

Ma huang: All natural but not always innocuous

by

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Herbal supplements are becoming increasingly popular and can be found everywhere from malls and discount stores to mail-order warehouses. Although many herbs have a low potential for adverse effects, some can cause life-threatening reactions. Many people assume that if something is "natural," the substance must be 100% safe. One all-natural product that can cause many adverse effects is the herb ma huang.

Ephedra sinica, the primary species of ma huang, is used as a weight-loss aid in people because of its stimulant effect and as a decongestant because of its vasoconstrictive effect. It is also used in the herbal products Herbal Ecstasy® and Ultimate Xphoria®. Many *Ephedra* species have been used medicinally. The herb may be taken as a tea or an infusion, or it may be combined into powdered drink mixes or capsules.

The active components of *Ephedra sinica* are alkaloids, including ephedrine and pseudoephedrine.^{1,2} Pseudoephedrine is most commonly recognized as the decongestant found in many over-the-counter cold medications.

Pharmacologically, ephedrine and pseudoephedrine 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 results in peripheral vasoconstriction and cardiac stimulation, causing increased blood pressure, tachycardia, mydriasis, ataxia, and restlessness. Central nervous system effects such as tremors and seizures may be seen. People often report vertigo, insomnia, and headache. The pseudoephedrine component causes more bronchodilation and decreases nasal congestion better than the ephedrine alkaloid.^{3,4} Ephedrine and pseudoephedrine are metabolized in the liver and excreted in the urine.

Clinical signs of ma huang toxicosis in animals are comparable to those seen with overdoses of over-the-counter and prescription products containing pseudoephedrine. Toxic effects are generally limited to the cardiovascular and central nervous systems. Adverse reactions from over-doses of cold, sinus, and allergy medications containing pseudoephedrine may develop at doses of 5 to 6 mg/kg, and deaths have occurred at doses of 10 to 12 mg/kg (ASPCA Animal Poison Control Center Database: Unpublished data, 1999). Doses are frequently difficult to calculate for herbal products because of seasonal growing conditions and natural variances of the alkaloids within the plant. Moreover, ingredients and concentrations may not be listed on the product, or the product may not be standardized (does not provide a guaranteed concentration of active ingredients per dose). Clinical signs usually develop within 30 minutes to several hours after ingestion. Initial signs usually begin with restlessness, pacing, and agitation. Vocalization may occur. Dogs may exhibit hallucinogenic behavior such as snapping at invisible flies or staring into a corner. On clinical examination, mydriasis, tachycardia (heart rates may exceed 200 beats/min), hypertension, muscle tremors, and seizures may be present. Death is usually due to cardiovascular collapse.

Most ingestions of ma huang are accidental. Dogs are more likely to ingest ma huang products than cats. Potbellied pigs also readily ingest ma huang products. Many of the drink mixes are chocolate-flavored, which makes them more palatable. Most cases of ingestion are from teas (usually before brewing), drinks, and capsules. In our experience at the ASPCA Animal Poison Control Center, prepackaged supplements are more commonly ingested than the straight herb.

For recent ingestions (less than 15 minutes), emesis may be induced in an asymptomatic animal. Administer activated charcoal and a cathartic such as sorbitol, magnesium sulfate, or sodium sulfate. Tremors, seizures, and nervousness are best controlled by acepromazine maleate (0.05 to 1 mg/kg intravenously, intramuscularly, or subcutaneously), chlorpromazine (0.5 to 1 mg/kg intravenously or intramuscularly), or a barbiturate such as phenobarbital (3 mg/kg intravenously to effect). For acepromazine and chlorpromazine, start at the low end of the dosage range and increase as needed. In certain instances, such as pseudoephedrine toxicosis or amphetamine overdose, phenothiazines work well to control the central nervous system effects because the cause of the seizure is not the same as in an epileptic animal. Dissociative effects of benzodiazepines are frequently exaggerated in dogs with pseudoephedrine toxicosis; animals can actually become more agitated after the administration of diazepam. Propranolol (0.02 to 0.06 mg/kg slowly intravenously) or other beta-blockers can be used to control tachycardia.

Administer intravenous fluids, and monitor the animal. Because of hypertension, pulmonary edema can occur, but it is rare. Obtain baseline blood tests, including serum potassium and glucose concentrations. The alkaloids are suspected of causing hyperglycemia and hyperinsulinemia, resulting in hypokalemia by shifting potassium from extracellular to intracellular spaces.⁵

In people, numerous drug interactions have been reported with ephedrine or pseudoephedrine-containing medications and herbs, including interactions with digoxin, halothane, and monoamine oxidase inhibitors such as selegiline hydrochloride (approved for use in dogs as Anipryl® --Pfizer Animal Health). Existing medical conditions such as cardiac and renal disease can increase toxicity.⁶⁻⁸

Many herbal supplements, especially those for weight loss, also include caffeine-containing plants such as guarana (*Paullinia cupana*). The combination of caffeine and ephedrine can result in enhanced toxicity because both drugs are stimulants and affect the cardiovascular and central nervous systems. Although most herbal companies are reputable, there are reports of adulterated products (*i.e.* additions of ingredients not listed on the label), plant identification errors (*i.e.* an herb mistakenly mixed into a batch of another herb), or labels that are written in a foreign language, making interpretation difficult.^{9,10}

Although most herbal supplements do not come under Food and Drug Administration regulations, proposed regulations were published in the *Federal Register* in 1997. These regulations would require that the maximum allowable dose and duration of use and the contraindications for use be printed on the label, similar to over-the-counter products.¹¹

Advise clients using herbal products to treat them like any other medication and keep them away from children and pets. Encourage clients to learn about the herbal drugs they are taking. If they wish to give herbal supplements to pets, encourage the owners to discuss proper dosages and treatment with a veterinarian who practices alternative or complementary medicine.

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