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

A. 510(k) Number:

k163570

B. Purpose for Submission:

New device

C. Measurand:

Cocaine and cocaine metabolites

D. Type of Test:

Qualitative Homogeneous Enzyme Immunoassay

E. Applicant:

Carolina Liquid Chemistries Corporation

F. Proprietary and Established Names:

Carolina Liquid Chemistries Cocaine and Cocaine Metabolite Test System (COCM)

G. Regulatory Information:

1. Regulation section:

   21 CFR §862.3250, Cocaine and Cocaine Metabolite Test System

2. Classification:

   Class II

3. Product code:

   DIO – Enzyme Immunoassay, Cocaine and Cocaine Metabolites

4. Panel:

   Toxicology (91)

H. Intended Use:

1. Intended use(s):

   See indications for use below.

2. Indication(s) for use:

   The Carolina Liquid Chemistries Cocaine and Cocaine Metabolite Test System (COCM) is for the qualitative determination of benzoylecgonine (cocaine metabolite) in human urine at a cutoff value of 300 ng/mL. The assay is designed for professional use with a clinical chemistry analyzer. For in vitro diagnostic use only.

   This assay provides a rapid screening procedure for determining the presence of benzoylecgonine in urine. The assay provides only a preliminary analytical result. A more specific alternative chemical method must be used in order to obtain a confirmed analytical result. Gas or Liquid Chromatography/Mass Spectrometry (GC/MS or LC/MS) is the preferred confirmatory method. Clinical considerations and professional judgment should be exercised with any drug of abuse test result, particularly when the preliminary test result is positive.

3. Special conditions for use statement(s):

   For prescription use only

4. Special instrument requirements:

   Performance characteristics were determined using the CLC480/Biolis 24i Clinical Chemistry Analyzer.

I. Device Description:

The Carolina Liquid Chemistries Cocaine and Cocaine Metabolite Test System (COCM) is a ready-to-use, liquid reagent homogeneous enzyme immunoassay for qualitatively determining the presence of cocaine metabolite (benzoylecgonine) in human urine. The COCM R1 Antibody/Substrate Reagent contains mouse monoclonal anti-benzoylecgonine antibody, glucose-6-phosphate (G6P), and nicotinamide adenine dinucleotide (NAD), stabilizers, and sodium azide as preservative, and the COCM R2, Enzyme-Drug Conjugate Reagent contains benzoylecgonine-labeled glucose-6-phosphate dehydrogenase (G6PDH) in buffer with sodium azide as preservative.

J. Substantial Equivalence Information:

1. Predicate device name(s):

   Lin-Zhi International, Inc. Cocaine Metabolite Enzyme Immunoassay

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

   k020763

3. Comparison with predicate:

Similarities		
Item	Candidate Device: Carolina Liquid Chemistries Cocaine and Cocaine Metabolite Test System (COCM) (k163570)	Predicate Device: Enzyme Immunoassay, Cocaine and Cocaine Metabolites (k020763)
Intended Use	It is intended for the qualitative determination of Benzoylecgonine (Cocaine Metabolite) in human urine at a cutoff value of 300ng/ml.	It is intended for the qualitative and semiquantitative determination of Benzoylecgonine (Cocaine Metabolite) in human urine at a cutoff value of 300ng/ml.
Method	Same	Enzyme Immunoassay
Reagent Composition	Same	▪ Antibody/Substrate Reagent {Rl}: Contains mouse monoclonal antibenzoylecgonine antibody, glucose-6-phosphate (G6P), and nicotinamide adenine dinucleotide {NAD), stabilizers, and sodium azide as preservative. ▪ Enzyme-drug Conjugate Reagent {R2}: Contains benzoylecgonine-labeled glucose-6-phosphate dehydrogenase (G6PDH) in buffer with sodium azide as preservative.
Sample type	Same	Urine
Cutoff	Same	300 ng/ml

Differences		
Item	Candidate Device: Cocaine Metabolite Enzyme Immunoassay (COCM) (k163570)	Predicate Device: Enzyme Immunoassay, Cocaine and Cocaine Metabolites (k020763)
Results mode	Qualitative only	Qualitative and semi-quantitative

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

CLSI EP05-A3: Evaluation of Precision Performance of Quantitative Measurement Procedures; Approved Guideline-Third Edition

CLSI EP07-A2: Interference Testing in Clinical Chemistry; Approved Guideline-Second Edition

CLSI EP17-A2: Evaluation of Detection Capability for clinical Laboratory Measurement Procedures; Approved Guideline-Second Edition.

CLSI EP09-A3: Measurement Procedure Comparison and Bias Estimation Using Patient Samples; Approved Guideline-Third Edition

L. Test Principle:

The assay is based on competition between benzoylecgonine labeled with the enzyme glucose-6-phosphate dehydrogenase (G6PDH) and free drug from the urine sample, for a fixed amount of antibody. In the absence of free drug from the urine sample, the specific antibody binds to the drug labeled with G6PDH causing a decrease in enzyme activity. The G6PDH enzyme activity is determined spectrophotometrically at 340 nm by measuring its ability to convert nicotinamide adenine dinucleotide (NAD+) to NADH.

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. Precision/Reproducibility:

To evaluate device precision, samples were prepared from negative urine samples spiked to nine different concentrations (cutoff, and ± 25 %, ± 50%, ± 75%, and ±100% of the cut off concentration 300 ng/dL) and were analyzed in duplicate, twice per day for 22.5 days to obtain a total of 90 replicates per concentration. Results are summarized below.

Concentration (ng/mL)	% of cutoff	Result
0	-100	90 Negative
75	-75	90 Negative
150	-50	90 Negative
225	-25	90 Negative
300	Cutoff	6 Negative / 84Positive
375	+25	90 Positive
450	+50	90 Positive
525	+75	90 Positive
600	+100	90 Positive

b. *Linearity/assay reportable range:*

Not applicable.

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

DRI Multi-Drug Calibrators were previously cleared under k983159.

d. *Detection limit:*

Not applicable.

e. *Analytical specificity:*

Interference and cross-reactivity studies were previously evaluated in k020763 and the results are summarized below.

Compound	Concentration Tested (µg/mL)	Cross-reactivity (%)
Acetaminophen	1500	Negative
Acetylsalicylic acid	1500	Negative
Amobarbital	1000	Negative
Amphetamine	1000	Negative
Burpropion	1000	Negative
Caffeine	1000	Negative
Codeine	1000	Negative
Chlorpheniramine	1000	Negative
Chorpromzaine	1000	Negative
Dextromethorphan	1000	Negative
Ecgonine	1000	Negative
Lidocaine	1000	Negative
Meperidine	1000	Negative

Compound	Concentration Tested (µg/mL)	Cross-reactivity (%)
Methadone	1000	Negative
Morphine	2000	Negative
Nicotine	1000	Negative
Lorazepam	1000	Negative
Phencyclidine	1000	Negative
Phenobarbital	1000	Negative
Propoxyphene	1000	Negative
Ranitidine	1000	Negative
Secobarbital	1000	Negative
Methamphetamine	1000	Negative
Methaqualone	1000	Negative
Valproic Acid	1000	Negative

Results of the cross reactivity studies are summarized below.

Structurally Related Cocaine Compounds		
Compound	Concentration (µg/mL)	Cross-reactivity
Benzoylecgonine	0.3	Positive
Cocaine	30	Positive
Norcocaine	60	Positive
Ecgonine, Methyl	350	Positive

Effect of pH:
To evaluate the effect of urine pH on device performance, negative urine samples with pH ranging from 3.00 to 11.00 (in increments of 1 pH unit) were spiked with benzoylecgonine to ±25% of the device cutoff. The pH ranges tested did not affect the results from the device.

Effect of specific gravity:
To evaluate the effect of urine specific gravity on device performance, negative urine samples with specific gravities ranging from 1.000-1.030 were spiked with benzoylecgonine to ± 25% of the device cutoff. The specific gravity ranges tested did not affect the results from the device.

f. Assay cut-off:

Refer to section M.1.a. above.

2. Comparison studies:

   a. *Method comparison with predicate device:*

      A total of 100 human urine specimens were quantitated for benzoylecgonine by liquid chromatography/mass spectrometry (LC/ MS) and these results were compared to the qualitative results obtained with the Carolina Liquid Chemistry Cocaine and Cocaine Metabolite Enzyme Immunoassay (COCM). Results from this analysis are summarized in the following table.

Results	Drug -free	Low negative (<-50% of cutoff)	Near cut off negative (between -50% of cutoff and cutoff)	Near cut off Positive (between cutoff and +50% of cutoff)	High Positive (>+50% of the cutoff)
Positive	0	0	0	24	26
Negative	30	11	9	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.