February 13, 2018

Microgenics Corporation
Minoti Patel
Manager, Regulatory Affairs
46500 Kato Road
Fremont, CA 94538

Re: K173195
Trade/Device Name: DRI Hydrocodone Assay
Regulation Number: 21 CFR 862.3650
Regulation Name: Opiate test system
Regulatory Class: Class II
Product Code: DJG
Dated: January 5, 2018
Received: January 8, 2018

Dear Minoti Patel:

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. 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); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR

Part 820); 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 the CDRH's Office of Surveillance and Biometrics/Division of Postmarket Surveillance.

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)*
K173195

Device Name
DRI Hydrocodone Assay

Indications for Use *(Describe)*

DRI Hydrocodone Assay:

The DRI Hydrocodone Assay is a homogeneous enzyme immunoassay for the qualitative and/or semi-quantitative determination of the presence of hydrocodone and its metabolites in human urine at a cut-off concentration of 300 ng/mL. The assay is intended to be used in laboratories and provides a simple and rapid analytical screening procedure to detect hydrocodone and its metabolites in human urine. The assay is designed for use with a number of clinical chemistry analyzers.

The semi-quantitative mode is for the purpose of enabling laboratories to determine an appropriate dilution of the specimen for confirmation by a confirmatory method such as
Liquid chromatography/tandem mass spectrometry (LC-MS/MS) or permitting laboratories to establish quality control procedures.

The assay provides only a preliminary analytical test result. A more specific alternative chemical method must be used to obtain a confirmed analytical result. Gas chromatography/ mass spectrometry (GC/MS) or Liquid chromatography/tandem mass spectrometry (LC-MS/MS) is the preferred confirmatory method

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.

DO NOT SEND YOUR COMPLETED FORM TO THE PRA STAFF EMAIL ADDRESS BELOW.

The burden time for this collection of information is estimated to average 79 hours per response, including the time to review instructions, search existing data sources, gather and maintain the data needed and complete and review the collection of information. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden, to:

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."

5. 510(k) Summary - k173195

A. Device Information

Category	Comments
Sponsor:	Microgenics Corporation Thermo Fisher Scientific 46500 Kato Road Fremont, CA 94538 Phone: 510-979-5000 FAX: 510-979-5002
Correspondent Contact Information:	Minoti Patel, RAC Manager, Regulatory Affairs Email: Minoti.patel@thermofisher.com Phone: 510-979-5000 FAX: 510-979-5002
Device Common Name:	Homogeneous Hydrocodone Enzyme Immunoassay
Trade or Proprietary Name	DRI Hydrocodone Assay
Predicate Device Product Code, Classification, Classification Name & Panel	DJG, Class II, 21 CFR 862.3650 – Opiate test system, 91 – Toxicology
Device Classification Name:	21 CFR Part 862.3650

Predicate Device Information:

Predicate Device:	DRI Hydrocodone Assay
Predicate Device Manufacturer:	Microgenics Corporation
Predicate Device Common Name:	Homogeneous Hydrocodone Enzyme Immunoassay
Predicate Device Premarket Notification #:	K150502
Predicate Device Product Code, Classification, Classification Name & Panel	DJG, Class II, 21 CFR 862.3650 – Opiate test system, 91 – Toxicology

B. Date Summary Prepared

December 15, 2017

C. Description of Device

The DRI Hydrocodone assay is supplied as a liquid ready-to-use homogeneous enzyme immunoassay. The assay uses specific antibodies that can detect Hydrocodone and Hydromorphone and Hydromorphone glucuronide. The assay is based on competition between a drug labeled with glucose-6-phosphate dehydrogenase (G6PDH) and free drug from the urine sample, for a fixed amount of specific antibody binding sites. In the absence of free drug from the sample, the specific antibody binds the drug labeled with G6PDH and causes a decrease in

enzyme activity. This phenomenon creates a direct relationship between the drug concentration in urine and enzyme activity. The enzyme activity is determined spectrophotometrically at 340 nm by measuring the conversion of nicotinamide adenine dinucleotide (NAD) to NADH.

The assay consists of reagents (A and E).

Reagent A contains mouse monoclonal anti-Hydrocodone antibody, glucose-6-phosphate (G6P), and nicotinamide adenine dinucleotide (NAD) in Tris buffer with sodium azide as a preservative.

Reagent E: Contains Hydrocodone derivative labeled with glucose-6-phosphate dehydrogenase (G6PDH) in Tris buffer with sodium azide as a preservative.

D. Intended Use

a. Intended Use:

See indications for use below.

b. Indication(s) Use:

DRI Hydrocodone Assay:

The DRI Hydrocodone Assay is a homogeneous enzyme immunoassay for the qualitative and/or semi-quantitative determination of the presence of hydrocodone and its metabolites in human urine at a cutoff concentration of 300 ng/mL. The assay is intended to be used in laboratories and provides a simple and rapid analytical screening procedure to detect hydrocodone and its metabolites in human urine. The assay is designed for use with a number of clinical chemistry analyzers.

The semi-quantitative mode is for the purpose of enabling laboratories to determine an appropriate dilution of the specimen for confirmation by a confirmatory method such as Liquid chromatography/tandem mass spectrometry (LC-MS/MS) or permitting laboratories to establish quality control procedures.

The assay provides only a preliminary analytical test result. A more specific alternative chemical method must be used to obtain a confirmed analytical result. Gas chromatography/ mass spectrometry (GC/MS) or Liquid chromatography/tandem mass spectrometry (LC-MS/MS) is the preferred confirmatory method

E. Comparison to Predicate Device

Both devices are exactly same product. The performance data collected for predicate is on AU 680 Analyzer and the performance data collected for this submission is on Indiko Plus. Both devices use same reagent and similar instrument systems. Both devices detect Hydrocodone and its metabolites. Both device's specific antibody detects Hydrocodone and its metabolites at cutoff concentration of 300 ng/mL. Comparison of DRI Hydrocodone Assay, Calibrators, Controls on Indiko and predicate devices demonstrated that the technological characteristics and intended use are substantially equivalent to the currently marketed predicate devices, DRI Hydrocodone Assay, (K150502)

F. Test Principle

The DRI Hydrocodone Assay is supplied as a liquid ready-to-use homogeneous enzyme immunoassay. The assay uses specific antibody that can detect Hydrocodone and its metabolites. The assay is based on competition between a drug labeled with glucose-6-phosphate dehydrogenase (G6PDH), and free drug from the urine sample, for a fixed amount of specific antibody binding sites. In the absence of free drug from the sample, the specific antibody binds the drug labeled with G6PDH and causes a decrease in enzyme activity. In the presence of free drug, the free drug occupies the antibody binding sites, allowing the drug bound G6PDH to interact with the substrate, resulting in enzyme activity. This phenomenon creates a direct relationship between the drug concentration in urine and enzyme activity. The enzyme activity is determined spectrophotometrically at 340 nm by measuring the conversion of nicotinamide adenine dinucleotide (NAD) to NADH.

G. Summary of Supporting Data

1. Analytical Performance:

Performance is evaluated at the manufacturer's site on Indiko Plus clinical analyzer.

a) Precision –Samples were prepared by spiking Hydrocodone into drug free urine at the cutoff (100%), 25%, 50% & 75% above and below the cutoff and tested in both qualitative and semi-quantitative modes using a Clinical Laboratory and Standards Institute (CLSI) protocol. Results presented below were generated by testing all samples in replicates of 2, twice per day for 20 days, total n=80.

LC-MS/MS values of spiked samples

Negative urine was spiked in 25% increments or decrements from the cutoff prepared and tested by LC-MS/MS.

The LC-MS/MS results are shown in the table below,

Spiked Conc. (ng/mL)	LC-MS/MS values (ng/mL)	% Recovery
0	0.00	N/A
75	89.50	119
150	174.85	117
225	242.37	108
300	318.50	106
375	410.66	110
450	501.62	111
525	592.11	113
600	667.52	111

Qualitative mode

Spiked samples were tested in duplicates twice a day, at least 2 hours apart, for 20 days in qualitative mode. The results of the precision study from 20 days are shown below.

Lot #1

% of Cutoff	Spiked Conc. (ng/mL)	LC-MS/MS values (ng/mL)	Total Run (n=80)	
			Number of determinants	Immunoassay Results
-100%	0	0.00	80	80 Negative
-75%	75	89.50	80	80 Negative
-50%	150	174.85	80	80 Negative
-25%	225	242.37	80	80 Negative
100%	300	318.50	80	22 Negative/ 58 Positive
+25%	375	410.66	80	80 Positive
+50%	450	501.62	80	80 Positive
+75%	525	592.11	80	80 Positive
+100%	600	667.52	80	80 Positive

Lot #2

% of Cutoff	Spiked Conc. (ng/mL)	LC-MS/MS values (ng/mL)	Total Run (n=80)	
			Number of determinants	Immunoassay Results
-100%	0	0.00	80	80 Negative
-75%	75	89.50	80	80 Negative
-50%	150	174.85	80	80 Negative
-25%	225	242.37	80	80 Negative
100%	300	318.50	80	4 Negative/ 76 Positive
+25%	375	410.66	80	80 Positive
+50%	450	501.62	80	80 Positive
+75%	525	592.11	80	80 Positive
+100%	600	667.52	80	80 Positive

Semi-quantitative mode

Spiked samples were tested in duplicates twice a day, at least 2 hours apart, for 20 days in semi-quantitative mode. The results of the precision study from 20 days are shown below.

Lot #1

% of Cutoff	Spiked Conc. (ng/mL)	LC-MS/MS values (ng/mL)	Total Run (n=80)	
			Number of determinants	Immunoassay Results
-100%	0	0.00	80	80 Negative
-75%	75	89.50	80	80 Negative
-50%	150	174.85	80	80 Negative
-25%	225	242.37	80	80 Negative
100%	300	318.50	80	24 Negative/ 56 Positive
+25%	375	410.66	80	80 Positive
+50%	450	501.62	80	80 Positive
+75%	525	592.11	80	80 Positive
+100%	600	667.52	80	80 Positive

Lot #2

% of Cutoff	Spiked Conc. (ng/mL)	LC-MS/MS values (ng/mL)	Total Run (n=80)	
			Number of determinants	Immunoassay Results
-100%	0	0.00	80	80 Negative
-75%	75	89.50	80	80 Negative
-50%	150	174.85	80	80 Negative
-25%	225	242.37	80	80 Negative
100%	300	318.50	80	7 Negative/ 73 Positive
+25%	375	410.66	80	80 Positive
+50%	450	501.62	80	80 Positive
+75%	525	592.11	80	80 Positive
+100%	600	667.52	80	80 Positive

b) Spike Recovery - In qualitative mode, there was no ± 2SD overlap between the spiked 300 ng/mL samples and spiked 225 and 375 ng/mL samples.

All 20 replicates of spiked 225 ng/mL (Low Control) samples were below the spiked 300 ng/mL (Cutoff) sample, and all 20 replicates of spiked 375 ng/mL (High Control) samples were above the spiked 300 ng/mL sample.

Spike Recovery Rate Data

Replicate	225 ng/mL (n=20)	375 ng/mL (n=20)
1	Negative	Positive
2	Negative	Positive
3	Negative	Positive
4	Negative	Positive
5	Negative	Positive
6	Negative	Positive
7	Negative	Positive
8	Negative	Positive
9	Negative	Positive
10	Negative	Positive
11	Negative	Positive
12	Negative	Positive
13	Negative	Positive
14	Negative	Positive
15	Negative	Positive
16	Negative	Positive
17	Negative	Positive
18	Negative	Positive
19	Negative	Positive
20	Negative	Positive
Overlap	No	No
Relative to C/O	All 20 below C/O	All 20 below C/O

In conclusion, spike recovery meets the Acceptance Criteria.

c) Analytical Recovery and Dilution Linearity -To demonstrate the dilution linearity for purpose of sample dilution and quality control of the entire assay range, drug free urine is spiked to the high calibrator level of Hydrocodone (1000 ng/mL) and diluted with drug free urine to generate 10 intermediate levels.

Each sample is run in replicates of five in semi-quantitative mode and the average is used to determine percent recovery compared to the expected target value. The percent recovery is summarized in the table below.

% Recovery of samples

Level	Expected Concentration (ng/mL)	Observed Concentration (ng/mL)	% Recovery
1	0	0	N/A
2	100	95	95.4
3	200	219	109.3

Level	Expected Concentration (ng/mL)	Observed Concentration (ng/mL)	% Recovery
4	300	331	110.3
5	400	427	106.7
6	500	529	105.8
7	600	624	104.1
8	700	696	99.4
9	800	798	99.7
10	900	893	99.2
11	1000	911	91.1

In conclusion, the dilution linearity study meets the Acceptance Criteria.

d) Method Comparison and Accuracy - One hundred and thirty six patient samples are analyzed by the DRI Hydrocodone Assay in both qualitative and semi-quantitative modes and the results are compared to LC-MS/MS. The overall concordance between LC-MS/MS and DRI Hydrocodone Assay is 82.4%.

Qualitative Mode

Candidate Device Results	Negative	< 50% of Cutoff concentration by LC-MS/MS (< 150 ng/mL)	Near Cutoff Negative (Between 50% below the cutoff and the cutoff concentration as determined by LC-MS/MS) (150 – 299.9 ng/mL)	Near Cutoff Positive (Between the cutoff and 50% above the cutoff concentration as determined by LC-MS/MS) (300 – 450 ng/mL)	High Positives (Greater than 50% above cutoff concentration (> 450 ng/mL)
Positive	0	7*	17*	9	48
Negative	42	3	10	0	0

* Discordant samples

Semi-Quantitative Mode

Candidate Device Results	Negative	< 50% of Cutoff concentration by LC-MS/MS (< 150 ng/mL)	Near Cutoff Negative (Between 50% below the cutoff and the cutoff concentration as determined by LC-MS/MS) (150 – 299.9 ng/mL)	Near Cutoff Positive (Between the cutoff and 50% above the cutoff concentration as determined by LC-MS/MS) (300 – 450 ng/mL)	High Positives (Greater than 50% above cutoff concentration (> 450 ng/mL)
Positive	0	7*	17*	9	48
Negative	42	3	10	0	0

* Discordant samples

*** Discordant Result Table for Discrepant Sample near cutoff**

Previous ID	New ID	Immunoassay		LC-MS/MS (ng/mL)		
		Qualitative mode	Semi quantitative mode	Hydrocodone	Hydromorphone	Hydromorphone 3β-glucuronide
4	46	Positive	Positive	126	< LLOQ**	179
11	47	Positive	Positive	132	< LLOQ	160
15	48	Positive	Positive	126	< LLOQ	314
17	49	Positive	Positive	82.7	< LLOQ	128
18	50	Positive	Positive	138	< LLOQ	677
19	51	Positive	Positive	131	< LLOQ	126
29	52	Positive	Positive	73.3	< LLOQ	262
28	63	Positive	Positive	162	< LLOQ	218
31	64	Positive	Positive	249	< LLOQ	356
32	65	Positive	Positive	253	< LLOQ	265
33	66	Positive	Positive	160	< LLOQ	739
34	67	Positive	Positive	270	< LLOQ	88.6
35	68	Positive	Positive	217	< LLOQ	158
40	69	Positive	Positive	236	< LLOQ	90.4
49	70	Positive	Positive	282	< LLOQ	242
51	71	Positive	Positive	295	< LLOQ	433
59	72	Positive	Positive	167	< LLOQ	149
3	73	Positive	Positive	193	< LLOQ	756
10	74	Positive	Positive	214	< LLOQ	434
12	75	Positive	Positive	207	< LLOQ	706
13	76	Positive	Positive	298	< LLOQ	190
14	77	Positive	Positive	198	< LLOQ	262
21	78	Positive	Positive	157	< LLOQ	124
22	79	Positive	Positive	287	< LLOQ	79.9

* Samples are discordant because of cross-reactivity of immunoassay to hydromorphone and hydromorphone-3β-glucuronide.
** Lower Limit of Quantitation (LLOQ) is 40 ng/mL.

e) Specificity - The cross-reactivity of DRI Hydrocodone and its metabolites, opiate compounds and structurally related and unrelated compounds are evaluated by adding known amounts of each analyte to drug-free negative urine. In both qualitative and semi-quantitative modes, the assay cross-reacted with Hydrocodone at 300 ng/mL (100% cross-reactivity), Hydromorphone at 325 ng/mL (92% cross-reactivity), Norhydrocodone at 13,000 ng/mL (2% cross-reactivity), Dihydrocodeine at 12,500 ng/mL (2% cross-reactivity). In semi-quantitative mode the assay cross-reacted with Hydromorphone-3β-glucuronide at 185 ng/mL (162% cross-reactivity).

In both qualitative and semi-quantitative modes, the assay exhibited minimal cross-reactivity with opiates and structurally related compounds at the tested concentrations.

In both qualitative and semi-quantitative modes, the assay produced a negative result when structurally unrelated compounds were spiked into 225 ng/mL of hydrocodone (Low control level), at the tested concentrations. In both qualitative and semi-quantitative modes, the assay produced a positive result when structurally unrelated compounds were spiked into 375 ng/mL of hydrocodone (High control level) at the tested concentrations. These results indicated there was no cross-reactivity of the assay to the structurally unrelated compounds.

Cross-reactivity of Hydrocodone and its metabolites

Hydrocodone and its Metabolites	Tested Concentration (ng/mL)	Response Equivalent to Cutoff (Positive/ Negative)	% Cross-Reactivity
Hydrocodone	250	Negative	100
	275	Negative	
	300	Positive	
	325	Positive	
	350	Positive	
Hydromorphone	200	Negative	92
	250	Negative	
	300	Negative	
	325	Positive	
	350	Positive	
	400	Positive	
Hydromorphone-3β-glucuronide	175	Positive	162
	185	Positive	
	200	Positive	
	250	Positive	
	300	Positive	
	350	Positive	
	400	Positive	
Norhydrocodone	10,000	Negative	2
	11,000	Negative	
	12,000	Negative	
	13,000	Positive	
	14,000	Positive	
	15,000	Positive	
6-Hydroxycodol (Dihydrocodeine)	11,000	Negative	2
	12,000	Negative	
	12,500	Positive	
	13,000	Positive	

Opiates and structurally related compounds

Drug free urine was spiked with the indicated concentrations of compounds.
Samples were tested in duplicates in both qualitative and semi-quantitative modes.

Results in qualitative mode are expressed where a negative number indicates rates below cutoff calibrator (negative result), and a positive number indicates rates above cutoff calibrator (positive result). The results are shown in the table below.

Cross-reactivity of Opiates and structurally related compounds

Opiates and Structurally Related Compounds	Tested Concentration (ng/mL)	Response Equivalent to Cutoff (Positive/ Negative)	% Cross Reactivity
6-Acetyl morphine	100,000	Negative	< 0.3
Buprenorphine	100,000	Negative	< 0.3
Buprenorphone 3β-D glucuronide	100,000	Negative	< 0.3
Codeine	150,000	Negative	< 0.2
Dextromethorphan	250,000	Negative	< 0.1
EDDP	150,000	Negative	< 0.2
Fentanyl	100,000	Negative	< 0.3
Heroin	100,000	Negative	< 0.3
Levorphanol	18,000 20,000 22,000	Negative Negative Positive	1.4
Methadone	100,000	Negative	< 0.3
Meperidine	100,000	Negative	< 0.3
Morphine	150,000	Negative	< 0.2
Morphine-3β-glucuronide	70,000	Negative	< 0.4
Morphine-6β-glucuronide	75,000	Negative	< 0.4
Nalbuphine	150,000	Negative	< 0.2
Naloxone	15,000 17,000	Negative Positive	1.8
Naltrexone	50,000 75,000 100,000	Negative Positive Positive	0.4
Norbuprenorphine	100,000	Negative	< 0.3
Norcodeine	150,000	Negative	< 0.2
Normorphine	150,000	Negative	< 0.2
Noroxycodone	50,000 100,000 110,000	Negative Negative Positive	0.3
Oxycodone	8,000 12,000 14,000	Negative Negative Positive	2.1
Oxymorphone-β-D-glucuronide	8,000 14,000	Negative Positive	2.1
Oxymorphone	8,000 12,0000 14,0000	Negative Negative Positive	2.1

Opiates and Structurally Related Compounds	Tested Concentration (ng/mL)	Response Equivalent to Cutoff (Positive/ Negative)	% Cross Reactivity
Tapentadol	100,000	Negative	< 0.3
Thebaine	100,000	Negative	< 0.3
Tramadol	100,000	Negative	< 0.3

Structurally unrelated compounds

Structurally unrelated compounds were spiked into drug free urine that has been spiked to 225 ng/mL or 375 ng/mL of hydrocodone.

Samples were tested in 5 replicates in both qualitative and semi-quantitative modes.

Results in qualitative mode are expressed as Δ Rate, where a negative number indicates rates below cutoff calibrator (negative result), and a positive number indicates rates above cutoff calibrator (positive result).

The results are shown in the table below.

Cross-reactivity of structurally unrelated compounds

Compounds	Tested Concentration. (ng/mL)	Spiked Hydrocodone Level		
		Low Control -25% of Cutoff (225 ng/mL)		Low Control 25% of Cutoff (375 ng/mL)
		Positive/ Negative		Positive/ Negative
Negative Urine	0	Negative		Positive
Acetaminophen	500,000	Negative		Positive
Acetylsalicylic acid	500,000	Negative		Positive
Amitriptyline	100,000	Negative		Positive
Amoxicillin	100,000	Negative		Positive
Amphetamine	1,000,000	Negative		Positive
Benzoylecgonine	1,000,000	Negative		Positive
Caffeine	100,000	Negative		Positive
Carbamazepine	500,000	Negative		Positive
Chlorpromazine	100,000	Negative		Positive
Clomipramine	10,000	Negative		Positive
Cimetidine	500,000	Negative		Positive
Desipramine	100,000	Negative		Positive
Diphenhydramine	100,000	Negative		Positive
Doxepin	100,000	Negative		Positive
Ephedrine	1,000,000	Negative		Positive
Fluoxetine	100,000	Negative		Positive
Fluphenazine	100,000	Negative		Positive
Ibuprofen	500,000	Negative		Positive
Imipramine	100,000	Negative		Positive
Maprotiline	100,000	Negative		Positive
Nortriptyline	100,000	Negative		Positive

Compounds	Tested Concentration. (ng/mL)	Spiked Hydrocodone Level		
		Low Control -25% of Cutoff (225 ng/mL)		Low Control 25% of Cutoff (375 ng/mL)
		Positive/ Negative		Positive/ Negative
Oxazepam	250,000	Negative		Positive
Phencyclidine (PCP)	100,000	Negative		Positive
Phenobarbital	100,000	Negative		Positive
Ranitidine	500,000	Negative		Positive
Secobarbital	100,000	Negative		Positive
Thioridazine	100,000	Negative		Positive

f) Interference - The potential interference of pH and endogenous physiologic substances on recovery of Hydrocodone using DRI Hydrocodone Assay is assessed by spiking known compounds of potentially interfering substances into the Low Control (225 ng/mL cutoff) and High Control (375 ng/mL cutoff). In the presence of the compounds listed below, the controls are detected accurately, indicating that these compounds did not show interference in the assay.

Interference substances

Compounds	Tested Concentration. (mg/dL)	Spiked Hydrocodone Level		
		Low Control -25% of cutoff (225 ng/mL)		High Control 25% of cutoff (375 ng/mL)
		Positive/ Negative		Positive/ Negative
Negative Urine	0	Negative		Positive
Acetaminophen	10	Negative		Positive
Acetone	500	Negative		Positive
Acetyl Salicylic Acid	10	Negative		Positive
Ascorbic Acid	150	Negative		Positive
Caffeine	10	Negative		Positive
Creatinine	400	Negative		Positive
Ethanol	10	Negative		Positive
Galactose	5	Negative		Positive
Glucose	1000	Negative		Positive
Hemoglobin	150	Negative		Positive
Human Serum Albumin	200	Negative		Positive
Ibuprophen	10	Negative		Positive
Oxalic acid	50	Negative		Positive
Riboflavin	3	Negative		Positive
Sodium Chloride	1000	Negative		Positive
Urea	1000	Negative		Positive

g) pH

pH samples

Compound	Tested Concentration	Spiked Hydrocodone Level	
		Low Control -25% of cutoff (225 ng/mL)	High Control 25% of cutoff (375 ng/mL)
		Positive/ Negative	Positive/ Negative
pH	4	Negative	Positive
pH	5	Negative	Positive
pH	6	Negative	Positive
pH	7	Negative	Positive
pH	8	Negative	Positive
pH	9	Negative	Positive
pH	10	Negative	Positive

h) Specific Gravity - Drug free urine samples with specific gravity ranging in value within 1.003 to 1.031 are split and spiked to a final concentration of either 225ng/mL or 375ng/mL (the Low Control and High Control concentrations, respectively). These samples are then evaluated in both qualitative and semi-quantitative modes. No interference is observed.

Specific gravity samples

Specific gravity	Spiked Hydrocodone Level		
	Low Control -25% of cutoff (225 ng/mL)		High Control 25% of cutoff (375 ng/mL)
	Positive/ Negative		Positive/ Negative
1.003	Negative		Positive
1.005	Negative		Positive
1.006	Negative		Positive
1.010	Negative		Positive
1.011	Negative		Positive
1.014	Negative		Positive
1.019	Negative		Positive
1.024	Negative		Positive
1.027	Negative		Positive
1.031	Negative		Positive

i) Traceability

The primary controls and calibrators are traceable to the 1 mg/mL Hydrocodone stock solution purchased from a commercial source which is established at 99.9% purity. The concentration of the primary control and calibrator stocks is confirmed by LC-MS/MS from three independent laboratories.

j) Stability

Open Vial Stability:

Open Vial stability studies for two lots stored at 2–8°C supports the claim of 60 days for qualitative and semi-quantitative modes. This data was presented in the original 510(k) submission K150502

Reagent On-Board Stability:

Reagent On-Board stability studies for one lot stored on-board clinical analyzer supports the claim of 60 days for qualitative and semi-quantitative modes.

Real Time Stability for Reagent

Real Time stability testing results show that the Low Control is detected as negative and the High Control is detected as positive for each time point for a period of 2 year at 2-8°C. The recoveries of the Low Control and High Control are within 80–120%. Our current shelf-life claim is 18 months.

k) Detection Limit - Limit of detection is not provided in a 510(k) of this type of assay.

l) Clinical Studies

a. **Clinical Sensitivity** - Clinical sensitivity is not provided in a 510(k) of this type of assay.

b. **Clinical Specificity** - Clinical specificity is not provided in a 510(k) of this type of assay.

m) Clinical cutoff - There are currently no SAMHSA recommendations for a clinical cutoff for hydrocodone as of today.

H. Conclusion

The information supports a determination of substantial equivalence between DRI Hydrocodone on Indiko Plus and DRI Hydrocodone Assay, Calibrators and Control Set on AU 680 (K150502).