

Bread dough toxicosis in dogs

Charlotte Means, DVM, MLIS

Abstract

Objective: To provide information on the ingestion, and subsequent toxicity, of raw bread dough in dogs.

Case summary: A report from the ASPCA animal poison control center (APCC) files of 3 cases of ingestion of raw bread dough by dogs. Clinical signs included vomiting, ataxia, blindness, hypothermia, and recumbency. All dogs were successfully treated for ethanol toxicosis.

New information: Ingestion of bread dough can cause gastric obstruction, bloat, or ethanol toxicosis. The treatment of ethanol toxicosis, including decontamination, IV fluids, management of metabolic acidosis, and hypoglycemia is discussed. Yohimbine can be used in cases where the dog is comatose or has developed severe respiratory depression.

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Summary

Many dogs, if given the opportunity, will readily ingest bread dough in the process of rising. During the process of rising, yeast produces ethanol. Because dogs will typically ingest all of the dough available (generally 1–2 loaves or a pan of rolls), a large doughy mass will fill the stomach. Internal body temperature causes the dough to rise rapidly, producing more and more ethanol. Ethanol is rapidly absorbed from the stomach and clinical signs of ethanol toxicosis can occur, including behavioral changes, vocalization, ataxia, CNS depression, and urinary incontinence. A significant metabolic acidosis may develop. As blood ethanol levels rise, respiratory depression, cardiac arrest, and ultimately, death, may occur. Although bread dough toxicosis can occur at any time, APCC receives the most calls around holidays especially Christmas and Easter. A common case scenario is that the dough is placed on a counter to rise overnight. The next morning, the owner finds missing bread dough and a symptomatic dog.

ASPCA Animal Poison Control Center, Urbana, IL, USA.

Address correspondence and reprint requests to:

Charlotte Means, DVM, MLIS, ASPCA Animal Poison Control Center, 1717 Philo Road, Suite #36, Urbana, IL 61802, USA. Tel.: (217) 337 5030, Fax: (217) 337 0599.

E-mail: cmeans@apcc.aspca.org

Case reports

Cases have been reported in the literature. In the 2 previously published reports, several border collies were fed uncooked pizza dough and in the second case, a dog ingested sourdough bread.^{1,2} The following 3 cases were received at the ASPCA animal poison control center (APCC) and are typical examples of bread dough toxicosis. Clinical information was obtained from the computerized databases of the APCC. The APCC is a 24-hour consultation service that receives calls from throughout the United States and Canada concerning incidents of animal poisoning from animal owners and practicing veterinarians. The APCC veterinarian collects information on the breed, sex, age, weight and number of animals exposed and at risk. Information on the substance ingested, quantity, source of exposure, and assurance of exposure is obtained as well. When available, information is obtained on the time of onset, types and duration of treatment, serum biochemical alterations, pathologic findings, and response to treatment. Follow-up calls are made as deemed necessary to update records as to progression of signs, response to treatment, and final outcome of the case. Information received is generally not confirmed by analytic methods.

Case 1: A 1-year-old, spayed female, 15.9 kg Border Collie ingested raw bread dough. One hour later, the dog exhibited mild vomiting. The next morning, the dog was

ataxic and appeared blind. At this time, the dog was presented to the veterinarian. Treatment consisted of cold-water gastric lavage and fluid therapy. The dog made an uneventful recovery.

Case 2: A 3-year-old, female, 9.5 kg Pomeranian mix ingested 20 buns that were rising. Ten hours later, the dog became ataxic. Since the dog was still alert, apomorphine was given to induce emesis. Fluid therapy was initiated and all clinical signs resolved in 12 hours.

Case 3: A 10-month old, male 8.2 kg Shetland Sheepdog ingested approximately 1 pound of dough. The dog began vomiting, approximately 3.5 hours post-exposure. After 1 hour of vomiting, the dog exhibited signs of ataxia and weakness. By the time the dog was presented to the veterinarian, the dog had a body temperature of 37.2 °C (99 °F). By morning, the dog was recumbent and comatose. The dog was given activated charcoal plus a cathartic, IV fluids, and yohimbine. The dog made a full recovery.^a

Discussion

Bread dough ingestion can cause ethanol toxicosis. Because dough expands, enlarges, and produces gas, foreign body obstruction, gastric dilation volvulus (GDV), and possible stomach rupture are theoretical, although unreported, complications. If the ingestion was recent, and no clinical signs are present, emesis may be effective. Because the stomach may rupture if the dough mass blocks the esophageal sphincter, emesis should be induced with caution. If the dog is retching but cannot successfully vomit the mass, a stomach tube can be passed to expel accumulated gas. Cold water lavage may slow yeast fermentation, decreasing ethanol production, and may remove portions of the dough. In extreme cases, surgical removal of the dough is necessary. Because fermentation causes the dough to expand and produce gas, bloat or GDV may result. If either of these conditions occurs, the dog should be stabilized and treated, as per standard protocol reported in the literature.³ Bloat has not been reported in the literature, but is considered a theoretical possibility.

Most dogs actually are presented to the veterinarian with ethanol toxicosis. Previous reports of raw dough ingestion in dogs did report ethanol toxicosis, although in one report the dogs died prior to receiving treatment. No necropsy was reported. Ethanol, like most short-chain alcohols, is rapidly absorbed from the stomach and intestines. Ethanol is metabolized in the liver by alcohol dehydrogenase enzymes (ADH) to acetaldehyde and then acetic acid. Because ADH limits the rate of metabolization, the half-life of ethanol will vary.⁴

If a dog demonstrates severe ataxia or CNS depression, emesis should not be induced. A dog could become

recumbent or comatose quickly and aspiration of the vomitus could occur. Blood ethanol levels can be obtained from most human hospitals. Levels of 2–4 mg/ml in adult dogs have produced clinical signs ranging from ataxia to coma.⁵ Blood alcohol levels may be useful for confirming toxicosis. Clinically, most veterinarians will not be able to obtain rapid ethanol analyses and will need to treat the animal based on clinical signs. After cold-water lavage, activated charcoal plus a saline cathartic should be left in the stomach (2 g/kg or a 240-ml bottle of a premixed activated charcoal solution per 25 pounds of body weight). The clinician should monitor the heart and respiratory rate, as well as monitor an electrocardiogram. Isotonic IV fluids are recommended and electrolytes should be supplemented as needed. Body temperature should be monitored for hypothermia. If hypothermia develops, the dog can be warmed with heating pads, warmed IV fluids or warm water enemas.⁶ Monitoring for metabolic acidosis includes blood gases, anion gap, and urine pH. During the metabolism of alcohol to acetyl-CoA, NAD⁺ is reduced to NADH + H⁺. The increase in NADH/NAD⁺ plus a contraction in the extracellular fluid volume leads to lactic acidosis. If muscle contractions from seizures or tremors are present, or if the animal is hypoxic, the acidosis may be increased.⁷ In a severely acidotic dog (pH < 7.1), sodium bicarbonate administration may be considered. Many dogs exhibiting clinical signs will also be hypoglycemic. The clinical signs of hypoglycemia are similar to ethanol toxicosis. Hypoglycemia occurs due to an increase in glycogenolysis, depleting glycogen stores, while at the same time gluconeogenesis is depressed.^{4,5} Several sites in the brain are sensitive to ethanol. These areas include the central adrenergic system, GABA inhibitors, dopamine and adenosine receptors.⁸ When alpha 2 receptors are stimulated, sedation, sympathetic inhibition, and vagal stimulation occur. Yohimbine is an alpha 2-adrenergic antagonist, which readily crosses the blood brain barrier.⁹ Yohimbine causes CNS stimulation and increased respiratory rates (as well as other effects), potentially contributing to arousal in animals that are comatose or have severe respiratory depression. In a study of ethanol narcotized mice, yohimbine failed to arouse mice, but rather significantly increased the time that the mice slept.¹⁰ However, in severe life-threatening conditions in which ventilator support is not available, yohimbine (0.1 mg/kg IV)⁹ may be considered for CNS stimulation. Because yohimbine could potentially prolong the duration of ethanol narcosis, yohimbine is recommended only in cases of life-threatening coma or severe respiratory depression. Because yohimbine has a short half-life, it can be administered at 2–3 hours intervals as needed. Yohimbine should be discontinued once the dog regains consciousness. Although there are

no published reports of the use of yohimbine in this type of clinical situation, the APCC has successfully recommended the use of yohimbine as an arousal agent in life-threatening cases of ethanol toxicosis. Doxapram (1–5 mg/kg IV)¹¹ can be used to treat respiratory depression as needed. In severe cases, positive pressure ventilation may be required.⁸

Based on over 60 cases treated by the APCC, the prognosis for full recovery is excellent if treated promptly. Many people bake their own bread, especially during holidays and special occasions. The rising process often provides opportunities for ingestion of bread dough by dogs. Many owners, after discovering the missing dough, will not be aware that this ingestion can be problematic, and therefore, the dog will not be presented to a veterinarian until toxicosis has developed.

Footnotes

^a ASPCA Animal Poison Control Center unpublished data, 2002

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