

Ingestion of Over-the-Counter CALCIUM SUPPLEMENTS

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The clinic phone rings, and Ms. Miller, a concerned dog owner, is on the line. Her English cocker spaniel, Buttons, has just eaten a whole box of her calcium supplement chews. Buttons ingested every chew – wrappers and all! The dog seems to be fine, but Ms. Miller is seeking medical advice.

The staff veterinarians and technicians at the ASPCA Animal Poison Control Center (APCC) are frequently consulted on cases of calcium supplement ingestion. Although these supplements come in various forms, one of the most commonly involved in pet exposures is nonprescription calcium chews, which come in many different flavors that can attract an animal's attention.

EXPOSURE AND SUSCEPTIBILITY

Most over-the-counter calcium supplements include vitamins D₃ (cholecalciferol) and K to help maximize calcium absorption. The calcium and vitamin D₃ in the chews have the potential to elevate serum calcium and phosphorus levels. Vitamin K has a wide margin of safety and is present only in small amounts in calcium supplements. Ingestion of a large quantity of chew wrappers may lead to intestinal

obstruction. Some chews are chocolate flavored, but the amount of actual chocolate present is minimal and not enough to cause clinical signs in pets.¹⁻⁴

MECHANISM OF ACTION

In cases of calcium supplement overdose, the calcium is usually not prob-



Although tempting to dogs, calcium supplements can be toxic in large quantities.

lematic because calcium salts are poorly absorbed from the gastrointestinal (GI) tract. A transient increase in serum calcium may occur but rarely requires medical intervention. Of much greater concern is the vitamin D₃ component. Vitamin D₃ can be more toxic to the patient because it increases the serum calcium level by increasing the absorption of calcium from the GI tract, decreasing the elimination of calcium by the kidneys, and increasing the resorption of calcium from the bones.^{1,5}

RISK FACTORS

In most cases, calcium chews do not

Common Calcium Supplements

Supplement	Vitamin D ₃ Content (IU)	Calcium Content (mg)	Vitamin K Content (µg)
AVON VitAdvance Soft Calcium Chew	200	650	—
Caltrate 600+D Calcium Dietary Supplement Tablet	200	600	—
CVS Soft Calcium Chew	100	500	40
LA Weight Loss Milk Chocolate Calcium Chew	200	500	—
Viactiv Soft Calcium Chew	100	500	40

contain enough absorbable calcium to be considered life threatening to pets.

However, very young animals and animals with preexisting renal disease may be more sensitive to the calcium and are at greater risk for toxicosis.^{1,3-5}

According to the APCC, vitamin D₃ doses below 0.1 mg/kg can cause mild, self-limiting GI upset in a healthy animal. Doses of 0.1 mg/kg or greater can cause hypercalcemia, which may lead to acute renal failure, but this dose is rarely reached with ingestion of calcium supplements.^{1,2,4}

The product label of calcium chews usually indicates the amount of vitamin D₃ in International Units (IU), so the first step in assessing an overdose situation is to convert IU to milligrams. For vitamin D₃, 1 IU = 0.025 µg or 0.000025 mg.⁴

CLINICAL SIGNS

Acute ingestion of calcium salts from calcium chews may cause vomiting, diarrhea, GI irritation, and, possibly, transient hypercalcemia.^{1,6} Signs of hypercalcemia include azotemia, twitching, nausea, abdominal pain, tachypnea, hematuria, melena, dehydration, and electrocardiographic changes.^{7,8} Acute exposure to calcium supplements should not result in soft tissue calcification.¹

Clinical signs of vitamin D₃ toxicosis may include anorexia, depression, vomiting, polydipsia, polyuria, and serum chemistry changes (elevated blood urea nitrogen, serum creatinine, calcium, and phosphorus). Lethargy and weakness may also be seen.

DIAGNOSIS

The history of exposure, clinical signs present, and serum chemistry findings must be determined when diagnosing calcium or vitamin D₃ toxicosis. If the patient has ingested more than 0.1 mg/kg of vitamin D₃, it is important to monitor renal values, including serum calcium and phosphorus. Other causes of hypercalcemia, such as normal juvenile hypercalcemia, cancer-associated

How Much Vitamin D₃ Did Buttons Ingest?

To calculate the amount of vitamin D₃ (cholecalciferol) Buttons ingested, the veterinary technician made the following assessments:

- **Weight:** According to Ms. Miller, Buttons weighs 30 lb. To obtain the dog's weight in kilograms, the technician divided 30 by 2.2, which equals 13.63 kg.
- **Number of chews eaten:** Based on the number of wrappers found in the dog's vomit, Buttons ate 40 chews.
- **Amount of D₃ in one chew (in International Units):** According to the product label, each chew contains 400 IU of vitamin D₃.
- **Amount of D₃ in one chew (in milligrams):** 1 IU = 0.000025 mg of D₃. Therefore, one chew contains 0.000025 mg × 400 IU = 0.01 mg of vitamin D₃.
- **Total amount of D₃ Buttons consumed:** 0.01 mg × 40 chews = 0.4 mg of D₃.
- **Total dose of D₃ Buttons consumed:** 0.4 mg ÷ 13.63 kg = 0.029 mg/kg.

Luckily for Buttons, the D₃ dose of 0.029 mg/kg is well below the 0.1 mg/kg dose of concern.

hypercalcemia, and hypoadrenocorticism, should be ruled out.

TREATMENT

Management of a patient with calcium or vitamin D₃ toxicosis depends on the dosage ingested and the severity of the signs. As noted above, transient hypercalcemia may occur in some cases but rarely requires treatment.^{1,6} Because some animals also ingest calcium chew wrappers, which may ball up and obstruct the GI tract, initial emesis in clinically normal patients may be of benefit. Activated charcoal does not bind to calcium salts, so it should be given only if the dose of vitamin D₃ is of concern.

Often, treatment includes fluid therapy using 0.9% saline, serum chemistry monitoring, and the use of GI protectants. Acute renal failure may be treated with furosemide and dopamine. Symptomatic and supportive care should be given as needed.

PROGNOSIS

The prognosis for patients that have ingested calcium chews depends on many factors. In most cases, a positive outcome may be expected if the exposure is caught early and signs are recognized and controlled. If hypercalcemia or acute renal failure is present,

the severity of the condition will affect the extent of treatment as well as the outcome. In cases in which renal effects worsen and lead to a loss of renal function, the prognosis is poor.⁷

ROLE OF THE TECHNICIAN

Many cases of calcium supplement ingestion begin as a phone call in which the patient needs to be assessed for risk. Veterinary technicians can assist with dose calculations and share information with the veterinarian. Often, initial decontamination is performed at home by a pet owner who is following the instructions of a veterinary technician.

Although the veterinarian is the one who determines the full treatment plan, basic symptomatic care and good nursing care by the veterinary technician will help achieve a positive outcome for these patients.^{1,4,7,8}

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In Buttons' case, the veterinarian instructed Ms. Miller to induce vomiting and to count the number of wrappers in the vomit. The technician then calculated the dose according to the estimated number of chews the dog ingested. Based on the dose and emesis results, no further action was warranted. After giving Ms. Miller instruc-
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tions to withhold food for an hour after emesis, the technician felt that no further care was needed. The next day, Ms. Miller called to say that Buttons never had any problems and that she was grateful for the clinic's help.

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