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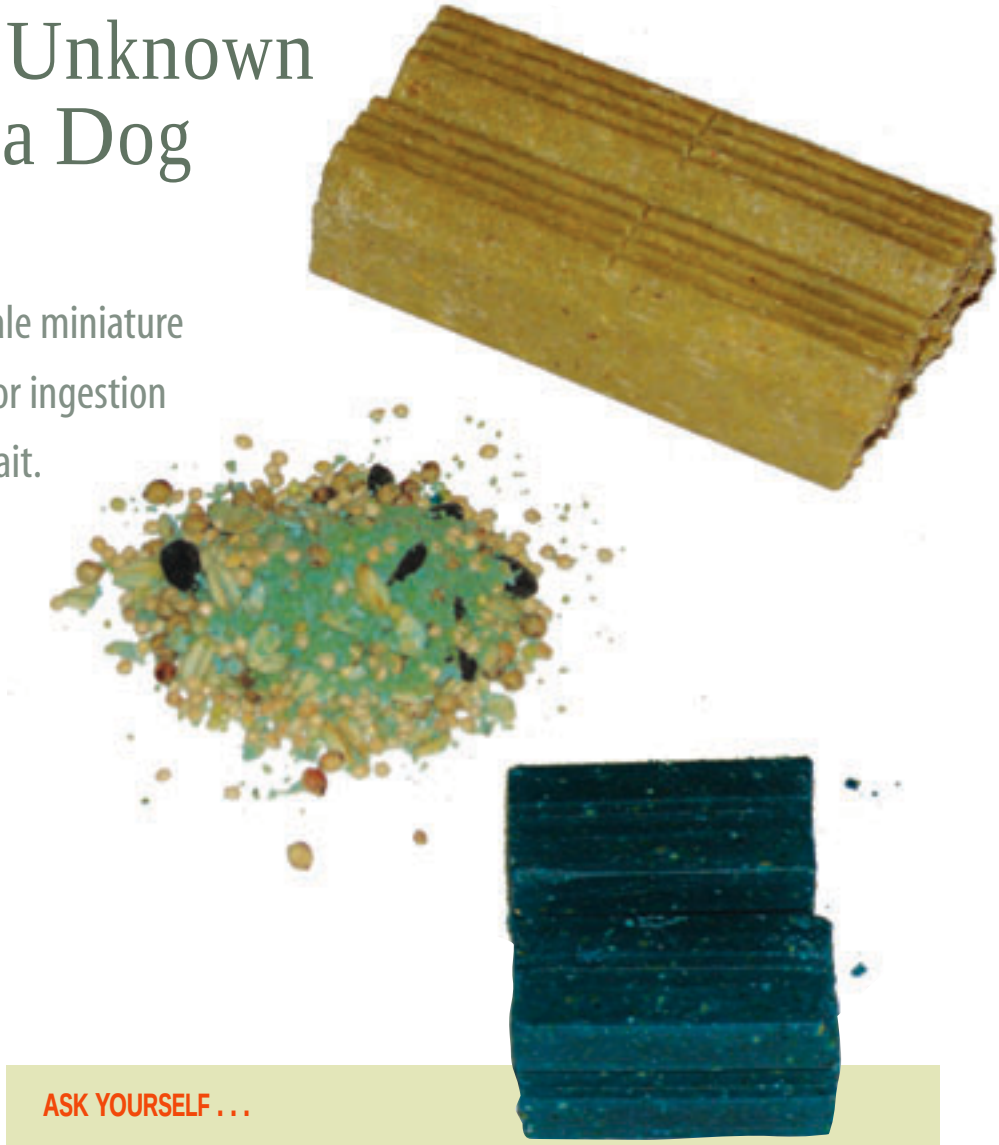
Ingestion of an Unknown Rodenticide in a Dog



A 4.5-kg 2-year-old spayed female miniature dachshund dog was presented for ingestion of an unknown rat and mouse bait.

Case Presentation. The owners had no information on the bait because they had just moved into the house and the bait had been left by the previous owner. The only information the owner could confirm was that the bait was a green pellet in a small bag. The owner caught the dog chewing on the bag about 1 hour previous to presentation; most of the contents were missing.

Physical Examination. The dog had no previous health problems and was not showing any clinical signs. The only significant finding on examination was the presence of bait between the dog's teeth.

Initial Treatment. Emesis was induced with 0.13 mg of apomorphine IV, and the dog vomited several times. About 2 tablespoons of the bait came up in the vomitus.

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ASK YOURSELF . . .

What is the next step?

A. Give a dose of activated charcoal and send the dog home with a prescription for a 7-day course of vitamin K_1.

B. Give a dose of activated charcoal; send the dog home with a prescription for a 30-day course of vitamin K_1; check prothrombin time 48 to 72 hours after the completion of vitamin K_1 therapy; obtain baseline serum calcium, phosphorus, blood urea nitrogen, and creatinine levels; and then recheck daily for 3 days.

C. Give a dose of activated charcoal, send the dog home with a prescription for a 30-day course of vitamin K_1; and check prothrombin time 48 to 72 hours after completion of vitamin K_1 therapy.

D. Give a dose of activated charcoal; send the dog home with a prescription for a 30-day course of vitamin K_1; and check serum calcium, phosphorus, blood urea nitrogen, and creatinine daily for 4 days.

Correct Answer: B
Give a dose of activated charcoal; send the dog home with a prescription for a 30-day course of vitamin K_1; check prothrombin time 48 to 72 hours after the completion of vitamin K_1 therapy; obtain baseline serum calcium, phosphorus, blood urea nitrogen, and creatinine levels; and then recheck daily for 3 days.

Although anticoagulant rodenticides are very popular, several other types of rodenticide are available on the market; bromethalin- and cholecalciferol-containing baits are commonly available. These baits have similar appearances but have different mechanisms of toxicity and are treated differently.

Mechanisms. *Anticoagulant rodenticides* prevent the recycling of vitamin K by inhibiting the action of vitamin K–epoxide reductase. Once the vitamin K supply is significantly reduced, the synthesis of vitamin K–dependent clotting factors (II, VII, IX, and X) are also significantly reduced. Common clinical signs may include weakness, lethargy, anorexia, pallor, epistaxis, coughing, dyspnea, and hemorrhage.

Tx at a glance

- Attempt to identify the brand name, manufacturer, active ingredient, and concentration of bait.
- Induce emesis if ingestion took place within the previous 4 hours and animal is showing no signs.
- Administer at least 1 dose of activated charcoal. Administer repeat doses of activated charcoal if ingestion is large.
- With small ingestions, administer vitamin K_1 or monitor prothrombin time daily for 3 days. If vitamin K_1 therapy is initiated, it should be continued for at least 14 to 30 days and prothrombin time should be checked 48 to 72 hours after completion.
- Monitor serum calcium, phosphorus, blood urea nitrogen, and creatinine at least daily for 4 days.

The mechanism of action for bromethalin is the uncoupling of *oxidative phosphorylation*. This uncoupling leads to depletion of adenosine triphosphate, which is necessary for the functioning of the sodium/potassium adenosine triphosphatase pumps that help maintain cellular osmotic balance. Without adequately functioning pumps, cells will swell. Neurologic signs predominate in bromethalin toxicosis: At high doses, seizures, muscle tremors, hyperexcitability, hyperreflexia, and depression can be seen. At lower doses, hindlimb ataxia, paresis, depression, and decreased conscious proprioception may occur.

Cholecalciferol (vitamin D_3) is the third most common type of rodenticide available. Vitamin D and its metabolites are important in the *regulation of calcium* in the body. Vitamin D is first metabolized to calcidiol in the liver and then to calcitriol in the kidneys. Formation of calcitriol in the kidneys is tightly regulated. Calcitriol is normally the active metabolite, but in overdose situations tissues will also respond to calcidiol and cause hypercalcemia. Initially, depression, weakness, and anorexia may be noted, followed by vomiting, polyuria, polydipsia, constipation, dehydration, and hematemesis.

TAKE-HOME MESSAGES

- Bait cannot be identified by the color or formulation.
- Remember that not all baits are anticoagulant based.

Treatment. For exposure to an unknown rodenticide, treatment should be inclusive for at least the 3 most common types of rodenticides. If the ingestion has been recent, induction of emesis is recommended. Consider administering at least 1 dose of activated charcoal. In large ingestions, multiple doses of activated charcoal over 48 hours may be warranted because both bromethalin and cholecalciferol may undergo enterohepatic recirculation.

With small ingestions, the clinician may choose to begin administering vitamin K_1 or to monitor prothrombin time daily for 3 days. If vitamin K_1 therapy is initiated, it should be continued for at least 14 to 30 days and prothrombin time should be checked 48 to 72 hours after completion of vitamin K_1 therapy. Because elevation in calcium can be delayed in cholecalciferol exposures, serum calcium, phosphorus, blood urea nitrogen, and creatinine should be monitored every 12 to 24 hours for 4 days.

Additional Diagnostics. Many laboratories do not conduct rodenticide testing and, when available, turnaround time can be as long as 5 days. Furthermore, of the laboratories that test for rodenticides, most only test for 1 or possibly 2 of the 3 types. If a laboratory can test for all 3 types in 3 to 4 days, a sample of vomitus from a recent ingestion or the bait itself can be submitted for identification. Even if diagnostic testing is pursued, it is still necessary to administer an appropriate amount of activated charcoal; monitor serum calcium, phosphorus, blood urea nitrogen, and creatinine daily for 4 days; and begin vitamin K_1 therapy or monitor prothrombin times pending test results.

See Aids & Resources, back page, for references, contacts, and appendices.
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