

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

**A. 510(k) Number:**

k071930

**B. Purpose for Submission:**

new assay

**C. Measurand:**

human chorionic gonadotropin (hCG)

**D. Type of Test:**

lateral flow immunoassay (three formats: strip, cassette, and midstream)

**E. Applicant:**

Blue Cross Bio-medical (Beijing) Co., Ltd.

**F. Proprietary and Established Names:**

One Step HCG Urine Pregnancy Test

**G. Regulatory Information:**

1. Regulation section: 21 CFR 862.1155, chorionic gonadotropin test system
2. Classification: Class II
3. Product code: LCX, JHI
4. Panel: 75, Chemistry

**H. Intended Use:**

1. Intended use(s):  
One Step hCG Urine Pregnancy Test by Blue Cross is a visually-read, lateral flow immunoassay for the qualitative determination of human chorionic gonadotropin (hCG) in urine to help in the early detection of pregnancy by visual. The device is

designed for over-the-counter use as well as professional use. Additional clinical examination should be performed to confirm the pregnancy.

2. Indication(s) for use:

See intended use.

3. Special conditions for use statement(s):

For prescription and over-the-counter use

Additional clinical examination should be performed to confirm the pregnancy.

4. Special instrument requirements:

none

**I. Device Description:**

Blue Cross Biomedical's One Step hCG Urine Pregnancy Test will be sold in three formats: test strip, cassette, and midstream. Each test device contains mouse monoclonal anti-beta-hCG antibody colloidal gold conjugate pre-dried on a pad. Mouse monoclonal anti-alpha-hCG antibodies (on test region) and goat anti- mouse IgG (on control region) are coated and immobilized on a membrane.

**J. Substantial Equivalence Information:**

1. Predicate device name(s): WHPM One-Step Pregnancy Test

2. Predicate K number(s): k041273 (professional use), k012284 (over the counter).

3. Comparison with predicate: The devices are similar in intended use, device design, material, test format, and principle. Specific reagents and antibodies vary.

**K. Standard/Guidance Document Referenced (if applicable):**

Guidance for Over-the Counter (OTC) Human Chorionic Gonadotropin (HCG) 510(k)s

Review Criteria for Assessment of Professional Use Human Chorionic Gonadotropin (HCG) In Vitro Diagnostic Devices (IVDs)

**L. Test Principle:**

The assay is based on an immunochromatographic technology. Each test device contains monoclonal anti- $\beta$  hCG antibody colloidal gold conjugate pre-dried on a pad. Monoclonal anti- $\alpha$  hCG antibodies (on the test region) and goat anti mouse IgG (on the control region) are coated and immobilized on a membrane. Other absorbent pads at the end of the assay absorb excess sample fluid. As the urine sample contacts the membrane, it dissolves the lyophilized conjugate. In a reactive sample, the hCG antigen will attach to

the anti  $\beta$ hCG monoclonal antibodies in the colloidal solution. As the conjugate moves forward on the membrane, anti- $\alpha$ hCG monoclonal antibody affixed on the test zone (“T”) will bind the HCG-gold conjugate complex, forming a pink line. In addition, all samples will cause a pink colored line to appear in the control zone (“C”). This line is formed by the binding of the polyclonal antibodies (Anti-mouse IgG) affixed onto the control zone to the sample-colloidal gold conjugate. Presence of this line indicates sufficient sample volume was added.

**M. Performance Characteristics (if/when applicable):**

1. Analytical performance:

a. *Precision/Reproducibility:*

Standard solutions of hCG with varying concentrations were tested using ten strips from each lot for each concentration. Results are tabulated below. An additional study evaluating concentrations between 0 and 25 mIU/mL is shown in the detection limit study, below.

HCG concentration	Lot 1		Lot 2		Lot 3	
	Pos	Neg	Pos	Neg	Pos	Neg
0mIU/ml	0	10	0	10	0	10
25mIU/ml	10	0	10	0	10	0
50mIU/ml	10	0	10	0	10	0
100mIU/ml	10	0	10	0	10	0
100IU/ml	10	0	10	0	10	0

b. *Linearity/assay reportable range:*

Linearity is not applicable since this is a qualitative test.

The test was evaluated for high dose hook effect. Negative urine specimens were spiked with high hCG concentration of 62,500; 125,000; 250,000; 500,000; 1,000,000 and 2,000,000 mIU/mL. Both the test line and the control line were visible at these concentrations. (However, at concentrations over 250,000mIU/ml, the test lines become lighter).

c. *Traceability, Stability, Expected values (controls, calibrators, or methods):*

One Step hCG Urine Pregnancy Test has been calibrated against reference material traceable to WHO 3<sup>rd</sup> IS (75/537).

d. *Detection limit:*

The detection limit was evaluated by testing 40 hCG-negative urine samples,

freshly collected, from healthy females. Each specimen was then divided into 7 portions and spiked to 0, 5, 12.5, 20, 25, 50 and 100 mIU/mL of hCG. Results of this testing are shown below.

<b>hCG concentration (mIU/mL)</b>	0	5	12.5	20	25	50	100
<b>No. of Positive specimens</b>	0	0	4	22	40	40	40
<b>No. of Negative specimens</b>	40	40	36	18	0	0	0
<b>Total number</b>	40	40	40	40	40	40	40

*e. Analytical specificity:*

To evaluate cross-reactivity, 20 fresh urine specimens obtained from healthy non- pregnant females were spiked with different concentrations of Lutenizing Hormone (LH), Follicle stimulating Hormone (FSH), and thyroid stimulating hormone (TSH) into negative (0 mIU/mL) and positive (25mIU/ml) samples. The results demonstrated no cross reaction with LH at 500mIU/ml, FSH at 2000 mIU/mL, and TSH at 1000 mIU/mL. Results are tabulated below.

	<b>500 mIU/mL hLH</b>	<b>1000 mIU/mL hFSH</b>	<b>1000 mIU/mL hTSH</b>
No. of Positive samples	0	0	0
No. of Negative samples	20	20	20

	<b>500 mIU/mL hLH</b>	<b>1000 mIU/mL hFSH</b>	<b>1000 mIU/mL hTSH</b>
No. of Positive specimens	20	20	20
No. of Negative specimens	0	0	0

The standards used in this evaluation were: hLH, WHO 2<sup>nd</sup> IS (80/552); hFSH, WHO 2<sup>nd</sup> IRP (78/549); hTSH, WHO 2<sup>nd</sup> IRP (80/558).

Common prescription and OTC drugs, and chemical and biological analytes were added to negative (0 mIU/mL) and positive (25 mIU/mL) urine samples. The following substances, (or pH) at the indicated concentrations, were tested. No interference was observed. All hCG-negative urine specimens read negative and all hCG positive specimens read positive.

<b>Analytes</b>	<b>Concentration</b>
Acetaminophen	20 mg/dl
Acetylsalicylic acid	20 mg/dl
Ascorbic acid	20 mg/dl
Caffeine	20 mg/dl
Gentisic acid	20 mg/dl
Phenylpropanolamine	20 mg/dl
Salicylic acid	20 mg/dl
Thiophene	20 mg/dl
Ampicillin	20 mg/dl
Tetracycline	20 mg/dl
EDTA	80 mg/dl
Benzoyllecgonine	10 mg/dl
Atropine	20 mg/dl
Cannabinol	10 mg/dl
Ethanol	1%
Methanol	1%
Albumin	2,000 mg/dl
Glucose	2,000 mg/dl
Bilirubin	1,000 µg/dl
Hemoglobin	1,000 µg/dl
pH 9	
pH 8	
pH 6	
pH 5	
pH 4	

*f. Assay cut-off:*

The test cutoff is set at 25 mIU/mL.

2. Comparison studies:

*a. Method comparison with predicate device:*

The performance of the three formats of the One Step HCG Urine Pregnancy test was compared to the predicate device. Studies were performed to evaluate the devices for both professional and OTC users.

Professional Use

Studies were conducted at three hospital laboratories. A total of 360 fresh urine samples (120 samples from each site) were collected during any time of the day from patients who visited the ob-gyn department of three hospitals. Patients included women who suspected pregnancy, and who had late periods, as well as those later in pregnancy. There were over 30 positive samples from women in

early pregnancy (defined by the sponsor as 35 days or less since last menstrual period). Medical professionals from the hospitals read the package inserts and conducted assays with the new and predicate devices side by side. Overall results are tabulated below.

<b>All three hospitals</b>	<b>Currently marketed hCG device (+)</b>	<b>Currently marketed hCG device (-)</b>	<b>Total</b>
One Step HCG Urine Pregnancy Test (+)	213	0	213
One Step HCG Urine Pregnancy Test (-)	0	147	147
Total	213	147	360

#### Over the Counter Use

A total of 360 women were enrolled to conduct the Blue Cross Biomedical One Step hCG Urine Pregnancy Test and the predicate device. This included 120 using each of the 3 formats. The age of these subjects ranged from 15 to 56 years of age, and their education level range from middle school to PhD. This study group included women who were pregnant, women who had missed menses, women who were not pregnant, women who are postmenopausal, and women who are infertile. Each test was run and interpreted according to its package insert and was performed by the subject without supervision. A summary of the results is tabulated below:

	<b>Currently Marketed HCG device (+)</b>	<b>Currently Marketed HCG device (-)</b>	<b>Total</b>
One Step HCG Urine Pregnancy Test strips (+)	65	-	65
One Step HCG Urine Pregnancy Test strips (-)	-	55	55
One Step HCG Urine Pregnancy Test cassette (+)	66	-	66
One Step HCG Urine Pregnancy Test cassette (-)	-	54	54
One Step HCG Urine Pregnancy Test midstream (+)	67	-	67
One Step HCG Urine Pregnancy Test midstream (-)	-	53	53
Grand Total	198	162	360

After recording their results, participants were asked to evaluate the test. All participants thought the test was either “very easy” or “easy” to read and interpret (on a scale ranging from very difficult to very easy).

*-b. Matrix comparison:*

Not applicable. The device is for use with urine samples only.

3. Clinical studies:

*a. Clinical Sensitivity:*

Not typically provided for this device type.

*b. Clinical specificity:*

Not typically provided for this device type.

*c. Other clinical supportive data (when a. and b. are not applicable):*

4. Clinical cut-off:

The test cutoff is set at 25 mIU/mL.

5. Expected values/Reference range:

Not applicable – this is a qualitative test.

**N. Proposed Labeling:**

The labeling is sufficient and it satisfies the requirements of 21 CFR Part 809.10.

**O. Conclusion:**

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