BROMETHALIN — It's Not What You Think

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Clients should be advised never to leave bromethalin out in the open where pets might have access to it.

Bromethalin is a rodenticide that is commonly mistaken for a second-generation anticoagulant, such as brodifacoum or bromadiolone, although it is actually a neurotoxin. Bromethalin is sometimes considered safer for use around dogs than second-generation anticoagulant rodenticides because a larger amount of bait must be ingested before signs develop. However, if signs do develop, they are extremely difficult to treat effectively.

MECHANISM OF ACTION

Bromethalin is thought to uncouple oxidative phosphorylation in mitochondria, resulting in decreased ATP generation. With decreased ATP, there is too little energy available to maintain sodium (Na^+) and potassium (K^+) ion channel pumps. This leads to fluid accumulation within myelin sheaths and vacuolation of the nervous system, resulting in nerve conduction impairment, paresis, paralysis, and death.[1]

TOXICITY

The oral LD_{50} of bromethalin is 2.38 to 5.6 mg/kg in bait[1] for dogs and 0.4 to 0.71 mg/kg in bait[1] for cats. Severe intoxication does occur at oral dosages below the LD_{50}.

ASYMPTOMATIC PATIENTS

Calculating a Dose

To determine whether a dog or cat has ingested a toxic amount, it is useful to calculate the dose of the anticoagulant involved:

Step 1 — Assume the worst-case scenario. What is the most that the animal could have consumed?

Step 2 — Multiply the percentage of active ingredient by 10 to get the milligrams of active ingredient per gram of rodenticide.

Step 3 — Multiply milligrams per grams by the amount of rodenticide ingested in grams.

Step 4 — Divide by kilograms of body weight to determine the dose ingested.

For example, a 20-lb dog ingests part of a box of brodifacoum rat bait weighing 0.75 oz. The concentration of the bait is 0.01%. The owner cannot say how much of the bait was left because she threw the box away, but she does not think the dog could have ingested more than 1 to 2 tsp.

Step 1 — The worst-case scenario is 0.75 oz (1 oz = 28.4 g; therefore, 0.75 oz = 21.3 g of bait).

Step 2 — 0.01% × 10 = 0.1 mg active ingredient per gram of bait

Step 3 — 0.1 mg/g × 21.3 g of bait = 2.13 mg active ingredient in 0.75 oz of bait

Step 4 — 2.13 mg/9.1 kg of body weight = 0.23 mg/kg

Decontamination and Laboratory Testing

For bromethalin, decontamination should be performed when a suspected dose of 0.1 mg/kg or higher is ingested by dogs and 0.05 mg/kg or higher is ingested by cats.[2] Dogs ingesting doses less than 0.1 mg/kg and cats ingesting doses less than 0.05 mg/kg are not expected to develop signs of toxicity.[2] If there are no contraindications (e.g., seizure disorder, lethargy, megaesophagus) and the exposure occurred within 2 to 4 hours, emesis should be induced using apomorphine or 3% hydrogen peroxide.

If emesis is not productive, one dose of activated charcoal should be given to bind to the poison and help prevent it from being absorbed into the system as it moves through the intestinal tract. If the exposure occurred hours

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or days ago, it may still be beneficial to give activated charcoal. If the amount or time of ingestion is unknown, repeated doses of activated charcoal should be given. The recommended dose of activated charcoal is 1 to 2 g/kg. For dogs that have ingested 0.5 to 0.75 mg/kg of bromethalin or cats that have ingested 0.1 to 0.3 mg/kg, continuing decontamination with a total of three doses of activated charcoal given every 8 hours is recommended.[2] For dogs and cats that have ingested larger amounts, further decontamination with a total of six doses of activated charcoal given every 8 hours is recommended.[2] Unless the animal develops diarrhea, it is recommended that a cathartic be added to every third dose of activated charcoal to enhance excretion.

SYMPTOMATIC PATIENTS

Clinical Signs of Toxicosis

Healthy animals can become symptomatic as early as several hours after ingesting a large amount of bromethalin or as late as 7 days after ingesting a small amount. Common signs include the following:

Dogs — Tremors, ataxia, depression, tachypnea, hyperreflexia, loss of vocalization, recumbency, anorexia, vomiting, death[3]

Cats — Ataxia, focal motor seizures, vocalization, rigidity, decreased proprioception, abdominal distension, recumbency, depression, death[4]

Other signs — Generalized seizures, head pressing, hyperesthesia, coma, hyperexcitability, nystagmus, hyperthermia, cyanosis, miosis, drooling

Bromethalin toxicosis may imitate other toxicoses (e.g., those of ethylene glycol, chlorpyrifos [in cats], metaldehyde, zinc phosphide, tremorgenic mycotoxins) or disease processes (e.g., cerebral or spinal trauma, tick paralysis, rabies, distemper).

Treatment

Because signs are so difficult to control once they begin, early and aggressive decontamination is the key to success when dealing with bromethalin. Once clinical signs have developed, mannitol, dexamethasone, and furosemide have been used to reduce cerebral edema and cerebrospinal fluid pressure; in experimentally dosed dogs, however, these drugs were of little benefit in slowing the development or reducing the severity of signs.[5]

Gingko biloba has reduced mortality in rats but only if given at the time of exposure to bromethalin.[6] The efficacy of gingko in preventing or treating signs of bromethalin toxicosis has not been demonstrated in dogs or cats.

Diazepam and barbiturates are recommended for controlling seizures.[5] Seizures that are unmanageable with diazepam and barbiturates may respond to gas anesthesia or propofol.

Supportive care should include supplemental feeding if the animal is anorectic and thermoregulation to prevent hyperthermia. Animals showing mild to moderate signs of bromethalin toxicosis (e.g., depression, ataxia, weakness) can recover, but recovery may be slow, taking days to weeks. Not all animals make a full recovery, especially in instances of severe toxicosis; some may have permanent neurologic effects.

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