Ingestion of moldy foods or compost may cause tremorgenic mycotoxicosis, a sometimes severe and potentially deadly systemic poisoning, in dogs. Veterinary technicians should become knowledgeable about potential causes and signs of tremorgenic mycotoxicosis. Some reports in the scientific literature suggest that mycotoxicosis is underdiagnosed.1–3

MYCOTOXINS

Mycotoxins are secondary metabolites that are produced by several fungal species and are toxic to animals, plants, and other organisms. Their effects differ based on their chemical structure.1 Tremorgenic mycotoxins generally cause a neurologic syndrome that includes tremors. These toxins are produced by molds that may be present on foods or compost. Molds grow under a range of conditions (32°F to more than 140°F [0°C to 60°C]), and different species have different oxygen requirements, but the optimal temperature range for mold growth is 68°F to 86°F (20°C to 30°C), which covers the standard room temperature range.4

Approximately 20 mycotoxins have been identified as tremorgens. Those most frequently reported to affect pets are penitrem A and roquefortine C, which are produced by Penicillium spp.5 These toxins may be detected in stomach contents or in the suspect food or compost. Diagnostic laboratories use chromatography or mass spectrometry to identify the mycotoxins and to rule out other potential toxicants.1,5 From a treatment perspective, identification of the specific mycotoxin is not always necessary because patient management will be the same regardless of the organism involved. However, it may be of benefit to have a definitive diagnosis to document the cause of the toxicologic syndrome. Multiple mechanisms of action have been suggested for tremorgenic mycotoxins. It is likely that the mechanism of action differs for each toxin and the species of animal involved in the exposure. Two reported mechanisms for different mycotoxins involve inhibition of the neurotransmitters glycine and γ-aminobutyric acid.2,4 A study in rats given the mycotoxin penitrem A showed a reduction in tremors when midazolam maleate, a γ-aminobutyric acid agonist, was given.2,6 Further studies need to be conducted to identify specific mechanisms of action.

ROUTES OF EXPOSURE

Reported tremorgenic mycotoxin exposures have involved ingestion of moldy food, including dairy foods, walnuts or peanuts, stored grains, and pasta as well as material from compost piles.1,2,6 Dogs, especially those with indiscriminate eating habits, may raid the garbage or compost piles after moldy foods have been discarded. One report1 from 2003 described two cases of tremorgenic mycotoxin intoxication in dogs, one involving the ingestion of moldy cream cheese and the other involving the ingestion of moldy macaroni and cheese. Another report1 described an incident involving four dogs from one household that had access to a compost pile. Documentation of such cases is important because
it increases awareness of toxicologic syndromes and may aid veterinary professionals in the diagnosis of other cases.

CLINICAL SIGNS
The most common signs of tremorgenic mycotoxin exposures reported to the ASPCA Animal Poison Control Center (APCC) include hyperthermia, salivation, vomiting, ataxia, tachycardia, fasciculation, tremors, and seizures.1-3 These signs may begin within 1 to 2 hours of exposure or be delayed for several hours. In the case of an 11-year-old Labrador retriever that raided its owners’ garage and ingested moldy cream cheese, signs were noted the following morning.1 Both penitrem A and roquefortine C were identified when remaining cream cheese from the wrapper was analyzed. The signs of exposure included generalized muscle fasciculation and hyperextension of the extremities, blepharospasm, vocalization, weakness, tachypnea, hyperventilation, and tachycardia.

Another documented tremorgenic mycotoxin exposure caused status epilepticus in a 3-year-old Labrador retriever.1 This dog developed further complications as a result of aspiration pneumonia, which may have been the result of initial vomiting or of a gastric lavage procedure that was performed in an effort to decontaminate the patient.1

Although signs from exposure generally resolve within 48 hours, in some cases, fasciculations or intention tremors persist for longer periods.1-3 Increasing awareness of potential signs and typical exposure situations (e.g., if the dog was suspected of rummaging through the garbage) may help veterinary staff identify the toxicologic syndrome and implement appropriate treatment.

DIAGNOSIS
A tentative diagnosis may be based on the exposure history and the resulting signs. Confirming the diagnosis takes time because stomach contents or remaining moldy material must be submitted to a diagnostic laboratory for analysis. Other toxicants that may cause a tremorgenic syndrome include strychnine, bromethalin rodenticides, metinaldehyde (found in some slug and snail baits), methylxanthines, human or veterinary medications, and illicit drugs.1-3,7

TREATMENT
Management of signs must be prioritized. Signs of acute central nervous system stimulation should generally be addressed first. The ASPCA APCC recommends controlling tremors and seizures with methocarbamol, a centrally acting muscle relaxant, at a dose of 55 to 220 mg/kg given IV to effect at a rate of no more than 2 ml/min.2,3,8 Tremor and seizure control may also be achieved by administering diazepam; however, case reports1,3 and ASPCA APCC data7 indicate that diazepam alone is often not effective. Barbiturates, including pentobarbital and phenobarbital, have also been shown to be effective in controlling tremors and seizures in dogs exposed to tremorgenic mycotoxins.1,3

Decontamination is indicated in patients that have been stabilized and in asymptomatic animals. Induction of emesis is generally not recommended for this type of exposure because the act of vomiting may trigger seizures. If the animal has not previously vomited spontaneously and the ingested substance is likely to still be in the stomach, gastric lavage should be performed. Gastric lavage is performed with the animal under general anesthesia with a cuffed endotracheal tube in place to prevent aspiration of fluids. Body-temperature water is instilled via gastric tube at 10 ml/kg of body weight. Gravity is used to instill the liquid; instillation should continue until the lavage fluid runs clear. Activated charcoal and a cathartic may then be instilled through the gastric tube before it is removed. Activated charcoal is effective at adsorbing organic compounds, while cathartics such as sorbitol and magnesium sulfate help expedite elimination of the toxicant via the gastrointestinal tract. Both gastric lavage and the administration of activated charcoal have the potential to affect electrolyte balances; therefore, electrolytes should be monitored closely.1,7

Symptomatic and supportive care is also indicated. The animal’s body temperature should be monitored and regulated because hyperthermia may be present until tremors and seizures are controlled, when hypothermia may set in. If the patient is in shock, other symptomatic and supportive treatments may include IV fluids and corticosteroids. Because tremors may last for several days, oral doses of methocarbamol may be continued after the pet is discharged from the hospital.2

ROLE OF THE TECHNICIAN
Veterinary technicians can play an integral role not only in the care of patients experiencing toxicosis but also in educating pet owners about this topic. Informing pet owners about the dangers of moldy food, garbage, and compost can help them become more diligent about keeping their pets from gaining access to and accidentally ingesting these substances. It is worthwhile to highlight potentially toxic substances in veterinary practice newsletters, clinic on-hold messages,

Glossary

Blepharospasm — Winking caused by involuntary contraction of the eyelid muscles

Fasciculation — Simultaneous, localized contraction of muscle fibers, visible as twitching under the skin

Intention tremor — Slow tremor of the extremities that occurs during voluntary movement

Secondary metabolite — Substance synthesized during secondary metabolism that is not essential to the organism’s growth

Tremorgenic — Inducing tremors
Risks of Inducing Emesis

When an animal has ingested a substance that may stimulate the central nervous system, inducing emesis may cause further stimulation, thereby triggering seizure activity. Therefore, the veterinarian must carefully evaluate circumstances such as the time since exposure, the toxicant, the dose of toxicant, the animal’s overall health, and, if the animal is not already in the clinic, the owner’s access to a veterinary care provider. If emesis is to be induced in these patients, it is safer to conduct this procedure at the veterinary clinic, where seizures can be controlled quickly. Patients may also be at risk for aspiration pneumonia if vomitus is aspirated during a seizure.

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REFERENCES

or other sources of client information distributed by the practice.

The veterinary technician can also be highly valuable to the attending veterinarian when patients present with signs of toxic exposure. Being knowledgeable about potential toxicants allows the technician to add his or her insight to discussions with the veterinarian and the pet owners. Supportive care is crucial to ensuring a full and speedy recovery when toxicosis occurs. The technician plays an important role in this care and the successful treatment of affected patients.