Antifreeze Poisoning

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BASIC INFORMATION

Description

Antifreeze products can contain ethylene glycol, propylene glycol, methanol, or a combination of these agents. Most automotive antifreeze liquids contain ethylene glycol and pose the greatest hazard to pets; they are often dyed a fluorescent green. Some relatively safe antifreeze products are available that contain propylene glycol, and they are dyed a blue or green color. Propylene glycol is considered a GRAS (generally recognized as safe) substance and is found in many food and pharmaceutical products, such as toothpaste and cosmetics. When ingested in large amounts, however, it can still cause illness. Methanol is present in windshield washer fluids as well as gasoline antifreezes.

Causes and Toxicity

All three compounds (ethylene glycol, propylene glycol, and methanol) are metabolized in the body to acids. Therefore, animals can develop a serious metabolic condition known as *acidosis* after drinking these fluids. In addition, all of these compounds can depress the brain and cause "drunken" behavior, mental depression, and coma.

Of the three compounds, ethylene glycol is of the most serious concern for pets. It is said to have a "sweet" taste that is attractive to dogs and cats. When it is metabolized by the body, crystals form that are deposited in the kidneys. It is not uncommon for this crystal formation to be so severe that kidney failure and subsequent death occurs.

Clinical Signs

Signs can occur within 1 hour after ingestion. Animals may appear "drunk" and wobbly. Vomiting and increased urination may occur initially. In many instances, mild, early signs are overlooked by animal caretakers, delaying life-saving treatment.

With ethylene glycol ingestion, dogs may appear to recover for a brief period, but cats often remain mentally depressed. Within 4-6 hours, more serious changes can develop, such as acidosis, rapid breathing, serious vomiting, decreased body temperature, heart arrhythmias (irregular heart rhythms), and severe depression or coma. Anywhere from 12-36 hours after ingestion, kidney failure may develop with decreased urine production. The kidney damage is often irreversible and fatal.

Diagnostic Tests

Diagnosis is based on a history of exposure and appropriate clinical signs. Because many ethylene glycol formulations contain a fluorescent dye, muzzles, paws, urine, and vomitus may fluoresce (glow) under ultraviolet (UV) light. Initial laboratory tests may show nonspecific changes or evidence of early metabolic and kidney abnormalities. Test kits are available that measure the concentration of ethylene glycol in the blood. In the absence of a commercial ethylene glycol test kit, a human hospital laboratory may be able to perform this analysis.

Later in the clinical course, laboratory tests may show severe abnormalities in kidney function. An ultrasound and/or biopsy of the kidney may be recommended to search for changes compatible with ethylene glycol poisoning. More tests may be indicated to rule out other diseases and toxins that can cause similar clinical signs.

TREATMENT AND FOLLOW-UP

Treatment Options

Because antifreeze products are rapidly absorbed, vomiting is induced only if no clinical signs are present and should be performed only under the direction of your veterinarian. Activated charcoal does not bind antifreeze well, so it is not usually indicated. Animals that exhibit signs of inebriation or have a positive ethylene glycol test are often hospitalized for monitoring of body temperature, breathing, heart rate and rhythm, and urine production. For propylene glycol and methanol ingestions, supportive care generally results in full recovery with no residual effects.

Because every moment that passes means further metabolism of ethylene glycol, all ethylene glycol exposures are considered to be medical emergencies. Animals are hospitalized for administration of intravenous fluids to protect the kidneys. Medications to prevent further metabolism of ethylene glycol (into products that harm the kidney) may be given, such as ethanol (grain alcohol) or fomepizole (*Antizol-Vet*). Fomepizole is approved for use only in dogs but has shown some success in cats as well. Intensive supportive treatment is usually needed for several days, especially if acute kidney failure develops. In severe cases, your veterinarian may recommend referral to a specialty facility for dialysis treatment, if it is available.

Follow-up Care

Intensive monitoring of urine output and laboratory tests are usually needed for several days. Animals that survive may have residual, chronic kidney damage that requires periodic monitoring.

Prognosis

Prognosis is good for animals ingesting methanol or propylene glycol. If the animal ingested a large amount of ethylene glycol or if treatment was delayed, the prognosis is grave and death is likely.

IF SPECIAL INSTRUCTIONS HAVE BEEN ADDED, THEY WILL APPEAR ON THE LAST PAGE OF THE PRINTOUT.