March 17, 2023

Healgen Scientific LLC
℅ Joe Shia
Director
LSI International Inc.
504 East Diamond Ave. Suite I
Gaithersburg, MD 20877

Re: K223162
Trade/Device Name: Healgen® Accurate Oral Fluid Drug Test, Healgen® Accurate Oral Fluid Drug Test COT
Regulation Number: 21 CFR 862.3870
Regulation Name: Cannabinoid Test System
Regulatory Class: Class II
Product Code: LDJ, MKU
Dated: February 12, 2023
Received: February 13, 2023

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/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 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 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,

Paula Caposino -S

Digitally signed by Paula Caposino -S
Date: 2023.03.17 13:12:26 -04'00'

Paula Caposino, Ph.D.
Acting Deputy Director
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)*

k223162

Device Name
Healgen® Accurate Oral Fluid Drug Test COT

Indications for Use *(Describe)*
The Healgen® Accurate Oral Fluid Drug Test COT is a lateral flow chromatographic immunoassay for the qualitative detection of COT in oral fluid at the cut-off concentration 30 ng/mL.
This assay provides only a preliminary result. An alternative laboratory test must be used to confirm the results provided by this drug test. Gas chromatography/mass spectrometry (GC/MS) is the preferred method confirmation test.

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.

This section applies only to requirements of the Paperwork Reduction Act of 1995.

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Department of Health and Human Services
Food and Drug Administration
Office of Chief Information Officer
Paperwork Reduction Act (PRA) Staff
PRAStaff@fda.hhs.gov

"An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB number."

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)*

k223162

Device Name
Healgen® Accurate Oral Fluid Drug Test

Indications for Use *(Describe)*
The Healgen® Accurate Oral Fluid Drug Test is a competitive binding lateral flow immunochromatographic assay for the qualitative and simultaneous detection of Marijuana (THC) and Cotinine in human oral fluid at the cutoff concentrations listed below and their metabolites.

Test	Calibrator	Cut-off (ng/mL)
Cotinine (COT)	(-) Cotinine	30
Marijuana (THC)	Delta-9-Tetrahydrocannabinol	40

This assay provides only a preliminary analytical test result. A more specific alternate chemical method must be used in order to obtain a confirmed analytical result. Gas chromatography mass spectrometry (GC/MS) and liquid chromatography mass spectrometry (LC/MS) are the preferred confirmatory methods.

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)

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510(k) SUMMARY
K223162

1. Date: March 16, 2023

2. Submitter:
HEALGEN SCIENTIFIC LLC
5213 Maple Street
Bellaire, TX 77401

3. Contact person:
Joe Shia
LSI International Inc.
504 East Diamond Ave., Suite I
Gaithersburg, MD 20877
Telephone: 240-505-7880
Fax: 301-916-6213
Email:shiajl@yahoo.com

4. Device Names: Healgen® Accurate Oral Fluid Drug Test
Healgen® Accurate Oral Fluid Drug Test COT

Classification:

Product Code	CFR #	Panel
LDJ	21 CFR, 862.3870 Cannabinoids Test System	Toxicology
MKU	21 CFR, 862.3220 Cotinine Test System	Toxicology

5. Predicate Devices:

LZI Oral Fluid Cannabinoids Enzyme Immunoassay, LZI Oral Fluid Cannabinoids Calibrators and LZI Oral Fluid Cannabinoids Controls, K141320
LabOne Micro-Plate Cotinine EIA (Oral Fluid), K033601

6. Intended Use
The Healgen® Accurate Oral Fluid Drug Test COT is a lateral flow chromatographic immunoassay for the qualitative detection of COT in oral fluid at the cut-off concentration 30 ng/mL.

This assay provides only a preliminary result. An alternative laboratory test must be used to confirm the results provided by this drug test. Gas chromatography/mass spectrometry (GC/MS) is the preferred method confirmation test.

The Healgen® Accurate Oral Fluid Drug Test is a competitive binding lateral flow immunochromatographic assay for the qualitative and simultaneous detection of Marijuana (THC) and Cotinine in human oral fluid at the cutoff concentrations listed below and their metabolites.

Test	Calibrator	Cut-off (ng/mL)
Cotinine (COT)	(-) Cotinine	30
Marijuana (THC)	Delta-9-Tetrahydrocannabinol	40

This assay provides only a preliminary analytical test result. A more specific alternate chemical method must be used in order to obtain a confirmed analytical result. Gas chromatography mass spectrometry (GC/MS) and liquid chromatography mass spectrometry (LC/MS) are the preferred confirmatory methods.

7. Device Description

The Healgen® Accurate Oral Fluid Drug Test COT is immunochromatographic assay that uses a lateral flow system for the qualitative detection of cotinine in human oral fluid. The Healgen® Accurate Oral Fluid Drug Test immunochromatographic assay for the qualitative and simultaneous detection of Marijuana (THC) and Cotinine in human oral fluid. The tests are the first step in a two-step process. The second step is to send the sample for laboratory testing if preliminary positive results are obtained.

8. Substantial Equivalence Information

A summary comparison of features of the Healgen® Accurate Oral Fluid Drug Test COT and Healgen® Accurate Oral Fluid Drug Test and the predicate devices are provided in following tables.

Table 1: Features Comparison of Healgen® Accurate Oral Fluid Drug Test COT and the Predicate Device

Item	Device	Predicate – K033601
Indication(s) for Use	For the qualitative determination of cotinine in human oral fluid.	For the qualitative and semi-quantitative analysis of cotinine in human oral fluid
Calibrators	Cotinine	Same
Methodology	Competitive binding, lateral flow immunochromatographic assays	A solid phase competitive enzyme-linked immunoassay
Type of Test	Qualitative	qualitative and semi-quantitative
Specimen Type	Human Oral fluid	Same
Intended Use	For Over-The-Counter uses	For prescription uses

Table 2: Features Comparison of Healgen® Accurate Oral Fluid Drug Test and the Predicate Device

Item	Device	Predicate – K141320
Indication(s) for Use	Same	Preliminary Drug screening test for the qualitative detection of drug analytes in oral fluid (human saliva) For In Vitro Diagnostic Use
Methodology	Same	Competitive binding, lateral flow immunochromatographic assays
Type of Test	Same	Qualitative
Specimen Type	Same	Human Oral Fluid

9. Test Principle

The Healgen® oral fluid drug test device is an immunoassay based on the principle of competitive binding. Drugs that may be present in the oral fluid specimen compete against their respective drug conjugates for binding sites on their specific antibody.

During testing, a portion of the oral fluid specimen migrates upward by capillary action. A drug, if present in the oral fluid specimen below its cut-off concentration, will not saturate the binding sites of its specific antibody. The antibody will then react with the drug-protein conjugate and a visible colored line will show up in the test line region of the specific drug strip. The presence of drug above the cut-off concentration in the oral fluid specimen will saturate all the binding sites of the antibody. Therefore, the colored line will not form in the test line region.

A drug-positive oral fluid specimen will not generate a colored line in the specific test line region of the strip because of drug competition, while a drug-negative oral fluid specimen will generate a line in the test line region because of the absence of drug competition.

To serve as a procedural control, a colored line will always appear at the control line region, indicating that proper volume of specimen has been added and membrane wicking has occurred.

10. Performance Characteristics

1. Analytical Performance

a. Precision-Reproducibility-Cut-Off

Precision-Reproducibility-Cut-Off studies were carried out for samples with concentrations of -100% cut off, -75% cut off, -50% cut off, -25% cut off, cut off, +25% cut off, +50% cut off, +75% cut off and +100% cut off. These samples were prepared by spiking cotinine or marijuana in negative oral fluid samples. Each cotinine or marijuana concentration was confirmed by LC/MS/MS. All sample aliquots were blindly labeled by the person who prepared the samples and didn't take part in the sample testing. For each concentration, tests were performed two runs per day for 25 days per device lot in a randomized order. The following are summaries.

COT

Results / Device Lot	-100% cut off	-75% cut off	-50% cut off	-25% cutoff	cut off	+25% cut off	+50% cut off	+75% cut off	+100% cut off
LC-MS (ng/mL)	*0*	*7.4*	*15.4*	*22.6*	*30.7*	*37.9*	*45.9*	*52.9*	*60.6*
Lot 1	50-/0+	50-/0+	50-/0+	50-/0+	24-/26+	48+/2-	50+/0-	50+/0-	50+/0-
Lot 2	50-/0+	50-/0+	50-/0+	48-/2+	23-/27+	50+/0-	50+/0-	50+/0-	50+/0-
Lot 3	50-/0+	50-/0+	50-/0+	49-/1+	24-/26+	49+/1-	50+/0-	50+/0-	50+/0-

THC

Result / Device Lot	-100% cut off	-75% cut off	-50% cut off	-25% cutoff	cut off	+25% cut off	+50% cut off	+75% cut off	+100% cut off
LC-MS (ng/mL)	0.00	9.5	20.7	30.2	40.8	51.4	59.2	68.3	81.5
Lot 1:	50-/0+	50-/0+	50-/0+	47-/3+	24-/26+	49+/1-	50+/0-	50+/0-	50+/0-
Lot 2:	50-/0+	50-/0+	50-/0+	48-/2+	28-/22+	48+/2-	50+/0-	50+/0-	50+/0-
Lot 3:	50-/0+	50-/0+	50-/0+	49-/1+	24-/26+	47+/3-	50+/0-	50+/0-	50+/0-

The following cut-off values for the candidate device has been verified.

Calibrator	**Cut-off (ng/mL)**
cotinine	30
marijuana	40

b. Linearity

Not applicable.

c. Stability

The devices are stable at 4-30 °C for 24 months based on the real time stability study at 4°C and 30°C.

d. Interference

Potential interfering substances were added to drug-free oral fluid and target drugs oral fluid with concentrations at 50% below and 50% above Cut-Off levels. These oral fluid samples were tested using three batches of the Healgen device. Compounds that showed no interference for cotinine and THC at a concentration of 100μg/mL are summarized in the following tables.

Acetaminophen	Diacetylmorphine	Naltrexone
(IR,2S)-(-)Ephedrine Hydrochloride	Diazepam	Naproxen
Acetylcodeine	Digoxin	Niacinamide
Acetylsalicylic Acid	Dihydrocodeine	Nicotinamide
Allobarbital	Diltiazem HCl	Niordiazepan
Alprazolam	Diphenhydramine HCl	Noscapine
Amobarbital	DL-Methadone	Omeprazole
Ampicillin	DL-Propranolol	Papaverine
Apomorphine	Doxylamine	Penicillin
ascorbic acid	Ecgonine Hydrochloride	Pentazocine
Atenolol	Ecgonine methylester	Pentobarbital
Atropine	Estradiol	Phencyclidine (PCP)
Baclofen	Estrone	Phenobarbital
Benzocaine	Fenoprofen	Phentermine
Benzoylecgonine	Fluconazole	Phenylephrine
beta-Phenethylamine	Furosemide	Phenylpropanolamine
bilirubin	Gemfibrozil	Phenytoin
Butabarbital	Gentisic Acid	Pioglitazone HCl
Butalbital	Heroin hydrochloride	Prednisolone
Caffeine	Hexobarbital	Prednisone
Carbamazepine	Hydrochlorothiazide	Procainamide HCl
Chlordiazepoxide	Hydrocodone	Procaine HCL
Chlorpromazine	Hydromorphone	Promethazine
Cimetidine	Ibuprofen	Pseudoephedrine
Citalopram HBr	Imipramine	Quinidine
Clobazam	L-Ephedrine	Quinine HCl
Clomipramine	L-Methamphetamine	R,R(-)-Pseudoephedrine
Clonazepam	L-Thyroxine	Salicylic Acid
Clonidine	Lamotrigine	Sertraline HCL
Clopidogrel bisulfate	Levetiracetam	Simvastin
Clorazepate	Lidocaine	Temazepam
Cocaethylene	Lormetazepam	Theophylline
Cocaine	Meperidine	Theophylline
Codeine	Metformin HCl	Thiamine
Cortisol	Methylphenidate HCl	Topiramate
D-Amphetamine	Metoprolol	Valproic Acid
D-Methamphetamine	Metronidazole	Verapamil
d,l-Salbutamol	Montelukast sodium salt	Zomepirac
Deoxycorticosterone	Morphine Sulfate	Zonisamide
Deta-9-THC (except for THC test)	Nalorphine	

Dextromethorphan	Naloxone	

Food items such as methanol cough drops, cough syrup, cola, mouthwash, coffee, tea, milk, sugar, chewing gum, alcohol, baking soda, salt, cranberry juice, orange juice, food coloring (red, blue, green), toothpaste, tomatoes and MSG were added in either drug-free oral fluid or oral fluid containing the target drugs with concentrations of 50% below and 50% above cutoff levels to a concentration of 5%. None of the substances showed interference. Hemoglobin showed no interference at 10mg/dL.

e. Specificity

To test specificity, drug metabolites and other components that are likely to interfere in oral fluid samples were tested using three batches of the Healgen device. The following are summaries.

COT

(-) Cotinine (Cut-off=30 ng/mL)	**Result Positive at (ng/mL)**	**% Cross-Reactivity**
(-) Cotinine	30	100%
S(-)-Nicotine	3000	1%
Trans-3-hydroxycotinine	10	300%
(+)-anabasine	1,350,000	0.002%
(+/-)-nornicotine	150,000	0.02%
Niacinamide	>100,000	< 0.03%

THC

Marijuana (Cut-off=40 ng/mL)	**Result Positive at (ng/mL)**	**% Cross-Reactivity**
Δ9-Tetrahydrocannabinol	40	100%
Δ8-Tetrahydrocannabinol	80	50%
11-nor-Δ9-THC-9 COOH	4	1000%
11-hydroxy-Δ9-THC	45	89%
Cannabinol	200	20%
Cannabidiol (CBD)	2,200	1.8%
11-Nor-Δ9-THC-carboxy-glucuronide	60	66.7%
(+)-11-nor-9-carboxy-Δ9-THC	50	80%
11-nor-Δ8-THC-9-COOH	20	200%
8-beta-11-dihydroxy-Δ9-THC	200	20%
8-beta-hydroxy-Δ9-THC	200	20%
Exo-THC	75	53.3%
l-11-Nor-Δ9-THC-9-Carboxylic Acyl-Glucuronide	15	266.7%
Δ8-THC Carboxylic Acid	20	200%
Δ9-THC Carboxylic Acid	4	1000%

f. Effect of Oral fluid pH

To investigate the effect of oral fluid pH, oral fluid samples with pH 4 to 9 were spiked with target drugs at 50% below and 50% above Cut-Off levels. These samples were tested using three lots of the device. Results were all positive for samples at and above +50% Cut-Off and all negative for samples at and below -50% Cut-Off.

g. Drug Recovery Study

Negative oral fluid samples in glass bottles were spiked with target drugs to concentrations of -50% and +50% of the cutoffs. The samples were transferred to Healgen devices and store at room temperature, at -20ºC and at 40ºC. Over 90% recoveries were observed for both cotinine and marijuana in the Healgen devices. Oral fluid samples can be stored in the device at -20ºC for at least 90 days. Oral fluid samples can be shipped overnight in the device for LC-MS confirmation.

2. Comparison Studies

Method comparison studies for the Healgen Device were performed at three testing sites for each target drug with one operator at each site. Operators tested total 427 samples for COT and 126 samples for THC. The obtained test results are compared to LC/MS/MS results. The results are presented in the tables below.

COT

Concentration Range (by LC-MS/MS)	**Number of samples**	**Test Results**		**The percentage of correct results (%)**
		No. of Positive	**No. of Negative**	
Drug-Free	112	0	112	100%
Less than Half the Cutoff Concentration	93	0	93	100%
Near Cutoff Negative	40	5	35	88%
Near Cutoff Positive	32	28	4	88%
High Positive	150	150	0	100%

Discordant Results

Sites	**Sample Number**	**LC/MS Result**	**Test Results**
Site 1	CM-098	23.43	Positive
Site 1	CM-003	27.70	Positive
Site 2	LH-140	24.62	Positive
Site 2	LH-161	28.88	Positive
Site 3	LS-007	29.32	Positive
Site 1	CM-096	30.38	Negative
Site 2	LH-069	32.64	Negative
Site 3	LS-082	30.75	Negative
Site 3	LS-002	31.84	Negative

THC

Concentration Range (by LC-MS/MS)	**Number of samples**	**Test Results**		**The percentage of correct results (%)**
		No. of Positive	**No. of Negative**	
Drug-Free	35	0	35	100
Less than Half the Cutoff Concentration	13	0	13	100

Near Cutoff Negative	7	2	5	71.4
Near Cutoff Positive	10	6	4	60
High Positive	61	61	0	100

Discordant Results

Sites	Sample Number	LC/MS Result	Test Results
Site 2	S0665123	38.3	Positive
Site 2	S0665139	38.7	Positive
Site 3	S0583367	40.6	Negative
Site 3	S0583363	42.2	Negative
Site 3	S0583368	46.0	Negative
Site 3	S0583371	47.0	Negative

3. Layuser Studies

Layuser studies for the Healgen® Accurate Oral Fluid Drug Test COT were performed at three testing sites. Total 362 layusers with diverse educational and professional backgrounds performed tests based on the product insert. The layuser results are compared to LC/MS/MS results. The results are presented in the tables below.

Concentration Range (by LC-MS/MS)	Number of samples	Test Results		The percentage of correct results (%)
		No. of Positive	No. of Negative	
Drug-Free	95	0	95	100%
Less than Half the Cutoff Concentration	39	0	39	100%
Near Cutoff Negative	35	4	31	89%
Near Cutoff Positive	39	34	5	87%
High Positive	154	154	0	100%

Discordant Results

Sites	Sample Number	LC/MS Result	Test Results
Site A	NX-032	27.97	Positive
Site B	PH-012	23.54	Positive
Site B	PH-028	29.77	Positive
Site C	AJ-096	29.89	Positive
Site A	NX-010	30.53	Negative
Site A	NX-010	38.64	Negative
Site B	PH-083	35.80	Negative
Site C	AJ-019	30.26	Negative
Site C	AJ-016	32.54	Negative

Layusers were given surveys on the ease of understanding the instruction for use. All layusers indicated that the device instruction is easy to understand and follow. A Flesch-Kincaid reading analysis was performed on the package insert and the scores revealed a reading Grade Level of 7.

4. Clinical Studies

Not applicable.

11. Conclusion

Based on the test principle and acceptable performance characteristics including precision, interference, specificity, method comparison and layuser studies of the device, it's concluded that the Healgen® Accurate Oral Fluid Drug Test and Healgen® Accurate Oral Fluid Drug Test COT are substantially equivalent to the predicates.