GARDEN VARIETY POISONS. Finding a chewed-on lily plant or pieces of plant, such as lily of the valley (Convallaria majalis), in the vomit allows for a definitive diagnosis.
Toxin ingestion is a near-everyday occurrence in veterinary practice. Companion animals are susceptible to several potentially life-threatening toxicants, ranging from human food and medication to animal medication, common plants, illicit drugs, routine household products, and more.

While there are many types of toxins and routes of contamination, this article focuses on general guidelines for management of cases of toxin ingestion, in which veterinary nurses play an important role. The clinical approach to these cases involves patient history, patient assessment, decontamination, diagnostics, treatment, and nursing care.

**PATIENT HISTORY**

Obtaining a thorough patient history is the first priority in toxicosis cases. Usually, a veterinary nurse goes through this process with the pet owner. It often starts over the phone, with the owner calling with concerns about an ingested substance (BOX 1). Obtaining some parts of the history can be challenging, as pets often ingest toxins unseen, and the onset of clinical signs may be delayed after ingestion. However, the information collected during the history is necessary for further recommendations about decontamination, diagnostics, and treatment.

With any potential toxin exposure, it is generally recommended for the pet to be seen by a veterinary nurse as soon as possible.
professional. If possible, the pet owner should be advised to bring any bottles/labels/packaging of the toxicant with them to better aid the veterinary team. It can also be helpful to consult a veterinary toxicologist (BOX 2).

PATIENT ASSESSMENT
Regardless of the type of hospital setting, toxicosis cases are unplanned and usually present on a walk-in basis. A veterinary nurse should assess the patient as soon as possible to obtain a baseline set of vital parameters (BOX 3). The evaluation should focus on the major systems (cardiovascular, respiratory, neurologic), as toxicants have differing physiologic effects on these (TABLE 1). Physiologic effects on renal and hepatic systems are better assessed diagnostically. Gastrointestinal (GI) symptoms (nausea/vomiting, diarrhea, inappetence) are prominent in many cases of toxin ingestion. Because clinical signs of toxin ingestion can be immediate (minutes to hours) or delayed (days to weeks) patient status on presentation will vary.

DECONTAMINATION
Decontamination is the process of removal or neutralization of dangerous/poisonous substances from a patient. When the toxin is ingested, the goals of decontamination are to inhibit toxin absorption and promote excretion and/or elimination. Generally speaking, to be most successful, safe, and beneficial for the patient, decontamination should take place within 1 to 2 hours of toxin ingestion. The most common gastric decontamination methods include emesis induction, gastric lavage, activated charcoal administration, and colonic enema.

Emesis Induction
Inducing emesis is indicated if toxin ingestion has been recent (within 1 to 2 hours); if the ingested toxin is known to stay in the stomach for prolonged periods (e.g., grapes, chocolate), even if time of ingestion is unknown; and if the patient is asymptomatic. Emesis induction is contraindicated in patients that are symptomatic, have airway disease, have an altered

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**BOX 1**
**Toxicosis Patient History Questions**

- How much does your pet weigh?
- What is the name of the toxin?
- If the toxin is a medicine:
  - What is the strength?
  - What is the generic name?
- Is it a special formulation (e.g., extended release)?
- What is the active ingredient of the toxin?
- How much do you think your pet ingested?
- How much could your pet have ingested? (worst-case scenario)
- How long ago (or what general time frame) did your pet ingest the toxin?
- Is your pet showing any signs/symptoms?
  - If so, how long have you noticed the signs/symptoms?
  - How old is your pet?
  - Does your pet have any underlying health issues?
  - Is your pet currently on any medications?

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**BOX 2**
**Toxicology and Poison Control Resources**

The two primary veterinary toxicology resources, the ASPCA Animal Poison Control Center and the Pet Poison Helpline, employ toxicologists who have database information regarding specific toxins. Their insight can often be critical to the successful management of toxicosis. These services also assign each case a number that can be referenced repeatedly as the patient’s status changes. Additionally, they can be called by pet owners (before arrival) and veterinary professionals (at patient presentation).

**ASPCA Animal Poison Control Center**
- 888-426-4435
- $65 consultation fee (waived with HomeAgain® microchip)
- Available 24 hours/day, 365 days/year

**Pet Poison Helpline**
- 855-213-6680
- $59 consultation fee
- Available 24 hours/day, 365 days/year
mentation, have already been vomiting, or have ingested a corrosive/caustic agent.\textsuperscript{1,3}

Successful emesis induction typically results in expulsion of 40% to 60% of gastric contents (\textbf{FIGURE 1}).\textsuperscript{1} The most common drug used to induce emesis in dogs is apomorphine (\textbf{TABLE 2}). Apomorphine is a centrally acting emetic that exerts its effects on dopamine receptors in the chemoreceptor trigger zone (CRTZ; the brain’s vomiting center).\textsuperscript{4} Apomorphine is not labeled for use in cats and is therefore contraindicated in this species.\textsuperscript{1,4} To induce vomiting in cats, xylazine or dexmedetomidine is recommended (\textbf{TABLE 2}). Both of these drugs are also centrally acting emetics that exert their effects on alpha receptors in the CRTZ.

Another, less desirable option for inducing emesis is oral administration of 3% hydrogen peroxide. Hydrogen peroxide works by locally irritating the gastric mucosa to stimulate the vomiting reflex. It was previously thought that hydrogen peroxide had minimal harmful effects; however, a recent study showed it to be associated with esophageal lesions and increased risk of gastric irritation/ulcers.\textsuperscript{5} Therefore, hydrogen peroxide should be used with caution.

\textbf{BOX 3}

Baseline Patient Parameters

- Weight (in kg)
- Mentation
- Heart rate
- Pulse rate and quality
- Respiratory rate
- Respiratory effort
- Mucous membrane color
- Capillary refill time
- Blood pressure

\textbf{TABLE 1} Potential Physiologic Effects of Toxicosis on the Major Body Systems

\begin{tabular}{|l|l|l|}
\hline
\textbf{CARDIOVASCULAR CHANGES} & \textbf{RESPIRATORY CHANGES} & \textbf{NEUROLOGIC CHANGES} \\
\hline
- Heart rate & - Respiratory rate & - Mentation/level of consciousness \\
  - Tachycardia &  - Tachypnea &  - Alert \\
  - Bradycardia &  - Bradypnea &  - Obtunded \\
- Heart rhythm &  - Respiratory effort &  - Stuporous \\
  - Atrial arrhythmias &  - increased effort &  - Comatose \\
  - Ventricular arrhythmias &  - Dyspnea &  \\
- Pulse quality &  - Oxygenation status &  \\
  - Synchronous pulses &  - Hypoxia &  \\
  - Asynchronous pulses &  - Hypoxemia &  \\
  - Stronger than normal pulses &  - Ventilation status &  \\
  - Weaker than normal pulses &  - Hyperventilation &  \\
- Blood pressure &  - Hypoventilation &  \\
  - Hypotension &  &  \\
  - Hypertension &  &  \\
- Mucous membrane color/ &  &  \\
  capillary refill time &  &  \\
  - Injected/rapid (vasodilation) &  &  \\
  - Pale/prolonged (vasoconstriction) &  &  \\
\hline
\end{tabular}
Ideally, pet owners should be advised to come to the hospital for emesis induction using approved drugs under veterinary supervision. After successful emesis, the vomitus should be collected and inspected for the presence of the toxicant.

**Gastric Lavage**

Gastric lavage is a more advanced method of removing gastric contents. It is indicated for cases of severe intoxication (large volume of toxin), toxins with a narrow margin of safety (e.g., strychnine, baclofen), patients at higher risk for aspiration (i.e., altered level of consciousness), or when emesis is contraindicated.²,³

The procedure for gastric lavage involves general anesthesia with the patient in lateral recumbency, passing of an orogastric tube, and using room-temperature water to lavage and empty gastric contents (FIGURE 2).² If activated charcoal (AC) is indicated, it can be administered via the orogastric tube once the lavage cycles are complete.

**Activated Charcoal Administration**

AC is administered orally following emesis induction and if indicated. AC particles have a large surface area, and AC acts as an adsorbent by binding toxins to help reduce systemic absorption from the GI tract.¹ Some formulations of AC include a cathartic (sorbitol) to increase GI motility, decrease absorption, and promote elimination through the GI tract.¹

The recommended dosing of AC with sorbitol is a single dose (1–5 g/kg PO).³ Repeated doses of AC without sorbitol (1–2 g/kg PO q6h to q4h) can be administered in cases of toxins that undergo enterohepatic recirculation or delayed distribution.³ If multiple doses of AC are to be administered, it is important to obtain a baseline sodium level, check the patient’s electrolyte levels every 4 to 12 hours, and ensure that the patient stays well hydrated to minimize the risk for life-threatening electrolyte imbalances.¹

AC is contraindicated in patients that present in the late stages of toxicosis, are symptomatic, have altered mentation, have a diminished gag reflex or airway disease, or have ingested toxins that do not readily bind to AC (i.e., xylitol, ethylene glycol).¹,³

**Colonic Enema**

Colonic enemas are indicated in patients that have ingested large amounts of a toxin or may be experiencing a delay in onset of clinical signs, or when elimination of toxicants from the lower GI tract is indicated. The technique involves lubricating and passing a red rubber catheter through the rectum to the level of the transverse colon (midabdomen).² Warm water and additional lubricant are used to irrigate the colon and expel toxin remnants (FIGURE 3).

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**TABLE 2 Emesis Induction Agents**

<table>
<thead>
<tr>
<th>APOMORPHINE¹</th>
<th>XYLAZINE²</th>
<th>DEMEDETOMIDINE³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injectable</td>
<td></td>
<td>Injectable</td>
</tr>
<tr>
<td>0.02 mg/kg SC</td>
<td></td>
<td>0.04 mg/kg IM</td>
</tr>
<tr>
<td>0.03 mg/kg IV</td>
<td></td>
<td>7 mcg/kg IM</td>
</tr>
<tr>
<td>0.04 mg/kg IM</td>
<td></td>
<td>3.5 mcg/kg IV</td>
</tr>
<tr>
<td>Tablet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.25 mg con</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ Contraindicated in cats.  
² Reversible with yohimbine.  
³ Reversible with atipamezole.  
⁴ Need to rinse eye thoroughly with sterile saline after use.

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² FIGURE 2. Gastric lavage in a dog that ingested baclofen.
DIAGNOSTICS
When it comes to toxicosis, the diagnostic workup is relatively minimal (usually in-house laboratory work), as more focus is directed toward decontamination and treatment.

A minimum database (MDB) should be obtained for patients presenting for toxicosis. The MDB can vary but in general could include packed cell volume/total protein, blood glucose, blood urea nitrogen, electrolytes, and/or urine specific gravity. The ingested toxin will also guide what laboratory work is most indicated (e.g., serial blood glucose monitoring for xylitol, clotting times for anticoagulant rodenticide, urine sediment for ethylene glycol).

Urine drug screen tests (UDSTs) are available for cases in which ingestion of an illicit substance is suspected (FIGURE 4). UDSTs use an immunoassay that indicates a positive result with a dye color change, meaning that the metabolite of the drug being tested for is present in the urine. However, UDSTs are meant for human use; no over-the-counter test is validated for veterinary species. This is especially important as the number of reported cases of tetrahydrocannabinol (THC) ingestion/toxicosis continues to rise. A 2012 study reported on the use of UDSTs for the detection of THC and found that dogs do not produce the same metabolites as humans, meaning the UDST for THC is not accurate in dogs. 

TREATMENT
Toxicosis patients often need to be hospitalized for anywhere from several hours to several days, depending on the toxin and severity of clinical signs. Once decontamination procedures have been performed, treatment should focus on providing supportive care.

Venous access is vital to ensure patent delivery of fluid therapy and medications. Crystalloid fluids help promote diuresis and toxicant excretion. Maintenance fluid requirements are 40 to 60 mL/kg/day, and fluid rates can vary from 1.5 to 4 times maintenance requirements, depending on the toxin.

### TABLE 3 Toxins With Antidotes

<table>
<thead>
<tr>
<th>TOXIN</th>
<th>ANTIDOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaminophen</td>
<td>N-Acetylcysteine</td>
</tr>
<tr>
<td>Ethylene glycol</td>
<td>Fomepizole (4-methylpyrazole, 4-MP)</td>
</tr>
<tr>
<td>Ethanol</td>
<td></td>
</tr>
<tr>
<td>Anticoagulant rodenticide</td>
<td>Vitamin K₁</td>
</tr>
<tr>
<td>Cholecalciferol rodenticide</td>
<td>Calcitonin</td>
</tr>
<tr>
<td>Organophosphate insecticide</td>
<td>Pralidoxime chloride (2-PAM)</td>
</tr>
<tr>
<td>Oleander</td>
<td>Digoxin</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>Flumazenil</td>
</tr>
<tr>
<td>Opioids</td>
<td>Naloxone</td>
</tr>
</tbody>
</table>

**FIGURE 3.** Colonic enema in a dog that ingested sago palm.

**FIGURE 4.** Example of a commercially available urine drug screen test.
Using pharmacologic agents to support the GI system is generally accepted, as the GI tract is commonly affected. While most toxicants do not have an antidote, some do (TABLE 3). Additional pharmacologic support should be provided based on specific signs of individual toxins.

Another treatment option is intralipid emulsion (ILE) administration. ILE was first considered as an antidotal therapy for lipophilic (fat-soluble) drug toxicosis in a 2011 study (BOX 4). The most popular theory on how ILE works is known as the lipid-sink effect, which suggests that ILE expands the intravascular lipid compartment and sequesters lipophilic toxins, thus lowering the concentration of available toxin. This prevents further tissue exposure until the toxin is excreted.

**NURSING CARE**

Monitoring involves diligent assessment and care over the duration of hospitalization. Patients exposed to toxins can present with a wide variety of signs and physiologic effects. Toxicosis cases can be complex because multiple body systems are often involved. Diligent assessment, close monitoring, attentive nursing care, and stabilization of the patient are essential. The level of nursing care ranges from outpatient supportive care to multiple days in the hospital.

Assessment and monitoring can include recording vital signs and assisting the veterinarian with treatment. Some poisoning cases may require additional monitoring (TABLE 4). Monitoring should also include assessment of discomfort, using a pain scoring system, and providing analgesia as needed.

**CONCLUSION**

It can be challenging to recognize, intervene in, and provide treatment and care for toxicosis cases, but also very rewarding. The role of veterinary nurses in these cases cannot be overstated. From initial patient history and assessment to decontamination and overall nursing care, veterinary nurses are involved in the entirety of a case. Being familiar with general guidelines of how to approach a toxicosis patient and the specific toxins commonly seen in practice is fundamental to successful patient outcomes.

To see the references for this article, please visit todaysveterinarynurse.com.

### BOX 4

**Intralipid Emulsion Use for Toxicosis**

- Indicated for toxicosis caused by a lipophilic drug
  - Local anesthetics
  - Ivermectin
  - Baclofen
  - Pyrethrins
  - Permethrins
  - Calcium-channel blockers
  - Beta blockers
  - Antidepressants
  - Synthetic cannabinoids
- 20% Intralipid emulsion dosing
  - Initial bolus: 1.5 to 4 mL/kg IV
  - Constant rate infusion: 0.25 mL/kg/min IV over 30 to 60 min
  - Additional intermittent boluses: 1.5 mL/kg IV q6h to q4h for the first 24 hours in hospital
- Administration/handling/storage
  - Maintain strict aseptic technique
  - Use dedicated catheter (peripheral or central)
  - Store unused portion in refrigerator
  - Discard solution after 24 hours
- Adverse effects
  - Fat overload syndrome
  - Hypertriglyceridemia
  - Lipemia

### TABLE 4 Potential Monitoring Needs for Toxicosis Patients

<table>
<thead>
<tr>
<th>COMPROMISED SYSTEM</th>
<th>MONITORING METHOD</th>
<th>TOXIN EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td>ECG</td>
<td>Chocolate, oleander</td>
</tr>
<tr>
<td>Neurologic</td>
<td>Modified Glasgow Coma Scale (mental status)</td>
<td>Bromethalin rodenticide, anxiety medications</td>
</tr>
<tr>
<td>Respiratory</td>
<td>Pulse oximetry or blood gases</td>
<td>Baclofen, acetaminophen</td>
</tr>
<tr>
<td>Hematologic</td>
<td>Clotting times</td>
<td>Anticoagulant rodenticide</td>
</tr>
<tr>
<td>Renal</td>
<td>Evaluation of urine output and renal parameters</td>
<td>NSAIDs, ethylene glycol</td>
</tr>
</tbody>
</table>

ECG = electrocardiography; NSAID = nonsteroidal anti-inflammatory drug.