October 4, 2018

Shenzhen New Industries Biomedical Engineering Co., Ltd
% Joe Shia
Scientific Reviewer
LSI International Inc
504E Diamond Ave., Suite F
Gaithersburg, MD 20877

Re: K182423
Trade/Device Name: MAGLUMI 2000 FT4
Regulation Number: 21 CFR 862.1695
Regulation Name: Free thyroxine test system
Regulatory Class: Class II
Product Code: CEC
Dated: August 31, 2018
Received: September 6, 2018

Dear Joe Shia:

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 (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 located 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.

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 803) for devices or postmarketing safety reporting (21 CFR 4, Subpart B) for combination products (see https://www.fda.gov/CombinationProducts/GuidanceRegulatoryInformation/ucm597488.htm); 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 4, Subpart A) for combination products; and, if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR Part 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to http://www.fda.gov/MedicalDevices/Safety/ReportaProblem/default.htm.

For comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (https://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/) and CDRH Learn (http://www.fda.gov/Training/CDRHLearn). 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 (http://www.fda.gov/DICE) for more information or contact DICE by email (DICE@fda.hhs.gov) or phone (1-800-638-2041 or 301-796-7100).

Sincerely,

Kellie B. Kelm -S

for Courtney H. Lias, Ph.D.
Director
Division of Chemistry and Toxicology Devices
Office of In Vitro Diagnostics
and Radiological Health
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: 06/30/2020
See PRA Statement below.

510(k) Number *(if known)*
k182423

Device Name
MAGLUMI 2000 FT4

Indications for Use *(Describe)*
The MAGLUMI 2000 FT4 assay is for in vitro diagnostic use in the quantitative determination of free thyroxine (FT4) in human serum. The measurement of FT4 is used in the diagnosis of thyroid disorders.

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.

k182423

510(k) SUMMARY

This summary of 510(k) safety and effectiveness information is submitted in accordance with the requirements of 21 CFR 807.92

1. Date: October 2, 2018

2. Submitter: Shenzhen New Industries Biomedical Engineering Co., Ltd.
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3. Contact person: Joe Shia
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4. Device Name: MAGLUMI 2000 FT4

Classification: Class II (assay)

Product Code	CFR #	Product Abbreviation	Product Name
CEC	862.1695	FT4	Free Thyroxine Test System

5. Predicate Devices:
K080167, Siemens ADVIA Centaur FT4

6. Intended Use:
The MAGLUMI 2000 FT4 assay is for in vitro diagnostic use in the quantitative determination of free thyroxine (FT4) in human serum. The measurement of FT4 is used in the diagnosis of thyroid disorders.

7. Device Description:

MAGLUMI 2000 FT4 kit consists of the following reagents:
Magnetic Microbeads- coated with T4 antigen, BSA, NaN3(<0.1%)
Calibrator Low-Containing BSA and T4 antigen, NaN_3 (<0.1%)
Calibrator High- Containing BSA and T4 antigen, NaN_3 (<0.1%)
Buffer- Containing BSA and NaN_3 (<0.1%)
ABEI Label- Anti-T4 monoclonal antibody labeled with ABEI, containing BSA, NaN_3 (<0.1%)
Control 1- Containing BSA and T4 antigen, NaN_3 (<0.1%)

Control 2- Containing BSA and T4 antigen, NaN_3 (<0.1%)

8. Standard/Guidance Documents
   Clinical and Laboratory Standards Institute EP5-A2 – Evaluation of Precision Performance of Clinical Chemistry Devices-Approved Guideline-Second Edition.
   Clinical and Laboratory Standards Institute EP6-A – Evaluation of the Linearity of Quantitative Analytical
   Clinical and Laboratory Standards Institute EP17-A2: Evaluation of detection Capability for Clinical Laboratory Measurement Procedures
   Clinical and Laboratory Standards Institute EP7-A2 – Interference Testing in Clinical Chemistry Clinical and Laboratory Standards Institute EP9-A2 – Method Comparison and Bias Estimation Using Patient Samples

9. Substantial Equivalence Information

Assay Similarities and Differences

Item	Predicate Device	Subject Device
Intended Use/ Indication for Use	The ADVIA Centaur FT4 Immunoassay is for in vitro diagnostic use in the quantitative determination of free thyroxine (FT4) in serum or plasma (heparinized or EDTA) using the ADVIA Centaur and ADVIA Centaur XP systems. Measurement of free thyroxine are used in the diagnostic and treatment of thyroid diseases.	The MAGLUMI 2000 FT4 assay is for in vitro diagnostic use in the quantitative determination of free thyroxine (FT4) in human serum. The measurement of FT4 is used in the diagnosis of thyroid disorders.
Specimen	Serum , heparinized plasma, EDTA plasma	serum
Measured Analyte	Free thyroxine	same
Measurement	Quantitative	same
Test principle	Competitive immunoassay	same
Capture Antibody	Biotin-labeled polyclonal anti-T4 bound to avidin paramagnetic particles	T4 antigen coated Magnetic microbeads
Detection Antibody	Acridium ester labeled T4	ABEI labeled monoclonal anti-T4 antibody
Measuring range	0.1-12.0 ng/dL	0.19-10.0 ng/dL
Sample size	25µL	40 µL
Calibration	2 Point	same
Calibrator	Calibrator A	Low and high Calibrators, 2 levels, ready for use
Calibrators packaging	Provided separately	Provided with reagent kit
Automated	Yes	same

10. Test Principle

The FT4 assay is a competitive chemiluminescence immunoassay using FDA previously cleared MAGLUMI 2000 instrument (k162698).

The sample (or calibrator/control, if applicable), ABEI-labeled anti-T4 monoclonal antibody, buffer and T4 antigen-coated magnetic microbeads are mixed thoroughly and incubated at 37°C. Free T4 present in the sample (or calibrator/control, if applicable) competes with T4 antigen immobilized on the magnetic microbeads for a limited number of binding sites on the ABEI-labeled anti-T4 monoclonal antibody, forming immuno-complexes. After precipitation in a magnetic field, decant the supernatant, and then perform a wash cycle. Subsequently, the Starter 1+2 are added to initiate a chemiluminescent reaction. The light signal is measured by a photomultiplier within 3 seconds as relative light units (RLUs), which is inversely proportional to the concentration of free T4 present in the sample (or calibrator/control, if applicable).

11. Performance Characteristics

1. Analytical Performance

a. Precision

The precision was determined using the CLSI EP5-A2 protocol as a guide. The study was conducted on three different instruments with three controls, two calibrators, four spiked patient serum pools and four native patient sample pools. The data was collected over 20 days in duplicate with 2 runs per day with a total of 80 samples analyzed per level on each instrument. The results (in ng/dL) obtained are summarized in the following tables:

Sample	Mean	Within-Run		Between-Run		Between-Day		Total	
	(N=240)	SD	CV	SD	CV	SD	CV	SD	CV
Control 1	1.006	0.0879	8.74%	0.0242	2.41%	0.0226	2.25%	0.094	9.34%
Control 2	1.9952	0.1482	7.43%	0.0391	1.96%	0.0282	1.41%	0.1558	7.81%
Control 3	3.9978	0.1852	4.63%	0.0487	1.22%	0.0632	1.58%	0.2016	5.04%
Calibrator low	0.3333	0.0311	9.33%	0.0083	2.49%	0.0084	3%	0.0333	9.99%
Calibrator high	7.1929	0.2109	2.93%	0.0679	0.94%	0.0625	0.87%	0.2302	3.20%
Serum Pool 1	0.5842	0.0498	8.52%	0.0271	4.64%	0.013	2.23%	0.0582	9.96%
Serum Poo2	0.9016	0.0788	8.74%	0.0276	3.06%	0.0239	3%	0.0868	9.63%
Serum Pool 3	1.71	0.1388	8.12%	0.0383	2.24%	0.0415	2.43%	0.1499	8.77%
Serum Pool 4	5.7965	0.1895	3.27%	0.0785	1.35%	0.0742	1.28%	0.2181	3.76%
Native patient pool 1	0.8375	0.0754	9.00%	0.0246	2.94%	0.0232	2.77%	0.0826	9.86%
Native patient pool 2	1.2837	0.1066	8.30%	0.0241	1.88%	0.0265	2.06%	0.1124	8.76%
Native patient pool 3	1.8821	0.1499	7.96%	0.0555	2.95%	0.0249	1.32%	0.1618	8.60%
Native patient pool 4	4.6233	0.2133	4.61%	0.0539	1.17%	0.0553	1.20%	0.2269	4.91%

b. Linearity

The linearity of the MAGLUMI FT4 method was determined following the CLSI EP6-A procedure. Samples were prepared by spiking T4 USP Standard into T4-free human serum samples to create 11 levels with FT4 concentrations from 0.19 to 10.0 ng/dL. Each sample was measured in quadruple on 3 lots of reagent. Linearity was evaluated using regression analysis based on CLSI EP6-A.

The assays are linear between 0.19 and 10.0 ng/dL with the following relationship:

Observed = 0.9898 (Expected) + 0.01364, $R^2 = 0.9991$

c. Stability

Accelerated stability study at 37ºC showed that all controls are stable for 12 months at 2-8ºC. Accelerated stability study at 37ºC showed all that calibrators are stable for 12 months at 2-8ºC. Accelerated stability study at 37ºC showed that the reagent is stable for 12 months at 2-8ºC. The real time stability at 2-8ºC is on-going.

d. Detection Limit

Detection limit studies were performed following CLSI EP17-A guidelines.
The limit of blank (LOB) is the 95th percentile value from 80 measurements of T4 free human serum samples using 3 different lots of FT4 reagents over 5 days. The LOB corresponds to the concentration below which analyte-free samples are found with a probability of 95% and was determined to be 0.087 ng/dL (highest of the 3 lots).
The limit of detection (LOD) is determined based on the LOB and the standard deviation of low concentration samples. The LOD corresponds to the lowest analyte concentration which can be detected. Four level of low samples were measured in 80 replicates over 5 days per sample using 3 lots of reagents. LOD was determined to be 0.143 ng/dL (highest of the 3 lots).
The limit of quantitation (LOQ) was determined by measuring six low serum samples, in six replicates per run, one run per day, over 5 days, using 3 lots of reagents. LOQ is defined as the lowest analyte concentration that can be reproducibly measured with an intermediate precision CV of ≤ 20 % and was determined to be 0.190 ng/dL (highest of the 3 lots).

e. Interference

Clinical serum samples may contain substances that could potentially interfere with the test. The cross-reactivity is defined as the ratio of the amount of T4 required to displace 50% of the maximally bound labeled T4 from the anti-T4 antibody, and the amount of the cross-reactant to give the same 50% displacement. Solutions of FT4 and potential cross reactants were prepared by spiking corresponding compounds in

various concentrations. Concentrations of the 50% displacement were measured for these solutions using 3 lots of reagents. The following table shows cross reactivity of potential cross reactant.

Cross Reactant	%Cross-reactivity
Monoiodotyrosine	<0.02%
L-Triiodothyronine	<0.02%
Diiodotyrosine	<0.02%
3,5-Diiodo-L-thyronine	<0.02%
Reverse Triiodothyronine	<0.02%

The effect of common drugs and interference substances were evaluated using human serum pools. For each substance, three serum samples containing a low, medium and high concentration of FT4 were analyzed. For all substances tested, no significant interference was defined as recovery ± 10% of initial value. The substances and the highest concentration tested which did not cause significant interference are listed below.

Compounds	Concentration
Conjugated bilirubin	20 mg/dL
Unconjugated bilirubin	20 mg/dL
Hemoglobin	1000 mg/dL
Triglycerides	1000 mg/dL
Cefoxitin	6.8 mg/dL
Levodopa	2 mg/dL
Metronidazole	12 mg/dL
Rifampicin	6 mg/dL
Methimazole	40 mg/dL
Propythiouracile	4 mg/dL
Ascorbic Acid	6 mg/dL
Acetaminophen	25 mg/dL
Phenylbutazone	4 mg/dL

The effect of human anti-mouse antibodies (HAMA), rheumatoid factor (RF) and human serum total protein was evaluated using human serum samples. Each potential interferent was added to FT4 human serum samples and tested triplicate using 3 lots of reagents. For all substances tested, no significant interference was defined as recovery ± 10% of initial value. The potential interferents and the highest concentration tested which did not cause significant interference are listed below.

Interferent	Concentration
HAMA	800 ng/mL
RF	1240 IU/mL
Total protein	12.5 g/dL

2. Comparison Studies

   A method comparison study was performed with 224 human serum samples with concentrations ranging from 0.19 to 10.0 ng/dL. The comparison of the MAGLUMI FT4 assay (y) with the predicate device, ADVIA CENTAUR FT4 assay (x), produced the following linear regression equation:

   $$Y = 1.0451X - 0.05375, R^2 = 0.9919$$

3. Expected values/Reference range:

   A total of 157 serum samples from normal, apparently healthy adult (22 years and older) individuals were tested according to the procedure in CLSI C28-A3. The expected normal range is 0.82 – 1.72 ng/dL based on the central 95% of the frequency distribution.

12. Conclusion

Based on the test principle and acceptable performance characteristics including precision, interference, specificity and method comparison of the device, it is concluded that the MAGLUMI 2000 FT4 is substantially equivalent to the predicate.