

# DEET TOXICOSIS

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DEET-based insect repellants  
should never be used on pets.



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**S**ummer is here – the birds are chirping, the children are laughing, and the insects are biting. With increased incidents of West Nile virus and other pest-borne diseases being reported, pet owners feel the need to keep their animals safe. Unfortunately, some owners attempt to ward off these insects with insecticidal sprays containing DEET. Because the manufacturers deem these products safe for adults and children, some owners assume that they are also safe to use on pets.

Many safety studies have been conducted to determine the effects of DEET on humans; however, the effects on an animal's system can be quite different. Animals may come into contact with these insecticides dermally, orally, or ocularly, and these exposures can lead to complications.

## SOURCES

Diethyltoluamide (N,N-diethyl-m-toluamide), commonly referred to as DEET, is a clear mixture of several isomers, among which the meta form is the most active. DEET is a known percutaneous penetration enhancer; thus, when used in combination with some other insecticides, it may cause increased absorption across the skin.<sup>1</sup> DEET-based insect repellents contain 5% to 100% DEET and can be formu-

lated as solutions, gels, sticks, aerosol sprays, and impregnated towelettes. Recently, a combination insecticide and repellent product composed of 9% DEET and 0.09% fenvalerate was developed to control fleas and other ectoparasites on dogs and cats. Although this particular product has been recently discontinued, other similar products remain on the market.<sup>2</sup>

## MECHANISM OF ACTION

The exact mechanism of DEET toxicity is unknown, but the toxic effects primarily involve the gastrointestinal tract and the central nervous system. Approximately 50% of topically applied DEET is absorbed within 6 hours, and peak plasma levels are reached in 1 hour when the exposure is oral or topical. DEET and its metabo-

lites remain in the skin and fatty tissue for 1 to 2 months after topical application, suggesting accumulation after repeated exposures.<sup>3,4</sup> Ingestion may produce signs in as fast as 30 minutes, implying a rapid oral absorption.

In animals, metabolism of DEET occurs in the liver (i.e., oxidation) with rapid elimination of the metabolites through the urine. Seventy percent of the dose (applied topically) is excreted within 24 hours. Excretion through the feces is minimal.<sup>4</sup>

## CLINICAL SIGNS

Based on experimental studies in animals, clinical signs of DEET toxicosis in dogs and cats include hypersalivation, vomiting, diarrhea, tremors, excitation, ataxia, and seizures.<sup>5,6</sup> Since November 2001, the ASPCA Animal Poison Control Center has received numerous reports regarding DEET toxicosis in dogs and cats. Vomiting was the most commonly reported clinical sign in dogs, whereas cats more commonly showed signs of tremors.

## TREATMENT

### Ocular Exposure

For ocular exposures, copious flushing of the eyes for 30 minutes is rec-

## Signs of DEET Toxicosis Reported to the ASPCA Animal Poison Control Center<sup>a</sup>

Dogs		Cats	
Clinical Signs	Reporting Frequency	Clinical Signs	Reporting Frequency
Vomiting	17%	Tremors	11.1%
Diarrhea	8%	Hypersalivation	6.9%
Lethargy	7.6%	Ataxia	5.6%
Anorexia	6.9%	Vomiting	4.2%
Hypersalivation	6.1%	Anorexia	4.2%
Cough	4.6%	Hypothermia	4.2%
Tremors	4.6%	Diarrhea	4.2%
Seizures	1.5%	Seizures	2.8%

<sup>a</sup>Since November 2001, 204 canine and 92 feline cases of DEET ingestion have been reported.

ommended. If the animal exhibits signs of ocular discomfort, such as squinting, pawing at the face, or rubbing the face into the ground, or if the owner is unable to flush the eyes thoroughly, the animal should be assessed by a veterinarian.

### Dermal Exposure

With dermal exposures, the animal should be bathed with a mild hand dishwashing detergent. Bathing should be repeated as necessary until the scent of the agent is no longer apparent.

### Oral Exposure

No treatment may be required if small quantities of DEET have been ingested and no clinical signs are evident. Pets should be monitored for stomach upset for 2 to 4 hours. If large quantities of DEET have been ingested in the past 30 minutes, and no clinical signs are present, emesis should be induced with 3% hydrogen peroxide at a dose of 1 tablespoon per 15 lb of body weight (not to exceed dosages of 3 tablespoons) or apomorphine at a dose of 0.03 mg/kg IV or 0.04 mg/kg IM.<sup>7</sup> Use of apomorphine in cats can be controversial because it can cause central nervous system stimulation; therefore, many veterinary professionals recommend not

using it in this species.<sup>8</sup> Emesis should be followed with a maximum of three doses of activated charcoal with a cathartic agent if available.

Veterinary care is required in dogs and cats with clinical signs after exposure to products containing DEET. If the animal is experiencing tremors or seizures, diazepam can be administered at 0.25 to 0.5 mg/kg IV. If the signs do not disappear after diazepam administration, pentobarbital can be given intravenously to effect. Vomiting can be controlled using an antiemetic such as metoclopramide at a dose of 0.1 to 0.5 mg/kg IM or PO. Fluid diuresis should be instituted as needed.<sup>4,9</sup> Because the kidneys are the primary site of elimination, animals that are symptomatic should be evaluated for hydration status and urinary function. Electrolyte and liver function should also be monitored because the liver is the primary site of metabolism.<sup>4,9</sup>

If pieces of the product container have been ingested, the animal should be monitored for foreign body irritation or obstruction. Adding fiber to the animal's diet for 48 hours postingestion may be necessary. If there is evidence of a foreign body, the pieces may have to be removed surgically. The end-point of therapy is reached

only when resolution of signs has occurred.

## CONCLUSION

The prognosis for animals exposed to DEET is often good. Recovery usually takes 24 to 72 hours with timely and appropriate care. By instructing owners never to use any product on their pets unless it is specifically labeled for use in that species, technicians can help owners understand the hazards that common household products such as insecticides pose to their pets.

## ACKNOWLEDGMENTS

The author thanks Sharon Gwaltney Brant, DVM, PhD, DABVT, DABT, Paul Eubig, DVM, Karla Smith, DVM, and Mindy Bough, CVT, of the ASPCA Animal Poison Control Center in Urbana, Illinois, for reviewing the column and providing suggestions.

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