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Mini Review

Mini-Review Study of Adulterants and Diluents in Some Seized Amphetamine-Type Stimulants

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Introduction

Drug

The definition of a drug is "any substance that in any part of the body changes normal metabolism". It also refers to any chemical substance taken to cure or prevent disease, improve mental or physical performance, or deal with reality or escape it. Drug abuse is nowadays a major global societal and economic problem. Analysis of abused drugs and their metabolites in human blood, urine, saliva, sweat, and hair, etc., has been a hot topic of research in recent years as an important step in monitoring drug abuse [1].

Illicit drug

There are many illegal drugs that are highly addictive and pose serious risks. Using these drugs usually starts as an experiment or as a result of curiosity. Other times, it may start with the medication prescribed for prescription pain to treat an illness or injury. A user may become hooked overtime on the drug's mental or physical effects. This leads the user to need more of the substance to have the same effects. A person with an illegal drug addiction will often endanger their health and safety without help. In many parts of the world, the use of legally banned psychotropic substances for non - medical purposes appears to be increasing [2-4], but the rate of increase is difficult to quantify. The prevalence of this behavior and its adverse health effects on individual societies is difficult to estimate because this behavior is unlawful and therefore often hidden. It is difficult even to estimate mortality associated with illicit drug use, the most tangible adverse health effect, for reasons discussed below [5]. Nevertheless, efforts must be made to estimate the contribution that illicit drug use makes to the global burden of disease because it is a pattern of behavior that has a significant adverse effect on the health and well - being of those involved, resulting in significant loss of life and disability [6].

Literature survey of amphetamine

Amphetamine, a powerful stimulant of the central nervous system (CNS), is used for syndrome treatment [7,8]. Its derivatives were abused as recreational drugs and used as unlawful euphoria. There is a high risk of dependence, so many countries have issued strict regulations to control their consumption and reduce the abuse of amphetamines. For example, amphetamines in the United Kingdom categorized as Class B while in Canadian law they are in Class I. They are also classified as illegal drugs in the European Union [9,10]. For many years, amphetamine and its derivatives have been the classic, illegal drugs of abuse, but have recently been replaced by a new legal alternative substance class, the cathinone - derivatives, to undermine drug regulatory law [11]. Cathinone is a natural beta - keto amphetamine analogue which forms the main component of the "Khat" plant leaves of Catha edulis [11]. Cathinone - derivatives abuse has grown significantly throughout the world due to their amphetamine - like stimulant effects [12,13].

Occurrence and toxicity of amphetamine

Methamphetamine (METH) and its 3,4 methylenedioxymethamphetamine (MDMA) derivative are widely used psychostimulant medicines. Euphoria, alertness, decreased appetite, increased locomotive activity, and hyperthermia are the acute effects of these drugs. Psychosis, aggressiveness, and neurotoxicity may result from long - term abuse of METH and MDMA. Especially due to its strong euphoric properties, METH has a very high potential for abuse. According to recent reports from the National Institute on Drug Abuse (NIDA) [14], METH and MDMA abuse is an extremely serious and growing problem in the U.S. and around the world. The use of METH and MDMA has been documented among significantly diverse populations. For example,

the use of amphetamines is increasing among young adults who attend "raves" or private clubs. METH use is also high among people with HIV infection [14]. Although the acute effects of these drugs are relatively well known, the long - term effects and potential neurotoxicity associated with these drugs are unclear.

Adulterants and diluents in amphetamine

Illicit drugs are seldom sold or used in their pure state throughout the world [15]. They are often mixed with other substances to provide a more manageable dosing unit [16]. Heroin, amphetamine, and cocaine are often extensively mixed or "cut" with a variety of substances, adulterants, and/or diluents to make it appear that a larger quantity of drug is actually present, thereby increasing the dealer's profit [17,18]. It is important to identify potential hazardous substances contaminating illicit drugs because these substances may be more toxic than the drug itself. Examples of dangerous mixtures sold on the European drug market are cocaine adulterated with atropine [19] or phenytoin [20]. Detailed knowledge and understanding of street drug cutting agents can provide distribution route information [21,22]. Comparative analysis can also support the composition of cutting agents linking two or more samples together [23]. Therefore, it is important to know about possible changes in the prevalence of these substances. Previous studies of adulterants and diluents seized in Denmark have shown ongoing shifting patterns in the use and distribution of various cutting substances [17,18].

Detection and determination of amphetamine

A body of substances known as "designer drugs" has been chemically synthesized in recent years with similar effects to those of the oldest drugs. They include amphetamines that the pharmaceutical industry initially developed and abandoned due to their lack of therapeutic interest but are now being used as abuse drugs. The 1990s saw a shift from the previous decade in the pattern of drug consumption. Heroin and cocaine were the prevailing drugs used about ten or fifteen years ago, and although they continue to be present in many drug addiction cases, amphetamines have largely replaced them in recent years. Of special interest among the latter are MDA and MDMA, the most widely used. Other amphetamines of habitual use at present include MA, AP, and MDEA. A number of experiments have shown that immunological techniques currently available are scarcely specific and therefore likely to yield many false positive and negative factors [23,24] this requires the use of more sensitive methods such as gas chromatography (GC) for confirmation [25-27].This technique is sensitive and selective enough for this type of determination.

Conventional GC-MS method for analysis of amphetamine

Gas chromatography combined with mass spectrometry (GC – MS) using electron impact (EI) ionization mode is the most widely used abuse analysis technique [28]. Different enantioselective methods for the enantio separation of amphetamine and its derivatives have been developed using several analytical techniques, such as gas chromatography (GC) [29,30], capillary electrophoresis (CE) [30,31], high-performance liquid chromatography (HPLC) [30,11] and more recently capillary electrochromatography Despite the availability of different types of chiral stationary phases, sometimes with broad chiral discrimination ability, it is still not an easy task to develop chiral separation) [32,33]. Small changes in the solvent structure or / and chromatographic / electrophoretic environment often have major effects on the ability of many CSPs to resolve chirals. Furthermore, it is difficult to predict which CSP might be suitable for the manan - separation of a given chiral molecule and most of the time one relies on a trial - and - error approach that is a time - consuming, labor - consuming, and money - consuming process [34]. For many separation techniques, different strate - gies have been defined, such as normal phase liquid chromatography [35], reversed phase liquid chromatography [36], polar organic solvent chromatography [37], supercritical fluid chromatography [38] and capillary electrochromatography [39].

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