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ETHYLENE GLYCOL TOXICITY (ANTIFREEZE)

What is it? Ethylene glycol is used for radiators in automobiles most commonly. Other people will use it as a way to prevent icing in plumbing (e.g. winterized toilets).

Who gets it? Dogs and cats – typically the younger, mischievous ones – are equally susceptible. Both will readily consume antifreeze because it has a very sweet taste.

What are the clinical signs? Shortly after drinking ethylene glycol many animals will appear drunk – wobbly gait, depressed, dilated pupils. They may vomit, drink and urinate more. Left untreated, dogs will get transiently better 12 hours after ingestion, but then progress to develop kidney failure within 2 days. Cats are more susceptible to antifreeze toxicity. While they can show similar signs to dogs, some cats seem to simply become depressed and develop signs of kidney failure within 12-24 hours. Other signs in both dogs and cats include ulceration of the mouth/tongue, seizures, excessive salivation, and painful kidneys

How is it diagnosed? There are a number of bench top tests that can be performed to screen for ethylene glycol in a pet. These tests have to be administered at the right time to be interpreted correctly. Testing too early or too late after exposure can lead to falsely negative results. False positive results can be obtained from other substances given to the pet – most commonly some activated charcoal products and some drugs contain substances that cross react with the test.

In addition to these errors, most tests are NOT considered reliable in cats. Cats require much smaller amounts of ethylene glycol to have fatal poisoning. Unfortunately, the bed-side tests we have typically do not measure concentrations at low enough levels to know if a toxic dose was ingested. Even if a less than fatal dose was ingested, for known ingestions, treatment should still be pursued to minimize injury to the kidneys.

If actual testing for the toxin is not possible, blood work and urinalysis can be performed to search for evidence of the toxic metabolites in the patient.

How is it treated? With most toxins, attempting to limit absorption of the toxin is the first step in therapy. Unfortunately, antifreeze is very rapidly absorbed from the GI tract. While inducing vomiting in the very recently exposed patient can be attempted, it may not provide any significant benefit. This fact is true to a lesser extent with administration of activated charcoal. If therapy is not initiated within an hour or so, activated charcoal is unlikely to provide a significant benefit. It still can be tried but should not be relied upon as a definitive therapy.

There are two major treatments for ethylene glycol toxicity. The treatment of choice for dogs is a drug called Fomepizole (or 4-methylpyrazole or 4-MP). This drug is administered intravenously multiple times over 24-36 hours to prevent the development of kidney failure. The drug is effective and safe with a very low incidence of complications associated with the drug. Unfortunately, this drug is expensive. This therapy was once thought to be ineffective in cats. However, recent studies suggest that if treated with higher doses than dogs and within 3 hours of exposure, this drug can be effective.

The alternative to Fomepizole is ethanol. Ethanol can be administered either orally or intravenously. Ethanol, while less expensive than Fomepizole, has many more metabolic side effects – it is profoundly sedating, worsens some of the metabolic problems encountered with antifreeze, and can create vomiting – which can lead to aspiration pneumonia in sedated patients. Managing a patient receiving ethanol therapy for ethylene glycol toxicity is more of a challenge.

Regardless of treatment with Fomepizole or ethanol, hospitalization for IV fluids and monitoring of urine output and electrolytes is required in order to have a reasonable chance for a positive outcome.

What is the aftercare? Following treatment for ethylene glycol exposure, long term aftercare depends on the degree, if any, of kidney dysfunction. If the kidneys are normal at the time of discharge, rechecking kidney enzymes in a week or so may be all that is required. If the kidneys have been damaged, the long term therapy for this might be necessary – this can include diet changes, medications to control blood pressure, as well as additional fluid therapy, among other things.

What is the prognosis? If diagnosed early (<5 hours after exposure for dogs and <3 hours after exposure for cats) and treated aggressively, the prognosis for recovery is generally excellent to good. However, once signs of kidney failure develop (azotemia, decreased urine production), the prognosis is grave – short of hemodialysis or kidney transplant, patients poisoned with ethylene glycol that develop kidney failure almost invariably die.