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

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

K123844

**B. Purpose for Submission:**

New device

**C. Measurand:**

Human Chorionic Gonadotropin (hCG)

**D. Type of Test:**

Qualitative chromatographic immunoassay

**E. Applicant:**

Chemtron Biotech, Inc.

**F. Proprietary and Established Names:**
Chemtrue® hCG Pregnancy Urine Dipstick
Chemtrue® hCG Pregnancy Urine Cassette Test
Chemtrue® hCG Combo (Serum/Urine) Cassette Test

**G. Regulatory Information:**

| Product Code | Classification | Regulation Section | Panel |
|---|---|---|---|
| JHI | Class II | 21CFR §862.1155<br><br>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:

   Chemtrue® hCG Pregnancy Urine Dipstick Test

   The Chemtrue® hCG Pregnancy Urine Dipstick Test is a rapid lateral flow qualitative immunoassay for early detection of human chorionic gonadotropin (hCG) in human urine in the device format of Dipstick. The test is designed to aid early detection of pregnancy. The device is intended for Prescription Use Only.

   The test kits are intended for prescription use including at physician's offices or other Point-Of-Care sites (POC).

   Chemtrue® hCG Pregnancy Urine Cassette Test

   The Chemtrue® hCG Pregnancy Urine Cassette Test is a rapid lateral flow qualitative immunoassays for early detection of human chorionic gonadotropin (hCG) in human urine in the device format of Cassette format. The test is designed to aid early detection of pregnancy. The device is intended for Prescription Use Only.

   The test kits are intended for prescription use including at physician's offices or other Point-Of-Care sites (POC).

   Chemtrue® hCG Combo (Serum/Urine) Cassette Test:

   The Chemtrue® hCG Combo (Serum/Urine) Cassette Test is rapid lateral flow qualitative immunoassays for early detection of human chorionic gonadotropin (hCG) in human urine or serum in Cassette format only. The test is designed to aid early detection of pregnancy. The devices are intended for Prescription Use Only.

   The test kits are for prescription use including professionals at physician's office laboratories (POLs) or Point-Of-Care site (POC).

3. Special conditions for use statement(s):

   For prescription use at point of care sites

4. Special instrument requirements:

   None

## I. Device Description:

The Chemtrue® hCG Pregnancy Urine test is designed in Dipstick and Cassette formats. The hCG Combo (Serum/Urine) Cassette test is distributed in Cassette format only. Each test device consists of one (1) individual test strip and each test strip in the device consists of:

1) A conjugate pad contains colloidal gold conjugated with monoclonal ( mouse) anti-hCG antibody specific to the beta subunit of hCG.

2) A nitrocellulose membrane which is striped with the specific goat anti-hCG in the test line (T line) and goat anti-mouse antibody in the control line (C line). The C line (serves as an internal process control of the system and appears as a colored band during the test regardless of the hCG level in the test sample.

All the configurations have the same membrane format, reagents and gold conjugate pad, as well as the same flow characteristics, except the test line in the nitrocellulose membrane for hCG Combo test is striped with polyclonal goat anti-hCG antibodies.

Devices are packaged one device per foil pouch and 25 devices in each kit.

## J. Substantial Equivalence Information:

1. Predicate device name(s) and 510(k) number(s):

| Predicate Device Name | 510(k) k number |
|---|---|
| OSOM Card II hCG Urine Test | K990578 |
| One-Step Urine/Serum Combo Pregnancy Card Test | K964461 |

2. Comparison with predicate:

**hCG urine Tests:**

| Item | SIMILARITIES | |
|---|---|---|
| | **Candidate Device** Chemtrue® hCG Pregnancy Urine Tests (Dipstick and Cassette) | **Predicate Device** OSOM Card II hCG Urine Test (k990578) |
| Intended Use | A rapid qualitative immunoassay for rapid determination of human chorionic gonadotropin (hCG) to aid in the early detection of pregnancy. The | Same |

| | | |
|---|---|---|
| | device is intended for Prescription Use Only. | |
| Technology principle | Lateral-flow immunoassay | Same |
| Specimen matrix | Human urine | Same |
| Results | Qualitative | Same |
| Result Interpretation | Visually-read line intensity | Same |
| Sensitivity/Cutoff characteristics | 20 mIU/mL | Same |
| Quality Control | Built-in Internal Control | Same |

| **Item** | **DIFFERENCES** | |
|---|---|---|
| | **Candidate Device** Chemtrue® hCG Pregnancy Urine Test (Dipstick and Cassette) | **Predicate Device** OSOM Card II hCG Urine Test (k990578) |
| Read time | Read the results at 5 minutes. | Read the results at 3 minutes. |
| Device format | Dipstick and Cassette | Cassette only |
| Storage | 4°C – 30°C | 15°C -30°C |

**hCG Serum/Urine Combo Test:**

| **Item** | **SIMILARITIES** | |
|---|---|---|
| | **Candidate Device** Chemtrue® hCG Combo (Serum/Urine) Cassette Test | **Predicate Device** One-Step Urine/Serum Combo Pregnancy Card Test (k964461) |
| Intended Use | A rapid qualitative immunoassay for rapid determination of human chorionic gonadotropin (hCG) to aid in the early detection of pregnancy | Same |
| Technology principle | Lateral-flow immunoassay | Same |
| Indication of Use | For prescription use, including professionals at physician's office labs (POLs) | Same |
| Specimen matrix | Human urine or serum | Same |
| Results | Qualitative | Same |
| Result Interpretation | Visually-read line intensity | Same |
| Read time | Read the results at 5 minutes | Same |
| Sensitivity/Cutoff characteristics | 25 mIU/mL | Same |
| Quality Control | Built-in Internal Control | Same |

| Items | DIFFERENCES | |
|---|---|---|
| | **Candidate Device** Chemtrue® hCG Combo (Urine/Serum) Test | **Predicate Device** One-Step Urine/Serum Combo Pregnancy Card Test (k964461) |
| Storage | $4^oC – 30^oC$ | $18^oC$ -$30^oC$ or refrigerated ($2-8^oC$) |

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

- FDA guidance: Review Criteria for Assessment of Professional Use Human Chorionic Gonadotropin (hCG) In Vitro Diagnostic Devices – Document Issued on: November 6, 1996.
- CLSI EP7-A2; Interference Testing in Clinical Chemistry

**L. Test Principle:**

The devices employ lateral flow immunoassay technology for detection of human chorionic gonadotropin (hCG) in urine or serum. Monoclonal (Polyclonal for hCG Combo) goat anti-hCG antibodies are pre-striped in the nitrocellulose membrane on the test region (T line) and goat anti- mouse antibodies on the control region (C line). During testing, the urine or serum specimen reacts with the conjugate pad (It contains colloidal gold particles conjugated with monoclonal anti-hCG antibody specific to the beta subunit of hCG) located just beneath the sample pad and above the membrane of the test strip. The specimen migrates upward on the membrane by capillary action to react with the antibodies on the membrane. If the hCG concentration in the specimen is at or above the designated detection limit, a red colored line at the test region will be present indicating a positive result, while its absence indicates a negative result. The control line (C line) serves as an internal process control. The control line should always appear, regardless of the hCG concentration of the test specimen, and the C line is an indicator that sufficient sample volume has been added to the test device and the sample has correctly migrated up the test strip.

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

1. <u>Analytical performance:</u>

   *a. Precision/Reproducibility:*

   The reproducibility study was conducted in three (3) POL sites by three (3) operators from each site with three (3) lots of each proposed device formats over three (3) non-consecutive days. The samples contained spiked hCG at concentrations of 0, 10, 15, 20, 25, 30, and 35 mIU/mL in urine; 0, 15, 20, 25, 30 and 35 mIU/mL in serum (used for hCG Combo Test). The identity and

concentrations of samples used in all studies were masked to the operator.

The samples were calibrated against WHO 5th IS (07/364) and the values were confirmed with a commercial quantitative immunoassay. The reproducibility between the sites is summarized in Tables 1 through 7 below:

hCG Dipstick Test

| | | Sites | | | | | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | | 2 | | 3 | | | |
| | **Spec.** | **+** | **-** | **+** | **-** | **+** | **-** | **+** | **-** |
| hCG concentration (mIU/mL) | **0** | 0 | 9 | 0 | 9 | 0 | 9 | 0 | 27 |
| | **10** (-50%cutoff) | 0 | 9 | 0 | 9 | 0 | 9 | 0 | 27 |
| | **15** (-25%cutoff) | 1 | 8 | 1 | 8 | 1 | 8 | 3 | 24 |
| | **20** (Cut-off) | 9 | 0 | 9 | 0 | 9 | 0 | 27 | 0 |
| | **25** (+25%cutoff) | 9 | 0 | 9 | 0 | 9 | 0 | 27 | 0 |
| | **30** (+50%cutoff) | 9 | 0 | 9 | 0 | 9 | 0 | 27 | 0 |
| | **35** (+75%cutoff) | 9 | 0 | 9 | 0 | 9 | 0 | 27 | 0 |

hCG Cassette Test

| | | Sites | | | | | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | | 2 | | 3 | | | |
| | **Spec.** | **+** | **-** | **+** | **-** | **+** | **-** | **+** | **-** |
| hCG concentration (mIU/mL) | **0** | 0 | 9 | 0 | 9 | 0 | 9 | 0 | 27 |
| | **10** (-50%cutoff) | 0 | 9 | 0 | 9 | 0 | 9 | 0 | 27 |
| | **15** (-25%cutoff) | 0 | 9 | 1 | 8 | 1 | 8 | 2 | 25 |
| | **20** (Cut-off) | 9 | 0 | 9 | 0 | 9 | 0 | 27 | 0 |
| | **25** (+25%cutoff) | 9 | 0 | 9 | 0 | 9 | 0 | 27 | 0 |
| | **30** (+50%cutoff) | 9 | 0 | 9 | 0 | 9 | 0 | 27 | 0 |
| | **35** (+75%cutoff) | 9 | 0 | 9 | 0 | 9 | 0 | 27 | 0 |

hCG Combo Urine Test

| | | Sites | | | | | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | | 2 | | 3 | | | |
| | **Spec.** | **+** | **-** | **+** | **-** | **+** | **-** | **+** | **-** |
| hCG concentration (mIU/mL) | **0** | 0 | 9 | 0 | 9 | 0 | 9 | 0 | 27 |
| | **15** (-40% cutoff) | 0 | 9 | 0 | 9 | 0 | 9 | 0 | 27 |
| | **20** (-20% cutoff) | 1 | 8 | 2 | 7 | 2 | 7 | 5 | 22 |
| | **25** (Cut-off) | 9 | 0 | 9 | 0 | 9 | 0 | 27 | 0 |
| | **30** (+20% cutoff) | 9 | 0 | 9 | 0 | 9 | 0 | 27 | 0 |
| | **35** (+40% cutoff) | 9 | 0 | 9 | 0 | 9 | 0 | 27 | 0 |

hCG Combo Serum Test

| | | Sites | | | | | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | | 2 | | 3 | | | |
| | **Spec.** | **+** | **-** | **+** | **-** | **+** | **-** | **+** | **-** |
| hCG concentration (mIU/mL) | **0** | 0 | 9 | 0 | 9 | 0 | 9 | 0 | 27 |
| | **15** (-40% cutoff) | 0 | 9 | 0 | 9 | 0 | 9 | 0 | 27 |
| | **20** (-20% cutoff) | 2 | 7 | 1 | 8 | 2 | 7 | 5 | 22 |
| | **25** (Cut-off) | 9 | 0 | 9 | 0 | 9 | 0 | 27 | 0 |
| | **30** (+20% cutoff) | 9 | 0 | 9 | 0 | 9 | 0 | 27 | 0 |
| | **35** (+40% cutoff) | 9 | 0 | 9 | 0 | 9 | 0 | 27 | 0 |

*b. Linearity/assay reportable range:*

Not applicable. This is a qualitative device.

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

Real-time and accelerated stability testing showed that the Chemtrue® hCG urine Dipstick/Cassette and hCG Combo Cassette Test devices are stable for 24 months when stored at $4^{o}C - 30^{o}C$. Protocols and acceptance criteria were reviewed and found acceptable

*d. Detection limit:*

To verify the claimed cut-off /sensitivity of the Chemtrue® hCG Tests, a study was conducted with three (3) lots per each hCG tests and device formats.

Chemtrue® hCG Urine Tests: Three (3) lots each of the Chemtrue® hCG Test formats were used for the study. The controls were prepared using 20 human urine or serum pools from non-pregnant donors with spiked hCG, which was traceable to WHO $5^{th}$ IS (07/364) at concentrations ranging from 0 to 100 mIU/mL. A separate set of the samples was used for each device format. Five (5) replicates were tested at each hCG level by three (3) operators. The results are summarized:

Chemtrue® hCG Pregnancy Urine Dipstick Test:

| hCG Conc. (mIU/mL) | # of Samples Tested | Lot 1 | | Lot 2 | | Lot 3 | | **# of Positives** |
|---|---|---|---|---|---|---|---|---|
| | | + | - | + | - | + | - | |
| 0 | 15 | 0 | 5 | 0 | 5 | 0 | 5 | **0/15** |
| 10 (-50% Cutoff) | 15 | 0 | 5 | 0 | 5 | 0 | 5 | **0/15** |
| 15 (-25% Cutoff) | 15 | 1 | 4 | 1 | 4 | 1 | 4 | **3/15** |
| 20 (Cutoff) | 15 | 5 | 0 | 5 | 0 | 5 | 0 | **15/15** |
| 40 (+200% | 15 | 5 | 0 | 5 | 0 | 5 | 0 | **15/15** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Cutoff) | | | | | | | | |
| 80 (+400% Cutoff) | 15 | 5 | 0 | 5 | 0 | 5 | 0 | **15/15** |

Chemtrue® hCG Pregnancy Urine Cassette Test:

| hCG Conc. (mIU/mL) | # of Samples Tested | Lot 1 | | Lot 2 | | Lot 3 | | **# of Positives** |
|---|---|---|---|---|---|---|---|---|
| | | + | - | + | - | + | - | |
| 0 | 15 | 0 | 5 | 0 | 5 | 0 | 5 | **0/15** |
| 10 (-50% Cutoff) | 15 | 0 | 5 | 0 | 5 | 0 | 5 | **0/15** |
| 15 (-25% Cutoff) | 15 | 1 | 4 | 1 | 4 | 1 | 4 | **3/15** |
| 20 (Cutoff) | 15 | 5 | 0 | 5 | 0 | 5 | 0 | **15/15** |
| 40 (+200% Cutoff) | 15 | 5 | 0 | 5 | 0 | 5 | 0 | **15/15** |
| 80 (+400% Cutoff) | 15 | 5 | 0 | 5 | 0 | 5 | 0 | **15/15** |

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Chemtrue® hCG Combo (Urine) Test:

| hCG Conc. (mIU/mL) | # of Samples Tested | Lot 1 | | Lot 2 | | Lot 3 | | **# of Positives** |
|---|---|---|---|---|---|---|---|---|
| | | + | - | + | - | + | - | |
| 0 | 15 | 0 | 5 | 0 | 5 | 0 | 5 | **0/15** |
| 10 (-60% Cutoff) | 15 | 0 | 5 | 0 | 5 | 0 | 5 | **0/15** |
| 20 (-20% Cutoff) | 15 | 1 | 4 | 1 | 4 | 1 | 4 | **3/15** |
| 25 (Cutoff) | 15 | 5 | 0 | 5 | 0 | 5 | 0 | **15/15** |
| 50 (+200% Cutoff) | 15 | 5 | 0 | 5 | 0 | 5 | 0 | **15/15** |
| 100 (+400% Cutoff) | 15 | 5 | 0 | 5 | 0 | 5 | 0 | **15/15** |

Chemtrue® hCG Combo (Serum) Test:

| hCG Conc. (mIU/mL) | # of Samples Tested | Lot 1 | | Lot 2 | | Lot 3 | | **# of Positives** |
|---|---|---|---|---|---|---|---|---|
| | | + | - | + | - | + | - | |
| 0 | 15 | 0 | 5 | 0 | 5 | 0 | 5 | **0/15** |
| 10 (-60% Cutoff) | 15 | 0 | 5 | 0 | 5 | 0 | 5 | **0/15** |
| 20 (-20% Cutoff) | 15 | 1 | 4 | 1 | 4 | 1 | 4 | **3/15** |
| 25 (Cutoff) | 15 | 5 | 0 | 5 | 0 | 5 | 0 | **15/15** |
| 50 (+200% Cutoff) | 15 | 5 | 0 | 5 | 0 | 5 | 0 | **15/15** |
| 100 (+400% Cutoff) | 15 | 5 | 0 | 5 | 0 | 5 | 0 | **15/15** |

*e. Analytical specificity:*

The cross-reactivity study was conducted with three (3) lots of each test format/configuration with spiked concentration of the structurally related or potential interfering substances in hCG negative and hCG positive (20 mIU/mL for hCG Urine Tests and 25 mIU/mL for Combo Test) urine and serum samples. The following compounds did not interfere with the urine and serum Chemtrue® hCG Tests at the following tested hCG concentrations:

| **Substance** | **Concentration** |
|---|---|
| Acetylsalicylate Acid | 20 mg/dL |
| Albumin (Human) | 2000 mg/dL |
| Ascorbic Acid | 20 mg/dL |
| Atropine | 20 mg/dL |
| Bilirubin | 2 mg/dL |
| Caffeine | 20 mg/dL |
| Cannabinol | 10 mg/dL |
| Ephedrine | 20 mg/dL |
| Gentisic Acid | 20 mg/dL |
| Glucose | 2000 mg/dL |
| Hemoglobin | 250 mg/dL |
| Ibuprofen | 40 mg/dL |
| Methadone | 10 mg/dL |
| Morphine | 6 µg/dL |
| Phenylpropanolamine | 20 mg/dL |
| Salicylic acid | 20 mg/dL |
| Uric Acid | 20 mg/dL |

Testing also demonstrated that the Chemtrue® hCG urine and serum tests do not cross react with hLH up to 300 mIU/mL, hFSH up to 1000 mIU/mL and hTSH up to 1000 µIU/mL.

An interference study with hCGßcf was also performed with three (3) lots of each format at the concentrations 125,000, 250,000, 500,000 and 1,000,000 pmol/mL of hCGßcf that were added into 5 and 50 mIU/mL hCG urine and serum controls,The results demonstrate that hCGßcf up to 5.0 IU/mL does not interfere with the urine or serum Chemtrue® hCG Tests.

The effect of specific gravity (SG) and pH were evaluated by testing urine sample duplicates at each sample level of hCG negative and 20 mIU/mL (25 mIU/mL for Combo Test). Samples with pH 2.0 to 9.0, and SG of 1.003 to 1.030 were evaluated. No interference was observed for pH value 2.0 to 9.0 and SG values from 1.003 to 1.030.

High Dose Hook effect.

The studies for hCG Urine (Dipstick/Cassette) and Combo Tests were performed on three (3) lots of each test format with spiked non-pregnant urine and serum pools at hCG concentrations of 50, 100, 200, 300 and 500 IU/mL. Five replicates of each lot were tested at each hCG concentration. No hook effect was observed. The results were the same across lots. The overall results are summarized in Tables below:

High Dose Effect Study Results Summary with hCG Urine Tests

| hCG Concentrations (IU/mL) | hCG Urine Tests | | | |
|---|---|---|---|---|
| | Dipstick | | Cassette | |
| | **+** | **-** | **+** | **-** |
| 50 | 15 | 0 | 15 | 0 |
| 100 | 15 | 0 | 15 | 0 |
| 200 | 15 | 0 | 15 | 0 |
| 300 | 15 | 0 | 15 | 0 |
| 500 | 15 | 0 | 15 | 0 |
| **TOTAL** | **75** | **0** | **75** | **0** |

High Dose Effect Study Results Summary with hCG Combo (Urine/Serum) Test

| hCG Concentrations (IU/mL) | hCG Combo Tests | | | |
|---|---|---|---|---|
| | Urine Test | | Serum Test | |
| | **+** | **-** | **+** | **-** |
| 50 | 15 | 0 | 15 | 0 |
| 100 | 15 | 0 | 15 | 0 |
| 200 | 15 | 0 | 15 | 0 |
| 300 | 15 | 0 | 15 | 0 |
| 500 | 15 | 0 | 15 | 0 |
| **TOTAL** | **75** | **0** | **75** | **0** |

*f. Assay cut-off:*

Not applicable

2. Comparison studies:

*a. Method comparison with predicate device:*

Chemtrue® hCG Pregnancy Tests were compared with the predicate kits stated in the tables below. A total of 300 clinical urine and 300 clinical serum samples were blind coded and tested with the appropriate device format by nine (9) operators from three (3) POL sites (three operators in each site). One hundred-fifty (150) hCG negative urine samples (collected from women of childbearing age, including peri-menopausal) and 150 hCG positive samples that represented women who were suspected to be pregnant within the first 30 days of pregnancy/the first trimester of pregnancy were evaluated. The hCG serum samples (150 positive and 150 negative) were quantitatively confirmed by Abbott i2000 instrument. Results were similar between sites. The overall results are summarized in tables below:

Chemtrue® hCG Pregnancy Urine Dipstick Test:

| | | **Predicate Device** OSOM Card II hCG Urine Test (k990578) | |
|---|---|---|---|
| | | **Positive** | **Negative** |
| **Chemtrue® hCG Dipstick Test** N=300 | **Positive** | 150 | 0 |
| | **Negative** | 0 | 150 |
| | **Total** | 150 | 150 |

Chemtrue® hCG Pregnancy Urine Cassette Test:

| | | **Predicate Device** OSOM® Card hCG Urine Test (k990578) | |
|---|---|---|---|
| | | **Positive** | **Negative** |
| **Chemtrue® hCG Cassette Test** N=300 | **Positive** | 149 | 0 |
| | **Negative** | 1 | 150 |
| | **Total** | 150 | 150 |

One discrepant result was from a single sample with a hCG concentration near the cut-off of the device (20 mIU/mL).

Chemtrue® hCG Combo Pregnancy Serum Test:

| | | **Predicate Device** One-Step Urine/Serum Combo Pregnancy Card Test (k964461) | |
|---|---|---|---|
| | | **Positive** | **Negative** |
| **Chemtrue® hCG Combo Serum Test** N=300 | **Positive** | 150 | 0 |
| | **Negative** | 0 | 150 |
| | **Total** | 150 | 150 |

Chemtrue® hCG Combo Pregnancy Urine Test:

| | | **Predicate Device** One-Step Urine/Serum Combo Pregnancy Card Test (k964461) | |
|---|---|---|---|
| | | **Positive** | **Negative** |
| **Chemtrue® hCG Combo Urine Test** N=300 | **Positive** | 150 | 0 |
| | **Negative** | 0 | 150 |
| | **Total** | 150 | 150 |

*b. Matrix comparison:*

Not applicable

3. Clinical studies:

Not applicable

*a. Clinical Sensitivity:*

Not applicable

*b. Clinical specificity:*

Not applicable

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

Not applicable

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.