# **Managing Intoxication from Human Drugs of Abuse**

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Because of the legal problems surrounding many of the drugs commonly abused by people, owners may be reluctant to admit that their animal has been exposed to these compounds. Another complicating factor is that drugs sold under one name may be laced with other substances. Symptomatic treatment of the animal is often the best management plan, even in cases where the exposure is known.

# Depressants

# Ethanol

Alcohol (ethanol, grain alcohol) is a very commonly used CNS depressant. The lowest published oral lethal dose for ethanol (100%) is 5.5 ml/kg in the dog and 6 ml/kg in the cat. The average percentage of alcohol in most drinks is 4% for beer, 10% for wine, 40% for vodka and 43% for whiskey (200 proof = 100% alcohol). Clinical signs of ethanol poisoning include vomiting, ataxia, CNS depression, hypothermia, arrhythmias, respiratory depression and coma. Treatment for ethanol toxicity is symptomatic and supportive. Emesis should only be induced if the animal is asymptomatic. Risk of aspiration must be considered before giving activated charcoal. Use fluid diuresis and respiratory support as needed. Monitor temperature and cardiac function. With monitoring and treatment, prognosis is good.

## **Barbiturates**

Street names: barbs, downers, red devils, goof balls, yellow jackets, block busters, pinks, reds and blues, Christmas trees

Barbiturates are CNS depressants, but occasionally may cause excitement in some animals. Barbiturates act directly on CNS neurons by activating the inhibitory GABA receptors and inhibiting the excitatory glutamate receptors. They are often classified by their onset of activity and duration of action: short-acting (pentobarbital, secobarbital) with duration of 3-4 hours and onset of 10-15 minutes; intermediate-acting (amobarbital, aprobarbital, butabarbital), with a duration of 6-8 hours and onset of 45-60 minutes; and long-acting (mephobarbital, phenobarbital) with a duration of 10-12 hours and onset of 1 hour. The oral LD50 for phenobarbital in dogs is 150 mg/kg. Clinical signs of barbiturate intoxication include CNS depression, ataxia, weakness and disorientation. With ingestion of larger amounts, respiratory depression, recumbency, coma, hypothermia and death may occur. If the exposure is recent and the animal is asymptomatic, emesis can be induced. Repeated doses of activated charcoal with a cathartic should be administered with care to prevent aspiration. Respiration should be monitored and intubation and ventilation given as needed. Temperature and cardiac function should be monitored. Alkaline diuresis may promote elimination in the urine.

## GHB

Street names: Gamma Hydroxybutyric Acid, Liquid Ecstasy, Liquid G, G, Grievous Body Harm, Georgia Home Boy, Cherry menth, Easy lay, Everclear, Fantasy, Gamma-oh, Goop, Great hormones at bedtime, G-riffick, Hydro, Jib, Jolt, Liquid E, Liquid X, Organic Quaalude, Salty water, Scoop, Sleep-500, Soap, Somatomax, Xyrem® (sodium oxybate), Vita-g, Water

Gamma hydroxybutyric acid (GHB) is a naturally occurring CNS depressant. It was used as an anesthetic, but was banned in the United States in the early 1990's. It is now promoted illegally as a growth hormone stimulant, diet aid, anabolic, hypnotic, and euphoriant. Despite the ban on the sale and manufacture of GHB, mail order kits and the internet have resulted in easy access to this agent. The exact mechanism of GHB action in the CNS is unknown, but GHB is structurally related to GABA (precursor in GHB formation). Health food products used as sleep aids may contain gamma butyrolactone (GBL) or 1,4 butanediol (BD) which produce similar effects as GHB. The primary effect is dose-related CNS depression, hypotonia, sedation, ataxia, disorientation, coma, bradycardia, tremors, respiratory depression and vomiting. The onset of signs is rapid after oral ingestion (15-30 min). Concurrent alcohol intake may result in delayed onset of symptoms. Peak blood levels of GHB occur 15 to 45 minutes after oral administration and elimination is rapid (complete elimination within 4-6 hrs). GHB is not detected on most routine urine and serum toxicology screens. Emesis is contraindicated due to the rapid onset of CNS depression. GHB is rapidly absorbed, so activated charcoal is also not likely to be beneficial. There is no antidote. Treatment is symptomatic and supportive. Monitor pulse oximetry and/or arterial blood gases in patients with respiratory depression. Intubation and ventilation may be needed.

# Benzodiazepines

Street names: Downers, V, Rophies, Roofies, Roach, Rope

Benzodiazepines are found as both prescription and illicit drugs. Prescription products include: alprazolam (Xanax®), clonazepam (Klonopin®), diazepam (Valium®), lorazepam (Ativan®), midazolam (Versed®), and temazepam. Flunitrazepam (Rohypnol®) is illegal in US and is known as the "date-rape" drug. Benzodiazepine receptors are found only in the CNS and the binding of benzodiazepines enhances the affinity of GABA receptors. Benzodiazepines have a quick onset of action (within 30 min) and can have short-, intermediate, or long-acting properties. Peak levels occur in 0.5-2 hours post ingestion. Benzodiazepines are primarily metabolized via glucuronidation, so cats may be more sensitive. Signs include ataxia, lethargy, hypothermia, hypotension, tachycardia,

and rarely CNS excitation (paradoxical reaction). There is a wide margin between symptomatic and lethal doses of benzodiazepines. In general, risk of death from overdose is minimal unless ingested with other depressants such as alcohol or barbiturates. In many cases animals can be monitored at home if desired, with the key factor being whether the animal is rousable if stimulated. This should be assessed at least every 20-30 minutes for several hours before assuming the animal is stable. Be sure to keep them warm. If larger doses are ingested, activated charcoal, IV fluids and thermoregulation may be used to support the animal. Flumazenil is specific antagonist and can be given if the dose is high enough that the animal is at risk of respiratory depression. Dose may be to be repeated.

## **Opiods and opiates**

Street names: Morphine: M, morph, Miss Emma

Heroin: smack, skag, hammer, H, horse, rock, white, slow, Harry cone, China white

Opioids and opiates are synthetic or natural compounds derived from the opium poppy (*Papaver somniferum*) and can be found in both prescription and illicit drugs. Opioids are generally classified (agonist or partial agonist) by their ability to exert effects at the different opioid receptors (mu, kappa, delta, sigma). Partial agonists are agonists at one (or more receptors) and antagonists at others. Opioids act centrally to elevate the pain threshold and to alter the psychological response to pain. Opioids are well absorbed from the GI tract, but bioavailability is variable as some opioids have a large first pass effect (i.e. fentanyl). These opioids are administered in other manners (CRI, buccal, transdermal) to reach therapeutic blood levels. Metabolism varies, but opioids generally undergo hepatic metabolism which may account for the sensitivity of cats (who are deficient in glucuronyl-S-transferase) to opioids. Signs include CNS depression, ataxia, respiratory depression, vomiting, bradycardia, and hypotension. Cats may show excitatory behavior and urinary retention. Detection of opioids can be made from urine or serum samples.

Treatment in an asymptomatic animal may include emesis if the ingestion is recent. Activated charcoal with cathartic should be administered and the patient monitored for up to 12 hours. If the animal becomes symptomatic, naloxone can be administered. As the duration of action of naloxone is much shorter than that of the opioids, repeat dosages may be necessary. Partial agonists/antagonists (i.e. butorphanol) may be used to partially reverse pure agonists if no naloxone is available. Monitor temperature, cardiac function and blood gases. Treatment times will vary with the half life of the opioid. If respiratory and cardiovascular function can be maintained then prognosis is good. For those cases that are seizuring, prognosis is guarded. As many human pain medications combine acetaminophen with opiods, question the owner carefully about the exact agent involved.

## Marijuana

Street names: hemp, pot, grass, Mary Jane, sensemilla, hash, hashish, Bhang, Ganja, charas, Thai stick, reefer, wacky-backy.

Marijuana (*Cannabis sativa*) is an annual herb of the nettle family. It is not considered toxic as a fresh plant, but toxicity increases when the plant is damaged by heating, drying, smoking, or ageing. Marijuana can be found in three main forms, as a dried herb (composed of top leaves and buds), as a resin (hash or hashish) that is extracted from the buds and flower heads, and less commonly, as a sticky liquid (hash oil) that is prepared from the resin. The female plant (sensemilla) contains the highest concentration of toxins. Marijuana contains up to 61 different cannabinoids. Delta 9-tetrahydrocannabinol (THC) is the predominant psychoactive agent of marijuana. The concentration of THC in the dried plant varies from 1%-8%. In hashish, which is derived from the resin of the flowering tops of the hemp plant, the concentration varies from 3% to 6% and in hash oil it varies from 30-50%. Marijuana is used medically in people to decrease intraocular pressure in glaucoma, combat nausea from chemotherapy and as an appetite stimulant in AIDS and cancer patients. Pure THC is also available by prescription as dronabinol, or in a synthetic form as nabilone.

In dogs, the onset of action occurs 30-90 minutes after ingestion, and signs may last up to 72 hours. Initial signs can include nervousness and disorientation progressing to depression (which may last 18-36 hours). Mydriasis, nystagmus, urinary incontinence and ataxia have also been described. Hypothermia in small animals may also occur. Exposure is rarely fatal, although it can occur in severe cases. Decontamination by emesis may be attempted but due to anti-emetic properties of cannabis, it may not be effective. Activated charcoal with a cathartic can be given (avoid if symptomatic). Supportive care should include fluids, thermoregulation, assisted respiration if needed and diazepam if agitated. In cases where an animal has consumed marijuana in baked goods (typically brownies), chocolate toxicosis may be additive to marijuana toxicosis. Urine drug testing can help confirm exposure, but false negatives may result.

#### Hallucinogens

#### LSD

Street names: Acid, Beast, Ben, Blotter, Blue caps, Blue drops, Brain buster, Brown caps, California sunshine, Cubes, Delysid®, Face melter, Ghost, Green caps, Hawk, Heavenly blue, Microdot, Orange wedges, Paper acid, Pearly gates, Pink drops, Purple haze, Purple wedges, Royal Blue, Sunshine, Wedding bells, White lightning, Window Pane, Yellow caps, Yellow drops

Lysergic acid diethylamide (LSD) is an indole derivative, with strong hallucinogenic effects, that acts as a non-selective serotonin agonist. LSD can come as a powder, tablet, capsule, sugar cube, or a drop of solution evaporated on filter or blotting paper ("blotter acid" or "postage stamps"). It can also be incorporated into a square of gelatin ("windowpane"). LSD is frequently adulterated. A natural source of LSD are the seeds of the morning glory family (*Ipomoea* sp.). LSD is not detected on most routine toxicology

screens. After ingestion, absorption is quite rapid and signs can be seen in 20-90 minutes. Signs may last for 0.7-12 hours depending on the dose. Disorientation, mydriasis, tachycardia, hypertension, and tremors are the most commonly seen signs. Because of rapid absorption, the value of gastrointestinal decontamination is limited. A quiet, dimly lit room should be provided and benzodiazepines are the mainstay of therapy. Cyproheptadine and phenothiazines may also be used for their anti-serotonin effects. Deaths from LSD are usually due to misadventure during hallucinations.

## PCP

Street names: Angel dust, Mist, Hog, Peace pill, Kay Jay, KJ, Crystal Joint, Elephant Tranquilizer, Super Grass, Super Weed, Rocket fuel, Scuffle, Sheets, Space Basing (PCP + Cocaine/Crack), Surfer, T, D.O.A., Cyclones, Snorts, Soma, Goon, Horse franks, Green (PCP-impregnated parsley), Dust, Sherms (tobacco laced with PCP), Clickers or Primos (marijuana cigarettes soaked in PCP)

Phencyclidine is a potent analgesic and anesthetic. It is a sympathomimetic and hallucinogenic drug that is structurally similar to ketamine. PCP is thought to stimulate alpha-adrenergic receptors, potentiating the effects of norepinephrine, epinephrine and serotonin. Adulterants, including embalming fluid, are very common in PCP. PCP is rapidly absorbed with the onset of action within 5 minutes. In a large overdose, effects may be seen for days following ingestion. Signs include: nystagmus, ataxia, muscle rigidity, hyperesthesia, aggression, hypertension, coma, and seizures. Major laboratories can perform specific PCP levels and identify active metabolite as well. Due to the quick onset of signs, decontamination is not a viable option. Monitor pulse oximetry, blood gases, body temperature and electrolytes. Minimize all sensory stimuli. IV benzodiazepines should be given if the animal is agitated, seizuring or is hypertensive. Large doses may be required in severely agitated patients. If severe hypertension persists, treat with IV nitroprusside.

## **Psilocybin mushrooms**

## Street names: Shrooms, magic mushrooms, caps

Psilocybin containing mushrooms (*Psilocybe, Panaeolus, Conocybe, Gymnophilus* and some *Stropharia*) grow in lawns, gardens, parks, road sides, and open woods across North America. They are coprophilous (prefer dung/manure substrates), but some species grow on mulch and rotting wood. Psilocybin mushrooms are used recreationally for hallucinogenic effects. They are thought to stimulate serotonin receptors within the CNS and PNS. The mechanism may also involve norepinepherine mediated pathways. The sale/use of "magic mushrooms" is illegal in US, but the sale of mycelia is **not** illegal. Whole mushrooms are frequently dipped in chocolate to disguise the bitter taste, but they can be powdered and put in capsules, milkshakes ("magic smoothies"), or other food substances for ease of administration. Signs begin 30-180 minutes after ingestion and may last from 6 hrs to 3 days. The most common signs are mentation/behavioral abnormalities, ataxia, vocalization, mydriasis and hyperthermia. Tachycardia, seizures, and muscle weakness are possible, but death is rare. Emesis/lavage and activated charcoal can be performed for recent asymptomatic ingestions. Treat symptomatically and consider cyproheptadine to control serotonin syndrome. Confine animal to minimize risk of trauma from misadventure.

## Stimulants

## Amphetamines

Street names: speed, bennies, meth, crank, crystal, chalk, snow seals (cocaine and amphetamine), b-bombs, aimies (amphetamine and amyl nitrate), ice, Ecstasy, MDMA

Amphetamines can be found in both prescription ADHD and weight loss medications (Ritalin®, Adderall®, Dexedrine®), as well as illicit substances (methamphetamine, Ecstasy). Pharmacologically, amphetamines are sympathomimetic alkaloids. The alkaloids stimulate alpha- and beta-adrenergic receptors, causing the release of endogenous catecholamines at synapses in the brain and heart. This stimulation causes peripheral vasoconstriction and cardiac stimulation resulting in hypertension, tachycardia, ataxia, restlessness, tremors, and seizures. Because signs can occur as early as 15-30 minutes of ingestion, decontamination at home is often not recommended. With ingestions of extended release forms, signs may not be seen for several hours. Asymptomatic animals may have emesis induced and activated charcoal administered. Fluid therapy is important to enhance elimination and maintain CV stability. Acidification of the urine (with ammonium chloride or ascorbic acid) to the pH range of 4.5-5.5 will enhance urinary excretion. Agitation, hyperactivity, and tremors tend to respond best to phenothiazines. For acepromazine and chlorpromazine, start at the low end of the dosage range and increase as needed. Diazepam can worsen dysphoria and is not recommended. Because part of the syndrome is related to serotonin excess, cyproheptadine has been used to manage some of the CNS effects. If tachycardia persists, propranolol may be used. Signs may persist up to 48-72 hrs in severe cases.

#### Cocaine

Street names: Crack, rock, flake, bernies, coke, girl, gold dust, stardust, snow, "C", white girl, leaf, blow, nose candy, her, white lady, baseball (same as free-base), speedball (cocaine and heroin), bernice, champagne, dama blanca, rich man's drug

Cocaine is a natural alkaloid derived from coca (Erythroxylon coca). It is a potent CNS stimulant with sympathomimetic effects. Cocaine blocks the re-uptake of norepinephrine and serotonin, resulting in an excess of neurotransmitters at the receptor sites, sensitizes sympathetic effector cells to give an exaggerated response to catecholamines and stimulates dopaminergic neurotransmission by blocking the reuptake of dopamine. Street cocaine is often adulterated, but there is a medical grade (schedule II) that is restricted to topical administration as a local anesthetic on mucous membranes of the oral, laryngeal, and nasal cavities. It is available as a 1-4% solution (eye anesthetic) or a 10-20% solution (nasopharyngeal anesthetic). Cocaine can be detected in plasma, stomach contents, and urine. Oral administration produces detectable plasma levels at 30 minutes, with peak levels reached between 50 and 90 minutes. Since cocaine is better absorbed in alkaline medium of the small intestine than in the acid medium of the stomach, peak effects may be delayed when ingested.

Dogs present initially with signs of serotonin syndrome (CNS excitement, hyperactivity, erratic behavior, and possibly seizures). Other possible signs are vomiting, hypersalivation, tachycardia and hyperthermia. Dogs may later become depressed and comatose. Death may be due to hyperthermia, cardiac arrest, or respiratory arrest. Since cocaine is rapidly absorbed and the patient can rapidly deteriorate, vomiting should only be induced within 15 minutes of ingestion. Gastric lavage under anesthesia, followed by activated charcoal, may be a safer alternative. Monitor heart rate, rhythm, BP, and electrolytes. Diazepam can be used to control tremors and seizures, naloxone can inhibit cocaine-induced hyperactivity and cyproheptadine can be used to treat serotonin syndrome. For life-threatening tachyarrythmias, use a beta-blocker such as propranolol.

## Nicotine

Nicotine is an alkaloid derived from both cultivated (Nicotiana tabacum) and wild tobaccos (N. attenuata, N. trigonophylla). Nicotine mimics acetylcholine (Ach) at sympathetic and parasympathetic ganglia, neuromuscular junctions of skeletal muscle and at some synapses in the CNS. Low doses cause depolarization and stimulation of receptors similar to acetylcholine. Higher doses cause stimulation followed by blockade at autonomic ganglia and myoneural junctions of skeletal muscle. Animals can ingest nicotine by eating cigarettes, cigars, pipe tobacco, snuff, nicotine gum or patches. Regular cigarettes contain 13-30 mg nicotine per cigarette, while the low yield cigarettes have 3-8 mg nicotine. Cigars contain 15-40 mg nicotine. Nicotine is well absorbed orally (15-30 min after chewing gum, 30-90 min for ingestion of tobacco). Gastric alkalinization enhances oral absorption of nicotine. The duration of signs is dose dependent and can vary from 1-2 hours following mild exposure up to 24 hours for severe exposures. The oral LD50 in the dog is 9.2 mg/kg.

Clinical signs include initial excitation, tachypnea, salivation, emesis, and diarrhea, followed by muscle weakness, tremors and depression. Large doses can cause tachycardia, shallow, slow respirations, collapse, coma, cyanosis, cardiac arrest, and death. If asymptomatic, induce emesis and give activated charcoal. Symptomatic care includes: IV fluids, oxygen and/or artificial ventilation, benzodiazepines or barbiturates for seizures, and atropine if parasympathetic effects are present. Antacids are contraindicated because they will enhance absorption. Poor prognosis with large doses or if artificial ventilation is required.

#### References

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