

It's not just marijuana anymore: A review of illicit drugs.

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Overview of the Issue

The exposure of animals to illicit drugs through inadvertent or intentional action can result in serious consequences. Each week Pet Poison Helpline receives calls where illicit drug exposure is confirmed or strongly suspected in cats and dogs. Understandably, the confirmation of illicit drug exposure can be difficult as pet owners may be unwilling to provide an accurate history. Additionally, the clinical presentation of animals suffering illicit drug exposures can be varied, subtle, and confusing. Typically, illicit drug exposure should be considered as a rule-out in cases involving acute onset behavioral or neurologic changes with no apparent cause and cases in which owners provide incongruent or questionable histories.

This lecture will cover common illicit drug exposures, the signs associated with those drugs and the mainstays of treatment. Additionally, the topic of on-site drug testing for illicit substances will be discussed. It is important to note that many illicit drugs contain impurities or are "laced" with other harmful substances. This may complicate the clinical picture and make treatment more difficult.

Testing for Illicit Drugs

The use of gas chromatography/mass spectrometry (GC/MS) is the current gold standard for drug detection in the body fluids of humans and animals. These tests may be performed in many veterinary and human medical labs in North America. However, the turn-around time for this testing is often days or longer and the cost of testing is rather expensive. Therefore, the use of such testing is often impractical in veterinary medicine. To quickly rule-out illicit drug exposure, rapid, on-site human urine drug screens may be helpful. These "at home" or on-site urine screening tests can easily be purchased at national chain pharmacies. Typically, these tests will screen for 1-12 illicit and commonly abused prescription drugs and drug classes including: marijuana (THC), cocaine, phenylcyclidine (PCP), amphetamine, methamphetamine, opiates, methadone, benzodiazepines, barbiturates, tricyclic antidepressants, and MDMA (Ecstasy). When purchased in local pharmacies, these tests cost \$10-35 each. These tests may also be purchased on-line for a considerable savings.

A recent study evaluated the use of these tests in dogs and found that they effectively identified opiates, benzodiazepines, barbiturates, amphetamines, and methamphetamines (Teitler, 2009). Unfortunately, the identification of marijuana (THC) or methadone was less reliable. Screening for cocaine and PCP was not evaluated. Regardless, these readily available and inexpensive tests may be of great value in diagnosing a patient with illicit drug exposure.

Amphetamines (including MDMA or "Ecstasy")

Common street names for these agents include: "speed," "dexies," "dex," and "uppers" for amphetamine; "glass" or "ice" for crystal methamphetamine; and "meth" or "crank" for powdered methamphetamine (may be dosed intravenously). MDMA or "ecstasy" is a popular club drug with similar physical structure to amphetamines and mescaline.

Illicit amphetamines, like their pharmaceutical counterparts, are sympathomimetic compounds. They stimulate the release of norepinephrine from stores in adrenergic nerve terminals. They also directly stimulate alpha and beta adrenergic receptors. Amphetamines are quickly absorbed from the GIT and readily cross the blood brain barrier (BBB).

Common clinical signs are often related to CNS stimulation and may include agitation, hyperactivity, mydriasis, head bobbing, tremors, and seizures. Additional signs include salivation, vocalization, hyperthermia, tachycardia (+/- PVCs) and hypertension. Occasionally, animals will present with weakness, bradycardia, and depression. Death may be due to disseminated intravascular coagulation secondary to severe hyperthermia and respiratory failure.

The range of toxicity varies with the agent of exposure. However, for MDMA ("Ecstasy"), dogs will typically develop clinical signs of mydriasis and agitation at 3 mg/kg within 45 minutes of ingestion. Dogs dosed at 9 mg/kg may develop tachypnea, circling, and excessive salivation. For dogs, 15 mg/kg has proven fatal.

Treatment is primarily symptomatic and supportive. Emesis is not often recommended due to the rapid onset of clinical signs. Gastric lavage and activated charcoal may be helpful if performed very soon after ingestion. Controlling hyperthermia, tachycardia and tremors are key elements in these cases. Chlorpromazine (up to 10-18 mg/kg) has been successfully used in a number of cases. Benzodiazepines are typically avoided as they have a propensity to increase CNS excitement. Other commonly used interventions include injectable methocarbamol, injectable beta-blockers, and IV fluids. In severe cases, general anesthesia is necessary. Additionally, serotonin syndrome may occur and can be treated with cyproheptadine (given orally or as a retention enema). Finally, acidifying the urine may increase the rate of excretion. Signs of toxicity may last for 8 hours or more.

Marijuana

Marijuana (*Cannabis sativa*) is also known by the street names "grass," "pot," "weed," and "Mary Jane." It is the most commonly reported illicit drug exposure to Pet Poison Helpline. Often, pets are exposed by ingesting baked goods (brownies or cookies) containing marijuana. Occasionally, pets ingest the dried and prepared plant or are intentionally exposed by people blowing smoke into their faces.

Depending on the route of administration, the onset of clinical signs may be 5-10 minutes (inhaling the smoke) or 30-60 minutes (ingestion). The signs of intoxication are similar to those seen in human beings. Most common are depression, a glassy eyed appearance, ataxia, mydriasis, disorientation, tremors, hypothermia and weakness. Despite its potent antiemetic effects, vomiting and salivation are common if the product was ingested. Additionally, bradycardia or tachycardia, vocalization, CNS stimulation, hyperactivity and seizures may occur.

The margin of safety for marijuana is very wide with the lethal dose being approximately 1000 times greater than the effective dose. The oral rat LD₅₀ is 666-1000 mg/kg. However, no deaths were reported in dogs ingesting 3-9 gm/kg of marijuana. Thus, rarely does toxicity lead to fatality in dogs and cats.

Treatment is primarily symptomatic and supportive. Decontamination may be performed if the ingestion was recent or large. Multiple doses of activated charcoal may decrease the half-life. Inducing emesis may be difficult due to the antiemetic properties of marijuana. Vital signs, especially body temperature, should be monitored and corrected as needed. CNS stimulation may be treated with diazepam. Recovery may take 24-72 hrs, depending on the dose.

Cocaine

Cocaine, an alkaloid extract from *Erythroxylon coca*, is typically sold in two solid forms—powder or crystal. The white powdered product (cocaine HCl) is commonly called “coke,” “C” or “blow” and is usually insufflated (snorted) or dissolved and injected IV. Cocaine can be further processed into the free alkaloid form (“free base”) often referred to as “crack”. “Crack” is a purer, more potent form of cocaine and is typically smoked.

Cocaine is a potent CNS stimulator due to its sympathomimetic effects. It causes a catecholamine release and blocks the reuptake of norepinephrine, serotonin, and dopamine. It also acts directly on the myocardium by blocking sodium channels.

Cocaine is well absorbed from many mucosal surfaces leading to a rapid onset of clinical signs. Though the half life of the drug is short and the effects last only 5-20 minutes in human beings, prolonged signs in animals may be due to organ damage. Additionally, animals may be used as “body packers,” thus harboring large amounts of drug in their GIT or peritoneum. Radiographs will aid in the diagnosis of “body packers.”

Early signs of cocaine intoxication include CNS stimulation such as hyperactivity, hyperesthesia, mydriasis, twitches/tremors, seizures and death. Common cardiac signs include tachycardia, hypertension, and cardiac arrest (likely secondary to coronary artery vasospasm and hypoxia). Life-threatening hyperthermia is also common.

Treatment is largely focused on the neurologic and cardiac systems while maintaining body temperature, electrolyte, and acid-base status. Many animals present too late for decontamination. Diazepam, barbiturates, and phenothiazines may be used for sedation and seizure control. Sodium bicarbonate should be administered to prevent arrhythmias associated with Na-K channel inhibition. Beta-blockers such as propranolol may be effective but their use is controversial. Due to the difficult and volatile nature of cocaine toxicity, consultation with an animal poison control center is strongly recommended.

Heroin

Heroin is a synthetic derivative of morphine. In human beings, it is usually injected intravenously but may be insufflated (snorted) or smoked. Animals, especially dogs, may be used as “pack mules” for the illegal transport heroin. The dogs are either fed baggies filled with the drug or baggies are surgically implanted in the peritoneum. Death may occur from either the drug itself or secondary to infection following non-sterile surgical technique.

Heroin (along with most opioids) is well absorbed from the GI tract and undergoes significant first-pass metabolism. Therefore, the amount absorbed orally will be significantly less as compared to the same amount delivered via injection or inhaled. Regardless, the amount of heroin needed to cause toxicity in a dog or cat is quite small and all exposures need to be managed aggressively. Because metabolism is heavily reliant upon conjugation to glucuronides, cats are more sensitive to heroin than dogs.

Clinical signs resulting from heroin intoxication may include early onset aggressive behavior (especially in dogs), vomiting, salivation, miosis, ataxia, CNS depression and unconsciousness. Life-threatening respiratory and cardiac depression is common. Respiratory depression and subsequent hypoxia are the leading cause of death. Seizures may also occur. Cats are more prone to exhibiting CNS excitation than dogs.

The induction of emesis following ingestion is typically not advised due to the rapid onset of CNS signs. In cases where a baggie of heroin has been ingested, extreme care must be taken to avoid rupture. Gastric lavage may be helpful in cases of large ingestions.

Treatment is typically focused on the respiratory and CNS signs. Respiratory depression and coma may be reversed with naloxone (0.02-0.04 mg/kg or greater IV, IM or SC). Naloxone has a short half-life and should be re-dosed as needed, as often as 30-90 minutes. Additionally, assisted ventilation may be necessary. Seizures should be treated with diazepam. Body temperature must be monitored closely as hypothermia is common. Though heroin is cleared more rapidly than morphine, symptoms may persist for many hours. Additionally, organ damage secondary to hypoxic injury may cause long-lasting or permanent effects.

POISON CONTROL RESOURCES

For assistance managing a potentially poisoned patient, a number of resources are available. In the US and Canada, veterinarians or pet owners may call Pet Poison Helpline (\$35/case) at (800) 213-6680 or the ASPCA's Animal Poison Control Center (\$60/case) at (888) 426-4435. Both of these services are available 24/7 and are staffed with experts in the field of veterinary toxicology. Pet Poison Helpline is additionally staffed with veterinary specialists in emergency and critical care and internal medicine, as well as PharmDs. The author recommends using either of these services in order to obtain the most accurate and current veterinary-specific clinical advice.

References/Suggested Reading

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