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

A. 510(k) Number:

k132085

B. Purpose for Submission:

New device

C. Measurand:

Human chorionic gonadotropin

D. Type of Test:

Lateral flow immunoassay

E. Applicant:

Co-Innovation Biotech Company Ltd.

F. Proprietary and Established Names:

Co-Innovation One Step hCG Test Strip

Co-Innovation One Step hCG Test Cassette

Co-Innovation One Step hCG Test Midstream

G. Regulatory Information:

1. Regulation section:

   Human chorionic gonadotropin 21 CFR 862.1155

2. Classification:

   Class II

3. Product code:

   LCX

4. Panel:

   Clinical Chemistry (75)

H. Intended Use:

1. Intended use(s):
   See indications for use.

2. Indication(s) for use:

   The Co-Innovation One Step hCG Test Strip is an in vitro diagnostic visual qualitative immunochromatographic assay designed for the rapid determination of human chorionic gonadotropin (hCG) in urine to aid in the early detection of pregnancy. It is intended for over-the-counter (OTC) use.

   The Co-Innovation One Step hCG Test Cassette is an in vitro diagnostic visual qualitative immunochromatographic assay designed for the rapid determination of human chorionic gonadotropin (hCG) in urine to aid in the early detection of pregnancy. It is intended for over-the-counter (OTC) use.

   The Co-Innovation One Step hCG Test Midstream is an in vitro diagnostic visual qualitative immunochromatographic assay designed for the rapid determination of human chorionic gonadotropin (hCG) in urine to aid in the early detection of pregnancy. It is intended for over-the-counter (OTC) use.

3. Special conditions for use statement(s):

   For over-the-counter use

4. Special instrument requirements:

   Not applicable

I. Device Description:

Each of the devices (strip, cassette, and midstream) contains a pouch with the test and instructions. The cassette and midstream nitrocellulose test strips are contained in plastic housing. The cassette test also contains a dropper. The strips of each device contain mouse monoclonal anti-β-hCG antibody colloidal gold conjugate pre-dried on the pad, mouse monoclonal anti-α-hCG antibody (on the Test Line) and goat anti mouse IgG polyclonal antibody (on the Control Line).

J. Substantial Equivalence Information:

1. Predicate device name(s):

Blue Cross Biomedical One-Step hCG Urine Pregnancy Test

2. Predicate 510(k) number(s):

k071930

3. Comparison with predicate:

Feature	New Device	Predicate (k071930)
Intended Use	Qualitative detection of human chorionic gonadotropin ("HCG") in urine	Same
Indications/ Intended Users	Over the Counter (OTC)	Over the Counter (OTC) Use and Prescription Use
Specimen	Urine	Same
Clinical cut-off	25mIU/mL	Same
Read time	5 minutes	Same
Test Principle	Colloidal Gold Immunoassay	Same
Traceability	WHO 3rd IS	Same
Format	Strip, cassette, midstream	Same
Reagents	Monoclonal anti-β hCG antibody colloidal gold conjugate on the pre-dried pad. Monoclonal anti-α hCG antibodies (on the test region) Goat anti mouse IgG (on the control region).	Same, but specific antibodies differ.

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

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

L. Test Principle:

The assay of each device uses a double antibody sandwich method. Each test device contains mouse monoclonal anti-β-hCG antibody colloidal gold conjugate pre-dried on a pad. Mouse monoclonal anti-α-hCG antibody (on the Test Line) and goat anti mouse IgG polyclonal antibody (on the Control Line) are coated and immobilized on a nitrocellulose membrane. During the test procedures, hCG in the urine specimen reacts with the dye conjugate (mouse anti-β-hCG antibody-

colloidal gold conjugate specific to the beta subunit of hCG) and forms a complex. Because of capillary and chromatographic effects of the nitrocellulose membrane, the complex migrates along the membrane to the α-hCG antibody line (T), and remains captured in the T line. As a result a red colored band develops in the T line, indicating a positive result. If there is no hCG in the urine, there is no red band in the test zone, indicating a negative result. The Control line should develop in the control zone regardless of the test result.

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. Precision/Reproducibility:

Precision studies were performed using urine samples spiked with a standard containing natural intact hCG, purified from urine, and calibrated versus the WHO 3rd standard. Concentrations included 0mIU/mL,12.5mIU/mL, 18.75mIU/mL, 25mIU/mL, 50mIU/mL, and 100mIU/mL hCG. Samples were masked and randomized prior to testing. The study was conducted over 10 days by multiple operators at 3 hospital sites. Three lots of each of the three formats were tested. The midstream format was tested with both the dip and (simulated) midstream method in this evaluation. Results are shown below:

Strip format test results:

hCG concentration	Lot 1		Lot 2		Lot 3	
	Positive	Negative	Positive	Negative	Positive	Negative
0 mIU/mL	0	30	0	30	0	30
12.5	0	30	0	30	0	30
18.75	0	30	0	30	0	30
25	30	0	30	0	30	0
50	30	0	30	0	30	0
100	30	0	30	0	30	0

Cassette format test results:

hCG concentration	Lot 1		Lot 2		Lot 3	
	Positive	Negative	Positive	Negative	Positive	Negative
0 mIU/mL	0	30	0	30	0	30
12.5	0	30	0	30	0	30
18.75	0	30	0	30	0	30
25	30	0	30	0	30	0
50	30	0	30	0	30	0
100	30	0	30	0	30	0

Midstream (dip) format test results:

hCG concentration	Lot 1		Lot 2		Lot 3	
	Positive	Negative	Positive	Negative	Positive	Negative
0 mIU/mL	0	30	0	30	0	30

12.5	0	30	0	30	0	30
18.75	0	30	0	30	0	30
25	30	0	30	0	30	0
50	30	0	30	0	30	0
100	30	0	30	0	30	0

Midstream (simulated midstream) test results

hCG concentration	Lot 1		Lot 2		Lot 3	
	Positive	Negative	Positive	Negative	Positive	Negative
0 mIU/mL	0	30	0	30	0	30
12.5	0	30	0	30	0	30
18.75	0	30	0	30	0	30
25	30	0	30	0	30	0
50	30	0	30	0	30	0
100	30	0	30	0	30	0

Lay user precision:

Spiked urine samples (prepared in the same way as those described above) were also tested by lay persons. All aliquots were masked and randomized prior to testing. The lay user particpants included various levels of educational backgrounds and ages (18 to 45 years). Each subject conducted one test, using the English package insert as guide. Results are shown below:

Format	Strip		Cassette		Midstream	
HCG Concentration	Positive	Negative	Positive	Negative	Positive	Negative
18.75mIU/ml	0	100	1	99	0	100
31.25mIU/ml	100	0	100	0	99	1
Total	100	100	101	99	99	101

b. Linearity/assay reportable range:

Not applicable. This is a qualitative assay.

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

The 510(k) describes traceability of the assay to the WHO 3rd reference material. Stability testing information (protocols and acceptance criteria) to support the claimed shelf life (2 years) was reviewed and deemed acceptable.

d. Detection limit:

See Precision section above (M.1.a.).

e. Analytical specificity:

The assay was tested for interference from endogenous compounds, potentially interfering clinical conditions, and exogenous compounds in the presence of 0 mIU/mL hCG and 25 mIU/mL hCG. Three lots were tested. No interference was observed from the compounds at the concentrations listed below.

Substances tested/ concentration	
Acetaminophen	20mg/dL
Aspirin	20mg/dL
Ascorbic acid	20mg/dL
Atropine	20mg/dL
Caffeine	20mg/dL
Glucose	2000mg/dL
Hemoglobin	500mg/dL
Tetracycline	20mg/dL
Ampicillin	20mg/dL
Albumin	2000mg/dL
Bilirubin	2mg/dL
Acetaminophen	20mg/dL
Aspirin	20mg/dL
Ascorbic acid	20mg/dL
Atropine	20mg/dL
Caffeine	20mg/dL
Glucose	2000mg/dL
Hemoglobin	500mg/dL
Tetracycline	20mg/dL
Ampicillin	20mg/dL
Albumin	2000mg/dL
Bilirubin	2mg/dL
Leukocyte	> 500/ul
Erythrocytes	> 250/uL
Uric acid	0.58 mMol/L
Ketone	> 80 mg/dL

To evaluate any effects of the hCG β-core fragment, urine from non-pregnant females containing 0 and 25 mIU/ml hCG were spiked with the hCGβ-core fragment (traceable to WHO reference reagent 99/708) to concentrations of 125,000, 250,000, 500,000 and 1,000,000 pmol/mL. Three batches of each format were tested. No effects were seen for the concentrations tested. Results are shown below:

hCGβ-core Fragment concentration (pMol/L)	hCG concentration	Batch 1		Batch 2		Batch 3	
		Positive	Negative	Positive	Negative	Positive	Negative
125000	0mIU/ml	0	1	0	1	0	1
250000	0mIU/ml	0	1	0	1	0	1
500000	0mIU/ml	0	1	0	1	0	1
1000000	0mIU/ml	0	1	0	1	0	1
125000	25mIU/ml	1	0	1	0	1	0
250000	25mIU/ml	1	0	1	0	1	0
500000	25mIU/ml	1	0	1	0	1	0
1000000	25mIU/ml	1	0	1	0	1	0

To evaluate for high dose hook effect, urine specimens spiked with hCG at concentrations shown below were tested across three lots. No hook effect was observed. Results are shown below:

hCG	**Positive**	**Negative**
62,500mIU/ml	9	0
125,000mIU/ml	9	0
250,000mIU/ml	9	0
500,000mIU/ml	9	0
1,000,000mIU/ml	9	0

Evaluations of the effect of the pH and specific gravity of urine specimens were also performed. Results of samples containing 0 and 25 mIU/mL hCG were unaffected across the pH range of 3-9 and specific gravity of 1.01-1.04.

Evaluations were performed to determine cross-reactivity with LH, FSH, TSH. No cross-reactivity was observed over 3 lots. Results are shown below for one representative lot.

hormone concentration	hCG concentration	Positive	Negative
500mIU/ml LH	0mIU/ml HCG	0	30
1000mIU/ml FSH	0mIU/ml HCG	0	30
1000uIU/ml TSH	0mIU/ml HCG	0	30
500mIU/ml LH	25mIU/ml HCG	30	0
1000mIU/ml FSH	25mIU/ml HCG	30	0
1000uIU/ml TSH	25mIU/ml HCG	30	0

f. Assay cut-off:
See Precision section above (M.1.a.). The assay cut-off of all devices is 25 mIU/mL.

2. Comparison studies:

a. Method comparison with predicate device:

A method comparison study was conducted where results of professional users with the candidate test were compared to results of professional users with the predicate device. Samples from 353 women were tested.

Cassette test		Predicate Device (tested by professional)	
		Positive result	Negative result
Candidate One step hCG test cassette method (tested by professional)	Positive result	39	0
	Negative result	0	74

Strip test		Predicate Device (tested by professional)	
		Positive result	Negative result
Candidate One step hCG test strip method (tested by professional)	Positive result	38	0
	Negative result	0	42

Midstream test - dip method		Predicate Device (tested by professional)	
		Positive result	Negative result
Candidate One step hCG test midstream dip method (tested by professional)	Positive result	37	0
	Negative result	0	43

Midstream test - simulated midstream		Predicate Device (tested by professional)	
		Positive result	Negative result
Candidate One step hCG test midstream simulated method (tested by professional)	Positive result	41	0
	Negative result	0	39

b. Matrix comparison:

Not applicable.

3. Clinical studies:

a. Clinical Sensitivity:

Not applicable.

b. Clinical specificity:

Not applicable.

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

A lay-user study was conducted with 353 layer users who tested their own urine using instructions contained in the English package insert. This

included 80 layer users using the test strip, 113 using the test cassette, and 160 users using the midstream test (80 using either the dip method or the midstream method). Approximately half of the women were less than 5 weeks pregnant (based on last menstrual period). Samples were randomly collected at various times throughout the day. Subject ages ranged from 18 to 45 years. Subjects responded to questionnaires after finishing the test and collected samples for tests by laboratory professionals using the candidate device, and indicated that they found the test easy to perform. Samples were masked and randomized prior to professional testing. Results are shown below:

Cassette test		Candidate Device (tested by professional)	
		Positive result	Negative result
Candidate One step hCG test cassette method (tested by lay user)	Positive result	39	0
	Negative result	0	74

Strip test		Candidate Device (tested by professional)	
		Positive result	Negative result
Candidate One step hCG test strip method (tested by lay user)	Positive result	38	0
	Negative result	0	42

Midstream test - dip method		Candidate Device (tested by professional)	
		Positive result	Negative result
Candidate One step hCG test midstream dip method (tested by lay user)	Positive result	37	0
	Negative result	0	43

Midstream test – midstream method		Candidate Device (tested by professional)	
		Positive result	Negative result
Candidate One step hCG test midstream, midstream method (tested by lay user)	Positive result	41	0
	Negative result	0	39

4. Clinical cut-off**:**

   Not applicable.

5. Expected values/Reference range:

   Not applicable.

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.