510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
TRIAGE-QUICK REVIEW DECISION SUMMARY

510(k) Number: k182779

This 510(k) was reviewed under OIR's Triage-Quick Review Program. This program represents an internal workload management tool intended to reduce internal FDA review resources for 510(k) applications that are of good quality upon receipt by FDA.

The information in the 510(k) is complete and supports a substantial equivalence (SE) determination. Please refer to the applicant's 510(k) summary for a summary of the information that supports this SE determination.

November 21, 2018

ARK Diagnostics, Inc.
Cherry Mun
Manager, Quality and Regulatory Affairs
48089 Fremont Boulevard
Fremont, California 94538

Re: k182779
Trade/Device Name: ARK EDDP Assay
Regulation Number: 21 CFR 862.3620
Regulation Name: Methadone test system
Regulatory Class: Class II
Product Code: DJR
Dated: September 28, 2018
Received: October 1, 2018

Dear Cherry Mun:

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,

Paula Caposino -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

510(k) SUMMARY

This 510(k) Summary of Safety and Effectiveness information is being submitted in accordance with the requirements of Safe Medical Device Act of 1990 and 21 CFR 807.92.

The assigned 510(k) number is K182779.

807.92 (a)(1): Name: **ARK Diagnostics, Inc.**

Address: 48089 Fremont Blvd
Fremont, CA 94538 USA

Owner Operator Number: 10027663
Establishment Registration: 3005755244

Phone: (510) 270-6270
FAX: (510) 270-6298
Contact: Cherry Mun – (510) 270-6288
Manager of Quality and Regulatory Affairs

Date Prepared: November 19th, 2018

807.92 (a)(2): Device Name – Trade Name, Common Name, and Classification

Trade Name: ARK™ EDDP Assay

Common Name: Homogeneous Enzyme Immunoassay, Methadone Test System

Classification:

Product Code	Classification	Regulation Section	Panel
DJR	Class II	21 CFR 862.3620 Methadone Test System	Toxicology (91)

807.92 (a)(3): Identification of the Legally Marketed Predicate Device

Immunalysis EDDP Specific Urine Enzyme Immunoassay (K151395)

807.92 (a)(4): Device Description

The ARK EDDP Assay is a homogeneous enzyme immunoassay technique used for the analysis of EDDP in human urine. The assay is based on competition between EDDP in the specimen and EDDP labeled with recombinant glucose-6-phosphate dehydrogenase (rG6PDH) for antibody binding sites. As the latter binds antibody, enzyme activity decreases. In the presence of EDDP from the specimen, enzyme activity increases and is directly related to the EDDP concentration. Active enzyme converts nicotinamide adenine dinucleotide (NAD) to NADH in the presence of glucose-6-phosphate (G6P), resulting in an absorbance change that is measured spectrophotometrically. Endogenous G6PDH does not interfere because the coenzyme NAD functions only with the bacterial enzyme used in the assay.

The ARK EDDP Assay consists of reagents R1 anti-EDDP rabbit antibody with substrate and R2 EDDP derivative labeled with bacterial recombinant G6PDH enzyme.

807.92 (a)(5): Intended Use / Indications for Use

ARK EDDP Assay

The ARK EDDP Assay is an immunoassay intended for the qualitative and/or semiquantitative determination of EDDP in human urine at cutoff concentrations of 100 ng/mL and 300 ng/mL. The assay is intended for use in laboratories with automated clinical chemistry analyzers. This *in vitro* diagnostic device is for prescription use only.

The semiquantitative mode is for the purpose of (1) enabling laboratories to determine an appropriate dilution of the specimen for confirmation by a confirmatory method, such as Gas Chromatography/Mass Spectrometry (GC/MS) or Liquid Chromatography/tandem Mass Spectrometry (LC-MS/MS), or (2) permitting laboratories to establish quality control procedures.

The ARK EDDP Assay provides only a preliminary analytical test result. A more specific alternative chemical method must be used in order to obtain a confirmed positive analytical result. Gas Chromatography/Mass Spectrometry (GC/MS) or Liquid Chromatography/tandem Mass Spectrometry (LC-MS/MS) is the preferred confirmatory method. Clinical consideration and professional judgment should be exercised with any drug test result, particularly when the preliminary test result is positive.

807.92 (a)(6): Technological Similarities and Differences to the Predicate

SUBSTANTIAL EQUIVALENCE COMPARATIVE TABLE

Comparison between the Immunalysis EDDP Specific Urine Enzyme Immunoassay and the ARK™ EDDP Assay

Characteristic	**Predicate Device** Immunalysis EDDP Specific Urine Enzyme Immunoassay (K151395)	**Candidate Device** ARK™ EDDP Assay
Similarities		
Test System	Homogenous enzyme immunoassay (EIA)	Same
Intended Use	For the qualitative and semiquantitative determination of EDDP in human urine; For *in vitro* diagnostic use	Same
Sample Matrix	Human urine	Same
User Environment	Clinical laboratories; Prescription use only	Same
Mass Spectrometry Confirmation	Required to confirm preliminary positive analytical results	Same
Platform Required	Automated clinical chemistry analyzer	Same
Reagents Form	Liquid – Ready to use	Same
Reagent Materials	Two (2) reagent system: Antibody/substrate reagent (antibodies to EDDP) and enzyme labeled conjugate (EDDP derivative labeled with enzyme) Sodium azide preservative	Same
Storage	2-8˚C until expiration date	Same
Measured Analyte	EDDP	Same
Detection	Absorbance change measured spectrophotometrically at 340 nm	Same

Characteristic	**Predicate Device** Immunalysis EDDP Specific Urine Enzyme Immunoassay (K151395)	**Candidate Device** ARK™ EDDP Assay
Differences		
Cutoff Levels	100 ng/mL, 300 ng/mL and 1000 ng/mL	100 ng/mL and 300 ng/mL

807.92 (b)(1) and 807.92 (b)(2): Brief Description of Nonclinical and Clinical Data

The following performance characteristics were obtained on the Beckman Coulter AU680® automated clinical chemistry analyzer.

Precision

Precision studies were performed using CLSI EP05-A3 as a guideline. Drug-free, negative human urine was supplemented with EDDP (0.0 to 200.0 ng/mL for the 100 ng/mL cutoff and 0.0 to 600.0 for the 300 ng/mL cutoff). Each level was assayed in quadruplicate twice a day for 20 days (N=160) and evaluated qualitatively and semiquantitatively. Results are summarized in the tables below.

Qualitative Precision – 100 ng/mL Cutoff

Human Urine (ng/mL)	Relative % Cutoff	# of Results	Qualitative Precision Results
0.0	-100	160	160 Negative
25.0	-75	160	160 Negative
50.0	-50	160	160 Negative
75.0	-25	160	160 Negative
100.0	Cutoff	160	123 Negative; 37 Positive
125.0	+25	160	160 Positive
150.0	+50	160	160 Positive
175.0	+75	160	160 Positive
200.0	+100	160	160 Positive

Semiquantitative Precision – 100 ng/mL Cutoff

Human Urine (ng/mL)	Relative % Cutoff	# of Results	Mean (ng/mL)	Semiquantitative Precision Results
0.0	-100	160	0.3	160 Negative
25.0	-75	160	22.6	160 Negative
50.0	-50	160	47.7	160 Negative
75.0	-25	160	72.2	160 Negative
100.0	Cutoff	160	98.1	114 Negative; 46 Positive
125.0	+25	160	125.3	160 Positive
150.0	+50	160	145.1	160 Positive
175.0	+75	160	169.4	160 Positive
200.0	+100	160	190.7	160 Positive

Qualitative Precision – 300 ng/mL Cutoff

Human Urine (ng/mL)	Relative % Cutoff	# of Results	Qualitative Precision Results
0.0	-100	160	160 Negative
75.0	-75	160	160 Negative
150.0	-50	160	160 Negative
225.0	-25	160	160 Negative
300.0	Cutoff	160	57 Negative; 103 Positive
375.0	+25	160	160 Positive
450.0	+50	160	160 Positive
525.0	+75	160	160 Positive
600.0	+100	160	160 Positive

Semiquantitative Precision – 300 ng/mL Cutoff

Human Urine (ng/mL)	Relative % Cutoff	# of Results	Mean (ng/mL)	Semiquantitative Precision Results
0.0	-100	160	0.3	160 Negative
75.0	-75	160	72.2	160 Negative
150.0	-50	160	145.1	160 Negative
225.0	-25	160	205.9	160 Negative
300.0	Cutoff	160	298.8	85 Negative; 75 Positive
375.0	+25	160	381.4	160 Positive
450.0	+50	160	461.0	160 Positive
525.0	+75	160	539.8	160 Positive
600.0	+100	160	620.0	160 Positive

Analytical Recovery

Recovery across the assay range was assessed using the semiquantitative mode. Drug-free, negative human urine was supplemented with EDDP (1100.0 ng/mL) and dilutions were made proportionally with drug-free human urine. EDDP concentrations ranged from 50.0 to 1000.0 ng/mL. At each level, percentage recovery was calculated based on the mean concentration (N=6) compared to the expected concentration. Results are summarized in the table below.

Theoretical Concentration (ng/mL)	Mean Concentration (ng/mL)	Recovery (%)
50.0	47.6	95.1
75.0	72.1	96.1
100.0	97.1	97.1
200.0	189.1	94.6
300.0	286.6	95.5
400.0	414.5	103.6
500.0	506.6	101.3
600.0	647.4	107.9
700.0	722.7	103.2
800.0	800.6	100.1
900.0	880.8	97.9
1000.0	955.8	95.6

Analytical Specificity

All compounds tested were added to drug-free, negative human urine and tested with the ARK EDDP Assay in both qualitative and semiquantitative modes.

The cross-reactivity of the following structurally related compounds was evaluated by spiking these compounds into drug-free, negative human urine to determine the minimum concentration that would give a positive result approximately equivalent to the 100 ng/mL and 300 ng/mL EDDP cutoffs. These concentrations were used to determine the percent cross-reactivity according to the formula:

% Cross-reactivity = (Cutoff concentration / Lowest concentration of cross-reactant causing a positive result) X 100

For compounds that did not produce a positive result, the highest concentration tested was used to calculate percent cross-reactivity.

Structurally Related Compounds – 100 ng/mL Cutoff

Compound	Concentration Tested (ng/mL)	Semiquantitative Mode Result (Positive/Negative)	Qualitative Mode Result (Positive/Negative)	Cross-reactivity (%)
EDDP	100	Positive	Positive	100
Methadone	2,000,000	Negative	Negative	<0.005
EMDP	400,000	Negative	Negative	<0.025
Chlorpromazine	100,000	Negative	Negative	<0.1
Diphenhydramine	100,000	Negative	Negative	<0.1
Methylphenidate	100,000	Negative	Negative	<0.1
Doxylamine	100,000	Negative	Negative	<0.1

Structurally Related Compounds – 300 ng/mL Cutoff

Compound	Concentration Tested (ng/mL)	Semiquantitative Mode Result (Positive/Negative)	Qualitative Mode Result (Positive/Negative)	Cross-reactivity (%)
EDDP	300	Positive	Positive	100
Methadone	4,500,000	Negative	Negative	<0.007
EMDP	1,000,000	Negative	Negative	<0.03
Chlorpromazine	100,000	Negative	Negative	<0.3
Diphenhydramine	100,000	Negative	Negative	<0.3
Methylphenidate	100,000	Negative	Negative	<0.3
Doxylamine	100,000	Negative	Negative	<0.3

Interference

Structurally Unrelated Compounds – 100 ng/mL Cutoff

High concentrations of the following structurally unrelated compounds were added into urine spiked with EDDP (± 25% of the 100 ng/mL cutoff concentration) and tested with the ARK EDDP Assay in both qualitative and semiquantitative modes. The substances listed at the concentrations below did not yield a false result relative to the 100 ng/mL cutoff.

Compound	Concentration Tested (ng/mL)	Spiked EDDP Level	
		75 ng/mL (-25% Cutoff)	125 ng/mL (+25% Cutoff)
4-bromo 2-5, dimethoxyphenethylamine	100,000	Negative	Positive
Acetaminophen	500,000	Negative	Positive
Acetylsalicylic Acid	500,000	Negative	Positive
6-Acetylcodeine	100,000	Negative	Positive
6-Acetylmorphine	100,000	Negative	Positive
Alprazolam	100,000	Negative	Positive
7-Aminoclonazepam	100,000	Negative	Positive
7-Aminoflunitrazepam	100,000	Negative	Positive
7-Aminonitrazepam	100,000	Negative	Positive
Amitriptyline	100,000	Negative	Positive
Amobarbital	100,000	Negative	Positive
S-(+)-Amphetamine	100,000	Negative	Positive
Benzylpiperazine	100,000	Negative	Positive
Bromazepam	100,000	Negative	Positive
Buprenorphine	100,000	Negative	Positive
Bupropion	100,000	Negative	Positive
Butabarbital	100,000	Negative	Positive
Butalbital	100,000	Negative	Positive
Caffeine	500,000	Negative	Positive
Cannabidiol	100,000	Negative	Positive
Cannabinol	100,000	Negative	Positive
Carbamazepine	100,000	Negative	Positive
Carisoprodol	100,000	Negative	Positive
Chlordiazepoxide	100,000	Negative	Positive
Cis-Tramadol	100,000	Negative	Positive
Clobazam	100,000	Negative	Positive
Clomipramine	100,000	Negative	Positive
Clonazepam	100,000	Negative	Positive
Clozapine	100,000	Negative	Positive
Codeine	100,000	Negative	Positive
Cotinine	100,000	Negative	Positive
Cyclobenzaprine	100,000	Negative	Positive
Dehydronorketamine	100,000	Negative	Positive
Demoxepam	100,000	Negative	Positive
Desipramine	100,000	Negative	Positive
Desalkylflurazepam	100,000	Negative	Positive
Dextromethorphan	100,000	Negative	Positive

Compound	Concentration Tested (ng/mL)	Spiked EDDP Level	
		75 ng/mL (-25% Cutoff)	125 ng/mL (+25% Cutoff)
Diazepam	100,000	Negative	Positive
Digoxin	100,000	Negative	Positive
Dihydrocodeine	100,000	Negative	Positive
Δ9 THC	100,000	Negative	Positive
Doxepin	100,000	Negative	Positive
1R,2S (-) Ephedrine	100,000	Negative	Positive
1S,2R (+) Ephedrine	100,000	Negative	Positive
Ethyl-β-D-Glucuronide	100,000	Negative	Positive
Ethylmorphine	100,000	Negative	Positive
(S-)-Fenfluramine	100,000	Negative	Positive
(R+)-Fenfluramine	100,000	Negative	Positive
Fentanyl	100,000	Negative	Positive
Flunitrazepam	100,000	Negative	Positive
Fluoxetine	100,000	Negative	Positive
Flurazepam	100,000	Negative	Positive
Haloperidol	100,000	Negative	Positive
Heroin	100,000	Negative	Positive
Hexobarbital	100,000	Negative	Positive
Hydrocodone	100,000	Negative	Positive
Hydromorphone	100,000	Negative	Positive
11-hydroxy-Δ9 THC	100,000	Negative	Positive
Ibuprofen	500,000	Negative	Positive
Imipramine	100,000	Negative	Positive
Ketamine	100,000	Negative	Positive
Lamotrigine	100,000	Negative	Positive
Levorphanol Tartrate	100,000	Negative	Positive
Lidocaine	100,000	Negative	Positive
Lorazepam	100,000	Negative	Positive
Lorazepam Glucuronide	50,000	Negative	Positive
Lormetrazepam	100,000	Negative	Positive
LSD	100,000	Negative	Positive
Maprotiline	100,000	Negative	Positive
(+)-MDA	100,000	Negative	Positive
MDEA	100,000	Negative	Positive
MDMA	100,000	Negative	Positive
Meperidine	100,000	Negative	Positive
Meprobamate	100,000	Negative	Positive
S(+)-Methamphetamine	100,000	Negative	Positive
Methaquolone	100,000	Negative	Positive
Methoxetamine	100,000	Negative	Positive
Methylone	100,000	Negative	Positive
Midazolam	100,000	Negative	Positive
Morphine	100,000	Negative	Positive
Morphine-3β-D-Glucuronide	100,000	Negative	Positive
Morphine-6β-D-Glucuronide	50,000	Negative	Positive
N-Desmethyltapentadol	100,000	Negative	Positive
Nalorphine	100,000	Negative	Positive

Compound	Concentration Tested (ng/mL)	Spiked EDDP Level	
		75 ng/mL (-25% Cutoff)	125 ng/mL (+25% Cutoff)
Naloxone	100,000	Negative	Positive
Naltrexone	100,000	Negative	Positive
Naproxen	100,000	Negative	Positive
Nitrazepam	100,000	Negative	Positive
11-nor-9-carboxy-Δ9-THC	100,000	Negative	Positive
Norbuprenorphine	50,000	Negative	Positive
Norcodeine	100,000	Negative	Positive
Nordiazepam	100,000	Negative	Positive
Norketamine	100,000	Negative	Positive
Normorphine	100,000	Negative	Positive
Norpropoxyphene	100,000	Negative	Positive
Norpseudoephedrine	100,000	Negative	Positive
Nortriptyline	100,000	Negative	Positive
Olanzapine	100,000	Negative	Positive
Oxazepam	100,000	Negative	Positive
Oxycodone	100,000	Negative	Positive
Oxymorphone	100,000	Negative	Positive
PCP	100,000	Negative	Positive
Pentazocine	100,000	Negative	Positive
Pentobarbital	100,000	Negative	Positive
Phenobarbital	100,000	Negative	Positive
Phentermine	100,000	Negative	Positive
Phenylephedrine	100,000	Negative	Positive
Phenylpropanolamine	100,000	Negative	Positive
Phenytoin	100,000	Negative	Positive
PMA	100,000	Negative	Positive
Prazepam	100,000	Negative	Positive
Propoxyphene	100,000	Negative	Positive
Propranolol	100,000	Negative	Positive
Protriptyline	100,000	Negative	Positive
R,R (+)- Pseudoephedrine	100,000	Negative	Positive
S,S (-)- Pseudoephedrine	100,000	Negative	Positive
Ranitidine	100,000	Negative	Positive
Ritalinic Acid	100,000	Negative	Positive
Salicylic Acid	100,000	Negative	Positive
Secobarbital	100,000	Negative	Positive
Sertraline	100,000	Negative	Positive
Sufentanil Citrate	50,000	Negative	Positive
Tapentadol	100,000	Negative	Positive
Temazepam	100,000	Negative	Positive
Theophylline	100,000	Negative	Positive
Thioridazine	100,000	Negative	Positive
Trazodone	100,000	Negative	Positive
Triazolam	100,000	Negative	Positive
Trifluoromethylphenylpiperazine	100,000	Negative	Positive
Trimipramine	100,000	Negative	Positive
Venlafaxine	100,000	Negative	Positive

Compound	Concentration Tested (ng/mL)	Spiked EDDP Level	
		75 ng/mL (-25% Cutoff)	125 ng/mL (+25% Cutoff)
Verapamil	100,000	Negative	Positive
Zolpidem Tartrate	100,000	Negative	Positive

Structurally Unrelated Compounds – 300 ng/mL Cutoff

High concentrations of the following structurally unrelated compounds were added into urine spiked with EDDP (± 25% of the 300 ng/mL cutoff concentration) and tested with the ARK EDDP Assay in both qualitative and semiquantitative modes. The substances listed at the concentrations below did not yield a false result relative to the 300 ng/mL cutoff.

Compound	Concentration Tested (ng/mL)	Spiked EDDP Level	
		225 ng/mL (-25% Cutoff)	375 ng/mL (+25% Cutoff)
4-bromo 2-5, dimethoxyphenethylamine	100,000	Negative	Positive
Acetaminophen	500,000	Negative	Positive
Acetylsalicylic Acid	500,000	Negative	Positive
6-Acetylcodeine	100,000	Negative	Positive
6-Acetylmorphine	100,000	Negative	Positive
Alprazolam	100,000	Negative	Positive
7-Aminoclonazepam	100,000	Negative	Positive
7-Aminoflunitrazepam	100,000	Negative	Positive
7-Aminonitrazepam	100,000	Negative	Positive
Amitriptyline	100,000	Negative	Positive
Amobarbital	100,000	Negative	Positive
S-(+)-Amphetamine	100,000	Negative	Positive
Benzylpiperazine	100,000	Negative	Positive
Bromazepam	100,000	Negative	Positive
Buprenorphine	100,000	Negative	Positive
Bupropion	100,000	Negative	Positive
Butabarbital	100,000	Negative	Positive
Butalbital	100,000	Negative	Positive
Caffeine	500,000	Negative	Positive
Cannabidiol	100,000	Negative	Positive
Cannabinol	100,000	Negative	Positive
Carbamazepine	100,000	Negative	Positive
Carisoprodol	100,000	Negative	Positive
Chlordiazepoxide	100,000	Negative	Positive
Cis-Tramadol	100,000	Negative	Positive
Clobazam	100,000	Negative	Positive
Clomipramine	100,000	Negative	Positive
Clonazepam	100,000	Negative	Positive
Clozapine	100,000	Negative	Positive
Codeine	100,000	Negative	Positive
Cotinine	100,000	Negative	Positive
Cyclobenzaprine	100,000	Negative	Positive
Dehydronorketamine	100,000	Negative	Positive

Compound	Concentration Tested (ng/mL)	Spiked EDDP Level	
		225 ng/mL (-25% Cutoff)	375 ng/mL (+25% Cutoff)
Demoxepam	100,000	Negative	Positive
Desipramine	100,000	Negative	Positive
Desalkylflurazepam	100,000	Negative	Positive
Dextromethorphan	100,000	Negative	Positive
Diazepam	100,000	Negative	Positive
Digoxin	100,000	Negative	Positive
Dihydrocodeine	100,000	Negative	Positive
Δ9 THC	100,000	Negative	Positive
Doxepin	100,000	Negative	Positive
1R,2S (-) Ephedrine	100,000	Negative	Positive
1S,2R (+) Ephedrine	100,000	Negative	Positive
Ethyl-β-D-Glucuronide	100,000	Negative	Positive
Ethylmorphine	100,000	Negative	Positive
(S-)-Fenfluramine	100,000	Negative	Positive
(R+)-Fenfluramine	100,000	Negative	Positive
Fentanyl	100,000	Negative	Positive
Flunitrazepam	100,000	Negative	Positive
Fluoxetine	100,000	Negative	Positive
Flurazepam	100,000	Negative	Positive
Haloperidol	100,000	Negative	Positive
Heroin	100,000	Negative	Positive
Hexobarbital	100,000	Negative	Positive
Hydrocodone	100,000	Negative	Positive
Hydromorphone	100,000	Negative	Positive
11-hydroxy-Δ9 THC	100,000	Negative	Positive
Ibuprofen	500,000	Negative	Positive
Imipramine	100,000	Negative	Positive
Ketamine	100,000	Negative	Positive
Lamotrigine	100,000	Negative	Positive
Levorphanol Tartrate	100,000	Negative	Positive
Lidocaine	100,000	Negative	Positive
Lorazepam	100,000	Negative	Positive
Lorazepam Glucuronide	50,000	Negative	Positive
Lormetrazepam	100,000	Negative	Positive
LSD	100,000	Negative	Positive
Maprotiline	100,000	Negative	Positive
(+)-MDA	100,000	Negative	Positive
MDEA	100,000	Negative	Positive
MDMA	100,000	Negative	Positive
Meperidine	100,000	Negative	Positive
Meprobamate	100,000	Negative	Positive
S(+)-Methamphetamine	100,000	Negative	Positive
Methaquolone	100,000	Negative	Positive
Methoxetamine	100,000	Negative	Positive
Methylone	100,000	Negative	Positive
Midazolam	100,000	Negative	Positive
Morphine	100,000	Negative	Positive

Compound	Concentration Tested (ng/mL)	Spiked EDDP Level	
		225 ng/mL (-25% Cutoff)	375 ng/mL (+25% Cutoff)
Morphine-3β-D-Glucuronide	100,000	Negative	Positive
Morphine-6β-D-Glucuronide	50,000	Negative	Positive
N-Desmethyltapentadol	100,000	Negative	Positive
Nalorphine	100,000	Negative	Positive
Naloxone	100,000	Negative	Positive
Naltrexone	100,000	Negative	Positive
Naproxen	100,000	Negative	Positive
Nitrazepam	100,000	Negative	Positive
11-nor-9-carboxy-Δ9-THC	100,000	Negative	Positive
Norbuprenorphine	50,000	Negative	Positive
Norcodeine	100,000	Negative	Positive
Nordiazepam	100,000	Negative	Positive
Norketamine	100,000	Negative	Positive
Normorphine	100,000	Negative	Positive
Norpropoxyphene	75,000	Negative	Positive
Norpseudoephedrine	100,000	Negative	Positive
Nortriptyline	100,000	Negative	Positive
Olanzapine	100,000	Negative	Positive
Oxazepam	100,000	Negative	Positive
Oxycodone	100,000	Negative	Positive
Oxymorphone	100,000	Negative	Positive
PCP	50,000	Negative	Positive
Pentazocine	100,000	Negative	Positive
Pentobarbital	100,000	Negative	Positive
Phenobarbital	100,000	Negative	Positive
Phentermine	100,000	Negative	Positive
Phenylephedrine	100,000	Negative	Positive
Phenylpropanolamine	100,000	Negative	Positive
Phenytoin	100,000	Negative	Positive
PMA	100,000	Negative	Positive
Prazepam	100,000	Negative	Positive
Propoxyphene	100,000	Negative	Positive
Propranolol	100,000	Negative	Positive
Protriptyline	100,000	Negative	Positive
R,R (+)- Pseudoephedrine	100,000	Negative	Positive
S,S (-)- Pseudoephedrine	100,000	Negative	Positive
Ranitidine	100,000	Negative	Positive
Ritalinic Acid	100,000	Negative	Positive
Salicylic Acid	100,000	Negative	Positive
Secobarbital	100,000	Negative	Positive
Sertraline	100,000	Negative	Positive
Sufentanil Citrate	50,000	Negative	Positive
Tapentadol	100,000	Negative	Positive
Temazepam	100,000	Negative	Positive
Theophylline	100,000	Negative	Positive
Thioridazine	100,000	Negative	Positive
Trazodone	100,000	Negative	Positive

Compound	Concentration Tested (ng/mL)	Spiked EDDP Level	
		225 ng/mL (-25% Cutoff)	375 ng/mL (+25% Cutoff)
Triazolam	100,000	Negative	Positive
Trifluoromethylphenylpiperazine	100,000	Negative	Positive
Trimipramine	100,000	Negative	Positive
Venlafaxine	100,000	Negative	Positive
Verapamil	100,000	Negative	Positive
Zolpidem Tartrate	100,000	Negative	Positive

Endogenous Substances – 100 ng/mL Cutoff

Interference studies were performed using CLSI EP07-A2 as a guideline. High concentrations of the following endogenous substances were added into urine spiked with EDDP (± 25% of the 100 ng/mL cutoff concentration). No interference was observed when tested with the ARK EDDP Assay in both qualitative and semiquantitative modes.

Compound	Concentration Tested	Spiked EDDP Level	
		75 ng/mL (-25% Cutoff)	125 ng/mL (+25% Cutoff)
Acetone	1000 mg/dL	Negative	Positive
Ascorbic Acid	1500 mg/dL	Negative	Positive
Bilirubin – Conjugated	2 mg/dL	Negative	Positive
Bilirubin – Unconjugated	2 mg/dL	Negative	Positive
Boric Acid	1% w/v	Negative	Positive
Creatinine	500 mg/dL	Negative	Positive
Ethanol	1000 mg/dL	Negative	Positive
Galactose	10 mg/dL	Negative	Positive
Gamma Globulin	500 mg/dL	Negative	Positive
Glucose	2000 mg/dL	Negative	Positive
Hemoglobin	300 mg/dL	Negative	Positive
Human Albumin	500 mg/dL	Negative	Positive
Oxalic Acid	100 mg/dL	Negative	Positive
Riboflavin	7.5 mg/dL	Negative	Positive
Sodium Azide	1% w/v	Negative	Positive
Sodium Chloride	6000 mg/dL	Negative	Positive
Sodium Fluoride	1% w/v	Negative	Positive
Urea	6000 mg/dL	Negative	Positive

Endogenous Substances – 300 ng/mL Cutoff

Interference studies were performed using CLSI EP07-A2 as a guideline. High concentrations of the following endogenous substances were added into urine spiked with EDDP (± 25% of the 300 ng/mL cutoff concentration). No interference was observed when tested with the ARK EDDP Assay in both qualitative and semiquantitative modes.

Compound	Concentration Tested	Spiked EDDP Level	
		225 ng/mL (-25% Cutoff)	375 ng/mL (+25% Cutoff)
Acetone	1000 mg/dL	Negative	Positive
Ascorbic Acid	1500 mg/dL	Negative	Positive
Bilirubin – Conjugated	2 mg/dL	Negative	Positive
Bilirubin – Unconjugated	2 mg/dL	Negative	Positive
Boric Acid	1% w/v	Negative	Positive
Creatinine	500 mg/dL	Negative	Positive
Ethanol	1000 mg/dL	Negative	Positive
Galactose	10 mg/dL	Negative	Positive
Gamma Globulin	500 mg/dL	Negative	Positive
Glucose	2000 mg/dL	Negative	Positive
Hemoglobin	300 mg/dL	Negative	Positive
Human Albumin	500 mg/dL	Negative	Positive
Oxalic Acid	100 mg/dL	Negative	Positive
Riboflavin	7.5 mg/dL	Negative	Positive
Sodium Azide	1% w/v	Negative	Positive
Sodium Chloride	6000 mg/dL	Negative	Positive
Sodium Fluoride	1% w/v	Negative	Positive
Urea	6000 mg/dL	Negative	Positive

Specific Gravity – 100 ng/mL Cutoff

Urine samples with specific gravity values ranging from 1.002 to 1.030 were tested in the presence of the two levels of EDDP at ± 25% of the 100 ng/mL cutoff concentration. No interference was observed when tested with the ARK EDDP Assay in both qualitative and semiquantitative modes.

Compound	Spiked EDDP Level	
	75 ng/mL (-25% Cutoff)	125 ng/mL (+25% Cutoff)
Specific Gravity 1.002	Negative	Positive
Specific Gravity 1.004	Negative	Positive
Specific Gravity 1.012	Negative	Positive
Specific Gravity 1.018	Negative	Positive
Specific Gravity 1.019	Negative	Positive
Specific Gravity 1.026	Negative	Positive
Specific Gravity 1.030	Negative	Positive

Specific Gravity – 300 ng/mL Cutoff

Urine samples with specific gravity values ranging from 1.002 to 1.030 were tested in the presence of the two levels of EDDP at ± 25% of the 300 ng/mL cutoff concentration. No interference was observed when tested with the ARK EDDP Assay in both qualitative and semiquantitative modes.

Compound	Spiked EDDP Level	
	225 ng/mL (-25% Cutoff)	375 ng/mL (+25% Cutoff)
Specific Gravity 1.002	Negative	Positive
Specific Gravity 1.004	Negative	Positive
Specific Gravity 1.012	Negative	Positive
Specific Gravity 1.018	Negative	Positive
Specific Gravity 1.019	Negative	Positive
Specific Gravity 1.026	Negative	Positive
Specific Gravity 1.030	Negative	Positive

pH – 100 ng/mL Cutoff

Urine samples with pH values from 3.0 to 11.0 were tested in the presence of the two levels of EDDP at ± 25% of the 100 ng/mL cutoff concentration. No interference was observed when tested with the ARK EDDP Assay in both qualitative and semiquantitative modes.

Compound	Spiked EDDP Level	
	75 ng/mL (-25% Cutoff)	125 ng/mL (+25% Cutoff)
Urine pH 3.0	Negative	Positive
Urine pH 4.0	Negative	Positive
Urine pH 5.0	Negative	Positive
Urine pH 6.0	Negative	Positive
Urine pH 7.0	Negative	Positive
Urine pH 8.0	Negative	Positive
Urine pH 9.0	Negative	Positive
Urine pH 10.0	Negative	Positive
Urine pH 11.0	Negative	Positive

pH – 300 ng/mL Cutoff

Urine samples with pH values from 3.0 to 11.0 were tested in the presence of the two levels of EDDP at ± 25% of the 300 ng/mL cutoff concentration. No interference was observed when tested with the ARK EDDP Assay in both qualitative and semiquantitative modes.

Compound	Spiked EDDP Level	
	225 ng/mL (-25% Cutoff)	375 ng/mL (+25% Cutoff)
Urine pH 3.0	Negative	Positive
Urine pH 4.0	Negative	Positive
Urine pH 5.0	Negative	Positive
Urine pH 6.0	Negative	Positive
Urine pH 7.0	Negative	Positive
Urine pH 8.0	Negative	Positive
Urine pH 9.0	Negative	Positive
Urine pH 10.0	Negative	Positive
Urine pH 11.0	Negative	Positive

Method Comparison

A total of one hundred nine (109) unaltered clinical human urine specimens that are not individually identifiable were analyzed for EDDP at the two cutoff levels with the ARK EDDP Assay in both qualitative and semiquantitative modes and the results were compared to GC/MS. The GC/MS confirmatory method was performed by a licensed reference laboratory. Results are summarized in the tables below.

Method Comparison – 100 ng/mL Cutoff

ARK Immunoassay Result	Low Negative Less than 50% below the Cutoff (< 50 ng/mL by GC/MS)	Near Cutoff Negative Between 50% below the Cutoff and the Cutoff (50 – 99 ng/mL by GC/MS)	Near Cutoff Positive Between the Cutoff and 50% above the Cutoff (100 – 150 ng/mL by GC/MS)	High Positive Greater than 50% above the Cutoff (> 150 ng/mL by GC/MS)
Negative	40	5	0	0
Positive	0	0	4	60

Method Comparison – 300 ng/mL Cutoff

ARK Immunoassay Result	Low Negative Less than 50% below the Cutoff (< 150 ng/mL by GC/MS)	Near Cutoff Negative Between 50% below the Cutoff and the Cutoff (150 – 299 ng/mL by GC/MS)	Near Cutoff Positive Between the Cutoff and 50% above the Cutoff (300 – 450 ng/mL by GC/MS)	High Positive Greater than 50% above the Cutoff (> 450 ng/mL by GC/MS)
Negative	49	4	0	0
Positive	0	1*	3	52

*Discordant Result

Sample ID Number	ARK Immunoassay Result	EDDP (ng/mL by GC/MS)
51	Positive	294

Traceability and Value Assignment

ARK EDDP Calibrators and Controls are prepared by volumetric dilution of high purity EDDP (certified solution traceable to HPLC) into non-sterile, processed human urine free of EDDP. Testing is performed with the ARK EDDP Assay on the Beckman Coulter AU680 automated clinical chemistry analyzer, calibrated with the ARK EDDP Calibrator.

Calibration Curve Stability

A stored calibration curve was effective up to at least 15 days based on supporting data. Calibration curve stability may depend on individual laboratory performance.

807.92 (b)(3): Conclusions from Nonclinical Testing

As summarized above, the ARK EDDP Assay is substantially equivalent to the legally marketed predicate device, Immunalysis EDDP Specific Urine Enzyme Immunoassay (K151395).