1	1.5
	7	37.2	0.95	38.7	2.05	36.7	1.05
	28	37.7	1.5	38.8	2.2	37.6	1.95

All samples yielded positive detection at 100 genome copies/mL at storage temperatures of 2-4°C and 25-30°C and each time point evaluated in the study. All internal Cepheid probe checks passed. Mean Ct values for all samples across all time points and temperatures had less than 3 Ct difference from the baseline values (Time = 0). There were no significant differences among lots and with time and temperature. These results support the sample handling claims in the device labeling.

8. Inactivation:

Uninfected Vero E6 cells were exposed to the PurSafe Plus Buffer to observe possible cytotoxicity. Serial dilutions of each buffer (3 PurSafe Plus Lots) were carried out across a 96-well plate ranging from 1:10 dilution to 1:2160 dilution. Some cytotoxicity was observed with the PurSafe Plus buffer at a dilution of 1:10, but the 1:60 dilution had healthy cells with

no cytotoxic effects. Therefore, for the subsequent inactivation studies, a 1:60 dilution of the Puritan MK buffer solution was used.

Subsequently, inactivation of SARS CoV-2 was evaluated in a cell culture-based assay using multiple lots of Puritan PurSafe Plus. The culture media from cells infected with SARS-CoV-2 virus (Isolate: USA-WA1/2020; Titer = 1.02×10^8 $TCID_{50}$/mL) was mixed at a ratio of 1:10 with the Puritan MK buffer and incubated for different time periods. Samples were collected at 0-, 1-, 5- and 30-minutes time points and mixed with 2% media to prepare serial dilutions starting at 1:60 for infectivity testing in 96-well plates. Four replicates were evaluated for each condition. Vero E6 cells were added to the wells to evaluate viral infectivity. Cytopathic effects (CPE) were visually observed over seven days to determine the outcome of the study.

For the cell-only controls no cytopathic effect was observed. The positive control SARS-CoV-2 culture fluid and virus treated with PBS resulted in positive CPE over the course of the assay.

No visible CPE was observed over the course of the assay in wells with virus mixed with Puritan MK buffer for any exposure time evaluated in the study. SARS-CoV-2 was inactivated after exposure to each lot of PurSafe Plus MK Buffer at all timepoints evaluated in the study. Therefore, the PurSafe Plus MK Buffer was effective at inactivating the SARS-CoV-2 virus.

9. Assay Cut-Off:

   N/A

B Comparison Studies:

1. Method Comparison with Predicate Device:

   N/A

2. Matrix Comparison:

   N/A

C Clinical Studies:

1. Clinical Sensitivity:

   N/A

2. Clinical Specificity:

   N/A

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

N/A

D Clinical Cut-Off:

N/A

E Expected Values/Reference Range:

N/A

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.