DRG Morphine (Opiate) Screen Test (RAP-3530)

Revised 16 July 2008

For the rapid determination of morphine and its metabolites in human urine.

For *in vitro* diagnostic use only.

INTENDED USE

The DRG® Morphine Screen Test is an in vitro diagnostic (IVD), qualitative, lateral flow, immunochromatographic urinary assay for the rapid detection of morphine in human urine at the Substance Abuse Mental Health Services Administration (SAMHSA) cut-off level of 2000 ng/ml. This test is designed to obtain a visual, qualitative result and intended for professional use only. It is not intended for quantitative analysis, nor for over-the-counter sale.

The DRG® Morphine Screen Test provides only preliminary analytical data. A more specific, quantitative, alternative method is required to obtain a confirmed analytical result. SAMHSA has established gas chromatography / mass spectrometry (GC/MS) as the preferred confirmatory method. Clinical considerations and professional judgment should be applied to any drug of abuse test result, particularly when preliminary positive results are indicated.

SUMMARY AND EXPLANATION OF TEST

The opiates, such as morphine, heroin, and codeine, are derived from the resin of opium poppy. Heroin and codeine are metabolized to morphine. Thus, the presence of morphine (or the metabolite, morphine glucuronide) in urine indicates heroin, codeine and/or morphine use. Morphine is the primary urinary marker for detecting opiate use. Urine screening for drugs of abuse usually detects the presence of the parent compounds and metabolites of the drug.

The DRG® Morphine Screen Test is a rapid, visual, lateral flow, competitive, immunochromatographic assay for the qualitative detection of morphine and its metabolites (morphine glucuronide), in human urine. The test is based on immunoassay principles and designed specifically for the assay and identification of morphine and morphine glucuronide in human urine at the cut-off level of 2000 ng/ml or higher, as set by SAMHSA.

PRINCIPLE OF THE PROCEDURE

The DRG® Morphine Screen Test is a competitive immunoassay in which chemically modified and bound morphine conjugate competes with urinary morphine and its metabolites (morphine glucuronide) for limited, specific morphine antibody binding sites. Each test device contains a sample reaction unit, a pink-colored, antibody-colloidal gold conjugate unit pre-labeled with specific antibody, and a chromatographic membrane pre-coated with drug conjugate in the device test region.

When free drug is absent from urine or at concentrations lower than the urinary detection cut-off level, the pink-colored, antibody-colloidal gold conjugate is free to bind to the immobilized drug conjugate pre-coated on the chromatographic membrane test region. Consequently, a pink-colored band will form in the test region indicating a negative result. When drug is present in urine at concentrations at or exceeding the detection cut-off level, it will bind to limited epitopes on the pink-colored, antibody-colloidal gold conjugate, completely competing with drug conjugate in the test region. In such cases, no band forms in the test region, indicating a positive result.

The DRG® Morphine Screen Test also provides a built-in process control. A pink-colored band should always appear in the control region, regardless of the presence of any urinary morphine or morphine glucuronide. This pink-colored control band verifies that: 1) sufficient urine volume was added, and 2) proper flow was obtained.

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If the control band is missing, the test was not performed correctly or failed to function correctly. In summary, negative urine will produce two pink-colored bands, one in the control region and one in the test region. Positive urine will produce one pink-colored band in the control region only.

REAGENTS AND MATERIALS SUPPLIED

Test device with the following components: a sample reaction unit, a pink-colored, colloidal gold conjugate unit, and a chromatographic membrane unit. A disposable sample pipette comes with the test card.
Test instructions

MATERIALS REQUIRED BUT NOT PROVIDED

Urine sample collection containers
Timer or clock

WARNINGS AND PRECAUTIONS

- **For *in vitro* diagnostic use.**
- Avoid cross contamination of urine samples by using a new sample collection container and pipette for each urine sample.
- Urine specimens may be potentially infectious. Avoid contact with skin by wearing gloves and proper laboratory attire. Properly handle and dispose of all used test devices in an approved biohazard container.
- Do not use a test device beyond the expiration date imprinted on the outside of the foil pouch.

STORAGE AND STABILITY

The test devices supplied can be stored at room temperature or refrigerated (2-28°C) and will remain stable until the expiration date.
Do Not Freeze.

SAMPLE COLLECTION AND PREPARATION

The fresh urine samples should be collected in a clean, dry container such that same-day testing may be performed. Urine specimens may be refrigerated at 2-8°C for 48hours, or frozen at -20°C for assaying at a later date. Specimens that have been refrigerated or frozen must be equilibrated to room temperature before testing. Urine samples exhibiting visible precipitates should be filtered, centrifuged or allowed to settle so that clear aliquots can be obtained for testing.

ASSAY PROCEDURE

- Do not open foil pouch until ready to begin testing. Refrigerated test device should be allowed to come to room temperature (15-28°C) before pouch is opened.
- Remove the test device from the sealed foil pouch by tearing along the notch.
- **FOR TEST STRIP:** Immerse the strips in urine with the arrow end pointing towards the urine. Do not introduce urine above the maximum level, as indicated by the arrows.
- **FOR TEST CARD:** Draw the urine sample into the pipette and dispense four drops (approximately 0.2ml) into the sample well of test device.

- Read the test result at five minutes.

IMPORTANT: In order to prevent an incorrect reading, do not read the test results after more than 10 minutes. After 10 minutes, the intensity of the colored lines may change or a new line may appear. To avoid confusion, discard the test device after interpreting the result.

INTERPRETATION OF RESULTS

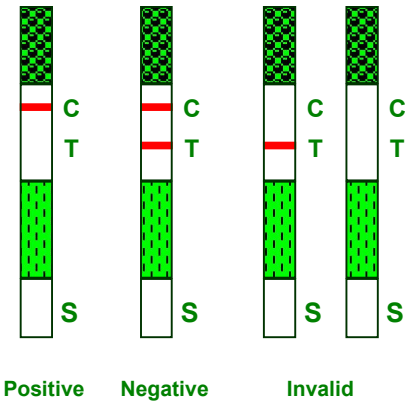
Negative: Two pink-colored bands appear, one in the control region and one in the test region. A negative result indicates free drug is absent from urine or at concentrations lower than the detection cut-off level of the test.

Positive: One pink-colored band appears in the control region with no apparent band appearing in the test region. A positive result indicates free drug is present in urine at concentrations at or exceeding the detection cut-off level of the test.

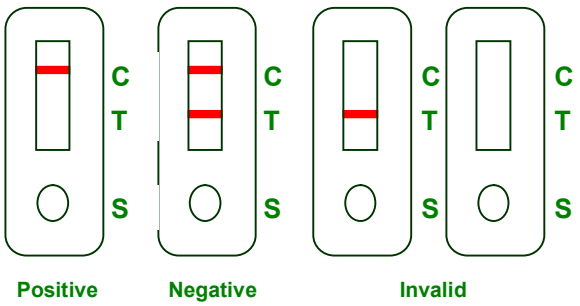
Invalid: No band appears in the control region, or a band appears in the test region only. An invalid test result may be due to improper assay procedures or damage to the device. If results are invalid, the assay is inconclusive and the specimen should be re-tested using a new test device.

Note: The test band intensity may be weaker or stronger than that of the control band, but a very faint band in the test region indicates that the free drug concentration is near the cut-off level in the urine. The specimen should be re-tested or confirmed with a more specific method before a positive determination is made.

TEST STRIPS



TEST CARDS



PROCESS AND QUALITY CONTROL

Good laboratory practice requires use of control materials that ensure proper test device performance and reliability. Quality control standards are available for the validation of device functionality from commercial sources such as BioRad, Alltech and Biopool. To test the quality of control standards, use the assay procedure for testing urine samples. The SAMHSA recommended guidelines for drugs of abuse screening test devices indicate that controls should contain the drug of abuse analyte at levels at least 25% above cut-off values.

AFTER TESTING

Urine specimens may be potentially infectious. Avoid contact with skin by wearing gloves and proper laboratory attire. Properly handle and dispose of all used test devices in an approved biohazard container. Residual urine should be disposed of in a medically approved manner after the completion of all testing, including the confirmatory assay.

PERFORMANCE CHARACTERISTICS

SENSITIVITY

The DRG® Morphine Screen Test has been designed for the detection of morphine and its metabolites (morphine glucuronide) in urine at the detection sensitivity of 2000 ng/ml, as suggested for immunoassay methods by SAMHSA. In sensitivity studies performed, samples with concentrations of morphine equal to or lower than 1000 ng/ml were identified as negative for all samples. Concentrations of morphine equal to or higher than 3000 ng/ml were identified as positive results for all samples.

PRECISION

In order to determine the precision of both the DRG® Morphine Screen Test Card and Test Strip devices, both within-lot and inter-lot reproducibility studies were performed. Results of the within-lot reproducibility studies clearly showed excellent repeatability for all positive and negative urine samples using one lot of DRG® Morphine Screen Test Card devices and one lot of Test Strip devices. The results of inter-lot reproducibility studies clearly demonstrated that there was no appreciable inter-lot variation when testing both positive and negative samples across three different lots of DRG® Morphine Screen Test Card and Test Strip devices.

SPECIFICITY STUDY

Device specificity was tested against compounds related to, or not associated with, morphine, prepared in drug-free, normal human urine. The following compounds produced positive results with the DRG® Morphine Screen Test at levels at or greater than the concentrations listed below:

Morphine	2000ng/ml
Codeine	2000ng/ml
Ethyl morphine	2000ng/ml

The following compounds were found not to have any impact on negative results when tested at levels of up to 100 µg drug/ml (100,000 ng drug/ml):

Acetaminophen	Acetone	Albumin

Amitriptyline
Ampicillin
Aspartame
Aspirin (Acetylsalicylic Acid)
Atropine
Benzocaine
Bilrubin
Caffeine
Chloroquine
(+)-Chlorpheniramine
(+/-)-Chlorpheniramine
Creatine
Dexbrompheniramine
Dextromethorphan
4-Dimethylaminoantipyrine
Dopamine
(+/-)-Ephedrine
(-)-Ephedrine
(+)-Epinephrine
Erythromycin
Ethanol
Furosemide
Glucose
Guaiacol glyceryl ether
Hemoglobin
Imipramine
(+/-)-Isoproterenol
(1R,2S)-(-)-N-Methyl-Ephedrine
Lidocaine
(+)-Naproxen
(+/-)-Norephedrine
Oxalic Acid
Penicillin-G
Pheniramine
Phenothiazine
L-Phenylephrine
β-Phenylethylamine
Procaine
Quinidine
Raboflavin
Ranitidine
Sodium Chloride
Sulindac
Tyramine
Vitamin C

ASSAY COMPARISONS & EQUIVALENCY

Accuracy and equivalency comparisons of both the DRG® Morphine Screen Test Card and Test Strip were evaluated against 152 individual in-house laboratory urine samples, as well as against 331 individual external SAMHSA-certified clinical laboratory urine samples. The results have been tabulated below.

Table 1. DRG® Morphine Card vs. Emit® II

DRG®	EMIT II (+)	EMIT II (-)	Row Totals
(+)	146	0	146
(-)	6	331	337
Col. Totals	152	331	483

When compared to Emit® II, the percent agreement with DRG® Morphine Screen Test Card positive samples was 146/152 or 96.1%. Negative samples recovered at 331/331 or 100%, while the overall relative accuracy obtained was 477/483 or 98.8%.

Table 2. DRG® Morphine Strip vs. Emit® II

DRG®	EMIT II (+)	EMIT II (-)	Row Totals
(+)	146	0	146
(-)	6	331	337
Col. Totals	152	331	483

When compared to Emit® II, the percent agreement with DRG® Morphine Screen Test Strip positive samples was 146/152 or 96.1%. Negative samples recovered at 331/331 or 100%, while the overall relative accuracy obtained was 477/483 or 98.8%.

Table 3. DRG® Morphine Card vs. GC/MS

DRG®	GC/MS (+)	GC/MS (-)	Row Totals
(+)	100	0	100
(-)	0	281	281
Col. Totals	100	281	381

When compared to the GC/MS data, the relative sensitivity or percent agreement of DRG® Morphine Screen Test Card positive samples with the external clinical study was 100/100 or 100%. Negative samples recovered a relative specificity of agreement of 281/281 or 100%. Finally, the overall relative accuracy obtained was 381/381 or 100%.

Table 4. DRG® Morphine Strip vs. GC/MS

DRG®	GC/MS (+)	GC/MS (-)	Row Totals
(+)	100	0	100
(-)	0	281	281
Col. Totals	100	281	381

When compared to the GC/MS data, the relative sensitivity or percent agreement of DRG® Morphine Screen Test Strip positive samples with the external clinical study was 100/100 or 100%. Negative samples recovered a relative specificity of agreement of 281/281 or 100%. Finally, the overall relative accuracy obtained was 381/381 or 100%.

LIMITATIONS OF PROCEDURE

This diagnostic test is designed for the medical or forensic in vitro detection of morphine and its metabolites (morphine glucunoride), in human urine.

This diagnostic test only provides a qualitative screening for morphine in urine. It is not to be used for the quantitative determination of morphine in urine. A positive result with this test indicates only the presence of morphine and its metabolites (morphine glucunoride) and should be confirmed by GS/MS. It does not indicate intoxication.

There is a possibility of false positive results due to user error or the presence of interfering factors in urine.

See “SPECIFICITY STUDY” for substances that produce positive results at high concentrations and those substances which don not interfere with test performance.

Adulterants, such as bleach or other strong oxidizing agents, may produce erroneous test results when added to urine specimens, regardless of the analysis method used. If an adulteration is suspected, a fresh urine specimen should be used.

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