Shenzhen YHLO Biotech Co., LTD.
Chungen QIAN
Deputy General Manager
Building 1, YHLO Biopark, Baolong 2nd Road
Baolong Subdistrict, Longgang District
Shenzhen, Guangdong 518116
China

Re: K223690
Trade/Device Name: iFlash-HCG; Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C)
Regulation Number: 21 CFR 862.1155
Regulation Name: Human Chorionic Gonadotropin (HCG) Test System
Regulatory Class: Class II
Product Code: DHA, JJE
Dated: October 31, 2023
Received: October 31, 2023

Dear Chungen QIAN:

We have reviewed your section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (the Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. Although this letter refers to your product as a device, please be aware that some cleared products may instead be combination products. The 510(k) Premarket Notification Database available at https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn.cfm identifies combination product submissions. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration. Please note: CDRH does not evaluate information related to contract liability warranties. We remind you, however, that device labeling must be truthful and not misleading.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to additional controls. Existing major regulations affecting your device can be found in the Code of Federal Regulations, Title 21, Parts 800 to 898. In addition, FDA may publish further announcements concerning your device in the Federal Register.

Additional information about changes that may require a new premarket notification are provided in the FDA guidance documents entitled "Deciding When to Submit a 510(k) for a Change to an Existing Device" (https://www.fda.gov/media/99812/download) and "Deciding When to Submit a 510(k) for a Software Change to an Existing Device" (https://www.fda.gov/media/99785/download).

Your device is also subject to, among other requirements, the Quality System (QS) regulation (21 CFR Part 820), which includes, but is not limited to, 21 CFR 820.30, Design controls; 21 CFR 820.90, Nonconforming product; and 21 CFR 820.100, Corrective and preventive action. Please note that regardless of whether a change requires premarket review, the QS regulation requires device manufacturers to review and approve changes to device design and production (21 CFR 820.30 and 21 CFR 820.70) and document changes and approvals in the device master record (21 CFR 820.181).

Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal statutes and regulations administered by other Federal agencies. You must comply with all the Act's requirements, including, but not limited to: registration and listing (21 CFR Part 807); labeling (21 CFR Part 801 and Part 809); medical device reporting (reporting of medical device-related adverse events) (21 CFR Part 803) for devices or postmarketing safety reporting (21 CFR Part 4, Subpart B) for combination products (see https://www.fda.gov/combination-products/guidance-regulatory-information/postmarketing-safety-reporting-combination-products); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820) for devices or current good manufacturing practices (21 CFR Part 4, Subpart A) for combination products; and, if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR Parts 1000-1050.

Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to https://www.fda.gov/medical-devices/medical-device-safety/medical-device-reporting-mdr-how-report-medical-device-problems.

For comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance) and CDRH Learn (https://www.fda.gov/training-and-continuing-education/cdrh-learn). Additionally, you may contact the Division of Industry and Consumer Education (DICE) to ask a question about a specific regulatory topic. See the DICE website (https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance/contact-us-division-industry-and-consumer-education-dice) for more information or contact DICE by email (DICE@fda.hhs.gov) or phone (1-800-638-2041 or 301-796-7100).

Sincerely,

Joseph A. Kotarek -S

Digitally signed by Joseph A. Kotarek -S
Date: 2023.12.11 16:05:00 -05'00'

Joey Kotarek, Ph.D.
Toxicology Branch Chief
Division of Chemistry
and Toxicology Devices
OHT7: Office of In Vitro Diagnostics
Office of Product Evaluation and Quality
Center for Devices and Radiological Health

Enclosure

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Food and Drug Administration

Indications for Use

Form Approved: OMB No. 0910-0120
Expiration Date: 06/30/2023
See PRA Statement below.

510(k) Number *(if known)*
k223690

Device Name
iFlash-HCG
Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C)

Indications for Use *(Describe)*
iFlash-HCG is a paramagnetic particle chemiluminescent immunoassay (CLIA) for quantitative detection of the intact human chorionic gonadotropin (hCG) molecule and the hCG β-subunit (β-hCG) in human serum and plasma using the automated Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C). The iFlash-HCG assay is to be used by laboratory professionals as an aid in early detection of pregnancy together with other clinical methods.

Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C) is a fully-automated, chemiluminescence immunoassay analyzer intended for quantitative or qualitative determination of analytes in human body fluids taken from clinical settings. It is used together with its supporting chemiluminescence immunoassay reagents. The Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C) is intended for use in clinical laboratories.

Type of Use *(Select one or both, as applicable)*

☒ Prescription Use (Part 21 CFR 801 Subpart D) ☐ Over-The-Counter Use (21 CFR 801 Subpart C)

CONTINUE ON A SEPARATE PAGE IF NEEDED.

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深圳市亚辉龙生物科技股份有限公司
SHENZHEN YHLO BIOTECH CO., LTD.

510(k) Summary

Submitter name	SHENZHEN YHLO BIOTECH CO., LTD
Address	Building 1, YHLO Biopark, Baolong 2nd Road, Baolong Subdistrict, Longgang District, Shenzhen, Guangdong, 518116, China
Contact person	**Name**: Chungen QIAN **Email**: ra@szyhlo.com **Address**: Building 1, YHLO Biopark, Baolong 2nd Road, Baolong Subdistrict, Longgang District, Shenzhen, Guangdong, 518116, China **Phone**: 86-755-26609335
Date prepared	Dec 9th, 2023
Device name	iFlash-HCG Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C)
Classification	**Product code**:DHA, JJE **CFR#**: 862.1155, 862.2160 **Device name**: System, Test, Human Chorionic Gonadotropin; Analyzer, Chemistry (Photometric, Discrete) for Clinical Use
Candidate Device	k223690
Predicate Devices	k003178, Elecsys HCG+β reagent; k162606, Cobas e 801 analyzer

1 Device Description

iFlash-HCG that includes testing reagents and three levels of calibrators is based on chemiluminescence immunoassay. HCG and hCG β-subunit (β-hCG) in the sample reacts with anti-HCG antibody coated paramagnetic microparticles and acridinium-labeled anti-HCG antibody conjugate to form a sandwich complex, after chemiluminescent reaction, HCG amount in the sample is derived from RLUs (relative light units) using a calibration curve. iFlash-HCG is intended to be used on Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C).

2 Intended Use

iFlash-HCG is a paramagnetic particle chemiluminescent immunoassay (CLIA) for quantitative detection of the intact human chorionic gonadotropin (hCG) molecule and the hCG β-subunit (β-hCG) in human serum and plasma using the automated Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C). The iFlash-HCG assay is to be used by laboratory professionals as an aid in early detection of pregnancy together with other clinical methods.

Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C) is a fully-automated, chemiluminescence immunoassay analyzer intended for quantitative or qualitative determination of analytes in human body fluids taken from clinical settings. It is used together with its supporting chemiluminescence immunoassay reagents. The Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C) is intended for use in clinical laboratories.

Technological Characteristics Comparison

Table 1:Technical Characteristics Comparison Table for the assay

Feature	**Candidate Assay** **iFlash-HCG** **k223690**	**Predicate Assay** **Elecsys HCG+ β reagent** **k003178**
Intended use	For quantitative detection of the intact human chorionic gonadotropin (hCG) molecule and the hCG β-subunit (β-hCG) in human serum and plasma; used by laboratory professionals as an aid in early detection of pregnancy	Same
Principle	Sandwich principle.	Same
Sample Matrix	Human serum, plasma	Same
Traceability	WHO International Standard 5th WHO IS Chorionic Gonadotrophin 07/364	4th International Standard (NIBSC) code 75/589
Calibrator	three-level Calibrator	2 levels
Assay range/measuring range	0.5-10000 mIU/mL	0.2 – 10000 mIU/mL
Method Comparison	Spearman correlation Coefficient (T) = 0.998, Slope = 0.986, y-intercept = -0.047 mIU/mL.	Correlation Coefficient (R) = 1.00, Slope = 0.9455, y-intercept = 0.482.

Table 2: Technical Characteristics Comparison Table for the analyzer

Feature	**Candidate Device** **Chemiluminescence Immunoassay Analyzer** **(Model: iFlash 3000-C)** **k223690**	**Predicate Device** **Cobas e 801 analyzer** **k162606**
Intended use	For quantitative or qualitative determination of analytes in human body fluids.	Same
Detection Method	Chemiluminescence using magnetic particle solid phase	Electrochemiluminescence
Automated	Yes	Same
Calibration	Utilizes a stored calibration curve	Same

3 Summary of Non-Clinical Performance

The non-clinical performance studies that support substantial equivalence are summarized below.

- Precision: Repeatability, Reproducibility according to EP05-A3
- Detection capability: LoB, LoD, LoQ according to EP17-A2
- Linearity according to EP06 2nd Edition
- Hook Effect
- Interference Study according to EP07-A3 and EP37 1st Edition
- Analytical Specificity (EP07-A3)
- Specimen Types Study
- Method Comparison with Predicate Device (EP09c 3rd Edition)
- Stability study (EP25-A)
- Trueness Study
- Sample Dilution Fold Study (EP34 1st Edition)
- Reference Interval Study (EP28-A3c)
- Carryover Study

Abovementioned studies demonstrate the fulfillment of performance specifications.

3.1 Precision (Repeatability, Reproducibility)

The experiment is established according to CLSI EP05-A3 protocol, 3 different operators in 3 different laboratories use 3 lots of iFlash-HCG reagent and 3 Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C) to conduct the study. For each lot of reagent, the same set of 9 levels of female serum samples with different HCG levels and 2 levels of controls are tested on 3 different Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C). The samples and controls are tested with 2 runs per day (at least a two-hour separation between runs), 2 replicates per run for 20 days.

Repeatability and reproducibility precision (SD and CV%) were calculated according to EP05-A3.

3.2 Detection Limit (LoB, LoD, LoQ)

The LoB, LoD, and LoQ study are performed based on EP17-A2 using female serum samples.

LoB is the highest observed measurement value on analyte free samples for 3 lots of reagent kits on one Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C). For each reagent lot, 5 analyte free samples are tested 4 times per day for 3 consecutive days to record 60 results. Calculation is based on EP17-A2 and LoB is determined to be LoB＝0.10 mIU/mL.

LoD is the maximal value of the LoDs obtained for 3 reagent lots on one Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C). Each reagent lot tests 5 low-concentration samples (LoB-5LoB) four times a day for 3 consecutive days to obtain 60 test results and calculation are based on EP17-A2. LoD is determined to be LoD ＝ 0.20 mIU/mL.

LoQ is the greatest LoQ across 3 reagent lots on one Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C). Each reagent lot tests 5 samples with a concentration equal to or slightly greater than LoD, 4 times a day for 3 days in total, and record 60 test

results. Total error limit is set as ≤30% and calculation is carried out as per EP17-A2. LoQ is determined to be LoQ＝ 0.50 mIU/mL.

3.3 Linearity

Linearity study is carried out in accordance with EP06 2nd Edition using female serum samples. Those claimed linearity interval (0.50 mIU/mL-10000.00 mIU/mL), low linearity interval (0.50 mIU/mL-1000.00 mIU/mL) and lower linearity interval (0.50 mIU/mL-100.00 mIU/mL) are studied on 3 reagent lots and on one Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C). For each interval, 11 different concentration level of samples are obtained by mixing low level serum samples and high level serum samples and each concentration level is calculated for mean value, standard deviation (SD) and coefficient of variation (CV%) with predefined allowable deviation target from linearity as ±15%. Calculation is based on guideline EP06 2nd Edition and linearity is evaluated to be 0.50-10000.00 mIU/mL.

3.4 Hook Effect

3 high concentration samples (sample 1, 750,000 mIU/mL; sample 2, 1,000,000 mIU/mL and sample 3, 1,250,000 mIU/mL) were prepared by adding calibrator high-value positive material into low female serum samples (<0.10 mIU/mL) with subsequent serial dilutions to prepare multiple concentration gradient samples. High-concentration samples 1-3 and diluted samples are tested using 3 different lots of the reagent on one Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C) with 3 replicates. The obtained results indicate no HOOK effect was observed within HCG/β-HCG concentration of 1,250,000 mIU/mL.

3.5 Interference Study

Endogenous and exogenous interference study is carried out based on EP07-A3 and EP37 1st Edition using female serum samples. Interference screening testing considers the relative deviation d_{obs} within ±10.0% to have no interference and dose effect test follows if interference exists for a specific substance.

iFlash-HCG is not susceptible to endogenous interference when evaluated at the levels presented in the table below:

Interferent	Concentration
Conjugated bilirubin	≤40mg/dL
Unconjugated bilirubin	≤40mg/dL
hemoglobin	≤1000mg/dL
triglyceride	≤3000 mg/dL
serum total protein	≤10 g/dL
rheumatoid factors	2000 IU/mL
HAMA	600 ng/mL
ANA	500 AU/mL

iFlash-HCG is not susceptible to exogenous interference-drug when evaluated at the levels presented in the table below:

Drug	Concentration
Phenylbutazone	400 μg/mL
Aspirin	1000 μg/mL
Acetaminophen	200 μg/mL
Ibuprofen	500 μg/mL
N-acetylcysteine	150 μg/mL
Methyldopa	25 μg/mL
Theophylline	60 μg/mL
Metformin	12 μg/mL
Isosorbide dinitrate	6 μg/mL
Rifampicin	48 μg/mL
Tetracycline hydrochloride	24 μg/mL
Cefoxitin	6600 μg/mL
Cyclosporine	2 μg/mL
Metronidazole	125 μg/mL
Ascorbic acid	60 μg/mL
Ampicillin-Na	100 μg/mL
Levodopa	20 μg/mL

3.6 Analytical Specificity (Cross-reactivity)

Cross-reactivity is carried out for potential cross-reactants LH, TSH and FSH using female serum samples based on EP07-A3. The iFlash-HCG is not susceptible to interference from the cross-reactants when evaluated at the levels presented in the table below:

Cross-Reactant	Concentration
LH	500 mIU/mL
FSH	200 mIU/mL
TSH	10000 mIU/mL

3.7 Specimen Types Study (Sample Matrix Comparison)

Values obtained from 97 female serum samples are compared with plasma samples using lithium heparin, sodium heparin and K_2-EDTA from the same patient, on 3 reagent lots and one Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C). For each reagent lot, paired serum and plasma samples are tested once and Passing-Bablok Regression analysis determines that claimed plasma samples are in good agreement with serum samples.

3.8 Method Comparison with Predicate Device

Method comparison is carried out between candidate devices and predicate devices as per EP09c 3rd Edition. 110 serum samples that cover 0.531mIU/mL- 9717mIU/mL (determined by predicate devices) are used during the study and Passing -Bablok regression provides the following regression equation, showing good consistency with the predicate:

Y=0.986X-0.047

correlation coefficient T= 0.998

3.9 Stability study

The stability data supports claims as reported in the user manual.

3.10 Trueness study

The WHO International Standard 5th WHO IS Chorionic Gonadotrophin 07/364 is formulated into samples with concentration of 25.00 mIU/mL (low-concentration sample), 200.00 mIU/mL (middle-concentration sample) and 4000.00 mIU/mL (high-concentration sample) for testing, on 3 reagent lots and one Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C)., with testing duplicates 3. For every sample under a reagent lot, relative deviation between the test result and corresponding target value falls within ±10.0%.

3.11 Sample Dilution Fold Study

Studies are performed with both female serum and plasma samples to determine the sample recovery after a 1:50, 1:100 and 1:200 dilutions are performed. 3 theoretical concentration samples at 12000.00 mIU/mL, 400000.00 mIU/mL and 800000.00 mIU/m are prepared by adding HCG positive material to HCG mixed low-value serum, plasma samples. Diluted samples at three dilution ratios are tested for 3 replicates with mean value calculated and multiplied by the dilution fold, which is recorded as the final concentration and compared with the theoretical concentration for relative deviation (within ±10%). Dilution study results support the claim that, samples with HCG concentrations above the measuring range 10000 mIU/mL can be diluted with the maximum dilution ratio 1:100 (either automatically by the analyzer or manually) .

3.12 Reference Interval Study

The reference interval study is performed in accordance CLSI EP28-A3c and obtained results are as follows:

Grouping	Number	95th percentile (mIU/mL)
Non-pregnant premenopausal women (age:18-50 years old)	130	0.6
Postmenopausal women (age:≥ 50 years old)	125	5.4

3.13 Carryover study

Carryover study is performed in accordance with CLSI H26-A2. Test samples with high HCG (≥1,000,000 mIU/mL) in triplicate and followed by low HCG (≤5 mIU/mL) concentrations in triplicate (i.e. H1, H2, H3, L1, L2, L3 as a run) on one Chemiluminescence Immunoassay Analyzer (Model: iFlash 3000-C) for five runs with no carryover effect.

4 Summary of Clinical Study

Not applicable.

5 Substantial Equivalence

Taking into account technological characteristics, performance specifications that have been fulfilled, and method comparison with predicate device, it is concluded that the candidate device is as safe and effective as predicate device.