Case: Molly survives antifreeze poisoning

Ethylene glycol is found in antifreeze products and is highly toxic to cats, causing acute kidney injury and death in many cases. The high mortality may be due to delays in presentation to the vet. In this case a young cat was witnessed ingesting antifreeze in a garage and was treated with fluid therapy and the antidote in the form of ethanol (vodka). The cat was monitored closely for complications such as hypothermia and volume overload and recovered fully because of prompt treatment.

Ethylene glycol is a colourless, odourless, chemical found in many household products, including antifreeze, de-icing products and screenwashes. Cats are notorious for finding their way under car bonnets looking for warm engines or wandering around in garages where there could be a spillage of antifreeze. This is where ethylene glycol poisoning becomes a grave concern. Prognosis is often poor, depending on the time between ingestion and presentation at the veterinary clinic. This case illustrates a case of ethylene glycol toxicity with a happy outcome. The veterinary team as a whole were vital to the successful outcome of this case.

History
Molly, an 8-month-old female neutered domestic shorthaired cat, weighing 2.6 kg, had been brought into her daytime veterinary clinic 1–2 h after having been seen licking a puddle of spilt ethylene glycol from a car engine on the floor of the owner’s garage.

On presentation she was lethargic and had hindlimb ataxia. She had been placed on intravenous fluid therapy (Hartmann’s solution) and then started on a continuous rate infusion (CRI) of ethanol (vodka). She was transferred to my practice for overnight care and ongoing treatment. After seeking advice from the Veterinary Poisons Information Service (VPIS) we increased the...
infusion dose using the following protocol:

- Make a 5% solution of ethanol by removing 125 ml of fluid from a 1 litre bag of Hartmann’s and replacing with 125 ml of 40% vodka. The CRI is run at 5 ml/kg/h so 13 ml/h. The CRI was given using a syringe driver to ensure accuracy of the dose (Figure 1).

Anti-emetics and gastro-protectants were also administered at regular intervals (ranitidine and maropitant).

**Nursing priorities**

Nursing priorities included:

- Maintenance of the intravenous (IV) catheter including checking patency, condition of the insertion site (ie, checking for redness, pain, etc). The bandage was checked regularly to ensure it hasn’t slipped or become soiled.

- Management of a recumbent patient. The infusion of ethanol had resulted in Molly becoming very sedated and even more ataxic. Therefore a litter tray was placed close to her bed and she was helped into it. A urinary catheter could have been placed to monitor urine output, but as she could still posture to urinate in her tray output was monitored this way. Other concerns for a patient with reduced consciousness include airway management, regular turning and ocular lubrication if needed.

- Demeanour was monitored closely as the treatment and/or the ethylene glycol could have changed her mentation.

- Monitoring hydration as Molly could become dehydrated if her fluid therapy was not adequate or overhydrated if her kidneys failed to excrete adequate water. This included monitoring fluid intake, skin tent, packed cell volume (PCV), total solids (TS), urine output, mucous membranes and body weight. Her chest was

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**Key point**

The ethanol infusion causes marked sedation and ataxia and treated cats need to be managed with attention to hydration, urination, turning, monitoring airway and ocular lubrication.

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Cats with acute kidney injury, cardiac disease or being treated with high rate fluids must be monitored for overhydration by regularly auscultating the chest and checking pulse and respiratory rate.
auscultated regularly for crackles that could indicate overhydration.

**Nursing treatment**

Blood tests were taken every 6 h to check for renal dysfunction and electrolyte imbalances.

A urine sample was collected to check for the presence of calcium oxalate crystals, proteins and glucose suggesting acute kidney injury had occurred. In Molly’s case no evidence of kidney injury was noted. The CRI was maintained at 13 ml/h for the time Molly spent with us. Medication was given at regular intervals by intravenous route for rapid onset under the direction of the veterinary surgeon.

A bandage was used to include Molly’s foot to reduce the risk of distal swelling whilst the IV catheter was in situ. Molly was hypothermic on presentation so a heat pad was placed underneath her blanket. Molly was monitored regularly (temperature, pulse, respiration) and it was important to auscultate the chest regularly, monitoring for tachycardia and crackles indicating pulmonary oedema. Blood pressure monitoring can also be included in the regular observations.

**Cat friendly practice priorities**

Molly was normally a feisty cat who could be difficult to handle. This was not seen during her early treatment but as she began to improve she resented examination more. A blanket is a very useful tool when it comes to handling fractious cats. For some cats gently placing a blanket over their head can calm them and allow you to carry out procedures such as catheter checks and flushes. In general, Molly responded to a ‘less is more’ approach with patience and minimal restraint (Figure 2). EMLA local anaesthetic cream was used to facilitate the regular blood sampling. Molly was kept in a cat only ward and had regular human interaction when she was happy to accept it. Comfort is always a priority. Adding extra vet beds, blankets or towels it can make a cat’s stay much easier. As Molly was very depressed and sedated by the alcohol infusion she was groomed and cleaned around her eyes and anus.

**Tip**

When restraining a cat a quiet, calm environment and minimal ‘less is more’ restraint is preferable to a rushed and heavy handed approach.
Outcome
Molly was successfully discharged back to her day practice and made a miraculous recovery. We had an update 2 weeks after discharge to say that Molly was recovering really well and didn’t have any permanent renal issues. Molly went home a happy, lively and feisty cat.

Discussion
Ethylene glycol is highly toxic and ingestion is rarely witnessed. A test kit for diagnosis is available but may be negative if the compound has already been metabolised. Diagnosis is usually made using laboratory tests revealing abnormalities such as acidosis with calcium oxalate crystalluria and, if untreated, acute kidney injury. Prognosis for ethylene glycol toxicity is grave but is very dependent on the timing from ingestion to treatment. A lot of people do not realise what chemicals pose a threat to cats. Cats are very inquisitive and like to investigate so if you have your car bonnet open take care to check for a cat. Household products also contain ethylene glycol so care should be taken to store them carefully.

Conclusions
Treating cats with ethylene glycol toxicity can require intensive nursing and a clear understanding of the possible complications. The clients need to be aware of the financial burden that they will incur for a cat with a poor prognosis (particularly if the cat has acute kidney injury). However, if treated promptly and appropriately cats can survive as Molly showed. However, if her owners had waited before bringing her to the surgery the outcome would have been very different.