



**510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
ASSAY ONLY**

I Background Information:

A 510(k) Number

K242767

B Applicant

Safecare Biotech (Hangzhou) Co., Ltd.

C Proprietary and Established Names

Safecare Urinary Tract Infection Test

D Regulatory Information

Product Code(s)	Classification	Regulation Section	Panel
JMT	Class I, meets the limitations of exemptions in 21 CFR 862.9 (c)(9)	21 CFR 862.1510 - Nitrite (Nonquantitative) Test System	CH - Clinical Chemistry
LJX	Class I, meets the limitations of exemptions in 21 CFR 864.9 (c)(9)	21 CFR 864.7675 - Leukocyte Peroxidase Test	HE - Hematology

II Submission/Device Overview:

A Purpose for Submission:

New device

B Measurand:

Urinary nitrite and leukocytes

C Type of Test:

Qualitative and semi-quantitative urinalysis

III Intended Use/Indications for Use:

A Intended Use(s):

See Indications for Use below.

B Indication(s) for Use:

The Safecare Urinary Tract Infection Test is for the qualitative detection of Leukocytes (LEU, white blood cells) and nitrite (NIT) in urine as an aid in the screening of a Urinary Tract infection (UTI). It is intended for over-the-counter home use.

C Special Conditions for Use Statement(s):

OTC - Over The Counter

D Special Instrument Requirements:

Not Applicable.

IV Device/System Characteristics:

A Device Description:

The Safecare Urinary Tract Infection Test is an in vitro diagnostic test device for qualitative detection of leukocytes and nitrite in urine. The device is composed of two-color pads aligned on a strip. One pad is employed for testing leukocyte and the other for nitrite by visually reading the color change of the pad and comparing to the corresponding blocks on a color chart.

B Principle of Operation:

The Safecare Urinary Tract Infection Test measures the color developed in two reaction zones (leukocytes and nitrite pads) on the test strips following application of a urine sample. The developed colors are then compared to calibration colors on the color chart.

This leukocyte test is based on the action of leukocyte esterase, which cleaves a derivatized pyrrolidine amino acid ester substrate to liberate derivatized hydroxy pyrazole. This compound then reacts with a diazonium salt to produce a colored compound (pink to purple).

This nitrite test uses the conversion of nitrate to nitrite by the action of bacteria in the urine. Urinary nitrite reacts with p-arsanilic acid to form a diazonium compound in an acidic medium. The compound then couples with 1,2,3,4-tetrahydrobenzo[h]quinolin-3-ol to produce a pink color.

V Substantial Equivalence Information:**A Predicate Device Name(s):**

Healgen URS Test Strips

B Predicate 510(k) Number(s):

K231045

C Comparison with Predicate(s):

Device & Predicate Device(s):	<u>K242767</u>	<u>K231045</u>
Device Trade Name	Safecare Urinary Tract Infection Test	Healgen URS Test Strips
General Device Characteristic Similarities		
Intended Use/Indications For Use	For the qualitative detection of leukocytes and nitrite in urine.	Same
Nitrite test methodology	By conversion of nitrate to nitrite using the action of p-arsanilic acid to form a diazonium compound in an acid medium. This compound then couples with 1, 2, 3, 4 - tetrahydrobenzo(h) quinoline to produce a pink color.	Same
Leukocyte test methodology	By hydrolysis of an indoxyl ester derivative through the action of leukocyte esterase. The liberated indoxyl ester reacts with a diazonium salt to produce a colored compound (pink to purple).	Same
Specimen type	Human urine	Same
Conditions for use	Over-the-counter	Same
General Device Characteristic Differences		
Storage condition	4 to 30 °C	2 to 30 °C
Limit of Detection (LOD)	Leukocyte esterase: 0.0018 mg/mL	Leukocyte: 15 cells/μL

Device & Predicate Device(s):	<u>K242767</u>	<u>K231045</u>
	Nitrite: 0.05 mg/dL LOD defined as the concentration of analyte that produces positive results at least 95% of the time	Nitrite: 0.05 mg/dL LOD defined as the concentration of analyte that produces positive results approximately 50% of the time

VI Standards/Guidance Documents Referenced:

None were referenced.

VII Performance Characteristics (if/when applicable):

1. Analytical Performance:

a. Precision/Reproducibility:

A precision study was performed with the Safecare Urinary Tract Infection Test at three (3) test sites with two (2) operators at each site. Samples were fresh urine samples collected and pooled on the same day that the study was conducted, then spiked with leukocyte esterase and nitrite stock solutions to obtain the concentration levels (1-8) listed in the table below. The evaluation included three (3) replicate assays over five (5) days. A total of forty-five (45) assay results on each of eight levels of test sample were obtained. Three lots of the device were used with each level of control. All sample concentrations were masked. Results are listed in the following table:

Level	Analyte	Concentration	Expected Value	N	% Agreement with Expected results
Level 1	Leukocyte	0 mg/mL	Negative	45	100
	Nitrite	0 mg/dL	Negative	45	100
Level 2	Leukocyte	0.0018 mg/mL	Trace	45	100
	Nitrite	0 mg/dL	Negative	45	100
Level 3	Leukocyte	0.0084 mg/mL	Small (+)	45	100
	Nitrite	0 mg/dL	Negative	45	100
Level 4	Leukocyte	0.015 mg/mL	Moderate (++)	45	100
	Nitrite	0 mg/dL	Negative	45	100
Level 5	Leukocyte	0.06 mg/mL	Large (+++)	45	100
	Nitrite	0 mg/dL	Negative	45	100
Level 6	Leukocyte	0 mg/mL	Negative	45	100
	Nitrite	0.1 mg/dL	Positive	45	100
Level 7	Leukocyte	0 mg/mL	Negative	45	100

Level	Analyte	Concentration	Expected Value	N	% Agreement with Expected results
	Nitrite	0.3 mg/dL	Positive	45	100
Level 8	Leukocyte	0.0084 mg/mL	Small (+)	45	100
	Nitrite	0.1 mg/dL	Positive	45	100

b. Linearity:

Not Applicable.

c. Analytical Specificity/Interference:

Potentially interfering substances were added into negative urine or urine with different leukocyte esterase and nitrite concentrations. These samples were tested with three lots of the Safecare Urinary Tract Infection Test by three different operators (one operator per lot). The following substances showed no interference with the test at the specified concentrations:

Substances	Concentration (mg/dL)
Albumin	1000
Ammonium Chloride	400
Ascorbic Acid	100
Bilirubin	10
Ciprofloxacin	1
Creatinine	600
Fructose	18
Galactose	15
Glucose	500
Glycine	900
Hemoglobin	100
Lactose	29
Oxalic Acid	1
Phenazopyridine	30
Phenolphthalein	4
Potassium Chloride	1200
Riboflavin	50
Sodium Nitrate	10
Sodium Nitrite*	10
Sodium Phosphate	1000
Sulfamethoxazole	40
Theophylline	4
Urea	4000

* This interferent is tested for Leukocyte results only.

High levels of glucose (≥ 1000 mg/dL) or high ascorbic acid (≥ 150 mg/dL) may decrease leukocyte readings. High ascorbic acid (≥ 150 mg/dL) may cause a false negative nitrite reading.

To investigate the effect of urine specific gravity and urine pH, urine samples with specific gravity ranging from 1.000 to 1.035 and urine samples with pH ranging from pH of 5 to 9 were tested at different leukocyte esterase and nitrite concentrations. The test results show that pH > 8.0 may cause false positive leukocyte readings, and specific gravity ≥ 1.035 may cause false negative leukocyte readings. Neither pH nor specific gravity affects nitrite testing.

Sample Carryover

A sample carryover study was performed. Three (3) lots of test strips were used for testing. The study was performed by either dipping the test strip into the sample or simulating urination with the sample and then holding the test strip vertically upwards or downwards for 10 seconds to allow the sample to flow from one pad to the other pad (i.e., run-over of high-concentration leukocyte esterase samples from the leukocyte pad to the nitrite pad and run-over of high-concentration nitrite samples from the nitrite pad to the leukocyte pad). Testing was also repeated in the other direction. The study demonstrated that carryover (run-over) does not impact the test results.

d. Assay Reportable Range:

The results of the analytical studies support the following measurement ranges:

Analyte	Measurement range
Leukocyte Esterase	qualitative: Negative, Trace, +, ++, +++ semi-quantitative: Negative, 0.0018, 0.0084, 0.015, 0.06 (mg/mL)
Nitrite	qualitative: Negative, Positive

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

Traceability

The nitrite test is traceable to NIST SRM 8040, and the leukocyte pad is traceable to a commercially available solution.

Stability

The sponsor provided information to support that the device is stable for 15 months when stored at 4-30°C based on real-time stability studies.

The sponsor instructs the user to use the test strip immediately after the foil pouch is opened, but no longer than 1 hour after opening, based on the results of an open-pouch stability study.

f. Detection Limit:

See Assay Cut-off section below.

g. Assay Cut-Off:

A cut-off study was performed to evaluate the lower limits of detection for each analyte on the Safecare Urinary Tract Infection Test. Urine samples were spiked to known

concentrations of each analyte. Each sample was tested in three (3) device lots by three (3) different operators in a total of 30 replicates per sample. The sponsor defined the lowest concentration with $\geq 95\%$ test of results positive as the limit of detection. The results support the claim that the sensitivity of the leukocyte test is 0.0018 mg/mL leukocyte esterase, and the sensitivity of the nitrite test is 0.05 mg/dL.

Leukocyte:

Leukocyte Esterase Concentration (mg/mL)	Results		Positive (%)
	Negative	Positive (\pm)	
0.00036	30	0	0
0.0006	27	3	10
0.0012	15	15	50
0.0018	0	30	100
0.0036	0	30	100

Nitrite:

Concentration (mg/dL)	Results		Positive (%)
	Negative	Positive	
0	30	0	0
0.04	7	23	76.7
0.05	0	30	100
0.06	0	30	100
0.08	0	30	100
0.1	0	30	100

The sponsor provided studies to support the recommended wetting time (1-2 seconds), the recommended reading time (2 minutes), and provided a lighting study supporting that the Safecare Urinary Tract Infection test can be correctly read under fluorescent, incandescent, and natural lighting conditions.

2. Comparison Studies:

a. Method Comparison with Predicate Device:

Three (3) sites were selected to perform the lay-user method comparison studies. One hundred and fifty-four (154) lay users with UTI symptoms were recruited to test their own urine sample using the Safecare Urinary Tract Infection Test. Laypersons performed one test with the Safecare Urinary Tract Infection Test according to the product insert and then collected a sample of their urine for comparison testing by professionals using the predicate device. The results obtained by the lay users using the Safecare Urinary Tract Infection Test compared to the results obtained by the professionals using the predicate device when used following its product insert are summarized below.

Results from 154 subjects testing their own urine samples using the midstream collection method for leukocytes:

LEU		Professional test results					Total
		+++	++	+	Trace	Negative	
Lay person test results (candidate device)	+++	9	1	0	0	0	10
	++	1	20	1	0	0	22
	+	0	1	31	2	0	34
	Trace	0	0	2	16	0	18
	Negative	0	0	0	0	70	70
Total		10	22	34	18	70	154
% Agreement (Exact Match)		90.00	90.91	91.18	88.89	100.00	
% Agreement (+/- Color Block)		100	100	100	100	100	

Results from 154 subjects testing their own urine samples using the midstream collection method for nitrite:

NIT		Professional test results		Total
		Positive	Negative	
Lay person test results	Positive	60	0	60
	Negative	0	94	94
Total		60	94	154
% Agreement (Exact Match)		100	100	

Lay users were also given surveys on the ease of understanding the package insert instructions. All lay users indicated that the device instructions were clear, simple, very clear, or very simple. The sponsor conducted a Flesch-Kincaid reading analysis on the package insert and the score revealed a reading grade level of less than 7.

b. Matrix Comparison:

Not Applicable. This device is intended to be used for urine samples using the midstream collection method.

3. Clinical Studies:

a. Clinical Sensitivity:

Not Applicable.

b. Clinical Specificity:

Not Applicable.

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

Not Applicable.

4. Clinical Cut-Off:

Not Applicable.

5. Expected Values/Reference Range:

The following information is provided in the labeling:

TEST STRIP RESULTS		RECOMMENDATIONS
Leukocytes (LEU)	Nitrite (NIT)	
Negative	Negative	Results suggest no sign of a UTI. If you have symptoms, consult your physician; there are some cases of UTI that the test may not detect.
Trace	Negative	Results suggest additional testing is required. Test again the following day with your first morning urine using a new strip. If you still have symptoms or if you get another trace LEU, consult your physician.
Positive +, ++, +++	Negative	Results suggest a sign of a UTI. Repeat the test next time you urinate using a new test strip. Make sure to wash the genital area first. If LEU is still positive, consult your physician.
Negative or Trace	Positive	Results suggest a sign of a UTI. Consult your physician immediately.
Positive +, ++, +++	Positive	Results suggest a sign of a UTI. Consult your physician immediately.

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.