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ANALYSIS OF DRUG IN URINE BY USING MULTI-DRUG TEST KIT

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ABSTRACT

Drug addiction, which is also known as substance dependence or dependence syndrome, is a condition where a person feels a strong urge to take a drug. Drug addiction became a stumbling block in our contemporary society. Drug addicts are involved in various illegal activities and drug addiction induces criminal behaviour. However, drug addiction and abuse are increasing day by day mostly among teenagers and youngsters. Initially, when the person uses a drug, they may discern what seems to be pragmatic. They also believe that they can control their use. But drugs can quickly take over a person's life. However, the addiction is to be controlled socially and scientifically. In the field of forensic science, there are diverse methods available for the analysis of drugs in a particular specimen. Here we are going to discuss one of the easiest and most effortless ways to detect drugs present in a urine specimen by using a Multi-Drug test Kit.

Keywords: Drug, COC, AMP, MET, THC, MTD, MDMA, MOP, OPI, TCA, etc

INTRODUCTION

The Multi-Drug kit can be used for the easy determination of drug and drug metabolites in human urine. The Multi-Drug one step Multi-Line screen test Device (Urine) is an immunoassay based on the principle of competitive binding drugs which may be present in the urine specimen, against their respective drug conjugate for binding sites on their specific antibody. When we test urine specimens by using a multi-drug kit, urine migrates upward by capillary action [1-5]. If the drug is present in the given specimen below its cut-off concentration, it will not saturate the binding sites of its specific antibody. The antibody then reacts with the drug-protein conjugate and a visible coloured line shows up in the test line region of the specific drug strip [6-10]. The twelve drugs which can be determined by using this multi-drug test kit are mentioned below:

Cocaine (COC): Cocaine is the second most used illicit drug after cannabis which is a powerfully addictive and potent central nervous system (CNS) stimulant, a schedule-II drug made from the leaves of the coca (*Erythroxylum coca*) plant native to South America and cultivated in many countries. Medically it is used as a local anaesthetic for surgeries on a valid basis of purpose. Commonly it is called as crack, pasta, bazooka, speedball, snuff, coke, snow, or white lady. Initially, it gives extreme energy and restlessness later results in tremors, over-sensitivity, and spasms. It is colourless, odourless, in nature having a crystalline structure and bitter taste. It is slightly soluble in water and completely soluble in

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alcohol. Coca leaves contain nearly 2% of cocaine. The leaves are to be dried in sunlight and treated with sulfuric acid which produces cocaine sulphate which is to be treated with hydrochloric acid which produces cocaine hydrochloride which contains 90% cocaine. It is to be administered by self through intravenous or intranasal (snorting) or by free-base smoking. The average detection time in urine is 2-3 days. The fatal dose for cocaine is 20 mg IV and 500 mg to 1.4 g orally. The cutoff for cocaine is 300ng/ml.

Amphetamine (AMP): Amphetamine is a non-catechol, sympathomimetic, central nervous system stimulating, schedule-II drug. Amphetamine produces increased wakefulness in association with decreased fatigue and appetite. It is synthesised in the laboratory with the help of ammonia and is available in the illicit market. Amphetamine which is frequently encountered in the form of sulphate salt and tablets, is used as an adjunct to psychological, educational, social, and other remedial measures in the treatment of attention deficit hyperactivity disorder (ADHD). Amphetamine is to be administered orally in the form of tablets and intranasally through powder. It is one of the drugs included in the dope test for athletes. The average detection time in urine is 1-3 days. The cutoff range for amphetamine is 1000ng/ml.

Methamphetamine (MET): methamphetamine is a methyl homolog of amphetamine which is a central nervous system stimulating schedule-II drugs. Methamphetamine shows more adverse effects compared to amphetamine. It is commonly called ice, glass, speed, meth, crank, crystal, and yaba. It is synthesised in the laboratory with the help of methylamine. It is administered orally, intranasal, intravenous, and snorting. The average detection time in urine is 1-3 days. The fatal dose is 150mg-2g. The cutoff range for methamphetamine is 1000 ng/ml.

Marijuana (THC): Marijuana is a type of cannabis commonly called pot, weed, ganja, etc. The active and main ingredient is THC (Δ9-tetrahydrocannabinol). It is a schedule-II drug that is administered orally or by smoke. It affects the Central nervous system. It is a greenish mixture of dried leaves of the plant. There are many plants of this genus, *Cannabis sativa, Cannabis indica, Cannabis mexicana, and Cannabis americana.* It is the most abused and addictive drug in India as well as America. It produces a euphoric effect and relaxation at first. Long-term consumption leads to short-term memory and slowed learning. The average detection time in urine is 1-10 days. The fatal dose is 2-10g/kg. The cutoff for marijuana is 300ng/ml.

Methadone (MTD): Methadone is a schedule-II narcotic analgesic drug that works on the central nervous system. It relieves the pain and works as a painkiller. It doesn't cause many euphoric senses but it is an intermediate drug in the opioid addiction recovery program. Long-term usage leads to diarrhoea, nausea, and anxiety issues. It is administered orally and intravenously. The average detection time in urine is 1-2 days. The cutoff for this is 50ng/ml.

Methylenedioxymethamphetamine(MDMA): Methylenedioxymethamphetamine is a designer and schedule-I drug which is a stimulant that works on the central nervous system. It is also called a rave drug or club drug commonly called ecstasy. This was synthesised in a laboratory in Germany. This drug is used for the diagnosis of obesity. Long-term intake can cause muscle tension, sweating, and blood pressure commonly blurred vision. Excessive intake leads to death by cardiac arrhythmia. It is ingested through ingestion, snorting, intravenous and intranasal. The cutoff for this is 35ng/ml.

Morphine(MOP): Morphine is an analgesic schedule-II drug that is a derivative of opium. Morphine is a semi-synthetic drug produced by the chemical modification of opiates. On average 11.2% of morphine is present in raw opium. It looks like a white powder, alkali in nature, and bitter. It is commonly called dreamer, mister blue, morpho, etc. It is used to relieve pain by the depressing central nervous system. Excessive intake of morphine leads to nausea, drug craving, impotency, and sterility. It is administered through inhalation, intravenous, etc. The average detection time in urine is 1-3 days. The fatal dose is 200mg. The cutoff for morphine is 40ng/ml.

Opiates(OPI): Opiates refer to natural alkaloids obtained directly from the poppy plant. From this natural and semi-synthetic drugs are obtained. Opioids work by attaching to opioid receptors on neurons found in the immune system and neurological system. The majority of opioids are converted in the liver to inactive molecules that are easily eliminated in the urine. The average detection time in urine is 1-3 days. The cut-off for opiates is 70ng/ml.

Phencyclidine (PCP): Phencyclidine or phenyl cyclohexyl piperidine is a dissociative hallucinogenic anaesthetic schedule 2 drug. It affects the central nervous system. It is a recreational illicit drug. It is from the arylcyclohexylamine class commonly called

angel dust, an animal tranquilliser, hog, and rocket fuel. It was introduced first for anaesthetic drugs later it showed many adverse effects such as seizures, coma, addiction, suicidal tendency, and violent behaviour. It is mostly used in the United States. It is administered orally, snorting, and intravenously. The average detection time in urine is 2-30 days. The cutoff for phencyclidine is 25ng/ml.

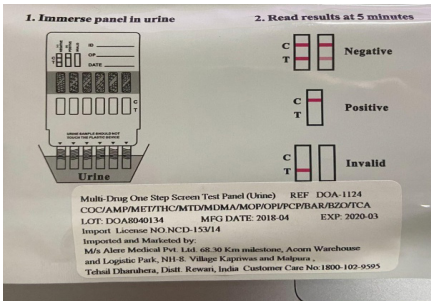
Barbiturates (BAR): Barbiturates are the central nervous system depressant drugs. They have scheduled 2 schedules 3 schedules 4 drugs. Barbiturates are sedatives, hypnotics, and tranquillisers that are used for treating insomnia, seizures, and headaches. They are administered as preoperative sedation in hospitals. There are many types such as Amobarbital, secobarbital, and butabarbital. Barbiturates are synthesised in the laboratory from the parent compound barbituric acid. The effect of barbiturates is long-lasting, short term, ultra short term. Long-term usage of barbiturates leads to coma, temporary breathing cessation, and leads to fatality. Commonly these are called barbs, red devils, blockbusters, etc. they are administered orally and intravenously. The average detection time in urine is 1- 7days. The cutoff for barbiturates is 300ng/ml.

Benzodiazepines (BZO): Benzodiazepines are the anti-anxiety, muscle relaxant drugs that act on the central nervous system especially by enhancing the inhibitory actions of neurotransmitters gamma-aminobutyric acid. They are schedule-II drugs. They are safer and more effective compared to barbiturates. They are used to treat sleep disorders, anxiety, and anaesthesia in some areas. They are alprazolam, diazepam, etc. They are synthesised in the laboratory. They are soluble in methanol. They are commonly called blues, benzos, goofballs, etc. Long-term usage leads to slurred speech, nystagmus, diplopia, dysarthria, ataxia, and coma. If taken alone, they are not toxic, but mixing with alcohol or other drugs can lead to death. They are administered orally and intravenously. The average detection time in urine is 1-7 days. The cutoff range for benzodiazepines is 100ng/ml.

Tricyclic Antidepressants (TCA): TCA (Tricyclic Antidepressants) are commonly used for the treatment of depressive disorders. TCA overdoses can result in profound CNS depression, cardiotoxicity, and ant cholinergic effects. TCA overdose is the most common cause of death from prescription drugs. TCAs are taken orally or sometimes by injection. TCAs are metabolised in the liver. The average detection time in Urine is 1-2 days. The average detection time in urine is 1-14 days. The cutoff range is 1000ng/ml.

MATERIAL AND METHODS

Multi-Drug Kit: Multi-Drug One Step Screen Test Panel (Urine COC/AMP/MET/THC/ MTD/ MDMA/MOP/OPI/PCP/BAR/BZO/TCA from M/s Alere Medical Pvt. Ltd. 68.30 Km milestone, Acorn Warehouse and Logistic Park, NH-8. Village Kapriwas and Malpura, Tehsil Dehradun, Distt. Rewari, India was used.

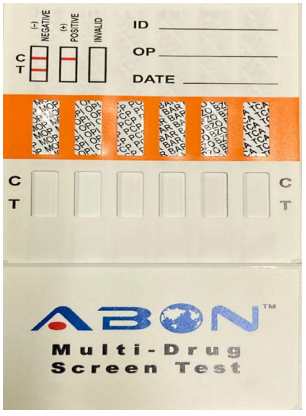


(a)

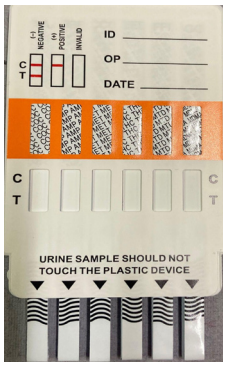


(b)

Figure. 1: (a) Multi-Drug kit packet (front) (b) Multi-Drug kit packet (back)



(a)



(b)

Figure 2: (a) Multi-Drug kit (opened with protection cap) (b) Multi-Drug kit (opened showing absorption zones)

Sampling: The urine specimen must be collected in a clean and dry container. Urine collected at any time of the day may be used. Urine specimens exhibiting visible precipitates should be centrifuged, filtered, or allowed to settle to obtain a clear supernatant for testing.

Storage: Urine specimens may be stored at 2-8^{0}C for up to 48 hours before testing. For prolonged storage, specimens may be frozen and stored below -20^o C. Frozen specimens should be thawed and mixed well before testing.

Miscellaneous items: Beaker, droppers, specimen collection container, timer, etc.

Procedure: Allow the test device, urine specimen, to equilibrate at room temperature (15-30^{o}C).

Bring the pouch to room temperature before opening it. Remove the test device from the sealed pouch and use it as soon as possible.

Take about 15-20ml urine in a clean beaker and open the kit and put it in the container having the specimen urine without taking time.

Wait for the coloured lines to appear. Read the result in 5 minutes. Do not interpret the result after 5 minutes.

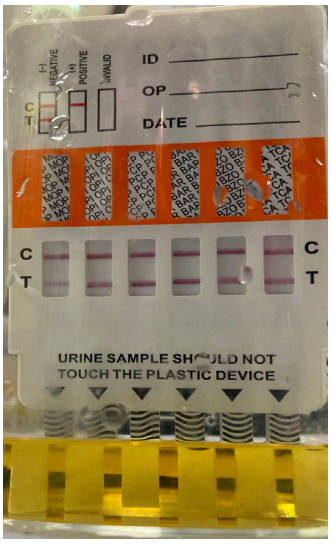


Figure 3: Multi-Drug Kit dipped in the urine specimen (spiked)

RESULT AND DISCUSSION

If the indicator shows a single line then it should be considered positive, if the indicator shows two lines it should be considered negative, if the indicator doesn't show any line it is invalid and it means it is out of the cut-off limit range. (Table 1)

Table 1: The cut-off limit for various drugs

S. No.	Drugs	Cutoff (ng/ml)
1	Cocaine (COC)	300
2	Amphetamine (AMP)	1000
3	Methamphetamine (MET)	1000
4	Marijuana (THC)	300
5	Methadone (MTD)	50
6	Methylenedioxymethamphetamine(MDMA)	35
7	Morphine(MOP)	40
8	Opiates(OPI)	70
9	Phencyclidine (PCP)	25
10	Barbiturates (BAR)	300
11	Benzodiazepines (BZO)	100
12	Tricyclic Antidepressants(TCA)	1000

False Negative: The sensitivity of the drug detection method determines whether a result is positive or negative. When the drug is present but not detected because the detection limit of the method used is too high or the absolute quantity of the drug in the specimen is too low, the result is a false negative. The identification of drugs in urine samples can be hampered by large amounts of fluids taken before taking a sample for examination. Although the absolute amount of medication or metabolite excreted may remain constant over time, the ultimate concentration per millilitre may be lower, potentially leading to a false-negative result. The level of acidity in the urine may also have an effect on the drug's excretion into the urine. In some instances, elimination is increased; in others, the drug is reabsorbed. There are a few things you may do to reduce the chances of getting a false-negative result. To begin, the sensitivity of the approach can be improved by analysing the drug's metabolites. Increasing the volume of the specimen used for analysis or treating it with chemicals can also improve the sensitivity of laboratory methods. However, when these new methods are used, sensitivity can be raised to the point where the same dose can be detected for up to 20 days. Due to the high sensitivity, estimations of when the drug was taken are significantly less reliable.

False Positives: If the findings show that the substance is present when it is not, this is known as a false positive. Ingested substances, such as asthma or allergy medication, can sometimes cause false positives. According to several experts, employees who are subject to drug testing should avoid using particular kinds of over-the-counter medications because they have been linked to false positives. Natural substances like herbal teas and poppy seeds were shown to have positive responses to screens. These could be actual positives based on analysis, but they must be separated from those caused by illegal drug usage. False positives have occurred as a result of errors or sabotage in the chain of custody for urine samples in some cases.

Positive: If your results are positive, it means one or more drugs were found in your body above an established level.

Negative: If your results are negative, it means no drugs were found in your body, or the level of drugs was below an established level, which differs depending on the drug.

CONCLUSION

The Multi-Drug urine test kit is an easy way to detect the drug in a given urine specimen without having bulky instruments, apparatus, chemicals, and reagents. The test uses a cutoff point. Any result below the cutoff number is a negative screen and any number above the cutoff number is a positive screen. We can easily determine drugs present in a given specimen at the very lowest level but it has some limits also as it is providing qualitative, preliminary analytical results. For quantitative analysis there must be a secondary analytical method is required i.e. Gas chromatography/Liquid Chromatography mass spectroscopy (GC/LC/MS).

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