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Ethylene Glycol (Radiator Fluid) Toxicity

Ethylene glycol is the principal ingredient of radiator fluid that is responsible for poisoning in dogs and cats. Antifreeze poisoning is most common in the fall and spring, when radiator fluid is inadvertently abandoned in streets and garages after automobile radiator fluid is changed. Antifreeze is colorless, odorless, and has a sweet taste that dogs and small children find appealing and will readily drink. Cats are less likely to drink unknown fluids. It is suspected that cat poisoning occurs after cats have walked through antifreeze and ingest it when they clean their feet. As little as a teaspoon of antifreeze is sufficient to cause death in cats and a tablespoon is all that is required to poison dogs.

Poisoning classically proceeds through three stages. Absorption after ingestion is rapid and initial signs occur within 30 minutes to 12 hours. Ethylene glycol is an alcohol; hence during the initial phase the animals appear "drunk" and consequently exhibit many of the classical signs associated with alcohol intoxication; staggering, stumbling, and poor coordination. Vomiting, nausea, extreme thirst, and frequent urination are also observed. Some animals simply sleep through this period and owners are not aware that poisoning has occurred. At the end of the first phase, the clinical signs resolve and the animal appears to have recovered. The second phase of intoxication occurs 12 to 24 hours after poisoning. The heart rate and breathing rate are rapid, but this is rarely noticed by owners. Unfortunately, most dogs and cats poisoned with antifreeze are not recognized until the third stage, when kidney damage becomes apparent and kidney (renal) failure occurs. Ethylene glycol is converted by the liver to more toxic substances (metabolites) that are responsible for the majority of injury to tissues including the kidney build up in the body, resulting in a life-threatening situation.

Early diagnosis of poisoning is often difficult because of an inadequate history and the nonspecific clinical signs, an inadequate history and the nonspecific clinical signs, which can mimic those of many other conditions. A high index of suspicion is vital for rapid diagnosis, and it is index of suspicion is vital for rapid diagnosis, and it is index of suspicion is vital for rapid diagnosis, and it is important not to rule out ethylene glycol poisoning because the owner has not seen the pet exposed to radiator fluid. Laboratory findings are often the key to making the diagnosis. Tests that support a diagnosis of ethylene glycol poisoning are available to your veterinarian.

Treatment involves prevention absorption from the stomach, increasing removal from the body, and preventing the alteration of ethylene glycol to its more toxic components. If poisoning is witnessed, vomiting should be induced immediately and the stomach cleaned out with activated charcoal. Your veterinarian will need to give intravenous fluid solutions. Additional treatment depends on the stage of the disease. If the animal is not in kidney failure, drugs to stop the metabolism of ethylene glycol or methods of directly removing the ethylene glycol and its metabolites from the body are indicated. Ethanol (alcohol) and 4-methylprazole (fomepizole; Antizol-Vet) stop the metabolism of ethylene glycol; however, these drugs must be administered within several hours of poisoning and are ineffective when kidney damage has occurred. An effective dose of 4-methylprazole to stop the conversion of ethylene glycol has not been identified for cats, so its use is not recommended in cats.

Peritoneal dialysis and hemodialysis are two techniques with which the poisons may be removed from the body.

If the animal is in kidney failure, techniques to support kidney function are required. Medications to encourage the kidney to produce urine are administered but are often futile and advanced techniques such as peritoneal dialysis or hemodialysis that replace the function of the failing kidneys may be necessary. Both of these procedures require referral to a specialty center. Support must be provided until the kidneys can heal, which may take several weeks to months and in some animals the damage is too severe and recovery is not possible. In these patients, kidney transplantation may be indicated to replace the crippled kidneys.

The most common problem caused by antifreeze poisoning is sudden kidney failure, and it is associated with a high death rate. The prognosis for animals to recover from acute kidney failure is poor; however, the prognosis has improved with the advent of hemodialysis, which provides support until the kidneys can regenerate. Antifreeze poisoning is a deadly disease. Prevention requires public awareness and responsible disposal of radiator fluid. The advent of less toxic antifreeze compounds such as propylene glycol will reduce the frequency of antifreeze poisoning in companion animals.