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

A. 510(k) Number:

k150925

B. Purpose for Submission:

New device

C. Measurand:

Benzoylecgonine

D. Type of Test:

Qualitative and semi-quantitative homogeneous enzyme immunoassay

E. Applicant:

Immunalysis Corporation

F. Proprietary and Established Names:

Immunalysis Benzoylecgonine Urine Enzyme Immunoassay
Immunalysis Benzoylecgonine Urine Calibrators
Immunalysis Benzoylecgonine Urine Control Set

G. Regulatory Information:

Product Code	Classification	Regulation Section	Panel
DIO – Cocaine and cocaine metabolite test system	Class II	21 CFR §862.3250	91 – Toxicology
DLJ – Clinical Toxicology Calibrator	Class II	21 CFR §862.3200	91 – Toxicology
LAS – Clinical Toxicology Control Material	Class I, reserved	21 CFR §862.3280	91 – Toxicology

H. Intended Use:

1. Intended use(s):

   See Indication(s) for use below.

2. Indication(s) for use:

   Immunalysis Benzoylecgonine Urine Enzyme Immunoassay

   The Immunalysis Benzoylecgonine Urine Enzyme Immunoassay is a homogeneous enzyme immunoassay with a dual cutoff of 150 ng/mL and 300 ng/mL. The assay is intended for use in laboratories for the qualitative and semi-quantitative analysis of Benzoylecgonine in human urine with automated clinical chemistry analyzers. This assay is calibrated against Benzoylecgonine. 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 Immunalysis Benzoylecgonine 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 / Mass Spectrometry (LC/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.

   Immunalysis Benzoylecgonine Urine Calibrators

   The Immunalysis Benzoylecgonine Calibrators are intended for in vitro diagnostic use for the calibration of assays for the analytes currently listed in the package insert: Benzoylecgonine. The calibrators are designed for prescription use with homogenous enzyme immunoassays on automated clinical chemistry analyzers.

   Immunalysis Benzoylecgonine Urine Control Set

   The Immunalysis Benzoylecgonine Control Set is intended for in vitro diagnostic use to monitor the performance of assays for the analyte currently listed in the package insert: Benzoylecgonine. The controls are designed for prescription use with homogenous enzyme immunoassays on automated clinical chemistry analyzers

3. Special conditions for use statement(s):

   For prescription use only.

4. Special instrument requirements:

Performance data was obtained using the Beckman AU400e clinical chemistry analyzer.

I. Device Description:

The Immunalysis Benzoylecgonine Urine Enzyme Immunoassay Kit contains two reagents, which are provided as ready-to-use:

- Antibody/Substrate Reagent (RA) – This reagent contains polyclonal sheep antibodies to benzoylecgonine, glucose-6-phosphate (G6P) and nicotinamide adenine dinucleotide (NAD) in Tris buffer with Sodium Azide as a preservative.
- Enzyme Conjugate Reagent (RE) – This reagent contains glucose-6-phosphate dehydrogenase (G6PDH) labeled with benzoylecgonine in Tris buffer with Sodium Azide as a preservative.

The Immunalysis Benzoylecgonine Urine Calibrators and the Immunalysis Benzoylecgonine Urine Control Sets are sold as individual bottles and are liquid and ready-to-use. The negative calibrator is a processed, drug-free synthetic urine matrix with sodium azide as a preservative. Each calibrator and control level contains a known concentration of Benzoylecgonine spiked into the negative calibrator matrix.

J. Substantial Equivalence Information:

1. Predicate device name(s):

   Randox Cocaine Metabolite Assay
   Randox Multidrug Calibrator Set
   Randox Multidrug Controls, Level 1 and 2

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

   k113751

3. Comparison with predicate:

Similarities		
Item	Candidate Devices	Predicate – k113751
Intended Use	Same	For the qualitative and semiquantitative determination of the presence of benzoylecgonine in human urine
Test Principle	Same	Homogeneous Enzyme Immunoassay

Similarities		
Item	Candidate Devices	Predicate – k113751
Cutoff	150 and 300 ng/mL	300 ng/mL
Reagent Form	Same	Liquid Ready-to-Use Two Reagent Assay
Reagent Storage	Same	2 – 8° C
Calibrator Levels	Same	Five levels at 0, 150, 300, 500, and 1000 ng/mL
Control and Calibrator Storage	Same	2 – 8° C

Differences		
Item	Candidate Devices	Predicate – k113751
Antibody	Polyclonal sheep antibody to benzoylecgonine	Mouse monoclonal antibodies to benzoylecgonine
Control Levels	Four levels at 112.5, 187.5, 225, and 375 ng/mL	Two levels at 225 and 375 ng/mL

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

- CLSI EP5-A2, Evaluation of Precision of Quantitative Measurement Procedures; Approved Guideline—Second Edition
- CLSI EP7-A2, Interference Testing in Clinical Chemistry; Approved Guideline—Second Edition

L. Test Principle:

The assay is based on the competition of benzoylecgonine labeled enzyme glucose-6-phosphate dehydrogenase (G6PDH) and the free drug in the urine sample for the fixed amount of antibody binding sites. In the absence of the free drug in the sample, the antibody binds the drug enzyme conjugate and enzyme activity is inhibited. This creates a dose response relationship between drug concentration in the urine sample 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):

1. Analytical performance:

   a. Precision/Reproducibility:
   A precision/cutoff characterization study was performed for 20 days, 2 runs per day

in duplicate (N=80) on drug-free negative urine samples spiked with benzoylecgonine to concentrations of ±25%, ±50%, ±75%, and ±100% of each cutoff, as well as a zero concentration sample. The benzoylecgonine concentrations in spiked samples were confirmed by mass spectrometry. The results of the study are summarized below:

Qualitative Analysis (for 150 ng/mL cutoff)			
Concentration (ng/mL)	% of cutoff	# of determinations	Result
0	-100%	80	80 Neg / 0 Pos
37.5	-75%	80	80 Neg / 0 Pos
75	-50%	80	80 Neg / 0 Pos
112.5	-25%	80	80 Neg / 0 Pos
150	Cutoff	80	36 Neg / 44 Pos
187.5	+25%	80	80 Pos / 0 Neg
225	+50%	80	80 Pos / 0 Neg
262.5	+75%	80	80 Pos / 0 Neg
300	+100%	80	80 Pos / 0 Neg

Qualitative Analysis (for 300 ng/mL cutoff)			
Concentration (ng/mL)	% of cutoff	# of determinations	Result
0	-100%	80	80 Neg / 0 Pos
75	-75%	80	80 Neg / 0 Pos
150	-50%	80	80 Neg / 0 Pos
225	-25%	80	80 Neg / 0 Pos
300	Cutoff	80	37 Neg / 43 Pos
375	+25%	80	80 Pos / 0 Neg
450	+50%	80	80 Pos / 0 Neg
525	+75%	80	80 Pos / 0 Neg
600	+100%	80	80 Pos / 0 Neg

Semi-quantitative Analysis (for 150 ng/mL cutoff)			
Concentration (ng/mL)	% of cutoff	# of determinations	Result
0	-100%	80	80 Neg / 0 Pos
37.5	-75%	80	80 Neg / 0 Pos
75	-50%	80	80 Neg / 0 Pos
112.5	-25%	80	80 Neg / 0 Pos
150	Cutoff	80	25 Neg / 55 Pos
187.5	+25%	80	80 Pos / 0 Neg
225	+50%	80	80 Pos / 0 Neg
262.5	+75%	80	80 Pos / 0 Neg
300	+100%	80	80 Pos / 0 Neg

Semi-quantitative Analysis (for 300 ng/mL cutoff)			
Concentration (ng/mL)	% of cutoff	# of determinations	Result
0	-100%	80	80 Neg / 0 Pos
75	-75%	80	80 Neg / 0 Pos
150	-50%	80	80 Neg / 0 Pos
225	-25%	80	80 Neg / 0 Pos
300	Cutoff	80	24 Neg / 56 Pos
375	+25%	80	80 Pos / 0 Neg
450	+50%	80	80 Pos / 0 Neg
525	+75%	80	80 Pos / 0 Neg
600	+100%	80	80 Pos / 0 Neg

b. *Linearity/assay reportable range:*

A linearity study in the semi-quantitative mode was conducted by spiking a drug-free urine pool with a high concentration of benzoylecgonine and generating serial dilutions to achieve concentrations ranging from 100 ng/mL to 1100 ng/mL. Each concentration was tested in triplicate and drug recovery calculated using the mean concentration of the replicates. The results are summarized below:

Linearity/Recovery		
Expected Concentration (ng/mL)	Mean Concentration (ng/mL)	Recovery (%)
100	98.9	98.9
150	162.9	108.6
200	194.7	97.4
300	304.5	101.5
400	419.7	104.9
500	489.9	98.0
600	602.8	100.5
700	736.4	105.2
800	803.1	100.4
900	946.0	105.1
1000	996.0	99.6
1100	1003.1	91.2

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

Traceability

The analyte in the calibrator and controls is traceable to a commercially available standard solution. The standard is certified material with the concentration verified by GC-MS or LC/MS-MS. This standard is diluted with the proper calibrator buffer to make the calibrator and controls to the desired concentrations. The concentrations are confirmed by Gas Chromatography/Mass Spectrometry Analysis (GC/MS) and/or

Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS).

Value Assignment/Expected Values

The Negative Calibrator is a processed, drug free urine matrix. The standard is compared to a reference negative standard to ensure that it is free of analyte. A value is assigned when the test is within the acceptable range.

The non-zero calibrators and the controls are prepared by spiking known concentrations of benzoylecgonine into the negative calibrator matrix. The concentrations are confirmed by GC/MS or LC/MS/MS. If any of the analytes are out of the acceptable range, then the calibrator or control is adjusted and re-tested. Values are assigned to the calibrator or control once the GC/MS or LC/MS/MS results are within the acceptable range.

Stability

A closed-vial accelerated stability study and an onboard, open vial stability study were conducted for the calibrators and controls. Real-time stability studies are ongoing. All stability protocols were reviewed and found to be acceptable. These studies support the closed vial stability claim of one year and the opened vial stability claim of 28 days when calibrators and controls are stored at 2-8°C.

d. Detection limit:

Not applicable.

e. Analytical specificity:

Structurally related compounds

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

Structurally Related Compounds at 150 ng/mL cutoff		
Compound	Concentration Tested (ng/mL)	Cross-reactivity (%)
Benzoylecgonine	150	100
Cocaine	100,000	0.15
Ecgonine	59,000	0.25
Ecgonine Methyl Ester	100,000	<0.15

Structurally Related Compounds at 300 ng/mL cutoff		
Compound	Concentration Tested (ng/mL)	Cross-reactivity (%)
Benzoylecgonine	150	100
Cocaine	100,000	<0.15
Ecgonine	100,000	<0.15
Ecgonine Methyl Ester	100,000	<0.15

Non-structurally related compounds

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 benzoylecgonine at ± 25% of the 150 ng/mL cutoff (112.5 ng/mL and 187.5 ng/mL) and ± 25% of the 300 ng/mL cutoff (225 ng/mL and 375 ng/mL). The results were the same for the qualitative and semi-quantitative modes and are summarized below:

Structurally Unrelated Compounds (for 150 ng/mL cutoff)			
Compound	Concentration Tested (ng/mL)	-25% Cutoff	+25% Cutoff
		Result	Result
4-Bromo-2,5,Dimethoxyphenethylamine	100,000	Negative	Positive
6-Acetylcodeine	100,000	Negative	Positive
6-Acetylmorphine	100,000	Negative	Positive
7-Aminoclonazepam	100,000	Negative	Positive
7-Aminoflunitrazepam	100,000	Negative	Positive
7-Aminonitrazepam	100,000	Negative	Positive
11-hydroxy-delta-9-THC	100,000	Negative	Positive
11-nor-9 carboxy-delta-THC	100,000	Negative	Positive
Acetaminophen	500,000	Negative	Positive
Acetylsalicylic Acid	500,000	Negative	Positive
Alprazolam	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
Chlorpromazine	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
Delta-9-THC	100,000	Negative	Positive
Demoxepam	100,000	Negative	Positive
Desakylflurazepam	100,000	Negative	Positive
Desipramine	100,000	Negative	Positive
Dextromethorphan	100,000	Negative	Positive
Diazepam	100,000	Negative	Positive
Digoxin	100,000	Negative	Positive
Dihydrocodeine	100,000	Negative	Positive
Diphenhydramine	500,000	Negative	Positive
Doxepin	100,000	Negative	Positive
EDDP	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
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
Ibuprofen	500,000	Negative	Positive
Imipramine	100,000	Negative	Positive
Ketamine	100,000	Negative	Positive
Lamotrignine	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
Lormetazepam	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
Methadone	100,000	Negative	Positive
Methamphetamine	100,000	Negative	Positive
Methaquolone	100,000	Negative	Positive
Methoxetamine	100,000	Negative	Positive
Methylone	100,000	Negative	Positive
Methylphenidate	100,000	Negative	Positive
Midazolam	100,000	Negative	Positive
Morphine	100,000	Negative	Positive
Morphine 3-D-glucuronide	100,000	Negative	Positive
Morphine 6-D-glucuronide	50,000	Negative	Positive
Nalorphine	100,000	Negative	Positive
Naloxone	100,000	Negative	Positive
Naltrexone	100,000	Negative	Positive
Naproxen	100,000	Negative	Positive
N-desmethyltapentadol	100,000	Negative	Positive
Nitrazepam	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
Norproxyphene	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
Trifluoromethylphenyl-piperazine	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

Structurally Unrelated Compounds (for 300 ng/mL cutoff)			
Compound	Concentration Tested (ng/mL)	-25% Cutoff Result	+25% Cutoff Result
4-Bromo-2,5,Dimethoxyphenethylamine	100,000	Negative	Positive
6-Acetylcodeine	100,000	Negative	Positive
6-Acetylmorphine	100,000	Negative	Positive
7-Aminoclonazepam	100,000	Negative	Positive
7-Aminoflunitrazepam	100,000	Negative	Positive
7-Aminonitrazepam	100,000	Negative	Positive
11-hydroxy-delta-9-THC	100,000	Negative	Positive
11-nor-9 carboxy-delta-THC	100,000	Negative	Positive
Acetaminophen	500,000	Negative	Positive
Acetylsalicylic Acid	500,000	Negative	Positive
Alprazolam	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
Chlorpromazine	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
Delta-9-THC	100,000	Negative	Positive
Demoxepam	100,000	Negative	Positive
Desakylflurazepam	100,000	Negative	Positive
Desipramine	100,000	Negative	Positive
Dextromethorphan	100,000	Negative	Positive
Diazepam	100,000	Negative	Positive
Digoxin	100,000	Negative	Positive
Dihydrocodeine	100,000	Negative	Positive
Diphenhydramine	500,000	Negative	Positive
Doxepin	100,000	Negative	Positive
EDDP	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
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

Ibuprofen	500,000	Negative	Positive
Imipramine	100,000	Negative	Positive
Ketamine	100,000	Negative	Positive
Lamotrignine	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
Lormetazepam	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
Methadone	100,000	Negative	Positive
Methamphetamine	100,000	Negative	Positive
Methaquolone	100,000	Negative	Positive
Methoxetamine	100,000	Negative	Positive
Methylone	100,000	Negative	Positive
Methylphenidate	100,000	Negative	Positive
Midazolam	100,000	Negative	Positive
Morphine	100,000	Negative	Positive
Morphine 3-D-glucuronide	100,000	Negative	Positive
Morphine 6-D-glucuronide	50,000	Negative	Positive
Nalorphine	100,000	Negative	Positive
Naloxone	100,000	Negative	Positive
Naltrexone	100,000	Negative	Positive
Naproxen	100,000	Negative	Positive
N-desmethyltapentadol	100,000	Negative	Positive
Nitrazepam	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
Norproxyphene	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
Trifluoromethylphenyl-piperazine	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 compounds

Potential interference from endogenous compounds was evaluated in the qualitative and semi-quantitative modes by spiking these compounds into drug free urine containing benzoylecgonine at ± 25% of the 150 ng/mL cutoff (112.5 ng/mL and 187.5 ng/mL) and ± 25% of the 300 ng/mL cutoff (225 ng/mL and 375 ng/mL). The results were the same for the qualitative and semi-quantitative modes and are summarized below:

Endogenous Compounds (for 150 ng/mL cutoff)			
Compound	Concentration Tested	-25% Cutoff	+25% Cutoff
Acetone	1.0 g/dL	Negative	Positive
Ascorbic Acid	1.5 g/dL	Negative	Positive
Bilirubin	0.002 g/dL	Negative	Positive
Creatinine	0.5 g/dL	Negative	Positive
Ethanol	1.0 g/dL	Negative	Positive
Galactose	0.01 g/dL	Negative	Positive
γ-Globulin	0.5 g/dL	Negative	Positive
Glucose	2.0 g/dL	Negative	Positive
Hemoglobin	0.300 g/dL	Negative	Positive
Human Serum Albumin	0.5 g/dL	Negative	Positive
Oxalic Acid	0.1 g/dL	Negative	Positive
Riboflavin	0.0075 g/dL	Negative	Positive
Sodium Azide	1% w/v	Negative	Positive
Sodium Chloride	6.0 g/dL	Negative	Positive
Sodium Fluoride	1% w/v	Negative	Positive
Urea	6.0 g/dL	Negative	Positive

Endogenous Compounds (for 300 ng/mL cutoff)			
Compound	Concentration Tested	-25% Cutoff	+25% Cutoff
Acetone	1.0 g/dL	Negative	Positive
Ascorbic Acid	1.5 g/dL	Negative	Positive
Bilirubin	0.002 g/dL	Negative	Positive
Creatinine	0.5 g/dL	Negative	Positive
Ethanol	1.0 g/dL	Negative	Positive
Galactose	0.01 g/dL	Negative	Positive
γ-Globulin	0.5 g/dL	Negative	Positive
Glucose	2.0 g/dL	Negative	Positive
Hemoglobin	0.300 g/dL	Negative	Positive
Human Serum Albumin	0.5 g/dL	Negative	Positive
Oxalic Acid	0.1 g/dL	Negative	Positive
Riboflavin	0.0075 g/dL	Negative	Positive
Sodium Azide	1% w/v	Negative	Positive
Sodium Chloride	6.0 g/dL	Negative	Positive
Sodium Fluoride	1% w/v	Negative	Positive
Urea	6.0 g/dL	Negative	Positive

Boric Acid was also evaluated. Boric Acid at a concentration of 1% w/v was found to cause false negative results at + 25% of the 150 and 300 ng/mL cutoffs in both the qualitative and semiquantitative modes and the following statement is provided in the limitations section of the labeling: *"Boric Acid is not recommended as a preservative for urine.*

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 benzoylecgonine at ± 25% of the 150 ng/mL cutoff (112.5 ng/mL and 187.5 ng/mL) and ± 25% of the 300 ng/mL cutoff (225 ng/mL and 375 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 benzoylecgonine at ± 25% of the 150 ng/mL cutoff (112.5 ng/mL and 187.5 ng/mL) and ± 25% of the 300 ng/mL cutoff (225 ng/mL and 375 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 concentrations of 150 ng/mL and 300 ng/mL is described in the precision section, M.1.a. above.

2. Comparison studies:

a. Method comparison with predicate device:

Eighty unaltered urine samples from clinical testing laboratories were analyzed for benzoylecgonine by the candidate device on the Beckman Coulter AU400e clinical chemistry analyzer and with LC/MS. Results were obtained in both qualitative and semi-quantitative modes and are summarized below:

(150 ng/mL Cutoff – Qualitative)				
	(<50% cutoff)	(-50% to cutoff)	(cutoff to +50%)	(>50% cutoff)
Positive	0	1*	4	36
Negative	36	3	0	0

Discordant Result Summary*	
Qualitative Result	LC/MS Concentration (ng/mL)
Positive	124

(300 ng/mL Cutoff – Qualitative)				
	(<50% cutoff)	(-50% to cutoff)	(cutoff to +50%)	(>50% cutoff)
Positive	0	0	4	36
Negative	36	4	0	0

(150 ng/mL Cutoff – Semi-quantitative)				
Candidate Device Results				
	(<50% cutoff)	(-50% to cutoff)	(cutoff to +50%)	(>50% cutoff)
Positive	0	1*	4	36
Negative	36	3	0	0

Discordant Result Summary*	
Semi-quantitative Result	LC/MS Concentration
Positive	124

(300 ng/mL Cutoff – Semi-quantitative)				
Candidate Device Results				
	(<50% cutoff)	(-50% to cutoff)	(cutoff to +50%)	(>50% cutoff)
Positive	0	0	4	36
Negative	36	4	0	0

b. Matrix comparison:

Not applicable.

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.