

Macadamia nut toxicosis in dogs

by

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Macadamia nuts are cultivated in the United States from *Macadamia integrifolia* and *Macadamia tetraphylla* trees commonly found in Hawaii. The commercially produced nuts are popular as party treats and as ingredients in cookies and candies. Each year, the ASPCA Animal Poison Control Center (APCC) receives calls concerning dogs consuming varying amounts of macadamia nuts (see *boxed text*). These relatively infrequent calls involve remarkably consistent findings and outcomes.

Clinical signs

From 1987 to 2001, the ASPCA APCC received 48 calls concerning dogs consuming macadamia nuts. Clinical signs commonly reported from most to least frequent were weakness, depression, vomiting, ataxia, tremors, and hyperthermia (*Figure 1*).¹ In 94% of cases from 1998 to 2001, dogs that had consumed macadamia nuts were reported to be showing at least one of these clinical signs (ASPCA APCC AnTox Medical Record Database: Unpublished data, 1987-2001).

Clinical signs were reported over a wide dosage range. Based on ASPCA APCC data, weakness was reported after dogs ingested as little as 2.4 to as much as 62.4 g/kg. Vomiting was reported to occur after the ingestion of 7 to 62.4 g/kg. The mean amount of macadamia nuts ingested was estimated to be 11.7 g/kg (range 2.2 to 62.4 g/kg). The reported time from ingestion of nuts to development of clinical signs was less than 12 hours in 79% of the cases.¹

These clinical signs of toxicosis were reproduced in the laboratory after administering 20 g/kg (about 2 tsp/lb) of commercially prepared roasted macadamia nuts to four healthy dogs via a stomach tube.¹ The dogs developed marked weakness with the inability to stand on their rear legs by 12 hours after dosing. Extensive blood tests were performed, but only serum lipase activities were elevated. All dogs appeared normal within 48 hours. Tremors were not noted in the experimentally exposed dogs. The reports of tremors in the field cases were probably related to muscle weakness.¹

A search of the human medical literature revealed reports of anaphylactic reactions to macadamia nuts similar to other nut IgE-mediated hypersensitivities.² There are no human case reports in the medical literature reporting symptoms similar to those identified in dogs. A novel protein has been isolated from the macadamia nut kernel that demonstrates antimicrobial activity.³ The importance of this research is unknown, but the finding suggests that pharmacologic activity from macadamia nuts may occur.

The exact cause of the clinical signs of toxicosis resulting from macadamia nut ingestion by dogs is unknown. The actual Mechanism of action could be specific to the dog and may involve constituents of the nuts themselves, contaminants from processing, mycotoxins, or other unidentified causes. Additional research is needed to answer this question.

Diagnosis

A diagnosis of macadamia nut toxicosis is based on a history of known exposure and consistent clinical signs. A history of exposure may be based on an observed ingestion, identification of chewed empty containers, or identification of macadamia nuts in vomitus or stool. Exposure to chocolate-covered macadamia nuts also may result in methylxanthine toxicosis and should be treated accordingly (see "*Toxicology Brief: Chocolate intoxication*" in the February 2001 issue). Consider macadamia nut exposure whenever a dog presents with an acute onset of marked rear

limb weakness with no evidence of central nervous system involvement, musculoskeletal pain, or trauma.

Treatment

The ASPCA APCC recommends home observation for uncomplicated, clearly evident macadamia nut toxicosis in dogs. Admit dogs with preexisting conditions or atypical presentations to a veterinary hospital for further care. Administering activated charcoal (2 g/kg orally) with a cathartic such as 70% sorbitol (3 ml/kg orally) hastens the passage of nuts through the digestive tract and may reduce the absorption of unidentified causative compounds. A complete medical investigation is indicated to rule out preexisting conditions or concurrent ingestions that could warrant further care.

Prognosis

The prognosis for complete recovery of dogs showing common signs of macadamia nut toxicosis with no evidence of complicating concurrent ingestion is extremely good. In the ASPCA APCC's experience, dogs routinely return to normal within 24 to 48 hours with only observation at home. All case consultations managed by the ASPCA APCC to date have resulted in complete recovery.

Macadamia nut ingestion in two pet dogs

Case 1

In December 2000, the ASPCA Animal Poison Control Center (APCC) received a call involving a 1.5-year old, castrated, 14.1-lb (6.4-kg) bichon frise that reportedly ingested 4 oz of macadamia nuts (17.7 g/kg) late in the day. The owner reported that seven and a half hours after ingestion, the dog vomited a large quantity of macadamia nuts and could not stand or walk without support. The ASPCA APCC veterinarian advised the owner, based on the clear evidence of macadamia nut exposure and the consistency of the clinical signs with known field and research cases, that recovery without treatment was expected within 12 to 36 hours. The dog remained at home under observation. When contacted by phone three days after exposure, the owner reported that the dog's clinical signs had subsided. The owner did not recall exactly when the dog had returned to normal.

Case 2

In July 2001, the ASPCA APCC received a call involving a 9-year-old, castrated, 26.8-lb (12.2-kg) cocker spaniel that reportedly consumed 5.3 oz of macadamia nuts (12.3 g/kg) one hour earlier. The dog was reported to be moderately ataxic with muscle tremors and mild dyspnea. In this case, the attending veterinarian administered an enema and provided pain relief combined with other symptomatic and supportive care before contacting the ASPCA APCC. No additional treatment procedures were recommended. Within nine and a half hours, the clinical signs resolved, and the dog fully recovered.

REFERENCES

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Figure 1 Frequency of Clinical Signs in Dogs After Macadamia Nut Ingestion from 2.2 to 62.4 g/kg

