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Review Article

Laboratory Diagnosis of Drug of Abuse-Latest Update

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Abstract

Substance abuse, also known as drug abuse, is the use of a drug in amounts or by methods which are harmful to the individual or others. It is a form of substance-related disorder. Substance use disorders (SUD) are mental health conditions that arise from chronic drug use. There is an increased recognition of this problem in Saudi Arabia. Drugs of abuse testing is the detection of one or more illegal and/or prescribed substances in the urine, blood, saliva, hair, or sweat. Testing detects substances not normally found in the body. Drug abuse testing usually involves an initial screening test followed by a second test that identifies and/or confirms the presence of a drug or drugs. Initial screening is done by urine tests and confirmation is done by blood tests. Major drug class screened are Amphetamines, Barbiturates, Benzodiazapines, Cannibinoids, Cocaine, methadone and opiates. In this article we reviewed lab diagnosis of drug of abuse.

Keywords: SUD, Drug of Abuse.

INTRODUCTION

Drug of abuse is quite common worldwide. Saudi Arabia is an Islamic country, and the societal norms and values are deeply rooted in religion. There are religious as well as legal prohibitions against possession or consumption of alcohol and narcotic substances, yet a portion of Saudis consume alcohol and use drugs [1]. Around 7 to 8% of Saudis report having used drugs [2, 3]. The most commonly abused substances among Saudis are amphetamines, heroin, alcohol, and cannabis [4]. Over the past decade, the use of cannabis and amphetamines has increased, while the use of heroin and volatile substances has decreased [1, 5]. A portion of Saudi females also uses drugs, and the usage among them may be on the rise [6]. Drugs are not as accessible to women as they are to men in Saudi Arabia due to the conservative nature of the society and the strict gender segregation. Therefore, women are prone to using primitive and volatile substances such as glue, gasoline, and shisha [6].

Drug of Abuse testing in Urine:

Both medical and legal drug testing, initial screening of urine specimens is conducted using commercially available immunoassays. If the initial screening is positive, then the individual drug or drug class must be confirmed by an alternative method, most commonly gas chromatography/mass spectrometry (GC-MS) for all legal drug testing. Immunoassays suffer from relatively low specificity due to interaction of antibody with molecules with similar structures resulting in false negative or positive results and can only be used to screen for the presence of a drug in the urine. Any positive immunoassay test is considered “presumptive positive” until it is confirmed by a more specific method such as Mass Spectrometry (MS).

Due to poor cross-reactivity with the morphine antibody used in opiate immunoassays, opioids such as oxycodone, methadone, fentanyl, propoxyphene, and, to a certain extent, oxymorphone, hydrocodone, and hydromorphone may not be detected during routine toxicological screen. Therefore, specific immunoassays must be used for detecting oxycodone, methadone, propoxyphene, and fentanyl. MS confirmation is required for legal drug testing, such as for workplace drug testing. Federal drug testing programs follow guidelines from the Substance Abuse and Mental Health Services Administration (SAMHSA) which

mandates the drugs to be tested. 12-Panel Urinalysis Drug Screen is to determine whether you have illicit substances in your system. A typical 12-Panel Urinalysis Drug Screen tests for active components in 10 different substances, including amphetamines, barbiturates, benzodiazepines, cannabis, cocaine, methadone, methaqualone, opioids, phencyclidine, and propoxyphene.

Typically, an immunoassay is used as a preliminary tool. If the test returns positive, it is usually sent for further confirmatory testing [7]

Opioids

Opioids are a class of drugs that are used to reduce pain (narcotic analgesics). Opioid testing is used to confirm the presence of opioids in the urine, blood, saliva, hair, or sweat. Opiates (from natural sources) codeine, morphine, heroin and heroin metabolite (6-monoacetylmorphine), Semi-synthetic opioids Hydrocodone, hydromorphone, oxycodone, oxymorphone Synthetic opioids Fentanyl and fentanyl analogs, meperidine, methadone, propoxyphene, tramadol, tapentadol. Other drugs loosely referred to as opioids (antagonists and agonist/antagonist) Buprenorphine, naloxone, naltrexone.

Positive screening tests are presumptive. This is because some screening tests have the potential for false-positive results. Therefore, screening tests that are positive are often confirmed with a second test that identifies the exact substance that is present. Confirmatory tests are usually more sensitive than screening tests and will detect lower levels of specific opioids. Confirmatory testing is usually performed with an instrument called a mass spectrometer. Types of mass spectrometry tests used for confirmatory testing include gas chromatography/mass spectrometry (GC/MS) and liquid chromatography-tandem mass spectrometry (LC-MS/MS) [7].

Alcohol

While alcohol blood testing is the most accurate method of measuring the amount of alcohol in the body, alcohol can also be measured in samples of a person's sweat, hair, urine, breath, and saliva. An alcohol blood test may be performed for several purposes, including workplace drug testing and determining if a driver is operating a vehicle while impaired. Several alcohol biomarkers can be measured in the blood including Carbohydrate-deficient transferrin (CDT) and Phosphatidylethanol (PEth).They tell about amount of alcohol present in the body. Additionally, ethyl glucuronide and ethyl sulfate (EtG/EtS) are alcohol metabolites that are typically measured in urine and sometimes in blood. Although EtG/EtS can detect evidence of alcohol much longer than ethanol testing, testing for EtG/EtS does not indicate the amount or frequency of alcohol consumption [9-11].

Amphetamines

Tests to detect the presence of substances of abuse can be done using urine, saliva, hair and sweat samples. Home tests consist of two steps: completing a simple urine test and, if the result is positive, sending a sample to the laboratory for further testing. Amphetamine stays in blood for 4-6 hrs, 24-48 hrs. In saliva, up to 4 days in urine and up to 90 days in hair.

Blood Tests

Methamphetamine will stay in the plasma for four to six hours. Blood tests can determine the difference between amphetamine abuse or proper use as prescribed by a doctor. When used as prescribed, levels of amphetamine in the blood range from 0.02 to 0.05 mg/L and occasionally up to 0.2 mg/L. Concentrations greater than 0.2 mg/L show a sign of amphetamine abuse, and concentrations greater than 2.5 mg/L can result in fatal overdoses.

Hair Tests

Depending on the length of hair, amphetamines can be detected for up to 90 days after ingestion. Hair tests are potentially the most reliable tests for detecting prior use of amphetamines, although they cannot detect recent or occasional drug use.

Saliva Tests

Oral fluid tests can detect amphetamines from 24 to 48 hours after intake. Saliva tests are noninvasive, and it is easy to collect samples. They can detect the parent drug rather than its metabolites and can detect same-day use in some cases.

Benzodiazepines

Benzodiazepines are extensively metabolized and parent compounds are not detected in urine. Benzodiazapines confirmation by random urine. Approximate detection time for long acting diazepam is 10 days, intermediate acting like alprazolam, lorazepam, oxazepam is 5 days and short acting triazolam and flurazepam as metabolite is 2 days.

If there is a question as to a patient's therapeutic compliance, a serum test request for the specific drug of interest may be of help. It is done by liquid chromatography- tandem mass spectroscopy [14-17].

CONCLUSION

It is important to diagnose drug of abuse. Although initial screening with urine gives presumptive diagnosis but due to high false positivity and false negativity. Laboratory diagnosis by gas chromatography/mass spectrometry (GC/MS) and liquid chromatography-tandem mass spectrometry (LC-MS/MS) is confirmatory.

Conflicts of Interest: There is no conflicts of interest.

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