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

A. 510(k) Number:

k050733

B. Purpose for Submission:

Clearance of new device

C. Measurand:

Oxycodone and its metabolite Oxymorphone

D. Type of Test:

Qualitative or Semi-quantitative Enzyme Immunoassay

E. Applicant:

Lin-Zhi International

F. Proprietary and Established Names:

Lin-Zhi International Oxycodone Enzyme Immunoassay
Lin-Zhi International Oxycodone DAU Calibrators
Lin-Zhi International Oxycodone DAU Controls

G. Regulatory Information:

1. Regulation section:

   21 CFR §862.3650, Opiate test system
   §862.3200, Clinical toxicology calibrator
   §862.3280, Clinical toxicology control material

2. Classification:

   Class II

3. Product code:

   DJG, enzyme immunoassay, opiates

DLJ, calibrators, drug specific
LAS, drug specific control materials

4. Panel:

Toxicology (91)

H. Intended Use:

1. Intended use(s):

The Oxycodone Enzyme Immunoassay is a homogeneous enzyme immunoassay with 100 and 300 ng/mL cutoffs. The assay is intended for use in the qualitative and semi-quantitative analyses of oxycodone and its metabolite, oxymorphone in human urine.

The Oxycodone calibrators are used to calibrate the oxycodone enzyme immunoassay for drug detection in human urine. The Oxycodone controls are used to validate the assay. The assay provides a simple and rapid analytical screening procedure to detect oxycodone and its metabolite in human urine.

2. Indication(s) for use:

The Oxycodone Enzyme Immunoassay is a homogeneous enzyme immunoassay with 100 and 300 ng/mL cutoffs. The assay is intended for use in the qualitative and semi-quantitative analyses of oxycodone and its metabolite, oxymorphone in human urine.

The Oxycodone calibrators are used to calibrate the oxycodone enzyme immunoassay for drug detection in human urine. The Oxycodone controls are used to validate the assay. The assay provides a simple and rapid analytical screening procedure to detect oxycodone and its metabolite in human urine.

The assay is designed for professional use with a number of automated clinical chemistry analyzers. Performance data submitted was obtained using the Hitachi 717 analyzer.

The Oxycodone Enzyme Immunoassay provides only a preliminary analytical test result. A more specific alternative chemical method must be used to obtain a confirmed analytical result. Gas chromatography/mass spectrometry (GC/MS) 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.

3. Special conditions for use statement(s):

For prescription, professional use only in clinical chemistry laboratories.

The assay is not designated for use in point-of-care settings.

Semi-quantitative results may be helpful in estimating the concentrations of drug(s) in samples. This can aid users when they are preparing dilutions of the samples for further analysis.

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4. Special instrument requirements:

The assay is designed for professional use with a number of clinical chemistry analyzers. Performance data submitted was obtained using the Hitachi 717 analyzer.

I. Device Description:

The assay consists of a ready-to-use liquid reagent containing antibodies against oxycodone (which also detect a metabolite Oxymorphone). The calibrators and controls are sold separately. See below for additional information about calibrators and controls.

J. Substantial Equivalence Information:

1. Predicate device name(s):

   DRI Oxycodone Assay

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

   k040411

3. Comparison with predicate:

Similarities		
Item	Device	Predicate
Measurement	Qualitative or semi-quantitative	Qualitative or semi-quantitative
Reagents	Ready-to-use liquid reagents	Ready-to-use liquid reagents
Cutoffs	100 or 300 ng/mL	100 or 300 ng/mL
Assay method principle	same	same

Differences		
Item	Device	Predicate
Calibration	2 different calibrator/control sets: 0, 75, 100, 225, and 300 ng/mL or 0, 100, 300, 500, and 800 ng/mL for semiquantitative determination	Calibrator set: 0, 100, 300, 500, and 1000 ng/mL for semiquantitative determination

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

None referenced

L. Test Principle:

The assay is based on competition for anti-oxycodone antibody binding sites between oxycodone in the sample and oxycodone conjugated to glucose-6-phosphate dehydrogenase (G6PDH). In the absence of free drug in the sample, the antibody binds the conjugated oxycodone thus decreasing the enzymatic activity of the G6PDH. The G6PDH activity is measured spectrophotometrically at 340 nm because of conversion of NAD to NADH.

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. Precision/Reproducibility:

Precision of the qualitative and semi-quantitative assays was evaluated by assaying calibrator and control material in replicates of 6 twice per day for 10 days (for total n = 120 per sample). All studies were performed on a Hitachi 717 analyzer. Results are summarized below for each cutoff for qualitative and semi-quantitative protocols (units = ng/mL).

Qualitative – 100 ng/mL cutoff

Sample	Mean mA/min	Within-run		Total	
		SD	% CV	SD	% CV
75	281.4	1.76	0.62 %	3.00	1.07 %
100	295.6	1.93	0.65 %	3.63	1.23 %
125	318.6	2.00	0.63 %	4.35	1.36 %
300	440.3	1.96	0.45 %	2.38	0.54 %

Semi-quantitative – 100 ng/mL cutoff

Sample	Mean ng/mL	Within-run		Total	
		SD	% CV	SD	% CV
75	76.3	2.31	3.02 %	2.88	3.78 %
100	94.1	2.13	2.37 %	2.89	3.07 %
125	117.5	2.39	1.99 %	2.93	2.49 %

Qualitative – 300 ng/mL cutoff

Sample	Mean mA/min	Within-run		Total	
		SD	% CV	SD	% CV
225	296	1.8	0.6 %	2.2	0.7 %
300	331	2.2	0.7 %	3.1	0.9 %
375	356	2.1	0.6 %	2.6	0.7 %

Semi-quantitative – 300 ng/mL cutoff

Sample	Mean ng/mL	Within-run		Total	
		SD	% CV	SD	% CV
225	225	4.8	2.1 %	5.8	2.6 %
300	280	5.1	1.9 %	6.8	2.4 %
375	368	6.4	1.8 %	9.4	2.6 %

b. Linearity/assay reportable range:

Analytical recovery of the semi-quantitative assays was evaluated by spiking negative urine samples to increasing concentrations within the calibration ranges (5 samples were tested for each spiked level). Mean observed values were compared to targeted values. Results are summarized below (units = mg/mL):

300 ng/mL Cutoff:

Spiked	Mean Observed	% Recovery	% CV
50	59.6	119.2 %	9.16 %
100	100.1	100.1 %	4.69 %
200	187.6	93.8 %	2.07 %
300	310.8	103.6 %	1.93 %
400	415.2	103.8 %	1.66 %
500	538.4	107.7 %	1.25 %
600	624.8	104.1 %	1.71 %

100 ng/mL Cutoff:

Spiked	Mean Observed	% Recovery	% CV
25	26.3	105.1 %	2.07 %
50	43.1	86.2 %	5.36 %
75	73.1	97.5 %	3.22 %
100	103.5	103.5 %	1.44 %
150	152.8	101.7 %	1.92 %
200	193.8	96.9 %	1.98 %
Spiked	***Mean Observed***	***% Recovery***	***% CV***
300	298.0	99.3 %	1.58 %

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

The calibrators and controls are prepared by spiking oxycodone into a processed, drug-free human urine matrix to the following targeted concentrations (which are confirmed by GC/MS analysis):

Material	100 ng/mL Cutoff	300 ng/mL Cutoff
Negative Calibrator	0 ng/mL	0 ng/mL
Low Calibrator	75 ng/mL	150 ng/mL
Cutoff Calibrator	100 ng/mL	300 ng/mL
Intermediate Calibrator	225 ng/mL	500 ng/mL
High Calibrator	300 ng/mL	800 ng/mL
Control Level I	75 ng/mL	225 ng/mL
Control Level II	125 ng/mL	375 ng/mL

Accelerated stability studies were described and support stability of > 8 months.

d. Detection limit:

Precision around the cutoff for the qualitative assays (100 and 300 ng/mL cutoffs) was evaluated by spiking 7 negative urine samples to 25% above the cutoffs (125 and 375 ng/mL, respectively) and 7 negative urine samples to 25% below the cutoffs (75 and 225 ng/mL, respectively). All samples above the cutoff tested positive and all samples below the cutoff tested negative.

Analytical sensitivity, defined as the lowest concentration that can be differentiated from the negative urine with 95% confidence, was determined to be 7.5 ng/mL for the 100 ng/mL cutoff and 15 ng/mL for the 300 ng/mL cutoff.

e. Analytical specificity:

Various potentially interfering substances were evaluated to determine whether they interfere with assay results. Test compounds were spiked into the drug-free calibrator to various concentrations and evaluated against the cutoff calibrators. The labeling lists the concentration of each compound that gave a response approximately equal to that of the

cutoff calibrator (as positive) or the maximal concentration of compound tested that remained negative. The only compounds that were seen to significantly cross-react were the oxycodone –related compounds hydrocodone, hydromorphone, and oxymorphone (see below).

Compound	300 ng/mL Cutoff ng/mL Positive	100 ng/mL Cutoff ng/mL Positive
oxycodone	300	100
hydrocodone	550	175
hydromorphone	1200	250
oxymorphone	325	125

f. Assay cut-off:

The two cutoffs for this device are 100 and 300 ng/mL. See Detection Limit section above for testing near the cutoff.

2. Comparison studies:

a. Method comparison with predicate device:

Clinical urine specimens (n = 59) were assayed with the device (qualitatively) and the predicate device. The two discrepant samples were determined by GC/MS to have 95 and 75 ng/mL oxycodone, respectively. Results are summarized below:

100 ng/mL cutoff		Predicate		% Agreement
		+	-	
Device	+	38	0	100 %
	-	2	19	90 %

Clinical urine specimens (n = 81) were assayed qualitatively with the device and by GC/MS analysis. Two discrepant samples were determined by GC/MS to contain 82 and 96 ng/mL oxycodone, respectively. Three other discrepant samples were determined by GC/MS to contain concentrations of Oxymorphone of 378 ng/mL, 623 ng/mL, and 410 ng/mL, respectively. Results are summarized below:

100 ng/mL cutoff		Qualitative Device		% Agreement
		+	-	
GC/MS	+	39	0	100%
	-	5	37	88.1%

Clinical urine specimens (n = 81) were assayed semi-quantitatively with the device and by GC/MS analysis. Two discrepant samples were determined by GC/MS to contain 82 and 96 ng/mL oxycodone, respectively. Three other discrepant samples were determined by GC/MS to contain concentrations of Oxymorphone of 378 ng/mL, 623 ng/mL, and 410 ng/mL, respectively. Results are summarized below:

100 ng/mL cutoff		Semi-quantitative Device		% Agreement
		+	-	
GC/MS	+	39	0	100%
	-	5	37	88.1%

Clinical urine specimens (n = 112) were assayed qualitatively with the device and by GC/MS analysis. The 4 discrepant samples were determined by GC/MS to have Oxymorphone concentration of 322 ng/mL, 421 ng/mL, 914 ng/mL, and 432 ng/mL respectively. Results are summarized below:

300 ng/mL cutoff		Qualitative Device		% Agreement
		+	-	
GC/MS	+	65	0	100%
	-	4	43	91.5%

Clinical urine specimens (n = 112) were assayed semi-quantitatively with the device and by GC/MS analysis. Four of the discrepant samples were determined by GC/MS to have Oxymorphone concentration of 322 ng/mL, 421 ng/mL, 914 ng/mL, and 432 ng/mL respectively. One discrepant sample was shown to contain 279 ng/mL Oxycodone. Results are summarized below:

300 ng/mL cutoff		Semi-quantitative Device		% Agreement
		+	-	
GC/MS	+	65	0	100%
	-	5	42	89.4%

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.