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Amphetamines (Part 1)

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The term "amphetamines" has come to mean a class of endogenous neurotransmitters that stimulate the sympathetic nervous system. This is a broad class of various substituted derivatives of phenylethylamine. This growing class of structurally related molecules may also stimulate the sympathetic nervous system in many different ways, such as affecting the re-release of neurotransmitters or preventing the re-uptake of neurotransmitters, hallucinogens, anorectics, bronchodilators and antidepressants.

In the amphetamines class, it is a slight structural difference that results in two different conformations (d and l) with very different biological activity. Carbon atoms will form four single bonds in molecules. The geometry of this carbon bonding leads to the asymmetry in a large molecule where each of the four bonds is attached to a different group. The properties of the molecule are greatly affected by this asymmetry. The molecules are noted by the d or l preceding the name of the drug. D-methamphetamine and l-methamphetamine have very different activities. D-methamphetamine is a very powerful central nervous system stimulant with highly addictive properties, where as the l isomer is most often used in inhalers and does not have the central nervous system activity nor any addictive properties. All of the compounds that have the structure of phenylethylamine will have this mixture of d and l molecules. In the production of these drugs they are usually noted as a racemic mixture, or specifically, as the d or l compound. To properly evaluate this family of compounds known as sympathomimetic amines, amphetamines or phenylethylamine, it is best done by describing each member of the class: **amphetamine**, **methamphetamine**, **phentermine**, **phenylpropanolamine**, **ephedrine/pseudoephedrine**, **cathine**, **cathinone**, **methcathinone**, **Khat**, **MDA**, and **MDMA**.

Amphetamine was first discovered in 1877 and exists as a racemic mixture of dextroamphetamine and levoamphetamine. The first medical use was in 1930 with the treatment of extreme sleep disorders (narcolepsy) and depression. The first prescription formulation of dl-amphetamine was released in 1933 as Benzedrine, in the form of an inhalant, to increase nasal blood flow and to enlarge the air passages to facilitate better breathing. The inhalant was soon discontinued and replaced with less addictive ephedrine, l-amphetamine and propylhexedrine. Physical effects of amphetamine abuse include decreased appetite, increased stamina and physical energy, increased sexual response/drive, involuntary body movements, increased perspiration, hyperactivity, nausea and increased heart rate. This drug is highly addictive and tolerance develops quickly. Withdrawal is an extremely unpleasant experience. A few street names for the drug are amp, speed, crank, dolls and crystal.

Methamphetamine was developed by the Japanese in 1919 and used during World War II to help soldiers stay alert and energize factory workers. Beginning in the 1950's, it was used in the United States as a medication for depression and to treat obesity. In the 1980's the manufacturing and illicit use of the drug became widespread especially in California. The oral use, smoking or injection has been reported to produce an intense "rush" lasting from a couple of hours to half a day. Methamphetamine is believed to result in a large level of the neurotransmitter dopamine, released into areas of the brain that regulate the feeling of pleasure. Long term use can result in addiction and brain damage, which is manifested in violent behavior, anxiety, confusion and insomnia. Street names are the same, or very similar, to those used for amphetamine.

Part 2 of this article will appear in the August issue of Toxicology Times

??? Did You Know ???

The coexistence of both a mental illness and a substance use condition is referred to as co-occurring mental and substance use disorders. There are no specific combinations of substance use disorders and mental disorders that are defined uniquely as co-occurring disorders. Co-occurring disorders may include any combination of two or more substance use disorders and mental disorders identified in the *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition (DSM-5). They are also referred to as having a dual diagnosis.
People with a mental health issue are more likely to experience an alcohol or substance use disorder than those not affected by a mental illness. Approximately 8.4 million adults have co-occurring disorders.
Source: SAMHSA

Question of the Month

Question: How often should serum methadone testing be performed?

Answer: SDRL recommends that all patients in methadone maintenance treatment programs have their serum levels measured at least once per year, ideally during an annual physical. This will provide baseline values moving forward. Other times to consider serum methadone testing include any time the patient requests a dose change or when a patient's urine sample tests negative for methadone metabolite and he/she denies medication misuse.