

# DrugSmart Cassette

## AMP/OPI/COC/THC/MDMA

FOR IN VITRO DIAGNOSTIC USE – CAT# 40540D

### INTENDED USE

The DrugSmart Cassette is a one-step immunoassay for the qualitative detection of multiple drugs and drug metabolites in human urine at the following cutoff concentrations:

Test	Calibrator	Cut-off (ng/ml)
AMP	Amphetamine	1000
COC	Benzoylcegonine	300
MDMA	3,4-methylenedioxymethamphetamine	500
OPI2000	Morphine	2000
THC	11-nor- $\Delta^9$ -THC-9-COOH	50

The DrugSmart Cassette is used to obtain a visual, qualitative result and is intended for professional use only.

*This assay provides only a preliminary result. Clinical consideration and professional judgment must be applied to any drug of abuse test result, particularly in evaluating a preliminary positive result. In order to obtain a confirmed analytical result, a more specific alternate chemical method is needed. Gas Chromatography/Mass Spectroscopy (GC/MS) is the preferred confirmation method.*

### SUMMARY AND EXPLANATION

**Amphetamine/Methamphetamine.** amphetamine, and metabolites are potent central nervous system stimulants. Acute higher doses induce euphoria, alertness, and sense of increased energy and power. More acute responses produce anxiety, paranoia, psychotic behavior, and cardiac dysrhythmias. Methamphetamine is excreted in urine as amphetamine and oxidized as deaminated and hydroxylated derivatives. However, methamphetamine is also excreted to some extent unchanged. Thus the presence of the parent compound in the urine indicates methamphetamine use.

**Cocaine** is a potent central nervous system stimulant and a local anesthetic found in the leaves of the coca plant. The psychological effects induced by using cocaine are euphoria, confidence and sense of increased energy. These psychological effects are accompanied by increased heart rate, dilation of the pupils, fever, tremors and sweating. Cocaine is excreted in the urine primarily as benzoylecgonine in a short period of time. Benzoylecgonine has a biological half-life of 5 to 8 hours, which is much longer than that of cocaine (0.5 to 1.5 hour), and can be generally detected for 24 to 60 hours after cocaine use or exposure.

**3,4-methylenedioxymethamphetamine** is classified as both a stimulant and a hallucinogen. Like methamphetamine, adverse effects of 3,4-methylenedioxymethamphetamine use include jaw clenching, teeth grinding, dilated pupils, perspiring, anxiety, blurred vision, vomiting, and increased blood pressure and heart rate. Overdose of 3,4-methylenedioxymethamphetamine may cause heart failure or extreme heart stroke. 3,4-methylenedioxymethamphetamine is taken orally in tablets or capsules and excreted in urine as parent compound as well as metabolic.

**Opiates**, such as heroin, morphine, and codeine, are central nervous system (CNS) depressants. The use of opiates at high doses produces euphoria and release from anxiety. Physical dependence is apparent in users and leads to depressed coordination, disrupted decision making, decreased respiration, hypothermia and coma. Heroin is quickly metabolized to morphine, morphine glucuronide and 6-acetylmorphine. Thus, the presence of morphine (or the metabolite, morphine glucuronide) in the urine indicates heroin, morphine, and/or codeine use.

**Tetrahydrocannabinol** is generally accepted to be the principle active component in marijuana. When ingested or smoked, it produces euphoric effects. Abusers exhibit central nervous system effects, altered mood and sensory perceptions, loss of coordination, impaired short term memory, anxiety, paranoia, depression, confusion, hallucinations and increased heart rate. When marijuana is ingested, the drug is metabolized by the liver, the primary metabolite of marijuana excreted in the urine is 11-nor- $\Delta^9$ -tetrahydrocannabinol-9-carboxylic acid. Therefore, the presence of detected cannabinoids, including the primary carboxyl metabolite, in the urine indicate marijuana/cannabis use.

The length of time following drug use of which a positive result may occur is dependent upon several factors, including the frequency and amount of drug, metabolic rate, excretion rate, drug half-life, and the drug user's age, weight, activity and diet.

**Adulteration** of urine samples may cause erroneous results in drugs of abuse test by either interfering with the drug screening test and/or destroying the drugs in the urine. Dilution of urine with water is probably the simplest urine adulteration method. Bleach, vinegar, visine, sodium bicarbonate, sodium nitrite, Drano, soft drinks and hydrogen peroxide are the examples of adulterants used to adulterate the urine sample. It is important to insure the integrity of urine samples in drugs of abuse test.

### TEST PRINCIPLE

The DrugSmart Cassette is based on the principle of competitive immunochemical reaction between a chemically labeled drug (drug-protein conjugate) and the drug or drug metabolites which may be present in the urine sample for the limited antibody binding sites. The test contains a nitrocellulose membrane strip pre-coated with drug-protein conjugate in the test region and a pad containing colored antibody-colloidal gold conjugate. During the test, the urine sample is allowed to migrate upward and dehydrate the antibody-colloidal gold conjugate. The mixture then migrates along the

membrane chromatographically by the capillary action to the immobilized drug-protein band on the test region. When drug is absent in the urine, the colored antibody-colloidal gold conjugate and immobilized drug-protein bind specifically to form a visible line in the test region as the antibody complexes with the drug-protein. When drug is present in the urine, it will compete with drug-protein for the limited antibody sites. The line on the test region will become less intense with increasing drug concentration. When a sufficient concentration of drug is present in the urine, it will fill the limited antibody binding sites. This will prevent attachment of the colored antibody-colloidal gold conjugate to the drug-protein on the test region. Therefore, the presence of the line on the test region indicates a **negative** result for the drug and the absence of the test line on the test region indicates a **positive** result for the drug.

A visible line generated by a different antigen/antibody reaction is also present at the control region of the test strip. This line should always appear, regardless of the presence of drugs or metabolites in the urine sample. This means that a **negative** urine sample will produce both test line and control line, and a **positive** urine sample will generate only control line. The presence of control line serves as a built-in control, which demonstrates that the test is performed properly.

### REAGENTS & MATERIALS SUPPLIED

- 25 individually wrapped test devices. Each device consists of different test strips in a plastic test strip holder. The test strip contains a colloidal gold pad coated with antibody (or drug-protein) and rabbit antibody. It also contains a membrane coated with drug-bovine protein conjugate (or antibody) in the test band and goat anti-rabbit antibody in the control band adulterant pads when applicable.
- One instruction sheet

### MATERIAL REQUIRED BUT NOT PROVIDED

- Timer
- Specimen collection container

### WARNINGS AND PRECAUTIONS

- For professional *in vitro* diagnostic use only
- Urine specimens may be potentially infectious. Proper handling and disposal methods should be established.
- Avoid cross-contamination of urine samples by using a new specimen collection container for each urine sample.
- Test device should remain sealed until ready for use.
- Do not use the test kit after the expiration date.
- A positive test result does not always mean an individual has taken the drug illegally as the drug can be administered legally. Do not store and or expose reagent kits at temperature greater than 30°C. Do not freeze.

### STORAGE

The DrugSmart Cassette should be stored at 2-30°C (36-86°F) in the original sealed pouch. Do not freeze. Do not store and or expose reagent kits at temperature greater than 30°C.

### SPECIMEN COLLECTION AND HANDLING

Fresh urine does not require any special handling or pretreatment. A fresh urine sample should be collected in the container provided. Alternately, a clean, dry plastic or glass container may be used for specimen collection. If the specimen will not be tested after the specimen collection, the specimen may be refrigerated at 2-8°C up to 2 days or frozen at -20°C for longer period of time. Specimens that have been refrigerated must be equilibrated to room temperature prior to testing. Specimens previously frozen must be thawed and mixed thoroughly prior to testing.

**Note:** Urine specimens and all materials coming in contact with them should be handled and disposed as if capable of transmitting infection. Avoid contact with skin by wearing gloves and proper laboratory attire.

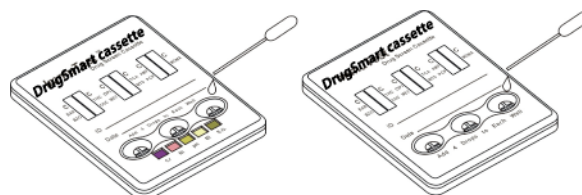
### ASSAY PROCEDURE

#### Preparation

1. If specimen, control, or test devices have been stored at refrigerated temperatures, allow them to warm to room temperature before testing.
2. Do not open test device pouch until ready to perform the test.

#### Testing

1. Remove the cassette test device from the sealed pouch.
2. Add three drops of the urine specimen to each sample well.
3. Read results of drugs of abuse tests at 5 minutes. Do not interpret result after 10 minutes.

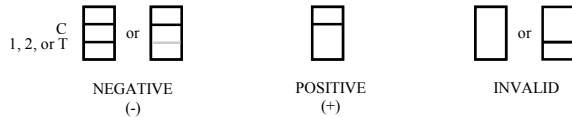


## INTERPRETATION OF RESULTS

**Negative (-): Colored lines appear in both Control Region (C) and Test Region (1, 2, or T).** The line in the control region is the control line, which is used to indicate proper performance of the device. The line in the test region is the drug probe line. The test line may have varying intensity either weaker or stronger in color than that of the control line. A negative result for a drug indicates that the concentration of that drug in urine is below the cutoff level.

**Positive (+): Colored line appears in the control region No line appears in the test region.** The complete absence of a test line indicates a positive result for that drug. A preliminary positive result for a drug indicates that the concentration of that drug in urine is at or above the cutoff level.

**Invalid: No colored line appears in the control region.** If the control line does not form, the test result is inconclusive and should be repeated.



## QUALITY CONTROL

An internal procedural control is included in the test device. A line must form in the Control band region regardless of the presence or absence of drugs or metabolites. The presence of the line in the Control region indicates that the proper sample volume has been used and that the reagents are migrating properly. If the line in the Control region does not form, the test is considered invalid.

To ensure proper kit performance, it is recommended that the test devices be tested once a week with external controls. External controls are available from commercial sources. It is important to make sure that the control values are within established limits. If the values of external control do not fall within established limits, the test results are invalid. Additional controls may be tested according to guidelines or requirements of local, state, and/or federal regulations or accrediting organizations.

## LIMITATIONS OF PROCEDURE

- The assay is designed for use with human urine only.
- A positive result with any of the tests indicates only the presence of a drug/metabolite and does not indicate or measure intoxication.
- There is a possibility that technical or procedural error as well other substances as factors not listed may interfere with the test and cause false results. See SPECIFICITY for lists of substances that will produce positive results, or that do not interfere with test performance.
- If adulteration is suspected, the test should be repeated with new sample.

## PERFORMANCE CHARACTERISTICS

### Accuracy

The accuracy of the DrugSmart Cassette was evaluated in comparison to commercially available drug screen tests. Sixty (60) negative urine samples collected from presumed non-user volunteers were tested by both DrugSmart Cassette and commercially available drug screen tests. Of these negative urine samples tested, all were found negatives by both methods. In a separate study, positive urine samples, obtained from clinical laboratories where the drug concentrations were determined by GC/MS, were tested by DrugSmart Cassette and commercial drug screen tests. The results of accuracy study are presented below:

Drug Test	GC/MS (<-50% C/O)	GC/MS (-50% C/O to C/O)	GC/MS (C/O to +50% C/O)	GC/MS (>+50% C/O)	% Agreement with GC/MS
AMP	(+)	0	0	10	55
	(-)	15	9	1	0
COC	(+)	0	0	8	71
	(-)	15	8	1	0
MDMA	(+)	0	1	6	37
	(-)	24	6	0	0
OPI2000	(+)	0	2	9	45
	(-)	15	6	0	0
THC	(+)	0	1	24	32
	(-)	15	12	0	0

### Precision

The precision of the DrugSmart Cassette was evaluated by testing three lots of the test devices at four study sites with spiked drug sample solutions on three consecutive days. Sample concentrations were confirmed by GC/MS.

AMP (ng/ml)	0	500	750	1000	1250	1500
(+/-)	0/135	0/135	34/101	75/60	110/25	135/0
COC300 (ng/ml)	0	150	225	300	375	450

(+/-)	0/135	0/135	30/105	65/70	96/36	135/0
MDMA (ng/ml)	0	250	375	500	625	750
(+/-)	0/135	0/135	35/100	75/60	95/40	135/0
OPI2000 (ng/ml)	0	1000	1500	2000	2500	3000
(+/-)	0/135	0/135	37/98	76/59	104/31	135/0
THC (ng/ml)	0	25	37.5	50	62.5	75
(+/-)	0/135	0/135	27/108	58/77	91/44	135/0

## Specificity

The specificity for the DrugSmart Cassette was determined by testing various drugs, drug metabolites, and other compounds that are likely to be present in urine. All compounds were prepared in drug-free normal human urine.

The following compounds produce positive results when tested at levels greater than the concentrations listed below.

Compound	Conc. (ng/ml)	Compound	Conc. (ng/ml)
<b>Amphetamine</b>			
d-Amphetamine	1,000	d-Methamphetamine	50,000
dl-Amphetamine	2,500	(+/-)3,4-MDMA	50,000
(+/-)3,4-MDA	1,250		
<b>Cocaine (300)</b>			
Benzoylcegonine	300	Cocaine	300
<b>MDMA</b>			
(+/-)3,4-MDMA	500	(+/-)3,4-MDA	4,000
(+/-)3,4-MDEA	450		
<b>Opiates (2000)</b>			
Morphine	2,000	Hydrocodone	4,000
Codeine	2,000	Hydromorphone	5,000
Ethylmorphine	1,000	Morphine-3-glucuronide	2,500
Heroin	5,000	Nalorphine	5,000
<b>THC</b>			
11-nor- $\Delta^9$ -THC-9-COOH	50	$\Delta^9$ -tetrahydrocannabinol	5,000
11-hydroxy- $\Delta^9$ -THC	1,000	Cannabinol	10,000
$\Delta^8$ -tetrahydrocannabinol	5,000	Cannabidiol	>100,000

## Interference

Two pools of drug-free urine were spiked with drug standards to 50% below and 50% above cutoff concentrations. The drug concentrations were confirmed by GC/MS. The following compounds were evaluated for potential positive and/or negative interference with the DrugSmart Cassette. All compounds were dissolved in the spiked sample solutions and tested with DrugSmart Cassette. An unaltered sample was used as a control. No positive interference or negative interference was found for the following compounds when tested at concentrations up to 100  $\mu$ g/ml.

Acetaminophen	Diphenhydramine	(+/-)-Norephedrine
Acetone	Dopamine	Oxalic Acid
Albumin	(+/-)-Epinephrine	Penicillin-G
Ampicillin	Erythromycin	Pheniramine
Ascorbic Acid	Ethanol	Phenothiazine
Aspartame	Furosemide	l-Phenylephrine
Aspirin	Glucose	$\beta$ -Phenylethylamine
Atropine	Guaiacal Glyceryl Ether	Procaine
Benzocaine	Hemoglobin	Quinidine
Bilirubin	Ibuprofen	Ranitidine
Caffeine	(+/-)-Isoproterenol	Riboflavin
Chloroquine	Ketamine	Sodium Chloride
(+)-Chlorpheniramine	Levorphanol	Sulindac
(+/-)-Chlorpheniramine	Lidocaine	Theophylline
Creatine	(+)-Naproxen	Tyramine
Dexbrompheniramine	Niacinamide	4-Dimethylaminoantipyrine
Dextromethorphan	Nicotine	(1R,2S)-(-)-N-Methyl-Ephedrine

## BIBLIOGRAPHY OF SUGGESTED READING

- Baselt, R. C., Disposition of Toxic Drugs and Chemicals in Man, Biomedical Publications, Davis, CA, 1982.
- Urine testing for Drugs of Abuse. National Institute on Drug Abuse (NIDA), Research Monograph 73, 1986.
- Fed. Register, Department of Health and Human Services, Mandatory Guidelines for Federal Workplace Drug Testing Programs, 53, 69, 11970-11979, 1988.
- Liu, Ray H. and Goldberger, Bruce A., Handbook of Workplace Drug Testing, AACC Press (1995).
- Gilman, A. G. and Goodman, L. S., The Pharmacological Basis of Therapeutics, eds. MacMillan Publishing, New York, NY, 1980.