TOXICOLOGY BRIEF

Permethrin Toxicosis in Cats

Mindy Bough, CVT

Permethrin is a synthetic type I pyrethroid insecticide that is used in an assortment of products from shampoos and sprays to topical canine spot-on products.[1] Many spot-on flea products are available at discount, grocery, and farm stores. Made by various manufacturers, these products have become increasingly popular because of their ease of application and length of efficacy (generally 1 month). Many of these products contain 45% to 65% permethrin and are labeled for use on dogs only. When applied according to label instructions, spot-on products are generally safe and efficacious. However, when these products are used on animals contrary to those listed on the label instructions, toxicosis may result. Veterinary technicians should be educated about the clinical signs associated with permethrin toxicosis in cats as well as treatment options.

Some pet owners apply spot-on permethrin-containing insecticides on their cats without reading the manufacturer's label,[2] whereas others may read the label but think that a small amount of the product is safe to use. Some cats are exposed to permethrin by coming into contact with dogs that have been treated with a spot-on product.[2,3] Despite the source of exposure, the end result can be devastating.

Clinical Signs

Pyrethroids act by modifying sodium ion channel activity in nerve cells. The resulting nervous excitation causes death in insects.[3] In most mammals, there is generally a rapid metabolic breakdown of pyrethroids by the liver; therefore, no signs of toxicity are likely to occur.[1,3] Permethrin is detoxified by ester hydrolysis or oxidation, followed by hepatic hydroxylation and conjugation to either glucuronides or sulfates. Because cats are generally deficient in metabolizing substances through hepatic glucuronidation, they are limited in their ability to metabolize permethrin quickly.[3] Cats will exhibit sensitivity to high concentrations of this insecticide. The clinical signs of permethrin toxicosis in cats may include muscle tremors, hyperexcitability, depression, ataxia, vomiting, seizures, anorexia, and death.[3,4] Signs may develop within a few hours to 3 days following exposure.[2]

Therapy

Treatment of permethrin toxicosis consists of tremor and/or seizure control, dermal decontamination, and supportive care.[4] An attempt should be made to stabilize the patient before starting decontamination. An intravenous catheter should be placed, if possible, to assist in the administration of medications and fluids.

Using diazepam alone usually will not control the seizures.[2] Therefore, the American Society for the Prevention of Cruelty to Animals–National Animal Poison Control Center recommends the use of intravenous methocarbamol, a centrally acting muscle relaxant, at a dose of 55 to 220 mg/kg. Clinical judgment—based on the severity of the symptoms and the therapeutic response noted—must be used to determine the frequency of administration. One third to one half the dose should be administered as a bolus (not exceeding 2 ml/minute), with the remaining dose given to effect. Methocarbamol doses may be repeated as needed but should not exceed 330 mg/kg/day.[3–5] Diazepam, phenobarbital, pentobarbital, or isoflurane may be required in conjunction with methocarbamol to achieve optimal seizure control.[3,4] Phenothiazine tranquilizers should not be used for seizure control because these drugs lower the seizure threshold.[1]

If injectable methocarbamol is not available (i.e., the clinic does not have the injectable product in stock and has been unable to locate a supply from a

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human pharmacy or other veterinary clinic) and oral administration of the tablet form is not possible (i.e., in the seizuring or vomiting patient), methocarbamol in tablet form may be administered rectally. Because this is an off-label route of administration, its clinical efficacy is not known. This method should be considered only if the injectable route is not available and the oral form cannot be administered successfully. The same dose, starting at the low end, should be used for rectal administration. The tablet should be dissolved in the equivalent of 3 ml of an isotonic solution (e.g., lactated Ringer's solution, normal saline), then administered rectally using a urinary catheter.[2]

After the animal has been stabilized, dermal decontamination should be performed. The cat's entire body should be bathed using warm water and a mild dish detergent (not dishwashing machine detergent), and the cat should then be dried thoroughly using a towel. The animal's body temperature should be monitored and thermoregulation provided as needed. Although hyperthermia is often apparent initially because of increased muscle activity from the tremors and/or seizures, hypothermia may set in later when muscle activity slows and the animal becomes exhausted.[2] Hypothermia may exacerbate clinical signs and increase recovery time.[3,4]

Proper supportive care (e.g., administration of intravenous fluids) is essential. Fluids will help maintain hydration and protect the kidney tubules from myoglobin buildup, which can occur from muscle damage caused by increased activity. Practitioners should know that atropine, which is commonly used to treat organophosphate insecticide poisoning, is not an antidote for and should not be used to treat permethrin toxicosis.[3,4] With prompt and aggressive treatment, recovery generally can occur within 24 to 72 hours.[4]

Education is often key in preventing permethrin toxicosis in cats. Because many flea and tick products are purchased outside the clinic setting, veterinary personnel should help educate pet owners on the importance of reading labels and of using only products specified for the species of their pet. Clients should also be educated about species differences associated with flea and tick products, possible adverse effects of these products, and what to do if their pet shows signs of toxicosis.

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About the Author

Ms. Bough is a certified veterinary technician at the American Society for the Prevention of Cruelty to Animals–National Animal Poison Control Center (NAPCC), Urbana, Illinois. She is a graduate of the veterinary technician program at Parkland College, Champaign, Illinois, and received her toxicology training at the NAPCC. She resides with her family and menagerie of pets in Fithian, Illinois.