Mushroom Poisoning in Dogs and Cats

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Several thousand species of mushrooms grow throughout the United States, but thankfully only a few are toxic to dogs and cats. Outdoor dogs, especially those allowed to roam freely through woods and fields, are at the greatest risk of poisoning. These dogs tend to eat or mouth anything that looks or tastes interesting and what is more exciting than a fresh mushroom. A few of these “field” mushrooms pose an additional hazard as they have an enticing fishy smell or have toxins present only in the natural, uncooked state. In some instances, indoor or indoor/outdoor dogs and cats may be of greatest risk simply because the mushrooms are found in their environment. Recreational or hallucinogenic mushrooms are an excellent example of this.

While the majority of mushrooms are considered non-toxic, some may result in severe clinical signs or death if ingested. In general, all mushroom ingestions in veterinary patients should be considered toxic unless the mushroom is accurately and rapidly identified by a person trained in mycology. Clinical signs associated with mushroom poisoning are dependent on the species of mushroom ingested, specific toxin within that mushroom, amount ingested, and age and size of animal. Early nonspecific signs include vomiting, diarrhea, abdominal pain, ataxia or incoordination, depression, tremors, and seizures.

Mushrooms known to cause poisoning can be roughly divided into five broad categories based on clinical signs. Included in increasing order of toxicity are those that cause gastrointestinal irritation, hallucinations, muscarinic reactions resulting in SLUDGE signs (salivation, lacrimation, urination, diarrhea, dyspnea, and emesis), psychotropic activity/seizures, and hepatic necrosis/kidney failure. The degree of toxicity and expected outcome differ for each general category and concentration of toxin present.

GASTROINTESTINAL IRRITATION

Mushrooms found in this general category include many of those in the genera Agaricus, Boletus, Chlorophyllum, Entoloma, Lactarius, Omphalotus, Rhodophyllus, Scleroderma and Tricholoma. The specific toxin for most of these mushrooms is unknown. Abdominal pain, vomiting, and diarrhea occur within 15 minutes to 2 hours of ingestion and resolve spontaneously within a few hours. Rarely do the signs last for 24 to 48 hours. Most animals improve without treatment, but supportive care in the form of antiemetics, histamine-2 antagonists (H2 blockers such as ranitidine or famotidine), proton pump inhibitors (omeprazole and others), and IV fluids is indicated for persistent signs. The prognosis for a full recovery is excellent and poisoning is rarely fatal.

HALLUCINATIONS

Psilocybe, Panaeolus, Conocybe and Gymnopilus mushrooms grow primarily in fields and pastures in the NW and SE United States. Often referred to as “magic mushrooms” they are also grown in basements and personal greenhouses for recreational use. Psilocybin and psilocin, the known toxins, are hallucinogens that readily cross the blood brain barrier into the central nervous system (CNS) where they stimulate serotonin receptors. In dogs, ataxia, weakness, vocalization, nystagmus, abnormal mentation, aggression, and increased body temperature occur within 15 minutes to 2 hours of ingestion. The signs in most dogs are short lived, lasting only for 4 to 6 hours, although some animals may take 24 to 48 hours for full resolution of signs. Emesis may be useful if induced early and clinical signs have not occurred. Treatment is supportive and includes sedation if needed, anticonvulsants, IV fluids, and attention to thermoregulation. The prognosis is generally good, although deaths have been reported.
MUSCARINIC REACTIONS OR “SLUDGE” PRODUCING

Mushrooms in the genera *Inocybe* and *Clitocybe* spp. are the most common members of this group. Both are found worldwide. *Inocybe* tends to grow under or around conifers or broad-leaved trees and *Clitocybe* grows in grasslands or on the forest floor. Muscarine, the toxin, competes with acetylcholine at its receptor binding sites. Once bound, muscarine acts like acetylcholine but is not degraded by acetylcholinesterase. Fortunately, muscarine does not cross the blood brain barrier so most of the effects are peripheral.

Depending on the amount of muscarine present, the signs of poisoning occur anywhere from a few minutes to 2 hours of ingestion and last for several days. The acronym SLUDGE is used to describe the commonly observed signs of salivation, lacrimation, urination, diarrhea, dyspnea, and emesis. Other reported signs include abdominal pain, miosis and bradycardia.

If the animal has not already vomited, emesis should be induced. Further decontamination with activated charcoal is usually not practical due to the rapid onset of clinical signs. Intravenous fluids should be administered for dehydration and atropine (0.2 to 2 mg/kg BW, ¼ IV and the remainder SQ or IM) as needed for the SLUDGE syndrome. Drying of respiratory secretions is a useful guide for repeat atropine dosing. The prognosis is generally good but varies depending on the amount of muscarine in the mushrooms, severity of signs, and response to atropine. It is important to note, however, that a single *Inocybe* and *Clitocybe* may be lethal if the amount of muscarine in the mushroom is high.

PSYCHOTROPIC ACTIVITY/SEIZURES

The most common species of mushrooms in this broad category are *Amanita pantherina* and *Amanita muscaria*. They are found throughout the United States, but are especially common in the deciduous and coniferous forests of the Pacific Northwest. Other less common species include the *Amanita gemmata*, *Amanita smithiana*, *Amanita strobiliformis* and *Tricholoma muscarium*. A few of these mushrooms are grown or kept by humans for recreational use and cats as well as dogs have been poisoned. Technically referred to as isoxazoles, the two major toxins, ibotenic acid and muscimol, readily cross the blood brain barrier. Ibotenic acid mimics the excitatory amino acid glutamic acid, acting most strongly at NMDA glutamate receptors and muscimol is potent a GABA agonist.

Clinical signs in dogs generally occur with 30 to 90 minutes of ingestion, are central in nature, and include lethargy, vocalization, incoordination, panting, labored breathing, paddling, aimless chewing, hyperactivity, muscle tremors, and seizures. Signs may occur as early as 15 minutes in cats and vary from profound depression to excitation and muscle tremors.

Emesis is not recommended due to the rapid onset of neurologic signs. Gastric lavage followed by activated charcoal is useful if performed early after an ingestion. Treatment is primarily symptomatic and supportive with special attention given to medications chosen for seizure control. Benzodiazepines such as diazepam and midazolam should be used carefully as they are GABAnergic in nature and may exacerbate effects; barbiturates may cause worsening of CNS depression and respiratory depression requiring mechanical ventilation. The prognosis depends on the amount of toxin present and mushroom ingested but is normally good with aggressive supportive care. Death may occur after ingestion of a single mushroom if the concentration of toxins is high enough.

HEPATIC NECROSIS/KIDNEY FAILURE

Common genera of mushrooms in this group include the *Amanita*, *Galerina* and *Leptota* with *Amanita phalloides* (death cap or death angel) being the most widely known. The death cap is frequently found around trees (birch, oak, etc) in warm, humid years in the NE United States, Pacific NW, and San Francisco Bay area. These cyclopeptide containing mushrooms are among the most poisonous in North America and very few dogs or cats survive ingestion. Amanitins, the primary toxins, are heat stable and not degraded by the acid stomach pH which means they are poisonous both as fresh and cooked mushrooms. Amanitins work by inhibiting RNA polymerase II and ribosomal protein synthesis. The net result is cell death, especially hepatocytes, but also intestinal crypt cells and proximal renal tubule cells where the metabolic rate is high.

The clinical signs occur in different phases and it is vitally important that veterinarians treating animals with mushroom exposures understand the time frame so early and aggressive treatment is provided. The earliest signs are gastrointestinal
(GI) and include severe abdominal pain, vomiting, and bloody diarrhea. They are often delayed for 6 to 24 hours after ingestion. This phase typically lasts for 24 to 48 hours and is followed by a quiet phase of 12 to 24 hours. During this time, liver enzymes increase until fulminant liver failure, hypoglycemia, coagulopathy, encephalopathy, coma, and death occur. Animals that survive the hepatic phase develop polyuria, polydipsia, vomiting, and anorexia, and die from proximal and distal renal tubule necrosis. A few dogs die early in the poisoning but for most, death occurs 3-5 days after ingestion.

Early diagnosis and treatment is critical if the dog or cat is to survive. There is currently no known antidote. Animals should be treated as early as possible and not just monitored to see if clinical signs develop. If not vomiting, emesis should be induced and followed with 3 doses of activated charcoal. Intravenous fluid therapy including dextrose, antiemetics, H₂ blockers, proton pump inhibitors, and phytonadione are useful for symptomatic and supportive care. Liver protectants such as silymarin, S-adenosylmethionine (SAMe), N-acetylcysteine (NAC), and Vitamin E all warrant use. An experimental procedure to drain the gall bladder was used to successfully to treat an A phalloides poisoned dog but has not yet been fully evaluated. The prognosis for recovery in dogs and cats is very poor with liver transplants the only known cure.

PET POISON HELPLINE

Pet Poison Helpline, an animal poison control center based in Minneapolis, is available 24 hours, seven days a week for pet owners and veterinary professionals that require assistance treating a potentially poisoned pet. The staff provides treatment advice for poisoning cases of all species, including dogs, cats, birds, small mammals, large animals and exotic species. As the most cost-effective option for animal poison control care, Pet Poison Helpline’s fee of $59 per incident includes follow-up consultation for the duration of the poison case. Pet Poison Helpline is available in North America by calling 800-213-6680. Additional information can be found online at www.petpoisonhelpline.com.

SELECTED REFERENCES

