

**510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
ASSAY ONLY TEMPLATE**

A. 510(k) Number:

K151395

B. Purpose for Submission:

New device

C. Measurand:

EDDP (2-ethylidene-1,5-dimethyl-3,3-diphenylpyrrolidine)

D. Type of Test:

Homogenous Enzyme Immunoassay, Qualitative and Semi-quantitative.

E. Applicant:

Immunoanalysis Corporation

F. Proprietary and Established Names:

Immunoanalysis EDDP Specific Urine Enzyme Immunoassay
Immunoanalysis EDDP Urine Calibrators
Immunoanalysis EDDP Urine Control Sets

G. Regulatory Information:

1. Regulation section:

21 CFR 862.3620, Enzyme Immunoassay, Methadone
21 CFR 862.3200, Calibrator, Drug Specific
21 CFR 862.3280, Drug Specific Control Materials

2. Classification:

Class II
Class I, reserved

3. Product code:

DJR
DLJ
LAS

4. Panel:

Toxicology (91)

H. Intended Use:

1. Intended use(s):

See Indications for use below.

2. Indication(s) for use:

Immunoassay EDDP Specific Urine Enzyme Immunoassay

The Immunoassay EDDP Specific Urine Enzyme Immunoassay is a homogeneous enzyme immunoassay with cutoffs of 100ng/mL, 300ng/mL and 1000ng/mL. The assay is intended for use in laboratories for the qualitative and semiquantitative analysis of EDDP in human urine with automated clinical chemistry analyzers. The 100ng/mL and 300ng/mL cutoff is for qualitative and semi-quantitative analysis. The 1000ng/mL cutoff is for qualitative analysis only. This assay is calibrated against EDDP. This in-vitro device is for prescription use only.

The semi-quantitative mode is for purposes of enabling laboratories to determine an appropriate dilution of the specimen for confirmation by a confirmatory method such as GC-MS or permitting laboratories to establish quality control procedures.

The Immunoassay EDDP Specific Urine Enzyme Immunoassay Kit 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) or Liquid Chromatography/Tandem Mass Spectrometry (LC-MS/MS) is the preferred confirmatory method. Clinical consideration and professional judgment should be applied to any drug of abuse test result, particularly when preliminary positive results are used.

Immunoassay EDDP Urine Control Sets

The Immunoassay EDDP Urine Control Sets are used as control materials in Immunoassay EDDP Specific Urine Enzyme Immunoassay.

Immunoassay EDDP Urine Calibrators

The Immunoassay EDDP Urine Calibrators are used as calibrators in the Immunoassay EDDP Specific Urine Enzyme Immunoassay for the qualitative and semi-quantitative determination of EDDP in urine on automated clinical chemistry analyzers.

3. Special conditions for use statement(s):

For prescription use only.

Not for use in Point of Care settings.

4. Special instrument requirements:

Beckman Coulter AU 400e chemistry analyzer was used to generate data for this submission.

Automated clinical chemistry analyzers capable of maintaining a constant reaction temperature, pipetting samples and reagents, mixing reagents, timing reactions and measuring enzyme rates at 340nm can be used for the assay.

I. Device Description:

Immunoassay EDDP Specific Urine Enzyme Immunoassay (EIA) Kit includes antibody/ substrate reagent and enzyme conjugate reagent.

- Antibody/ substrate reagent includes recombinant fab antibodies to EDDP, glucose-6-phosphate (G6P) and nicotinamide adenine dinucleotide (NAD) in Tris buffer with

Sodium Azide as a preservative.

- Enzyme conjugate reagent includes EDDP derivative labeled with glucose-6-phosphate dehydrogenase (G6PDH) in Tris buffer with Sodium Azide as a preservative.

Calibrators and controls are sold as individual bottles. The EDDP calibrators and control sets consist of:

- Negative Calibrator – a processed, drug-free synthetic urine matrix with sodium azide as a preservative.
- Immunalysis EDDP Urine Calibrator – Level 1 containing 100ng/mL of EDDP
- Immunalysis EDDP Urine Calibrator – Level 2 containing 300ng/mL of EDDP
- Immunalysis EDDP Urine Calibrator – Level 3 containing 500ng/mL of EDDP
- Immunalysis EDDP Urine Calibrator – Level 4 containing 1000ng/mL of EDDP
- Immunalysis EDDP Urine Control Set 1 containing LOW (75ng/mL) and HIGH (125ng/mL) controls for a cutoff of 100ng/mL of EDDP
- Immunalysis EDDP Urine Control Set 2 containing LOW (225ng/mL) and HIGH (375ng/mL) controls for a cutoff of 300ng/mL of EDDP
- Immunalysis EDDP Urine Control Set 3 containing LOW (750ng/mL) and HIGH (1250ng/mL) controls for a cutoff of 1000ng/mL of EDDP

All calibrator and control solutions are prepared from drug-free synthetic urine matrix and commercially available, DEA exempt, EDDP drug standard obtained from a commercial sources.

All reagents are sold in liquid form and ready to use.

J. Substantial Equivalence Information:

1. Predicate device name(s):

DRI® Methadone Metabolite Enzyme Assay
DRI® Methadone Metabolite Urine Calibrators and Controls

2. Predicate 510(k) number(s):

K023617

3. Comparison with predicate:

Item	Immunoanalysis EDDP Specific Urine Enzyme Immunoassay (Candidate Device)	DRI® Methadone Metabolite Enzyme Immunoassay, k023617 (Predicate Device)
Intended use	For the qualitative and semi-quantitative determination of the presence of EDDP in human urine. For in vitro diagnostic use.	Same
Measured analyte(s)	EDDP	Same
Assay cutoff	100ng/mL, 300ng/mL and 1000ng/mL of EDDP	300ng/mL and 1000ng/mL of EDDP
Assay calibrated against	EDDP	Same
Test system type	Homogenous enzyme immunoassay	Same
Antibody type	Recombinant fab antibodies to EDDP	Mouse monoclonal antibodies to EDDP
Storage conditions	2 - 8°C until expiration date	Same
Calibrator form	Liquid	Same
Calibrator levels	0, 100, 300, 500 and 1000 ng/mL of EDDP	0, 150, 300, 500, 1000, 1500 and 2000 ng/mL of EDDP
Control set levels	For 100 ng/mL cutoff, the set contains 75 ng/mL and 125 ng/mL level of EDDP. For 300 ng/mL cutoff, the set contains 225 ng/mL and 375 ng/mL level of EDDP. For 1000 ng/mL cutoff, the set contains 750 ng/mL and 1250 ng/mL level of EDDP.	For 1000 ng/mL cutoff, the set contains 750 ng/mL and 1250 ng/mL level of EDDP. For 300 ng/mL cutoff, the calibrators at 150 ng/mL and 500 ng/mL levels of EDDP are used as controls.

K. Standard/Guidance Document Referenced (if applicable):

- CLSI EP5-A2: Evaluation of Precision Performance of Quantitative Measurement Methods.
- CLSI EP7-A2: Interference Testing in Clinical Chemistry

L. Test Principle:

The assay is based on the competition of EDDP labeled enzyme glucose-6-phosphate dehydrogenase (G6PDH) and the free EDDP in the urine sample for the fixed amount of antibody binding sites. In the absence of the free EDDP in the urine sample, the antibody (recombinant antibody) binds the EDDP enzyme conjugate and enzyme activity is inhibited. This creates a dose response relationship between EDDP concentration in the urine and enzyme activity. The enzyme G6PDH activity is determined at 340 nm spectrophotometrically by the conversion of NAD to NADH.

M. Performance Characteristics (if/when applicable):

All the performance studies were performed on the Beckman Coulter AU 400e chemistry analyzer.

1. Analytical performance:

NOTE: the 1000 ng/mL cutoff is for qualitative analysis only.

a. *Precision/Reproducibility:*

A precision study was performed by one experienced operator following the CLSI (EP5-A2) precision guidelines. Drug free negative urine was spiked with EDDP to concentrations representing 0, 25, 50, 75, 100, 125, 150, 175 and 200% of the device cutoff (100ng/mL, 300ng/mL and 1000ng/mL). Each level sample was tested in duplicate per run, two runs per day for twenty days (total N= 80/level) on the Beckman Coulter AU 400e chemistry analyzer. The results are summarized in the table below:

Qualitative Precision Result for 100ng/mL cutoff:

Concentration as % of the Cutoff Level	Target EDDP concentration (ng/mL)	Immunoanalysis EDDP Urine EIA # Neg / # Pos
0	0	80 Neg / 0 Pos
25	25	80 Neg / 0 Pos
50	50	80 Neg / 0 Pos
75	75	80 Neg / 0 Pos
100	100	43 Neg / 37 Pos
125	125	0 Neg / 80 Pos
150	150	0 Neg / 80 Pos
175	175	0 Neg / 80 Pos
200	200	0 Neg / 80 Pos

Qualitative Precision Result for 300ng/mL cutoff:

Concentration as % of the Cutoff Level	Target EDDP concentration (ng/mL)	Immunoanalysis EDDP Urine EIA # Neg / # Pos
0	0	80 Neg / 0 Pos
25	75	80 Neg / 0 Pos
50	150	80 Neg / 0 Pos
75	225	80 Neg / 0 Pos
100	300	40 Neg / 40 Pos
125	375	0 Neg / 80 Pos
150	450	0 Neg / 80 Pos
175	525	0 Neg / 80 Pos
200	600	0 Neg / 80 Pos

Qualitative Precision Result for 1000ng/mL cutoff:

Concentration as % of the Cutoff Level	Target EDDP concentration (ng/mL)	Immunoanalysis EDDP Urine EIA # Neg / # Pos
0	0	80 Neg / 0 Pos
25	250	80 Neg / 0 Pos
50	500	80 Neg / 0 Pos
75	750	80 Neg / 0 Pos
100	1000	46 Neg / 34 Pos
125	1250	0 Neg / 80 Pos
150	1500	0 Neg / 80 Pos
175	1750	0 Neg / 80 Pos
200	2000	0 Neg / 80 Pos

Semi-Quantitative Precision Result for 100ng/mL cutoff:

Concentration as % of the Cutoff Level	Target EDDP concentration (ng/mL)	Immunoanalysis EDDP Urine EIA # Neg / # Pos
0	0	80 Neg / 0 Pos
25	25	80 Neg / 0 Pos
50	50	80 Neg / 0 Pos
75	75	80 Neg / 0 Pos
100	100	10 Neg / 70 Pos
125	125	0 Neg / 80 Pos
150	150	0 Neg / 80 Pos
175	175	0 Neg / 80 Pos
200	200	0 Neg / 80 Pos

Semi-Quantitative Precision Result for 300ng/mL cutoff:

Concentration as % of the Cutoff Level	Target EDDP concentration (ng/mL)	Immunoanalysis EDDP Urine EIA # Neg / # Pos
0	0	80 Neg / 0 Pos
25	75	80 Neg / 0 Pos
50	150	80 Neg / 0 Pos
75	225	80 Neg / 0 Pos
100	300	13 Neg / 67 Pos
125	375	0 Neg / 80 Pos
150	450	0 Neg / 80 Pos
175	525	0 Neg / 80 Pos
200	600	0 Neg / 80 Pos

b. Linearity/assay reportable range:

Linearity study in the semi-quantitative mode was conducted by spiking drug free urine pool with EDDP (serial dilutions of a high concentration EDDP in urine in increments of 10%) to achieve concentrations ranging from 0ng/mL to 1100ng/mL, and testing each level in triplicate on the Beckman Coulter AU 400e clinical

chemistry analyzer. The results of the linearity/recovery study are summarized below:

Expected Concentration (ng/mL)	Mean Concentration (ng/mL)	Recovery (%)
0	2.3	N/A
100	109.5	109.5
200	203.8	101.9
300	292.7	97.6
400	413.4	103.4
500	492.2	98.4
600	638.0	106.3
700	746.0	106.6
800	833.7	104.2
900	926.1	102.9
1000	980.0	98.0
1100	1037.8	94.3

c. Traceability, Stability, Expected values (controls, calibrators, or methods):

Traceability

Calibrators and controls are prepared from a standard solution of EDDP purchased from a commercial vendor. This standard solution is diluted with drug-free synthetic urine matrix to make the three control sets of low and high controls, and calibrator set (of 5 level calibrators). The concentrations of the prepared solutions are confirmed by GC/MS or LC/MS/MS.

Value Assignment – Calibrators and Controls

A commercially available standard solution of EDDP is mixed with a commercially available drug-free synthetic urine matrix to the desired calculated concentrations for the LOW and HIGH controls for the three cutoffs and the calibrators. The calibrators and controls are tested by GC/MS or LC/MS/MS. Values are assigned to the controls once the GC/MS or LC/MS/MS results are within acceptable ranges. The negative standard is prepared with the drug-free synthetic urine matrix. The negative standard

is compared to a reference negative standard to ensure that it is free of EDDP. Value is assigned when the test result is within the acceptable range. Acceptance criteria for value assignment were reviewed and deemed acceptable.

Calibrators and Controls Stability Studies

Accelerated and real-time stability studies in the qualitative and semi-quantitative modes were conducted on multiple lots of Immunalysis EDDP Urine Controls and Immunalysis EDDP Urine Calibrators. The stability protocols and acceptance criteria for open and closed vial were reviewed and found acceptable. The open vial and closed vial study results support the open vial stability claim of twelve months and closed vial stability claim of twelve months when stored at 2 to 8 °C for the Immunalysis EDDP Urine Controls and Immunalysis EDDP Urine Calibrators.

d. Detection limit:

Not applicable.

e. Analytical specificity:

The sponsor performed studies at all claimed cutoffs in both qualitative and semi-quantitative modes to evaluate the cross-reactivity of compounds that are structurally related to EDDP. Results are summarized below:

Structurally Related Compounds at 100 ng/mL cutoff - Qualitative		
Compound	Concentration Tested (ng/mL)	Cross-reactivity (%)
EDDP	100	100
Methadone	700,000	0.01
EMDP	1,000,000	<0.01
Chlorpromazine	90,000	0.11
Diphenhydramine	1,000,000	0.01
Methylphenidate	100,000	0.10
Doxylamine	1,000,000	<0.01
LAAM	1,000,000	<0.01
(±)-alpha methadol	1,000,000	0.01
(-)-iso-methadone	100,000	<0.1

Structurally Related Compounds at 300 ng/mL cutoff - Qualitative		
Compound	Concentration Tested (ng/mL)	Cross-reactivity (%)
EDDP	300	100
Methadone	1,000,000	<0.03
EMDP	1,000,000	<0.03
Chlorpromazine	300,000	0.1
Diphenhydramine	1,000,000	<0.03
Methylphenidate	360,000	0.08
Doxylamine	1,000,000	<0.03
LAAM	1,000,000	<0.03

(±)-alpha methadol	1,000,000	<0.03
(-)-iso-methadone	100,000	<0.3
Structurally Related Compounds at 1000 ng/mL cutoff - Qualitative		
Compound	Concentration Tested (ng/mL)	Cross-reactivity (%)
EDDP	1000	100
Methadone	1,000,000	<0.01
EMDP	1,000,000	<0.01
Chlorpromazine	1,000,000	<0.01
Diphenhydramine	1,000,000	<0.01
Methylphenidate	1,000,000	<0.01
Doxylamine	1,000,000	<0.01
LAAM	1,000,000	<0.01
(±)-alpha methadol	1,000,000	<0.01
(-)-iso-methadone	100,000	<1.0

Structurally Related Compounds at 100 ng/mL cutoff – Semi-quantitative		
Compound	Concentration Tested (ng/mL)	Cross-reactivity (%)
EDDP	100	100
Methadone	700,000	0.01
EMDP	1,000,000	<0.01
Chlorpromazine	90,000	0.11
Diphenhydramine	1,000,000	0.01
Methylphenidate	100,000	0.10
Doxylamine	1,000,000	<0.01
LAAM	1,000,000	<0.01
(±)-alpha methadol	1,000,000	0.01
(-)-iso-methadone	100,000	<0.1

Structurally Related Compounds at 300 ng/mL cutoff – Semi-quantitative		
Compound	Concentration Tested (ng/mL)	Cross-reactivity (%)
EDDP	300	100
Methadone	1,000,000	<0.03
EMDP	1,000,000	<0.03
Chlorpromazine	300,000	0.1
Diphenhydramine	1,000,000	<0.03
Methylphenidate	360,000	0.08
Doxylamine	1,000,000	<0.03
LAAM	1,000,000	<0.03
(±)-alpha methadol	1,000,000	<0.03
(-)-iso-methadone	100,000	<0.3

Potential interference from non-structurally related drugs and metabolites was evaluated in the qualitative and semi-quantitative modes by spiking these compounds into drug free urine containing EDDP at $\pm 25\%$ of the cutoff (75ng/mL and 125ng/mL for the 100ng/mL cutoff, 225ng/mL and 375ng/mL for the 300ng/mL or 750ng/mL and 1,250ng/mL for the 1,000ng/mL cutoff). The results were the same for the qualitative and semi-quantitative modes and are summarized below:

Non - Structurally Related Compounds at 100 ng/mL cutoff			
Compound	Concentration Tested (ng/mL)	-25% Cutoff	+25% Cutoff
		Result	Result
Acetylsalicylic Acid	500,000	Neg	Pos
6-Acetylcodeine	100,000	Neg	Pos
6-Acetylmorphine	100,000	Neg	Pos
Alprazolam	100,000	Neg	Pos
7-Aminoclonazepam	100,000	Neg	Pos
7-Aminoflunitrazepam	100,000	Neg	Pos
7-Aminonitrazepam	100,000	Neg	Pos
Amitriptyline	100,000	Neg	Pos
Amobarbital	100,000	Neg	Pos
S-(+)-Amphetamine	100,000	Neg	Pos
Benzylpiperazine	100,000	Neg	Pos
Bromazepam	100,000	Neg	Pos
Buprenorphine	100,000	Neg	Pos
Bupropion	100,000	Neg	Pos
Butabarbital	100,000	Neg	Pos
Butalbital	100,000	Neg	Pos
Caffeine	500,000	Neg	Pos
Cannabidiol	100,000	Neg	Pos
Cannabinol	75,000	Neg	Pos
Carbamazepine	100,000	Neg	Pos
Carisoprodol	100,000	Neg	Pos
Chlordiazepoxide	100,000	Neg	Pos
cis-Tramadol	100,000	Neg	Pos
Clobazam	100,000	Neg	Pos
Clomipramine	50,000	Neg	Pos
Clonazepam	100,000	Neg	Pos
Clozapine	100,000	Neg	Pos
Codeine	100,000	Neg	Pos
Cotinine	100,000	Neg	Pos
Cyclobenzaprine	100,000	Neg	Pos
Dehydronorketamine	100,000	Neg	Pos
Demoxepam	100,000	Neg	Pos
Desipramine	30,000	Neg	Pos
Desalkylflurazepam	100,000	Neg	Pos

Dextromethorphan	100,000	Neg	Pos
Diazepam	100,000	Neg	Pos
Digoxin	100,000	Neg	Pos
Dihydrocodeine	100,000	Neg	Pos
Δ^9 THC	100,000	Neg	Pos
Doxepin	100,000	Neg	Pos
1R,2S (-) Ephedrine	100,000	Neg	Pos
1S,2R (+) Ephedrine	100,000	Neg	Pos
Ethyl- β -D-Glucuronide	100,000	Neg	Pos
Ethylmorphine	100,000	Neg	Pos
Fenfluramine	100,000	Neg	Pos
Fentanyl	100,000	Neg	Pos
Flunitrazepam	100,000	Neg	Pos
Fluoxetine	100,000	Neg	Pos
Flurazepam	100,000	Neg	Pos
Haloperidol	100,000	Neg	Pos
Heroin	100,000	Neg	Pos
Hexobarbital	100,000	Neg	Pos
Hydrocodone	100,000	Neg	Pos
Hydromorphone	100,000	Neg	Pos
11-hydroxy- Δ^9 THC	100,000	Neg	Pos
Ibuprofen	500,000	Neg	Pos
Imipramine	50,000	Neg	Pos
Ketamine	100,000	Neg	Pos
Lamotrigine	100,000	Neg	Pos
Levorphanol Tartrate	100,000	Neg	Pos
Lidocaine	100,000	Neg	Pos
Lorazepam	100,000	Neg	Pos
Lorazepam Glucuronide	50,000	Neg	Pos
Lormetazepam	100,000	Neg	Pos
LSD	100,000	Neg	Pos
Maprotiline	100,000	Neg	Pos
(+)-MDA	100,000	Neg	Pos
MDEA	100,000	Neg	Pos
MDMA	100,000	Neg	Pos
Meperidine	50,000	Neg	Pos
Meprobamate	100,000	Neg	Pos
S(+)-Methamphetamine	100,000	Neg	Pos
Methaqualone	100,000	Neg	Pos
Methoxetamine	100,000	Neg	Pos
Methylone	100,000	Neg	Pos
Midazolam	100,000	Neg	Pos
Morphine	100,000	Neg	Pos
Morphine-3 β -D-Glucuronide	100,000	Neg	Pos
Morphine-6 β -D-Glucuronide	50,000	Neg	Pos

N-Desmethyltapentadol	100,000	Neg	Pos
Nalorphine	100,000	Neg	Pos
Naloxone	100,000	Neg	Pos
Naltrexone	100,000	Neg	Pos
Naproxen	100,000	Neg	Pos
Nitrazepam	100,000	Neg	Pos
11-nor-9-carboxy - Δ 9-THC	100,000	Neg	Pos
Norbuprenorphine	50,000	Neg	Pos
Norcodeine	100,000	Neg	Pos
Nordiazepam	100,000	Neg	Pos
Norketamine	100,000	Neg	Pos
Normorphine	100,000	Neg	Pos
Norproxyphene	100,000	Neg	Pos
Norpseudoephedrine	100,000	Neg	Pos
Nortriptyline	100,000	Neg	Pos
Olanzapine	100,000	Neg	Pos
Oxazepam	100,000	Neg	Pos
Oxycodone	100,000	Neg	Pos
Oxymorphone	100,000	Neg	Pos
PCP	50,000	Neg	Pos
Pentazocine	100,000	Neg	Pos
Pentobarbital	100,000	Neg	Pos
Phenobarbital	100,000	Neg	Pos
Phentermine	100,000	Neg	Pos
Phenylephedrine	100,000	Neg	Pos
Phenylpropanolamine	100,000	Neg	Pos
Phenytoin	100,000	Neg	Pos
PMA	100,000	Neg	Pos
Prazepam	100,000	Neg	Pos
Propoxyphene	100,000	Neg	Pos
Propranolol	100,000	Neg	Pos
Protriptyline	100,000	Neg	Pos
R,R (+)- Pseudoephedrine	100,000	Neg	Pos
S,S (-)- Pseudoephedrine	100,000	Neg	Pos
Ranitidine	100,000	Neg	Pos
Ritalinic Acid	100,000	Neg	Pos
Salicylic Acid	100,000	Neg	Pos
Secobarbital	100,000	Neg	Pos
Sertraline	100,000	Neg	Pos
Sufentanil Citrate	50,000	Neg	Pos
Tapentadol	100,000	Neg	Pos
Temazepam	100,000	Neg	Pos
Theophylline	100,000	Neg	Pos
Thioridazine	30,000	Neg	Pos
Trazodone	100,000	Neg	Pos

Triazolam	100,000	Neg	Pos
Trifluoromethylphenyl-piperazine	100,000	Neg	Pos
Trimipramine	100,000	Neg	Pos
Venlafaxine	100,000	Neg	Pos
Verapamil	100,000	Neg	Pos
Zolpidem Tartrate	100,000	Neg	Pos

Non - Structurally Related Compounds at 300 ng/mL cutoff			
Compound	Concentration Tested (ng/mL)	-25% Cutoff	+25% Cutoff
		Result	Result
4-bromo 2-5, dimethoxyphenethylamine	100,000	Neg	Pos
Acetaminophen	500,000	Neg	Pos
Acetylsalicylic Acid	500,000	Neg	Pos
6-Acetylcodeine	100,000	Neg	Pos
6-Acetylmorphine	100,000	Neg	Pos
Alprazolam	100,000	Neg	Pos
7-Aminoclonazepam	100,000	Neg	Pos
7-Aminoflunitrazepam	100,000	Neg	Pos
7-Aminonitrazepam	100,000	Neg	Pos
Amitriptyline	100,000	Neg	Pos
Amobarbital	100,000	Neg	Pos
S-(+)-Amphetamine	100,000	Neg	Pos
Benzylpiperazine	100,000	Neg	Pos
Bromazepam	100,000	Neg	Pos
Buprenorphine	100,000	Neg	Pos
Bupropion	100,000	Neg	Pos
Butabarbital	100,000	Neg	Pos
Butalbital	100,000	Neg	Pos
Caffeine	500,000	Neg	Pos
Cannabidiol	100,000	Neg	Pos
Cannabinol	100,000	Neg	Pos
Carbamazepine	100,000	Neg	Pos
Carisoprodol	100,000	Neg	Pos
Chlordiazepoxide	100,000	Neg	Pos
cis-Tramadol	100,000	Neg	Pos
Clobazam	100,000	Neg	Pos
Clomipramine	100,000	Neg	Pos
Clonazepam	100,000	Neg	Pos
Clozapine	100,000	Neg	Pos
Codeine	100,000	Neg	Pos
Cotinine	100,000	Neg	Pos
Cyclobenzaprine	100,000	Neg	Pos

Dehydronorketamine	100,000	Neg	Pos
Demoxepam	100,000	Neg	Pos
Desipramine	100,000	Neg	Pos
Desalkylflurazepam	100,000	Neg	Pos
Dextromethorphan	100,000	Neg	Pos
Diazepam	100,000	Neg	Pos
Digoxin	100,000	Neg	Pos
Dihydrocodeine	100,000	Neg	Pos
Δ^9 THC	100,000	Neg	Pos
Doxepin	100,000	Neg	Pos
1R,2S (-) Ephedrine	100,000	Neg	Pos
1S,2R (+) Ephedrine	100,000	Neg	Pos
Ethyl- β -D-Glucuronide	100,000	Neg	Pos
Ethylmorphine	100,000	Neg	Pos
Fenfluramine	100,000	Neg	Pos
Fentanyl	100,000	Neg	Pos
Flunitrazepam	100,000	Neg	Pos
Fluoxetine	100,000	Neg	Pos
Flurazepam	100,000	Neg	Pos
Haloperidol	100,000	Neg	Pos
Heroin	100,000	Neg	Pos
Hexobarbital	100,000	Neg	Pos
Hydrocodone	100,000	Neg	Pos
Hydromorphone	100,000	Neg	Pos
11-hydroxy- Δ^9 THC	100,000	Neg	Pos
Ibuprofen	500,000	Neg	Pos
Imipramine	100,000	Neg	Pos
Ketamine	100,000	Neg	Pos
Lamotrigine	100,000	Neg	Pos
Levorphanol Tartrate	100,000	Neg	Pos
Lidocaine	100,000	Neg	Pos
Lorazepam	100,000	Neg	Pos
Lorazepam Glucuronide	50,000	Neg	Pos
Lormetazepam	100,000	Neg	Pos
LSD	100,000	Neg	Pos
Maprotiline	100,000	Neg	Pos
(+)-MDA	100,000	Neg	Pos
MDEA	100,000	Neg	Pos
MDMA	100,000	Neg	Pos
Meperidine	100,000	Neg	Pos
Meprobamate	100,000	Neg	Pos
S(+)-Methamphetamine	100,000	Neg	Pos
Methaqualone	100,000	Neg	Pos
Methoxetamine	100,000	Neg	Pos
Methylone	100,000	Neg	Pos

Midazolam	100,000	Neg	Pos
Morphine	100,000	Neg	Pos
Morphine-3 β -D-Glucuronide	100,000	Neg	Pos
Morphine-6 β -D-Glucuronide	50,000	Neg	Pos
N-Desmethyltapentadol	100,000	Neg	Pos
Nalorphine	100,000	Neg	Pos
Naloxone	100,000	Neg	Pos
Naltrexone	100,000	Neg	Pos
Naproxen	100,000	Neg	Pos
Nitrazepam	100,000	Neg	Pos
11-nor-9-carboxy - Δ 9-THC	100,000	Neg	Pos
Norbuprenorphine	50,000	Neg	Pos
Norcodeine	100,000	Neg	Pos
Nordiazepam	100,000	Neg	Pos
Norketamine	100,000	Neg	Pos
Normorphine	100,000	Neg	Pos
Norproxyphene	100,000	Neg	Pos
Norpseudoephedrine	100,000	Neg	Pos
Nortriptyline	100,000	Neg	Pos
Olanzapine	100,000	Neg	Pos
Oxazepam	100,000	Neg	Pos
Oxycodone	100,000	Neg	Pos
Oxymorphone	100,000	Neg	Pos
PCP	100,000	Neg	Pos
Pentazocine	100,000	Neg	Pos
Pentobarbital	100,000	Neg	Pos
Phenobarbital	100,000	Neg	Pos
Phentermine	100,000	Neg	Pos
Phenylephedrine	100,000	Neg	Pos
Phenylpropanolamine	100,000	Neg	Pos
Phenytoin	100,000	Neg	Pos
PMA	100,000	Neg	Pos
Prazepam	100,000	Neg	Pos
Propoxyphene	100,000	Neg	Pos
Propranolol	100,000	Neg	Pos
Protriptyline	100,000	Neg	Pos
R,R (+)- Pseudoephedrine	100,000	Neg	Pos
S,S (-)- Pseudoephedrine	100,000	Neg	Pos
Ranitidine	100,000	Neg	Pos
Ritalinic Acid	100,000	Neg	Pos
Salicylic Acid	100,000	Neg	Pos
Secobarbital	100,000	Neg	Pos
Sertraline	100,000	Neg	Pos
Sufentanil Citrate	50,000	Neg	Pos
Tapentadol	100,000	Neg	Pos

Temazepam	100,000	Neg	Pos
Theophylline	100,000	Neg	Pos
Thioridazine	30,000	Neg	Pos
Trazodone	100,000	Neg	Pos
Triazolam	100,000	Neg	Pos
Trifluoromethylphenyl-piperazine	100,000	Neg	Pos
Trimipramine	100,000	Neg	Pos
Venlafaxine	100,000	Neg	Pos
Verapamil	100,000	Neg	Pos
Zolpidem Tartrate	100,000	Neg	Pos

Non - Structurally Related Compounds at 1000 ng/mL cutoff			
Compound	Concentration Tested (ng/mL)	-25% Cutoff	+25% Cutoff
		Result	Result
4-bromo 2-5, dimethoxyphenethylamine	100,000	Neg	Pos
Acetaminophen	500,000	Neg	Pos
Acetylsalicylic Acid	500,000	Neg	Pos
6-Acetylcodeine	100,000	Neg	Pos
6-Acetylmorphine	100,000	Neg	Pos
Alprazolam	100,000	Neg	Pos
7-Aminoclonazepam	100,000	Neg	Pos
7-Aminoflunitrazepam	100,000	Neg	Pos
7-Aminonitrazepam	100,000	Neg	Pos
Amitriptyline	100,000	Neg	Pos
Amobarbital	100,000	Neg	Pos
S-(+)-Amphetamine	100,000	Neg	Pos
Benzylpiperazine	100,000	Neg	Pos
Bromazepam	100,000	Neg	Pos
Buprenorphine	100,000	Neg	Pos
Bupropion	100,000	Neg	Pos
Butabarbital	100,000	Neg	Pos
Butalbital	100,000	Neg	Pos
Caffeine	500,000	Neg	Pos
Cannabidiol	100,000	Neg	Pos
Cannabinol	100,000	Neg	Pos
Carbamazepine	100,000	Neg	Pos
Carisoprodol	100,000	Neg	Pos
Chlordiazepoxide	100,000	Neg	Pos
cis-Tramadol	100,000	Neg	Pos
Clobazam	100,000	Neg	Pos
Clomipramine	100,000	Neg	Pos
Clonazepam	100,000	Neg	Pos

Clozapine	100,000	Neg	Pos
Codeine	100,000	Neg	Pos
Cotinine	100,000	Neg	Pos
Cyclobenzaprine	100,000	Neg	Pos
Dehydronorketamine	100,000	Neg	Pos
Demoxepam	100,000	Neg	Pos
Desipramine	100,000	Neg	Pos
Desalkylflurazepam	100,000	Neg	Pos
Dextromethorphan	100,000	Neg	Pos
Diazepam	100,000	Neg	Pos
Digoxin	100,000	Neg	Pos
Dihydrocodeine	100,000	Neg	Pos
Δ^9 THC	100,000	Neg	Pos
Doxepin	100,000	Neg	Pos
1R,2S (-) Ephedrine	100,000	Neg	Pos
1S,2R (+) Ephedrine	100,000	Neg	Pos
Ethyl- β -D-Glucuronide	100,000	Neg	Pos
Ethylmorphine	100,000	Neg	Pos
Fenfluramine	100,000	Neg	Pos
Fentanyl	100,000	Neg	Pos
Flunitrazepam	100,000	Neg	Pos
Fluoxetine	100,000	Neg	Pos
Flurazepam	100,000	Neg	Pos
Haloperidol	100,000	Neg	Pos
Heroin	100,000	Neg	Pos
Hexobarbital	100,000	Neg	Pos
Hydrocodone	100,000	Neg	Pos
Hydromorphone	100,000	Neg	Pos
11-hydroxy- Δ^9 THC	100,000	Neg	Pos
Ibuprofen	500,000	Neg	Pos
Imipramine	100,000	Neg	Pos
Ketamine	100,000	Neg	Pos
Lamotrigine	100,000	Neg	Pos
Levorphanol Tartrate	100,000	Neg	Pos
Lidocaine	100,000	Neg	Pos
Lorazepam	100,000	Neg	Pos
Lorazepam Glucuronide	50,000	Neg	Pos
Lormetazepam	100,000	Neg	Pos
LSD	100,000	Neg	Pos
Maprotiline	100,000	Neg	Pos
(+)-MDA	100,000	Neg	Pos
MDEA	100,000	Neg	Pos
MDMA	100,000	Neg	Pos
Meperidine	100,000	Neg	Pos
Meprobamate	100,000	Neg	Pos

S(+)-Methamphetamine	100,000	Neg	Pos
Methaqualone	100,000	Neg	Pos
Methoxetamine	100,000	Neg	Pos
Methylone	100,000	Neg	Pos
Midazolam	100,000	Neg	Pos
Morphine	100,000	Neg	Pos
Morphine-3 β -D-Glucuronide	100,000	Neg	Pos
Morphine-6 β -D-Glucuronide	50,000	Neg	Pos
N-Desmethyltapentadol	100,000	Neg	Pos
Nalorphine	100,000	Neg	Pos
Naloxone	100,000	Neg	Pos
Naltrexone	100,000	Neg	Pos
Naproxen	100,000	Neg	Pos
Nitrazepam	100,000	Neg	Pos
11-nor-9-carboxy - Δ 9-THC	100,000	Neg	Pos
Norbuprenorphine	50,000	Neg	Pos
Norcodeine	100,000	Neg	Pos
Nordiazepam	100,000	Neg	Pos
Norketamine	100,000	Neg	Pos
Normorphine	100,000	Neg	Pos
Norproxyphene	100,000	Neg	Pos
Norpseudoephedrine	100,000	Neg	Pos
Nortriptyline	100,000	Neg	Pos
Olanzapine	100,000	Neg	Pos
Oxazepam	100,000	Neg	Pos
Oxycodone	100,000	Neg	Pos
Oxymorphone	100,000	Neg	Pos
PCP	100,000	Neg	Pos
Pentazocine	100,000	Neg	Pos
Pentobarbital	100,000	Neg	Pos
Phenobarbital	100,000	Neg	Pos
Phentermine	100,000	Neg	Pos
Phenylephedrine	100,000	Neg	Pos
Phenylpropanolamine	100,000	Neg	Pos
Phenytoin	100,000	Neg	Pos
PMA	100,000	Neg	Pos
Prazepam	100,000	Neg	Pos
Propoxyphene	100,000	Neg	Pos
Propranolol	100,000	Neg	Pos
Protriptyline	100,000	Neg	Pos
R,R (+)- Pseudoephedrine	100,000	Neg	Pos
S,S (-)- Pseudoephedrine	100,000	Neg	Pos
Ranitidine	100,000	Neg	Pos
Ritalinic Acid	100,000	Neg	Pos
Salicylic Acid	100,000	Neg	Pos

Secobarbital	100,000	Neg	Pos
Sertraline	100,000	Neg	Pos
Sufentanil Citrate	50,000	Neg	Pos
Tapentadol	100,000	Neg	Pos
Temazepam	100,000	Neg	Pos
Theophylline	100,000	Neg	Pos
Thioridazine	30,000	Neg	Pos
Trazodone	100,000	Neg	Pos
Triazolam	100,000	Neg	Pos
Trifluoromethylphenyl-piperazine	100,000	Neg	Pos
Trimipramine	100,000	Neg	Pos
Venlafaxine	100,000	Neg	Pos
Verapamil	100,000	Neg	Pos
Zolpidem Tartrate	100,000	Neg	Pos

Endogenous compounds

Potential interference from endogenous compounds was evaluated in the qualitative and semi-quantitative modes by spiking these compounds into drug free urine containing EDDP at $\pm 25\%$ of the cutoff (75ng/mL and 125ng/mL for the 100ng/mL cutoff, 225 ng/mL and 375 ng/mL for the 300 ng/mL cutoff or 750 ng/mL and 1,250 ng/mL for the 1,000 ng/mL cutoff).. The results were the same for the qualitative and semi-quantitative modes for all cutoffs and are summarized below:

Compound	Concentration Tested	-25% Cutoff	+25% Cutoff
Acetone	1.0 g/dL	Neg	Pos
Ascorbic Acid	1.5 g/dL	Neg	Pos
Bilirubin	0.002 g/dL	Neg	Pos
Creatinine	0.5 g/dL	Neg	Pos
Ethanol	1.0 g/dL	Neg	Pos
Galactose	0.01 g/dL	Neg	Pos
γ -Globulin	0.5 g/dL	Neg	Pos
Glucose	2.0 g/dL	Neg	Pos
Hemoglobin	0.300 g/dL	Neg	Pos
Human Serum Albumin	0.5 g/dL	Neg	Pos
Oxalic Acid	0.1 g/dL	Neg	Pos
Riboflavin	0.0075 g/dL	Neg	Pos
Sodium Azide	1% w/v	Neg	Pos
Sodium Chloride	6.0 g/dL	Neg	Pos
Sodium Fluoride	1% w/v	Neg	Pos
Urea	6.0 g/dL	Neg	Pos

Boric Acid was also evaluated. Boric Acid at a concentration of 1% w/v was found to cause false negative results at $\pm 25\%$ of the 100ng/mL cutoff (75ng/mL and 125ng/mL), 300ng/mL cutoff (225ng/mL and 375ng/mL) and 1000 ng/mL cutoff

(750ng/mL cutoff and 1250ng/mL) in both the qualitative and semiquantitative modes. The following statement is provided in the limitations section of the labeling: “*Boric Acid at 1% w/v may cause false negative results. Boric Acid should not be used as a preservative for urine specimens.*”

pH and Specific Gravity

To evaluate potential interference from the pH of urine, device performance in the qualitative and semi-quantitative modes was tested using a range of urine pH values (3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0 and 11.0). All test samples were prepared in drug free urine containing EDDP at $\pm 25\%$ of the 100 ng/mL cutoff (75 ng/mL and 125 ng/mL), 300 ng/mL cutoff (225 ng/mL and 375 ng/mL) and 1000 ng/mL cutoff (750 ng/mL cutoff and 1250 ng/mL). No positive or negative interference was observed at urine pH values ranging from 3.0 to 11.0 for each test mode.

To evaluate potential interference from the specific gravity of urine, device performance in the qualitative and semi-quantitative modes was tested using a range of urine specific gravity values (1.000, 1.002, 1.005, 1.010, 1.015, 1.020, 1.025 and 1.030). All test samples were prepared in drug free urine containing EDDP at $\pm 25\%$ of the 100 ng/mL cutoff (75 ng/mL and 125 ng/mL), 300 ng/mL cutoff (225 ng/mL and 375 ng/mL) 1000 ng/mL cutoff (750 ng/mL cutoff and 1250 ng/mL). No positive or negative interference was observed at urine specific gravity values ranging from 1.000 to 1.030 for each test mode.

f. Assay cut-off:

Characterization of how the device performs analytically around the claimed cutoff concentration of 100 ng/mL, 300 ng/mL and 1000 ng/mL EDDP is described in the precision section, M.1.a. above.

2. Comparison studies:

a. Method comparison with predicate device:

A total of 80 unaltered urine samples from clinical testing laboratories were analyzed by the candidate device in the qualitative and semi-quantitative modes on the Beckman Coulter AU 400e clinical chemistry analyzer and the comparative mass spectrometry based quantitative method (LC/MS). The results from the study are summarized below:

Qualitative Mode for 100ng/mL cutoff:

Candidate Device Results	<50% of cutoff concentration by LC/MS (< 50ng/mL)	Near Cutoff Negative (Between 50% below the cutoff and the cutoff concentration by LC/MS) (50 ~ 99 ng/mL)	Near Cutoff Positive (Between the cutoff and 50% above the cutoff concentration by LC/MS) (100 ~ 150 ng/mL)	High Positive (Greater than 50% above the cutoff concentration by LC/MS) > 150 ng/mL
Positive	0	1	4	36
Negative	36	3	0	0

% Agreement among positives is 98%.

% Agreement among negatives is 100%.

Qualitative Discordant Results for 100ng/mL cutoff:

Test Device	LC/MS Result
POS	97.0 ng/mL

Qualitative Mode for 300ng/mL cutoff:

Candidate Device Results	<50% of cutoff concentration by LC/MS (< 150ng/mL)	Near Cutoff Negative (Between 50% below the cutoff and the cutoff concentration by LC/MS) (150 ~ 299 ng/mL)	Near Cutoff Positive (Between the cutoff and 50% above the cutoff concentration by LC/MS) (300 ~ 450 ng/mL)	High Positive (Greater than 50% above the cutoff concentration by LC/MS) > 450 ng/mL
Positive	0	0	4	36
Negative	36	4	0	0

% Agreement among positives is 100%.

% Agreement among negatives is 100%.

Qualitative Mode for 1000ng/mL cutoff:

Candidate Device Results	<50% of cutoff concentration by LC/MS (<500ng/mL)	Near Cutoff Negative (Between 50% below the cutoff and the cutoff concentration by LC/MS) (500 ~ 999 ng/mL)	Near Cutoff Positive (Between the cutoff and 50% above the cutoff concentration by LC/MS) (1000 ~ 1500 ng/mL)	High Positive (Greater than 50% above the cutoff concentration by LC/MS) > 1500 ng/mL
Positive	0	0	4	36
Negative	36	4	0	0

% Agreement among positives is 100%.

% Agreement among negatives is 100%.

Semi-Quantitative Mode for 100ng/mL cutoff:

Candidate Device Results	<50% of cutoff concentration by LC/MS (< 50ng/mL)	Near Cutoff Negative (Between 50% below the cutoff and the cutoff concentration by LC/MS) (50 ~ 99 ng/mL)	Near Cutoff Positive (Between the cutoff and 50% above the cutoff concentration by LC/MS) (100 ~ 150 ng/mL)	High Positive (Greater than 50% above the cutoff concentration by LC/MS) > 150 ng/mL
Positive	0	1	4	36
Negative	36	3	0	0

% Agreement among positives is 98%.

% Agreement among negatives is 100%.

Semi-Quantitative Discordant Results for 100ng/mL cutoff:

Table 41 - Discordant Result Summary – 100ng/mL Cutoff – Semi-Quantitative				
Sample ID	In-House ID	Semi-Quantitative Results 100ng Cutoff		LC/MS Confirmation
		Value	Result	EDDP
JM042877	15980	149.5	POS	97.0

Semi-Quantitative Mode for 300ng/mL cutoff:

Candidate Device Results	<50% of cutoff concentration by LC/MS (< 150ng/mL)	Near Cutoff Negative (Between 50% below the cutoff and the cutoff concentration by LC/MS) (150 ~ 299 ng/mL)	Near Cutoff Positive (Between the cutoff and 50% above the cutoff concentration by LC/MS) (300 ~ 450 ng/mL)	High Positive (Greater than 50% above the cutoff concentration by LC/MS) > 450 ng/mL
Positive	0	0	4	36
Negative	36	4	0	0

% Agreement among positives is 100%.

% Agreement among negatives is 100%.

b. Matrix comparison:

Not applicable. Urine is the only claimed matrix for the candidate device.

3. Clinical studies:

a. Clinical Sensitivity:

Not applicable.

b. Clinical specificity:

Not applicable.

c. Other clinical supportive data (when a. and b. are not applicable):

Not applicable.

4. Clinical cut-off:

Not applicable.

5. Expected values/Reference range:

Not applicable.

N. Proposed Labeling:

The labeling is sufficient and it satisfies the requirements of 21 CFR Part 809.10.

O. Conclusion:

The submitted information in this premarket notification is complete and supports a substantial equivalence decision.