DRI™ Opiate Assay

thermo scientific

IVD **For In Vitro Diagnostic Use**

Rx Only

REF 10014601 (3 x 18 mL)
0135 (100 mL Kit)
0136 (500 mL Kit)

Intended Use
The DRI™ Opiate Assay is a homogeneous enzyme immunoassay intended for the qualitative or semi-quantitative determination of opiates in human urine with 300 ng/mL or 2000 ng/mL as a cutoff calibrator.

The assay provides only a preliminary analytical test result. A more specific alternative chemical method must be used in order to obtain a confirmed analytical result. Gas chromatography/ mass spectrometry (GC/MS) is the preferred confirmatory method.[1,2] 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
FOR LABORATORY USE ONLY

Opiate compounds, such as morphine and codeine, are naturally occurring alkaloids of opium and are widely used as analgesics. Although drug abusers may abuse morphine and codeine, another opiate compound, heroin, is synthesized from morphine and is the most commonly abused opiate. When ingested or injected, heroin is metabolized to the molecule, 6-Monoacetyl morphine, which is hydrolyzed back to morphine. Opiates are rapidly metabolized by the body and excreted in urine, allowing immunoassays to detect recent use of morphine, codeine, and/or heroin.

The DRI Opiate Assay is a homogeneous enzyme immunoassay[3] using ready-to-use liquid reagents. The assay uses monoclonal antibodies that detect opiates in urine. The assay is based on the competition between an enzyme glucose-6-phosphate dehydrogenase (G6PDH) labeled drug and the free drug from the urine sample for a fixed amount of specific antibody binding sites. In the absence of free drug from the sample, the specific antibody binds the drug-labeled G6PDH and the enzyme activity is inhibited. This phenomenon creates a direct relationship between drug concentration in urine and the enzyme activity. The enzyme G6PDH activity is determined spectrophotometrically at 340 nm by measuring its ability to convert nicotinamide adenine dinucleotide (NAD) to NADH.

Reagents
Antibody/Substrate Reagent
Contains monoclonal anti-morphine antibody, glucose-6-phosphate (G6P), and nicotinamide adenine dinucleotide (NAD) in Tris buffer with sodium azide as a preservative.
Enzyme Conjugate Reagent
Contains morphine labeled with glucose-6-phosphate dehydrogenase (G6PDH) in Tris buffer with sodium azide as a preservative.

Additional Materials Required (sold separately):

REF	Kit Description
Use with 2000 ng/mL Cutoff	
1664	DRI Negative Calibrator, 10 mL
1388	DRI Negative Calibrator, 25 mL
1588	DRI Multi-Drug Calibrator 1, 10 mL
1589	DRI Multi-Drug Calibrator 1, 25 mL
1591	DRI Multi-Drug Calibrator 2, 10 mL
1592	DRI Multi-Drug Calibrator 2, 25 mL
1594	DRI Multi-Drug Calibrator 3, 10 mL
1595	DRI Multi-Drug Calibrator 3, 25 mL
1597	DRI Multi-Drug Calibrator 4, 10 mL
1598	DRI Multi-Drug Calibrator 4, 25 mL
DOAT-2	MAS® DOA Total – Level 4, 6 x 18 mL
DOAT-3	MAS® DOA Total – Level 5, 6 x 18 mL
Use with 300 ng/mL Cutoff	
1664	DRI Negative Calibrator, 10 mL
1388	DRI Negative Calibrator, 25 mL
1609	DRI Opiate Calibrator 1, 25 mL
0034	DRI Low Urine Calibrator, 5 mL
1610	DRI Opiate Calibrator 3, 25 mL
0036	DRI High Urine Calibrator, 5 mL
DOAT-4	MAS® DOA Total – Level 2, 6 x 18 mL
DOAT-5	MAS® DOA Total – Level 3, 6 x 18 mL

⚠ Precautions and Warnings
1. **DANGER:** This test is for in vitro diagnostic use only. The reagents are harmful if swallowed.
2. Reagents used in the assay components contain ≤0.09% sodium azide, ≤0.2% bovine serum albumin (BSA) and ≤0.5% Drug-specific antibody. Avoid contact with skin and mucous membranes. Flush affected areas with copious amounts of water. Get immediate medical attention for eyes, or if ingested. Sodium azide may react with lead or copper plumbing to form potentially explosive metal azides. When disposing of such reagents, always flush with large volumes of water to prevent azide build - up. Clean exposed metal surfaces with 10% sodium hydroxide.
3. Do not use the reagents beyond their expiration dates.

H317 - May cause allergic skin reaction.
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Avoid breathing mist or vapor. 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.

Reagent Preparation and Storage
The reagents are ready for use. No reagent preparation required. All assay components, when stored at 2-8 °C, are stable until the expiration date indicated on the label.

Specimen Collection and Handling
Collect urine specimens in plastic or glass containers. Care should be taken to preserve the chemical integrity of the urine sample from the time it is collected until the time it is assayed.

Specimens kept at room temperature that do not receive initial test within 7 days[4] of arrival at the laboratory may be placed into a secure refrigeration unit at 2 to 8°C for two months.[5] For longer storage prior to analysis or for sample retention after analysis, urine specimens may be stored at -20°C.[5,6]

Laboratories following the SAMHSA mandatory guidelines should refer to SAMHSA "Short-Term Refrigerated Storage" and "Long-Term Storage" requirements.[7]

Specimens within a pH range of 3 to 11 are suitable for testing with this assay.

To protect the integrity of the sample, do not induce foaming and avoid repeated freezing and thawing. An effort should be made to keep pipetted samples free of gross debris. It is recommended that grossly turbid specimens be centrifuged before analysis. Frozen samples should be thawed and mixed prior to analysis. Adulteration of the urine sample may cause erroneous results. If adulteration is suspected, obtain another sample and forward both specimens to the laboratory for testing.

Handle all urine specimens as if they were potentially infectious.

Assay Procedure
Analyzers capable of maintaining a constant temperature, pipetting samples, mixing reagents, measuring enzymatic rates at 340 nm and timing the reaction accurately can be used to perform this assay.

Refer to the specific application instructions of each analyzer for chemistry parameters before performing the assay.

Quality Control and Calibration
Good laboratory practice suggests the use of control specimens to ensure proper assay performance. Use controls near the cutoff calibrator to validate the calibration. Control results must fall within established ranges as determined by your laboratory. If 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.

Qualitative analysis
For qualitative analysis of samples, use the 300 ng/mL or 2000 ng/mL calibrator as a cutoff level for distinguishing "positive" from "negative" samples. The DRI Opiate Low Urine Calibrator contains 300 ng/mL morphine. The DRI Multi-Drug Calibrator 2 contains 2000 ng/mL morphine.

Semi-quantitative analysis
For semi-quantitative analysis, use all calibrators.

Results and Expected Values
Qualitative results
A sample that exhibits a change in absorbance (ΔA) value equal to or greater than the value obtained with the cutoff calibrator is considered positive. A sample that exhibits a change in absorbance (ΔA) value lower than the value obtained with the cutoff calibrator is considered negative.

Semi-quantitative results
A rough estimate of drug concentration in the samples can be obtained by running a standard curve with all calibrators and quantitating samples off the standard curve. Refer to the analyzer-specific protocol sheets.

Limitations

1. A positive result from this assay indicates only the presence of opiates and does not necessarily correlate with the extent of physiological and psychological effects.
2. A positive result by this assay should be confirmed by another nonimmunological method such as GC, TLC or GC/MS.
3. The test is designed for use with human urine only.
4. It is possible that other substances and/or factors (eg, technical or procedural) not listed in the specificity table may interfere with the test and cause false results.

Typical Performance Characteristics

Performance data results obtained on the Hitachi 717 analyzer are shown below.[8] The results obtained in your laboratory may differ from these data.

Precision

The following tables summarize the precision results obtained by testing the 300 ng/mL calibrator, 2000 ng/mL calibrator, and their respective low and high controls.

Hitachi 717 Qualitative

Using the 300 ng/mL cutoff calibrator	Within-run Precision		Total Precision	
	Mean ± SD (mA/min)	% CV	Mean ± SD (mA/min)	% CV
Low Control (225 ng/mL)	374 ± 2.2	0.6	374 ± 2.6	0.7
Cutoff	401 ± 2.3	0.6	401 ± 3.2	0.8
High Control (375 ng/mL)	421 ± 2.4	0.6	421 ± 3.0	0.7

Using the 2000 ng/mL cutoff calibrator	Within-run Precision		Total Precision	
	Mean ± SD (mA/min)	% CV	Mean ± SD (mA/min)	% CV
Low Control (1500 ng/mL)	458 ± 2.6	0.6	458 ± 3.6	0.8
Cutoff	486 ± 3.2	0.7	486 ± 4.3	0.9
High Control (2500 ng/mL)	507 ± 3.1	0.6	507 ± 4.2	0.8

Hitachi 717 Semi-quantitative

Using the 300 ng/mL cutoff calibrator	Within-run Precision		Total Precision	
	Mean ± SD (ng/mL)	% CV	Mean ± SD (ng/mL)	% CV
Low Control (225 ng/mL)	226 ± 6.0	2.7	226 ± 8.2	3.6
Cutoff	303 ± 8.1	2.7	303 ± 9.4	3.1
High Control (375 ng/mL)	379 ± 15.1	4.0	379 ± 15.9	4.2

Using the 2000 ng/mL cutoff calibrator	Within-run Precision		Total Precision	
	Mean ± SD (ng/mL)	% CV	Mean ± SD (ng/mL)	% CV
Low Control (1500 ng/mL)	1513 ± 42.8	2.8	1513 ± 54.4	3.6
Cutoff	2008 ± 64.7	3.2	2008 ± 83.5	4.2
High Control (2500 ng/mL)	2517 ± 88.0	3.5	2517 ± 124.4	4.9

Sensitivity

Sensitivity, defined as the lowest concentration that can be differentiated from the negative urine with 95% confidence, is 6 ng/mL for the 300 ng/mL cutoff assay and 26 ng/mL for the 2000 ng/mL cutoff assay.

Accuracy

One hundred and seventy nine urine samples were assayed with the DRI Opiate Assay at 300 ng/mL cutoff, and one hundred and sixty three samples were assayed with the DRI Opiate Assay at the 2000 ng/mL cutoff on the Hitachi 717 and bt GC/MS.

The overall concordance between the DRI Opiate Assay on the Hitachi 717 and GC/MS was 96.1% for the 300 ng/mL cutoff, with 100.0% (91 of 91) agreement for positive samples and 92.0% (81 of 88) agreement for the negative samples. The overall concordance for the 2000 ng/mL cutoff was 97.5% with 100.0% (89 of 89) agreement for positive samples and 94.6% (70 of 74) agreement for negative samples.

DRI Opiate Qualitative Assay, 300 ng/mL Cutoff

Hitachi 717	GC/MS +	GC/MS -
+	91	7
-	0	81

DRI Opiate Qualitative Assay, 2000 ng/mL Cutoff

Hitachi 717	GC/MS +	GC/MS -
+	89	4
-	0	70

Interference

Interference from endogenous and exogenous substances were investigated. No interference was observed when urine samples were spiked with the following compounds up to the concentrations indicated.

Compound	Concentration	Compound	Concentration
Acetaminophen	100 µg/mL	Glucose	3 g/dL
Acetone	1000 mg/dL	Hemoglobin	300 mg/dL
Ascorbic acid	1500 mg/dL	HSA	500 mg/dL
Aspirin	100 µg/mL	Ibuprofen	100 µg/mL
Caffeine	100 µg/mL	Oxalic acid	100 mg/dL
Creatinine	500 mg/dL	Riboflavin	7.5 mg/dL
Ethanol	1%	Sodium Chloride	1.5 g/dL
Galactose	10 mg/dL	Urea	6 g/dL

Specificity

The specificity of the assay was evaluated using 300 ng/mL and 2000 ng/mL as cutoff calibrators. The following tables summarize the results.

The compounds in the table below produced a result approximately equivalent to the cutoff calibrator.

Compound	300 ng/mL Cutoff Concentration	2000 ng/mL Cutoff Concentration
6-Monoacetyl Morphine	280	2500
Codeine	180	1200
Dihydrocodeine	650	4500
Heroin	380	2400
Hydrocodone	650	6500
Hydromorphone	1400	13000
Levorphanol	10500	87000
Morphine	300	2000
Morphine-3-Glucuronide	600	5000
Morphine-6-Glucuronide	270	1350
Oxycodone	10500	90000
Oxymorphone	37000	300000
Ranitidine	500000	3000000

Concentration of compounds that produced a negative result with both the 300 ng/mL and 2000 ng/mL cutoff calibrators:

Compound	Concentration (ng/mL)	Compound	Concentration (ng/mL)
Acetaminophen	500000	Imipramine	100000
Acetylsalicylic acid	500000	Maprotiline	100000
Amitriptyline	100000	Meperidine	20000
Amphetamine	1000000	Methadone	500000
Benzoylecgonine	1000000	Metronidazole	1000000
Caffeine	10000	Nalbuphine	1000000
Carbamazepine	500000	Naloxone	100000
Chlorpromazine	10000	Naltrexone	3000000
Clomipramine	100000	Normorphine	100000
Cyclazocine	35000	Nortriptyline	100000
Desipramine	100000	Oxazepam	250000
Dextromethorphan	100000	Phencyclidine	1000000
Doxepine	100000	Phenobarbital	1000000
Ephedrine	1000000	Secobarbital	1000000
Fentanyl	100000	Talwin	100000
Fluoxetine	100000	Thebaine	1100
Fluphenazine	100000	Thioridazine	100000
Ibuprofen	500000	Tramadol	100000

References

1. Urine Testing for Drugs of Abuse. National Institute on Drug Abuse (NIDA). Research Monograph 73, 1986.
2. Mandatory Guidelines for Federal Workplace Drug Testing Programs. National Institute on Drug Abuse. Federal Register Vol. 53, No 69, pp 11970 (1988).
3. Rubenstein KE, Schneider RS, and EF Ullman: Homogeneous Enzyme Immunoassay: A New Immunochemical Technique. Biochem Biophys Res Commun 47, 846-851 (1972).
4. Ciuiti R, Quercioli M, Borsotti M. Stabilita delle principali droghe d'abuso in campioni di urine non trattate rispetto a campioni di urine stabilizzate Drugs of abuse stability in native urine specimens vs. stabilized urine samples. *biochimica clinica*, 2014, vol. 38, n. 2, pg. 103-109.
5. Gonzales E, Ng G, Pesce A, West C, West R, Mikel C, Latyshev, S, Almazan P. Stability of pain-related medications, metabolites and illicit substances in urine. *Clinica Chimca Acta* 416: (2013) 30-35.
6. C52-A2, Toxicology and Drug Testing in the Clinical Laboratory; Approved Guideline – Second Edition, *Clinical and Laboratory Standards Institute (CLSI)* (April 2007).
7. *Notice of Mandatory Guidelines for Federal Workplace Drug Testing Program: Final Guidelines; Federal Register,* Substance Abuse and Mental Health Administration (SAMHSA), (1994) 110 (June 9):11983.
8. Data on file at Microgenics, a part of Thermo Fisher Scientific.

Glossary:
http://www.thermofisher.com/symbols-glossary

Microgenics Corporation
46500 Kato Road
Fremont, CA 94538 USA
US Customer and
Technical Support:
1-800-232-3342

EC REP
B·R·A·H·M·S GmbH
Neuendorfstrasse 25
16761 Hennigsdorf, Germany

For insert updates go to:
www.thermofisher.com/diagnostics

Other countries:
Please contact your local Thermo Fisher Scientific representative.

0140-14-EN
2020 04

thermo scientific