

# CEDIA® Cocaine OFT Assay

**IVD** For In Vitro Diagnostic Use Only  
(For Use with Oral-Eze® Oral Fluid Collection System)

## Rx Only

<b>REF</b>	10018590	(3 x 17 mL Kit)
	10014764	(65 mL Kit)
	10021745	(495 mL Kit)

## Intended Use

The Thermo Scientific CEDIA Cocaine OFT Assay is intended for use in the qualitative determination of benzoylecgonine in human oral fluid at a cutoff concentration of 15 ng/ml in neat oral fluid. The specimen must be collected exclusively with the Oral-Eze® Oral Fluid Collection System. The assay is calibrated against benzoylecgonine and performed on clinical chemistry analyzers. This in vitro diagnostic device is intended for clinical laboratory use only.

**The CEDIA® Cocaine OFT Assay provides only a preliminary analytical test result. A more specific alternative method must be used to obtain a confirmed analytical result. Gas Chromatography/Mass Spectrometry (GC/MS) and Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS) are the preferred confirmatory methods.<sup>(1-3)</sup> Clinical consideration and professional judgment should be applied to any drug of abuse test result particularly when preliminary positive results are used.**

## Summary and Explanation of the Test

The collection of oral fluid is less invasive and no special facilities are required. Oral fluid contains mostly parent drug and therefore is a better indicator of recent drug use.

Cocaine and its major metabolites, benzoylecgonine (BE) and ecgonine methyl ester are the primary analytes to appear in oral fluid after the administration of cocaine either intravenously or by inhalation.<sup>(4)</sup> Cocaine enters saliva by passive diffusion and its concentration is much higher in saliva than in plasma. Cocaine is detectable in oral fluid within 2 hours after intake of cocaine whereas the metabolites have longer half-life and are detectable for several hours. Detection levels of cocaine and its metabolite BE are dose-dependent and in chronic abuse cases, they can be present in oral fluid 12-36 hours.<sup>(5)</sup>

CEDIA Cocaine OFT Assay uses recombinant DNA technology to produce a unique homogeneous enzyme immunoassay system.<sup>(6)</sup> The assay is based on the bacterial enzyme  $\beta$ -galactosidase, which has been genetically engineered into two inactive fragments. These fragments spontaneously re-associate to form fully active enzyme that, in the assay format, cleave a substrate, generating a color change that can be measured spectrophotometrically.

In the assay, analyte in the sample competes with analyte conjugated to one inactive fragment (enzyme donor) of  $\beta$ -galactosidase for antibody binding site. If analyte is present in the sample, it binds to antibody, leaving the inactive enzyme fragment free to form active enzyme. If the analyte is not present in the sample, antibody binds to analyte conjugated on the inactive fragment, inhibiting the re-association of inactive  $\beta$ -galactosidase fragments, and no active enzyme is formed. The amount of active enzyme formed and resultant absorbance change are directly proportional to the amount of analyte present in the sample.

## Reagents

- 1. EA Reconstitution Buffer**  
Contains buffer salts, 1.5 mg/L rabbit polyclonal anti-benzoylecgonine antibody, stabilizer, and preservative.
- 1a EA Reagent**  
Contains 0.171 g/L Enzyme Acceptor (microbial), buffer salts and preservative.
- 2. ED Reconstitution Buffer**  
Contains buffer salts, stabilizers, and preservative.
- 2a ED Reagent**  
Contains 0.142 mg/L Enzyme Donor (microbial) conjugated to benzoylecgonine derivative, 1.67 g/L chlorophenol red- $\beta$ -D-galactopyranoside, stabilizers, detergent and preservative.

## Additional Materials Required (sold separately)

<b>REF</b>	<b>Kit Description</b>
10014954	CEDIA Multi-Drug OFT Negative Calibrator
10014955	CEDIA Multi-Drug OFT Cutoff Calibrator
10014957	CEDIA Multi-Drug OFT Controls Kit
96100-050	Oral-Eze Collection Device (50/Box)
96100-500	Oral-Eze Collection Device (500/Box)
96105-050	Oral-Eze Sample Extractor (50/Box)
96105-500	Oral-Eze Sample Extractor (500/Box)

## Precautions and Warnings

This test is for in vitro diagnostic use only. The reagents are harmful if swallowed.

**DANGER:** Powder reagent contains  $\leq 56\%$  w/w Bovine serum albumin (BSA),  $\leq 2\%$  w/w Sodium azide and  $\leq 0.5\%$  w/w Drug-specific antibody (Rabbit). Liquid reagent contains  $\leq 1.0\%$  Bovine serum,  $\leq 0.3\%$  Sodium azide and  $\leq 0.1\%$  Drug-specific antibody (Rabbit).

H317 - May cause allergic skin reaction.

H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled.

EUH032 - Contact with acids liberates very toxic gas.

Avoid breathing dust/mist/vapors/spray. Contaminated work clothing should not be allowed out of the workplace. Wear protective gloves/eye protection/face protection. In case of inadequate ventilation wear respiratory protection. If on skin: Wash with plenty of soap and water. IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing. If skin irritation or rash occurs: Get medical advice/attention. If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician. Wash contaminated clothing before reuse. Dispose of contents/ container to location in accordance with local/regional/national/international regulations.

Do not use the reagents beyond their expiration dates.

## Reagent Preparation and Storage

For preparation of the solutions, refer to the section below. Remove the kit from refrigerated storage (2-8°C) immediately prior to preparation of the solutions.

In the case of accidental spill, clean and dispose of material according to your laboratory's SOP, local, state, and country regulations, with consideration that the material contains potentially infectious materials.

In the case of damaged packaging on arrival, contact your technical support representative (refer to back page of this PI).

Prepare the solutions in the following order to minimize possible contamination.

## R2 Enzyme donor solution

Connect Bottle 2a (ED reagent) to Bottle 2 (ED Reconstitution Buffer) using one of the enclosed adapters. Mix by gentle inversion, ensuring that all the lyophilized material from Bottle 2a is transferred into Bottle 2. Avoid the formation of foam. Detach Bottle 2a and adapter from Bottle 2 and discard. Cap Bottle 2 and let stand approximately 5 minutes at room temperature (21-25°C). Mix again. Record the reconstitution date on the bottle label. Place the bottle directly into the reagent compartment of the analyzer or into refrigerated storage (2-8°C) and let stand 30 minutes before use.

## R1 Enzyme acceptor solution

Connect Bottle 1a (EA reagent) to Bottle 1 (EA Reconstitution Buffer) using one of the enclosed adapters. Mix by gentle inversion, ensuring that all the lyophilized material from Bottle 1a is transferred into Bottle 1. Avoid the formation of foam. Detach Bottle 1a and adapter from Bottle 1 and discard. Cap Bottle 1 and let stand approximately 5 minutes at room temperature (21-25°C). Mix again. Record the reconstitution date on the bottle label. Place the bottle directly into the reagent compartment of the analyzer or into refrigerated storage (2-8°C) and let stand 30 minutes before use.

**NOTE 1:** The components supplied in this kit are intended for use as an integral unit. Do not mix components from different lots.

**NOTE 2:** Avoid cross-contamination of reagents by matching reagent caps to the proper reagent bottle. The R2 solution (Enzyme Donor) should be yellow-orange in color. A red or red-purple color indicates that the reagent has been contaminated and must be discarded.

**NOTE 3:** The R1 and R2 solutions must be at the reagent compartment storage temperature of the analyzer before performing the assay. Refer to the analyzer specific application sheet for additional information.

Store reagents at 2-8°C. **DO NOT FREEZE.** For stability of the unopened components, refer to the box or bottle labels for the expiration date.

**R1 Solution:** 60 days refrigerated on analyzer or at 2-8°C.

**R2 Solution:** 60 days refrigerated on analyzer or at 2-8°C.

## Specimen Collection and Handling

Oral fluid samples are suitable for use in the CEDIA Cocaine OFT Assay. Collect oral fluid samples using the Oral-Eze Oral Fluid Collection System. Care should be taken to preserve the chemical integrity of the oral fluid sample from the time it is collected until the time it is assayed by securely capping the samples, storing the samples at 2-8°C or at room temperature (21-25°C), and testing within 21 days after collection.

## Handle oral fluid samples as if they were potentially infectious.

Samples within a pH range of 5-9 are suitable for testing with this assay.

## Oral-Eze Sample Processing Procedure

1. Label the sample collection vial with proper identification.
2. Check the sample collection date on the vial to ensure that the sample is within 21 days from the date of collection.
3. Open the cap and compress the pad to express the sample.
4. Recap the vial and the sample is ready for testing.
5. Ensure that the oral fluid samples are maintained between 4°C and 37°C during shipping.
6. Samples can be stored at room temperature (21-25°C) for 21 days. They should be stored at 2-8°C.

## Assay Procedure

The Oral-Eze Oral Fluid Collection Device contains a preservative buffer that dilutes the neat oral fluid sample. The calibrator and control levels are set at diluted levels so that sample absorbance values can be compared directly to the absorbance value of the cutoff calibrator. The assay result is reported as a positive or negative result relative to the neat oral fluid cutoff of 15 ng/mL. The concentrations reported in this insert refer to the neat oral fluid concentration, unless otherwise noted.

**NOTE:** To correlate the Oral-Eze result from the assay or the associated LC-MS/MS confirmation result to a neat oral fluid value, the result from the Oral-Eze sample should be multiplied by a factor of 3.

1. Pipet the processed oral fluid samples and controls into labeled sample cups and place the cups into the sample ring of the MGC 240 analyzer.
2. Load reagents (reagent 1 and reagent 2) into the reagent compartment of the analyzer.
3. Pipet calibrators into labeled cups and load the cups into the sample ring of the analyzer.
4. Program the run setup using 570 nm as primary wavelength and 660 nm as the secondary wavelength. Refer to the parameter sheet for detailed instructions on how to program the analyzer.
5. Use the cutoff calibrator as a reference for distinguishing negative from positive samples.

## Quality Control

The CEDIA Multi-Drug OFT Controls are designed to be used with the CEDIA Cocaine OFT Assay. Good laboratory practice suggests the use of control specimens to ensure proper assay performance. Ensure that controls results are within the established ranges determined by laboratory practices and guidelines. If control results fall outside of established ranges, assay results are invalid. All quality control requirements should be performed in conformance with local, state, and/or federal regulations or accreditation requirements.

## Interpretation of results

A sample that exhibits a change in absorbance ( $\Delta A$ ) value equal to or greater than the value obtained with the cutoff calibrator is considered positive. A sample that exhibits a change in absorbance ( $\Delta A$ ) value lower than the value obtained with the cutoff calibrator is considered negative.

## Extraction Efficiency and Drug Recovery

Extraction efficiency of the preservative buffer in recovering the drug from the collection device pad was determined by testing the recovery of the drug by LC-MS/MS method. The oral fluid samples at the cutoff level and  $\pm 50\%$  control levels recovered within  $\pm 20\%$  from nominal values.

## Limitations

A positive result from this assay indicates only the presence of benzoylecgonine and does not necessarily correlate with the extent of physiological and psychological effects.

It is possible that other substances and/or factors (e.g.: technical or procedural), other than those investigated in the specificity study may interfere with the test and cause false results.

## Specific Performance Characteristics

Typical performance results obtained on the MGC 240 analyzer are shown below. The results obtained in your laboratory may differ from these data.

## Precision and Cutoff Characterization

Negative neat oral fluid samples were collected and prepared by spiking benzoylecgonine at negative, -75%, -50%, -25%, below the cutoff, at the cutoff, and +25%, +50%, +75% and +100% above the cutoff. All spiked neat oral fluid sample concentrations were confirmed by LC-MS/MS. The neat oral fluid samples were processed using the Oral-Eze® device to obtain diluted oral fluid samples. The diluted oral fluid samples were confirmed by LC-MS/MS and tested in the CEDIA® Cocaine OFT Assay in qualitative mode.

The randomized CLSI (EP5-A2) precision protocol was followed with five replicates of each sample for each run, 2 runs per day for five non-consecutive days, total N= 50/level.

The results are summarized in the table below.

Analyte	Tested Concentration (ng/mL)	Neat Oral Fluid LC-MS/MS (ng/mL)	Diluted Oral Fluid LC-MS/MS (ng/mL)	Cocaine OFT Assay # Neg / # Pos
Benzoylecgonine	0	0	0	50 Neg / 0 Pos
Benzoylecgonine	3.75	3.86	1.08	50 Neg / 0 Pos
Benzoylecgonine	7.5	7.46	2.34	50 Neg / 0 Pos
Benzoylecgonine	11.25	11.65	3.68	50 Neg / 0 Pos
Benzoylecgonine	15.0	15.89	4.68	50 Neg / 0 Pos*
Benzoylecgonine	18.75	19.69	6.26	0 Neg / 50 Pos
Benzoylecgonine	22.5	22.94	6.74	0 Neg / 50 Pos
Benzoylecgonine	26.25	27.93	8.43	0 Neg / 50 Pos
Benzoylecgonine	30.0	33.59	9.13	0 Neg / 50 Pos

\*Diluted samples were recovered low by LC-MS/MS

## Specificity and Cross-Reactivity

Metabolites of cocaine were tested for cross-reactivity in the assay. The cross-reactant solutions were prepared by adding the compounds to neat oral fluid samples at the concentration listed in the table below. The neat oral fluid samples were processed using the Oral-Eze device to obtain diluted oral fluid samples which were tested in the CEDIA Cocaine OFT Assay. The concentrations listed below produced a result approximately equal to the cutoff calibrator except for Ecgonine methyl ester which produced a result below the cutoff calibrator.

Compounds	Tested Concentration in Neat Oral Fluid (ng/mL)	Cocaine OFT Assay Negative / Positive
Cocaethylene	180	Positive
Cocaine	180	Positive
Ecgonine	3,000	Positive
Ecgonine methyl ester	9,000	Negative

Various common over-the-counter medications and structurally unrelated compounds were tested for cross-reactivity in the assay. The cross-reactant solutions were prepared by adding the compound to neat oral fluid at the concentrations listed in the table below. The neat oral fluid samples were processed using the Oral-Eze device to obtain diluted oral fluid samples which were tested in the CEDIA Cocaine OFT assay. All the compounds tested negative and did not show any cross-reactivity.

Compounds	Tested Concentration in Neat Oral Fluid (ng/mL)	Cocaine OFT Assay Negative / Positive
Acetaminophen	1,800,000	Negative
Acetylsalicylic Acid	1,800,000	Negative
Alprazolam	30,000	Negative
Amobarbital	30,000	Negative
Amoxicillin	240,000	Negative
Amphetamine	240,000	Negative
Ampicillin	30,000	Negative
Atropine	30,000	Negative
$\beta$ -Phenethylamine	30,000	Negative
Bupropion	30,000	Negative
Butabarbital	30,000	Negative
Butalbital	30,000	Negative
Caffeine	60,000	Negative
Captopril	1,800,000	Negative
Chlordiazepoxide	240,000	Negative
Chlorpromazine	30,000	Negative
Cimetidine	600,000	Negative
Clonazepam	30,000	Negative
Clorazepate	30,000	Negative
Codeine	105,000	Negative
Cotinine	30,000	Negative
Cyclizine	30,000	Negative
Dextromethorphan	30,000	Negative
Diacetylmorphine	30,000	Negative
Diazepam	120,000	Negative
Digoxin	120,000	Negative
Diphenhydramine	30,000	Negative
Enalapril	120,000	Negative
Fluoxetine	600,000	Negative
Gentisic Acid	30,000	Negative
Hydrocodone	30,000	Negative
Ibuprofen	600,000	Negative
Imipramine	24,000	Negative
<i>l</i> -Ephedrine	30,000	Negative
Levothyroxine	600,000	Negative
Lidocaine	30,000	Negative

(Con't)

Compounds	Tested Concentration in Neat Oral Fluid (ng/mL)	Cocaine OFT Assay Negative / Positive
Loperamide	30,000	Negative
Medazepam	30,000	Negative
Meperidine	30,000	Negative
Methadone	120,000	Negative
Methamphetamine	240,000	Negative
Metoprolol	30,000	Negative
Morphine	60,000	Negative
Naproxen	30,000	Negative
Niacinamide	30,000	Negative
Nicotine	30,000	Negative
Nifedipine	1,500,000	Negative
Norchlordiazepoxide	30,000	Negative
Nordiazepam	30,000	Negative
Penicillin	30,000	Negative
Pentobarbital	30,000	Negative
Phencyclidine	15,000	Negative
Phenobarbital	120,000	Negative
Phenylephrine	30,000	Negative
Phenylpropanolamine	30,000	Negative
Procainamide	30,000	Negative
Procaine	30,000	Negative
Propoxyphene	120,000	Negative
Pseudoephedrine	30,000	Negative
Quinidine	30,000	Negative
Ranitidine	600,000	Negative
Salbutamol	30,000	Negative
Salicylic Acid	300,000	Negative
Secobarbital	240,000	Negative
Temazepam	30,000	Negative
$\Delta^9$ -THC	30,000	Negative
11-nor- $\Delta^9$ -THC-COOH	15,000	Negative
Theophylline	30,000	Negative
Tolmetin	30,000	Negative
Verapamil	600,000	Negative
Zomepirac	30,000	Negative

### Endogenous, Exogenous Substances and pH Interference

The potential interference from several endogenous and exogenous substances, and pH on the detection accuracy of samples containing benzoylecgonine at  $\pm$  50% of the cutoff concentration were tested in the assay. The interfering substances were added to neat oral fluid at the concentrations listed in the table below. The neat oral fluid samples were processed using the Oral-Eze® collection device and tested in the CEDIA® Cocaine OFT Assay. No interference was observed with the interfering substances and pH 5-9 samples at the  $\pm$  50% cutoff concentrations.

Substances	Tested Concentration in Neat Oral Fluid	Cocaine OFT Assay	
		-50% Benzoylecgonine	+50% Benzoylecgonine
Low Control	7.5 ng/mL	Negative	N/A
High Control	22.5 ng/mL	N/A	Positive
Cotinine	0.03 mg/mL	Negative	Positive
Nicotine	0.015 mg/mL	Negative	Positive
Hemoglobin	0.6 mg/mL	Negative	Positive
Human serum albumin	24 mg/mL	Negative	Positive
Sodium Chloride	18 mg/mL	Negative	Positive

(Con't)

Substances	Tested Concentration in Neat Oral Fluid	Cocaine OFT Assay	
		-50% Benzoylecgonine	+50% Benzoylecgonine
Cholesterol	45 mg/mL	Negative	Positive
Acetaminophen	0.3 mg/mL	Negative	Positive
Acetylsalicylic Acid	0.3 mg/mL	Negative	Positive
Ibuprofen	0.12 mg/mL	Negative	Positive
Coffee	6% v/v	Negative	Positive
Milk	3% v/v	Negative	Positive
Orange Juice	6% v/v	Negative	Positive
Cranberry Juice	6% v/v	Negative	Positive
Soft drink (Coke)	6% v/v	Negative	Positive
Toothpaste	6% v/v	Negative	Positive
Mouthwash	6% v/v	Negative	Positive
Tea	6% v/v	Negative	Positive
Denture Adhesive	6% v/v	Negative	Positive
Alcohol	6% v/v	Negative	Positive
Baking Soda	6% v/v	Negative	Positive
Cough Syrup	6% v/v	Negative	Positive
Whole Blood	6% v/v	Negative	Positive
Hydrogen Peroxide	6% v/v	Negative	Positive
pH	5-9	Negative	Positive

### Additional Interference from other Food and Dental Products

Potential interference from additional compounds was tested by collecting neat oral fluid from volunteers after use of the following substances: hard candy, chewing gum, chewing tobacco, cigarettes and tooth whitening strips. The  $\pm$  50% controls in the presence of above interfering substances were detected accurately in the CEDIA Cocaine OFT Assay.

### Method Comparison

Forty-one natural (unaltered) neat oral fluid samples from rehabilitation clinics were collected. The neat oral fluid samples were processed using the Oral-Eze collection device. Both the neat and diluted oral fluid samples were tested by LC-MS/MS method while only the diluted samples were tested in the CEDIA Cocaine OFT Assay.

The overall concordance between CEDIA Cocaine OFT Assay and LC-MS/MS using a cutoff of 15 ng/mL in neat oral fluid is 100.0%. The comparison of sample results by the CEDIA Cocaine OFT Assay to LC-MS/MS showed 100.0% sensitivity and 100.0% specificity.

Candidate Device Results	Less than half the cutoff concentration by LC-MS/MS analysis	Near Cutoff Negative (Between 50% below the cutoff and the cutoff concentration)	Near Cutoff Positive (Between the cutoff and 50% above the cutoff concentration)	High Positive (greater than 50% above the cutoff concentration)
Negative	19	2	0	0
Positive	0	0	2	18

## References

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2. Maurer, H. H. (2005). *Advances in Analytical Toxicology*: The Current Role of Liquid Chromatography-Mass Spectrometry in Drug Quantification in Blood and Oral Fluid. *Analytical and Bioanalytical Chemistry*, 381, 110-118.
3. Lambert, W. E., et al. (2002). Simultaneous, quantitative determination of opiates, amphetamine, cocaine and Benzoylcegonine in oral fluid by liquid chromatography quadrupole-time-of-flight mass spectrometry. *Chromatogr B Analyt Technol Biomed Life Sci.*, 779, 321-30.
4. Cone, E. J., Darwin, W. D., & Oyler, J. M. (1997). Cocaine disposition in saliva following intravenous, intranasal and smoking administration. *Journal of Analytical Toxicology*, 21, 465-475.
5. Cone, E. J., & Weddington, W. W. (1989). Prolonged occurrence of cocaine in human saliva and urine after chronic use. *Journal of Analytical Toxicology*, 13, 65-72.
6. Henderson, D. R., et al. (1986). CEDIA, A New homogeneous Immunoassay System *Clin. Chem.*, 32, 1637-1641.

## Glossary:

<http://www.thermofisher.com/symbols-glossary>



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