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

A. 510(k) Number:

k123567

B. Purpose for Submission:

Modification of device (change in hCG antibody)

C. Measurand:

Human chorionic gonadotropin (hCG)

D. Type of Test:

Qualitative chromatographic immunoassay

E. Applicant:

Church & Dwight Co., Inc.

F. Proprietary and Established Names:

FIRST RESPONSE Gold Digital Pregnancy Test

G. Regulatory Information:

Product code	Classification	Regulation section	Panel
LCX	Class II	21 CFR 862.1155 Human chorionic gonadotropin (hCG) test system	Chemistry (75)

H. Intended Use:

1. Intended use(s):

   See Indications for use below.

2. Indication(s) for use:

   The FIRST RESPONSE™ Gold Digital Pregnancy Test is an over-the-counter chromatographic immunoassay for the qualitative detection of human chorionic gonadotropin (hCG) in urine. The device is intended for use as an aid in early detection of pregnancy, in some cases as early as five (5) days before the expected period, i.e., as early as six (6) days before the day of the missed period.

   Important note regarding negative results:

   Some pregnant women will not be able to detect hCG in their urine 5 days before the expected period. If you test negative before your missed period, but think you may still be pregnant, you should re-test again a few days after your missed period.

All results should be confirmed by your healthcare provider, especially when making decisions about future medical care.

3. Special conditions for use statement(s):

   For over-the-counter use

4. Special instrument requirements:

   None

I. Device Description:

The FIRST RESPONSE Gold Digital Pregnancy Test is a screening device intended for the early detection of pregnancy by the lay user through the qualitative detection of human chorionic gonadotropin (hCG) hormone in urine, in some cases as early as 5 days before the expected period. The FIRST RESPONSE Gold Digital Pregnancy Test consists of a plastic housed test stick containing an immunochromatographic strip and electronic and optical components along with a microprocessor and specific algorithms to digitally display test results. The test strip contains streptavidin-biotin chemistry, mouse monoclonal and goat anti-mouse polyclonal antibodies.

J. Substantial Equivalence Information:

1. Predicate device name(s):

   FIRST RESPONSE Early Result Pregnancy test

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

   k083716

3. Comparison with predicate:

Similarities		
Item	Proposed Device	Predicate Device (k083716)
Intended use	Early detection of pregnancy	Same
Target User	Over-the-counter	Same
Analyte	hCG	Same
Test principle	Lateral flow sandwich immunochromatographic assay	Same
Specimen	Urine	Same
Time to Result	3 minutes	Same

Differences		
Item	Proposed device	Predicate device (k083716)
Results	YES+ = pregnant NO- = not pregnant	2 pink lines = pregnant 1 pink line = not pregnant
Electronic components	Microprocessor with specific circuitry and algorithm. LCD readout with battery as power source	None
hCG isoforms detected	intact hCG hyperglycosylated hCG hCG β-subunit hCG β-core fragment	intact hCG hyperglycosylated hCG hCG β-subunit

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

None referenced

L. Test Principle:

The detection of hCG in urine is accomplished by a series of immunochemical reactions via component reagents that are deposited onto a chromatographic strip contained within the plastic housing.

A digital component integral with the chromatographic strip reads and displays the result of the immunochemical reaction on an LCD (Liquid Crystal Display) screen of the device.

The test is performed by placing the absorbent collection tip of the device into the urine stream for 5 seconds (or alternatively by fully immersing the collection tip for 5 seconds in a urine sample that was collected in a cup). A clock symbol will begin to blink in about 30 seconds after the urine is applied to indicate to the consumer that the test is working. The test result is read on the LCD screen of the device within 3 minutes. A "YES+" test result indicates that the pregnancy hormone (hCG) was detected (pregnant) and a "NO-" test result indicates that no hCG was detected (not pregnant).

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

   a. Precision/Reproducibility:

   Urine standards containing hCG at concentrations of 0, 3, 6, 10, 15, and 25 mIU/mL prepared in negative urine pool and calibrated against the WHO 4th International Standard (IS) for hCG were tested using five different lots of the First Response® Gold Digital Pregnancy Test. Each sample was tested in replicates of ten for a total of sixty devices per lot. Testing was performed over three consecutive days, each day using a different technician.

hCG level	Lot# 1	Lot# 2	Lot# 3	Lot# 4	Lot# 5	% Positive
0 mIU/mL	30/30 NO-	30/30 NO-	30/30 NO-	30/30 NO-	30/30 NO-	0%
3 mIU/mL	30/30 NO-	30/30 NO-	30/30 NO-	30/30 NO-	30/30 NO-	0%
6 mIU/mL	13/30 YES+	14/30 YES+	13/30 YES+	14/30 YES+	13/30 YES+	45%
10 mIU/mL	30/30 YES+	30/30 YES+	30/30 YES+	30/30 YES+	30/30 YES+	100%
15 mIU/mL	30/30 YES+	30/30 YES+	30/30 YES+	30/30 YES+	30/30 YES+	100%
25 mIU/mL	30/30 YES+	30/30 YES+	30/30 YES+	30/30 YES+	30/30 YES+	100%

b. Linearity/assay reportable range:

Not applicable. This is a qualitative device.

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

The device is standardized to the World Health Organization's 4th International Standard for Chorionic Gonadotropin.

The devices are stable until the expiration date printed on box when stored in the pouch at room temperature (30°C).

Stability testing protocols and sponsor's acceptance criteria were reviewed and found to be acceptable. The claimed shelf life of the devices stored in pouches at room temperature is 2 years.

d. Detection limit:

To determine the detection limit and analytical cut-off of the FIRST RESPONSE® Gold™ Digital Pregnancy Test, hCG urine standards of known concentration were tested. Urine standards containing hCG at concentrations of 0, 3, 6, 10, 15, and 25 mIU/mL were tested by laboratory technicians according to package insert instructions with three lots of devices in replicates of 20. The results show that the analytical sensitivity of the device (the lowest concentration that yields 100% positive results) is 10 mIU /mL and the analytical cut-off level at which approximately half of the devices yield positive results and the remainder yield negative results is 6 mIU /mL. All devices were negative at 0 and 3 mIU /mL.

	hCG concentration (mIU/mL)					
	0	3	6	10	15	25
Lot# 10671	0/20 YES+	0/20 YES+	8/20 YES+	20/20 YES+	20/20 YES+	20/20 YES+
Lot# 10681	0/20 YES+	0/20 YES+	10/20 YES+	20/20 YES+	20/20 YES+	20/20 YES+
Lot# 10691	0/20 YES+	0/20 YES+	9/20 YES+	20/20 YES+	20/20 YES+	20/20 YES+
TOTAL	0/60 YES+	0/60 YES+	27/60 YES+	60/60 YES+	60/60 YES+	60/60 YES+
% Positive	0%	0%	45%	100%	100%	100%

An additional study was performed to assess the analytical sensitivity and cut-off using a simulated mid-stream technique. Samples with known hCG concentrations were tested in replicates of 20 at each concentration using a technique to simulate the midstream testing method:

hCG concentration (mIU/mL)				
	0	**3**	**6**	**10**
Test results	0/20 YES+	0/20 YES+	10/20 YES+	20/20 YES+
% Positive	0%	0%	50%	100%

e. Analytical specificity:

To determine if the FIRST RESPONSE Gold Digital Pregnancy Test has a high dose hook effect, the test was challenged with samples with very high levels of hCG. Urine hCG standards at 0.1, 0.2, 0.5, 1, 5, 10, 25, 50, 100 and 500 IU /mL were evaluated with the FIRST RESPONSE® Gold™ Digital Pregnancy Test devices according to package insert instructions in replicates of 10 at each level. All devices tested with the hCG standards yielded the expected positive results. No "high-dose hook" effect was observed at hCG levels up to 500 IU /mL. The results are summarized below:

hCG Concentration	Results
0.1 IU/mL	10/10 YES+
0.2 IU/mL	10/10 YES+
0.5 IU/mL	10/10 YES+
1 IU/mL	10/10 YES+
5 IU/mL	10/10 YES+
10 IU/mL	10/10 YES+
25 IU/mL	10/10 YES+
50 IU/mL	10/10 YES+
100 IU/mL	10/10 YES+
500 IU/mL	10/10 YES+

In order to evaluate the potential for high concentrations of hCG beta core fragment (βcf) to cause false results, third trimester pregnancy urine samples prepared to contain 500,000 and 1,000,000 pmol/L of hCG βcf were each tested on 10 devices. All devices tested with the hCG standards yielded the expected positive results. No "high-dose hook" effect was observed at hCG βcf levels up to 1,000,000 pmol/L.

hCG βcf concentration	Test results
500,000 pmol/L	10/10 YES+
1,000,000 pmol/L	10/10 YES+

Various prescription and OTC drugs (acetaminophen, acetylsalicylic acid, ascorbic acid, ampicillin, atropine, caffeine, gentisic acid, phenothiazine, phenylpropanolamine and tytracycline, all at 10 µg/mL), potential endogenous interferents (glucose and albumin at 20 mg/mL, hemoglobin, bilirubin, and estriol at 10 µg/mL) and homologous hormones (hLH and hFSH at 1000 mIU/mL, hTSH at 1 mIU/mL) were added to aliquots of urine pools that tested negative for hCG and urine pools that contained hCG at 10mIU/mL. Samples were tested in replicates of 10. No affects on test performance were observed.

f. Assay cut-off:

See detection limit section above.

2. Comparison studies:

a. Method comparison with predicate device:

A total of 600 urine samples were randomized and tested according to package insert instructions with three lots of the FIRST RESPONSE® Gold™ Digital Pregnancy Test (one subject device randomized from the three lots/per sample) and one lot of the predicate devices. The results are summarized below:

Device	Correct Negative	Correct Positive	Accuracy
First Response® Gold Digital Pregnancy Test (Subject Device)	300/300	300/300	100% (600/600)
First Response® Early Result Pregnancy Test (Predicate Device)	300/300	300/300	100% (600/600)

The results show no discrepancies between the FIRST RESPONSE Gold Digital Pregnancy Test and the predicate device, the FIRST RESPONSE Early Result Pregnancy Test.

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):

   Detection of hCG in Early Pregnancy Clinical Samples

   A total of 504 urine samples from 50 characterized cycle segments taken from conceptive cycles collected from 50 different pregnant women were tested according to package insert instructions. Every urine sample from each cycle segment was randomized. Each urine sample was tested with one device selected from three device lots according to a randomization table, and the three device lots were represented equally across all of the samples included within the study.

   The FIRST RESPONSE Gold Pregnancy Test detected hCG in 60% of the cycles five days before the expected menstrual period and in 100% of the cycles on the day of the expected menstrual period. The table below summarizes detection of hCG with the FIRST RESPONSE Gold Digital Pregnancy Test relative to the day of the expected menstrual period (EMP) for the conceptive cycles tested.

Day relative to Expected Menstrual Period	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	EMP
Day relative to LH Peak	LH +4	LH +5	LH +6	LH +7	LH +8	LH +9	LH +10	LH +11	LH +12	LH +13	LH +14	LH +15
#Cycles positive for hCG	0/2	0/8	1/18	1/35	6/45	15/48	30/50	42/49	48/50	50/50	49/49	50/50
Cumulative % Cycles	0%	0%	6%	3%	13%	31%	60%	86%	96%	100%	100%	100%

Note: EMP was calculated by adding 15 days to the day with the highest quantitative urinary concentration of luteinizing hormone (LH), i.e., day of LH peak plus 15 days (LH+15).

Non-pregnant urine sample analysis

A study was performed to determine the incidence of positive results in urine from non-pregnant females when tested with the candidate device. A total of 306 urine samples (from 102 pre-menopausal women (ages 18-40), 102 peri-menopausal women (ages 41-55), and 102 postmenopausal women (ages 56-75)) were tested with three lots of FIRST RESPONSE Gold Digital Pregnancy Tests according to package insert instructions. No pre-selection or pre-screening based on hCG was performed prior to testing. The results of this study are presented below:

Sub- population	**No. of samples**	**Positive Results**
Pre-menopausal (18-40 yrs old)	102	0/102 (0%)
Peri-Menopausal (41-55 yrs old)	102	0/102 (0%)
Post-Menopausal (> 55 yrs old)	102	0/102 (0%)

Lay-user Study

The purpose of this study was to determine the ability of consumers to perform a self-test using the FIRST RESPONSE® Early Result Pregnancy Test, and read and interpret their test results following package insert instructions. One hundred and two female subjects between the ages of 18 and 45 were recruited. Consumer interpretation of results compared to lab technicians are tabulated below:

Result	Number of samples	Consumer vs. Technicians
Pregnant	13	13/13 (100%)
Non-Pregnant	89	89/89 (100%)
TOTAL	102	102/102 (100%)

A second study was performed to evaluate the FIRST RESPONSE Gold Digital Pregnancy test around the cut-off in the hands of the intended user. Female lay-users (ages 18-45) were recruited to test one masked hCG sample (8 or 12 mIU/mL). Participants varied in education level. The test results were as follows:

hCG Standards (mIU/mL)		
	8	**12**
Test results	15/20 YES+	20/20 YES+
% Positive	75%	100%

All lay-users answered in the affirmative to questions regarding the ease of interpretation of test results and ease of following the package insert instructions.

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.