

# Things That Make 'em Go 'ADR:

## Everyday Toxicology for Everyday Technicians

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### Agenda

Core Toxicology Terminology and Trends	Triage and Decontamination
Top Toxin Exposures	Client Education

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### Toxicology Overview

- Toxicology is the study of adverse effects of chemical, biological, or physical agents.
  - The adverse effects of substances on living organisms
  - “The dose makes the poison” -Paracelsus principle
  - Nothing is truly “toxic” or “safe”
  - Exposure dependent relative to patient and exists on a spectrum
  - Water, oxygen, and sodium are all toxic at excessive levels
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### Toxicology Terminology - Core Definitions

<u>Term</u>	<u>Definition</u>
Toxin vs Toxicant	Toxin = naturally produced (e.g., botulinum toxin); Toxicant = synthetic (e.g., ethylene glycol). Example: Snake venom (toxin) vs antifreeze (toxicant).
LD50 (Median Lethal Dose)	Dose causing death in 50% of test population.
Toxic Threshold / Toxic Dose	Estimated dose at which adverse effects begin. Example: Xylitol $\geq 0.1$ g/kg $\rightarrow$ hypoglycemia in dogs.
Bioavailability	Fraction of dose that reaches systemic circulation. Influenced by formulation and first-pass metabolism.
Half-life ( $t_{1/2}$ )	Time for plasma concentration to reduce by 50%. Guides monitoring duration and repeat dosing of charcoal.
Toxicokinetics (ADME)	Absorption, Distribution, Metabolism, Excretion. I.E.: “what the body does to the toxin.” Example: Enterohepatic recirculation prolongs NSAID toxicity.
Toxicodynamics	“What the toxin does to the body” I.E.

<u>Term</u>	<u>Definition</u>
	mechanism at receptor/cellular level. Example: Acetaminophen → oxidative injury/methemoglobinemia in cats.
Antidote	Agent that counteracts a toxin. Example: N-acetylcysteine for acetaminophen.
Decontamination	Interventions to reduce absorption (emesis, charcoal, bathing).

## Scope in Veterinary Medicine

<u>Metric</u>	<u>Data</u>
ER visits	10-15%
ASPCA APCC 2025 cases	> 376,000 cases
Animals affected	334,000 animals
Increase	3.7% increase over 2024
Milestone	July 2025 APCC = 5 Millionth lifetime case

## Distribution

Canines	70-80%
Felines	15-25%
Age	Animals < 3 years old

## Environment

<u>Urban</u>	<u>Rural</u>
Medications, edibles, household chemicals	Pesticides, livestock feed contaminants, envenomation

## Common Sources of Toxins

<u>Category</u>	<u>Examples</u>
Human medications	NSAIDs, acetaminophen, SSRIs, ADHD meds
Foods	Chocolate, xylitol, grapes/raisins, onions
Plants	Lilies (feline), sago palm, oleander, dieffenbachia
Household chemicals	Cleaners, bleach, detergents
Environmental toxins	Antifreeze (ethylene glycol), pesticides
Veterinary misuse	Permethrin in felines

## Routes of Exposure

Route	Notes
Ingestion	~80–90% of cases reported
Dermal exposure	Topicals, spills, environmental contact
Inhalation	Smoke, aerosols, fumes
Injection/envenomation	Snakes, insects
Ocular exposure	
<ul style="list-style-type: none"><li>Multiple route exposures increase severity and complexity</li></ul>	

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## Toxicokinetics- ADME

### What the body does to the toxin

Process	Details
Absorption	gastric emptying, formulation
Distribution	lipid solubility, protein binding, BBB penetration
Metabolism	hepatic cytochrome P450 enzyme pathways; Enterohepatic recirculation prolongs toxin presence
Excretion	renal (urine), biliary (feces), pulmonary (gases)

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## Toxicodynamics

### What the toxin does to the body

- Interaction of toxin with cellular receptors or enzymes
- Mechanisms: oxidative stress, enzyme inhibition, ion disruption
- Target organs: liver (biotransformation), kidneys (excretion)

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## Generalized Clinical Signs

System	Signs
GI	Vomiting, diarrhea, hypersalivation
Neurologic	Tremors, seizures, ataxia, altered mentation
Cardiovascular	Tachycardia, arrhythmias, hypotension
Respiratory	Tachypnea, dyspnea, cyanosis
Hepatic	Icterus, elevated ALT/AST
Renal	PU/PD, azotemia, oliguria/anuria

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## Triage and Initial Assessment

### SAMPLE History

Category	Details
Signs/Symptoms	What clinical signs are already present?
Allergies	Any known drug reactions or sensitivities that may impact treatment
Medications	Current medications or recent exposures
Past medical history	Underlying disease (renal, hepatic, neurologic) affecting risk
Last meal	Impacts absorption and emesis decisions
Events/Environment	What happened? Access to trash, toxins, environment

### TOX

Category	Details
Substance	Exact toxin
Amount	Estimate dose and convert to mg/kg when possible
Time	When exposure occurred
Route	Oral, dermal, inhalation, injection
Co-exposures	Multiple toxins or mixed products
Owner reliability	Confidence in history accuracy

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### Assess - ABCs

#### Primary Survey

Airway

Breathing

Circulation

### Life-Threatening Symptoms

- Seizures
- Respiratory Depression
- Shock

### Stabilization > Diagnostics and Decontamination

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#### Stabilization

- Oxygen

- Dyspneic
- Cyanotic
- Sedate/Depressed/Obtunded
- IV Access\*
- Fluid Therapy
- Control active seizures, tremors, etc.

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## Diagnostics

STAT/Point of Care	Additional
Blood Glucose	Chemistry Profile
Lactate	Complete Blood Count
ECG	Urinalysis
TPR	Blood Gas
Blood Pressure	Rapid Drug Screens
	Imaging

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## Decontamination

### General Principles

- Reduce further absorption and interrupt systemic exposure as early as possible
- Golden Period: 1-2 hours post ingestion

### Emesis

Species	Method
Canine	Apomorphine (IV or Conjunctival)
Feline	Dexmedetomidine

### *Contraindications:*

- Unstable patient
- Neurologically inappropriate
- Ingestion of: Caustic Agents, Hydrocarbons, Sharps
- Alcohol Ingestion > 30 min prior

### Activated Charcoal

- Cathartic (sorbitol) use for first dose only!

### *Do not use in:*

- Hyponatremia, dehydration, and salt toxicosis

### *Does not bind to:*

- Heavy Metals

- Alcohols (Methanol, ethanol, sugar alcohols)
- Xylitol
- Ethylene glycol
- Hydrocarbons
- Caustic substances
- Things on the periodic table

*Other contraindications:*

- Endoscopy
- Anticipated or recent abdominal surgery of the GI tract
- Confirmed or suspected gastric or intestinal obstruction
- Gastrointestinal hemorrhage or perforation
- Late-stage presentation with clinical signs already present
- Dehydration
- Hypernatremia
- Hypovolemic shock
- Compromised/Unprotected airway

### Gastric Lavage

- When emesis is contraindicated or fails
- Requires anesthesia and cuffed ET tube
- Carries risk of aspiration and esophageal injury
- Large life-threatening ingestions that are recent

### Dermal/Ocular Wash

- Removal of products (collars)
- Bath with mild detergent
- Flush eyes with saline or water

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## Common Antidotes

- Antidotes available for <10% of toxins → supportive care critical

Antidote	Use
N-acetylcysteine	Acetaminophen
Vitamin K1	Anticoagulant rodenticides (warfarin, brodifacoum)
Atropine	Organophosphates/carbamates
Fomepizole or Ethanol	Ethylene glycol
Lipid Emulsion Therapy	Lipophilic toxins (permethrin)
Naloxone	Opioids
S-adenosyl-methionine (S-AMe)	Hepatoprotectant

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## Hospitalization vs Outpatient Care

- Outcomes are dependent on dose, timing, toxin type, species, and treatment.

## Common Treatments

Category	Details
Fluid Balance	IVF, Urine Measurement
GI Therapy	Anti-emetics, Gastroprotectants
Continuous Nursing	O2, TPR, BP, ECG, BG, Mentation Scoring
Support	Nutritional Support, Husbandry, FAS Minimization

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## Human Medications

### Overview

- Includes both OTC and RX
- Most common: NSAIDs, SSRIs/SNRIs, Amphetamines/ADHD Rx, Beta-blockers/calcium channel blockers

### Observations / Clinical / Treatment

Category	Details
Owner Observations	Vomiting, Lethargy, Agitation, Tremors, Collapse, Decreased appetite
Clinical Presentation	GI ulceration/melena, Seizures, Arrhythmias, Hypo/hypertension
Clinical Concerns	NSAIDs → azotemia; SRIs → hyperthermia; CCBs → bradycardia/hypotension
Laboratory/Diagnostics	CBC, Chemistry, ECG, BP
Decontamination/Treatment	Early emesis, Charcoal, IV fluids, GI protectants, Anti-seizure meds, cardiac support
Antidotes	Lipid therapy (toxin dependent)
Nursing Care	ECG monitoring, Fluid balance, GI protection, Neurologic checks

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## Chocolate (Methylxanthines)

Category	Details
Active toxin	theobromine ( $\pm$ caffeine)
Potency by Type	Dark/baking chocolate: highest; Milk chocolate: moderate; White chocolate: minimal

Category	Details
Owner Observations	Restlessness, Panting, Vomiting, Hyperactivity, Polyuria
Clinical Presentation	Tachycardia, Arrhythmias, Tremors, Seizures, Hyperthermia
Clinical Concerns	Sinus tachycardia → ventricular arrhythmias
Diagnostics	ECG, Chemistry, BP
Treatment	Early emesis, Charcoal, IV fluids, Beta-blockers, Anti-seizure meds, Cardiac support
Antidotes	None
Nursing Care	ECG monitoring, IV Fluids, Neurologic checks, Low stimulation

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## Xylitol

Category	Details
Source	Sugar-free gum, peanut butter, baked goods
Notes	Concentration varies; Access to the label!
Owner Observations	Vomiting, Weakness, Collapse within 30–60 minutes post ingestion
Clinical Presentation	Hypoglycemia, Seizures, Icterus, Coagulopathy
Clinical Concerns	Early hypoglycemia; Delayed hepatic failure
Diagnostics	STAT BG, Serial BG q1–2h, Chemistry, Coagulation panel
Treatment	Dextrose bolus + CRI, IV fluids, GI protectants, Anti-seizure meds, cardiac support
Antidotes	None
Nursing Care	BG monitoring, Liver value trends, Neurologic checks, Feeding once stable

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## Cannabis - THC

Category	Details
Notes	Edibles (higher concentrations; may include chocolate, xylitol); Vape Pens (also nicotine)
Owner Observations	Disorientation, Urinary incontinence, Lethargy, Hypersensitivity
Clinical Presentation	Ataxia, Bradycardia, Hypothermia, Mydriasis, Urinary incontinence, Agitation



Category	Details
Clinical Concerns	Co-toxins
Diagnostics	Drug Screen, Base Line Profiles
Treatment	Activated charcoal, ILE, IV fluids, Anti-emetics, Sedation
Antidotes	None
Nursing Care	IVF, Quiet/dark environment, Neurologic checks, Temperature support, Sanitation

## Ethylene Glycol - Antifreeze

Category	Details
Notes	Found in food products, cosmetics, pharmaceuticals; “Pet-Safe” Antifreeze
Owner Observations	PU/PD (early), Drunken behavior, Vomiting
Clinical Presentation	Metabolic acidosis, Tachypnea, Dehydration, Oliguria/anuria
Clinical Concerns	Renal tubular necrosis
Phases	0–12 hr neurologic; 12–24 hr cardiopulmonary; 24–72 hr renal failure
Diagnostics	Blood Gas, Urinalysis, Blood Chemistry
Treatment	Aggressive IVF, Acidosis correction
Antidotes	Fomepizole or ethanol (time dependent)
Nursing Care	ICU Monitoring, Fluid balance documentation, Complication management

## Rodenticides- Anticoagulants

Category	Details
Agents	Warfarin, Brodifacoum, Bromadiolone
Onset	24-72 hours
Owner Observations	Lethargy, Pale gums, Coughing, Bleeding/bruising, Hematuria
Clinical Presentation	Bruising, Hemorrhage, Anemia
Clinical Concerns	inhibit vitamin K epoxide reductase → coagulopathy
Diagnostics	PT, CBC, Chemistry, Imaging, UA
Treatment	Early emesis, Charcoal, Plasma transfusion
Antidotes	Vitamin K

Category	Details
Nursing Care	ICU Monitoring, Coagulation monitoring, Minimize stress

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## Rodenticides- Bromethalin

Category	Details
Notes	Dose dependent onset; Cats → paralytic syndrome
Owner Observations Low Dose	Vomiting, Anorexia, Nystagmus, Depression, Tremors, Hindlimb weakness
Owner Observations High Dose	Hyperexcitability, Hyperthermia, Tremors, Seizures
Clinical Presentation	Ataxia, Seizures, Altered CNS
Clinical Concerns	Failure of Na <sup>+</sup> /K <sup>+</sup> pumps → cerebral edema
Diagnostics	None- usually WNL
Treatment	Emesis, Gastric lavage, Charcoal, ICP management
Antidotes	None
Nursing Care	ICU Monitoring, Neurologic checks

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## Rodenticides- Cholecalciferol/Vit D3

Category	Details
Notes	Also Vit D supplements and calcitriol
Onset	12-36 hours
Owner Observations	Anorexia, Lethargy, Weakness, Vomiting, Constipation/Diarrhea, Melena, Hematemesis, PU/PD
Clinical Presentation	GI symptoms, Lethargy, PU/PD, AKI signs
Clinical Concerns	Hypercalcemia → soft tissue mineralization
Diagnostics	Blood Chemistry, Urinalysis, BP, ECG
Treatment	Emesis, Charcoal, Aggressive IVF
Antidotes	Bisphosphates, Calcitonin, ILE
Nursing Care	ICU Monitoring, Ca <sup>+</sup> and Renal Monitoring, Maintain hydration

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## Lilies

Category	Details
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Category	Details
Focus	Feline
Species	Easter, Tiger, Asiatic, Day lilies
Owner Observations	Vomiting, Hypersalivation, Anorexia
Clinical Presentation	Dehydration, Abdominal/Renal Pain, Oliguria/Anuria
Clinical Concerns	Nephrotoxin → proximal tubular necrosis
Diagnostics	Chemistry, Urinalysis
Treatment	Early emesis, Charcoal, IV fluids, Renal Support
Antidotes	None
Nursing Care	ICU Monitoring, Fluid balance, Renal monitoring

## Grapes - Raisins

Category	Details
Focus	Canine
Notes	Can occur with tamarind
Owner Observations	Vomiting, Lethargy, Anorexia
Clinical Presentation	GI symptoms, Dehydration, Oliguria
Clinical Concerns	Nephrotoxin- tartaric acid suspected
Diagnostics	Chemistry, Urinalysis
Treatment	Emesis, Charcoal, IV fluids, GI protectants
Antidotes	None
Nursing Care	ICU Monitoring, Fluid balance, Renal monitoring

## Household Chemicals

Category	Details
Agents	bleach, detergents, disinfectants, drain cleaners
Irritants	Detergents, dilute bleach
Caustics	Concentrated acids/alkalis
Oxidizers	Peroxides
Owner Observations	Hypersalivation, Vomiting, Skin irritation, Pawing
Clinical Presentation	GI irritation, Oral/ocular ulcers, Dermal burns, Respiratory irritation
Clinical Concerns	Mucosal irritation, Electrolyte imbalance,

Category	Details
	Organ injury
Diagnostics	Guided by PE
Treatment	AVOID emesis; Dilution; Dermal/Ocular flushing; Analgesia
Antidotes	None
Nursing Care	Analgesia, Wound management, Nutritional support, Monitoring

## Permethrin

Category	Details
Sources	spot-on products, flea baths, insecticides
Owner Observations	Agitation, Tremors, Hypersalivation, Seizures
Clinical Presentation	Severe tremors, Hyperthermia
Clinical Concerns	Sodium channel prolongation → tremors/seizures
Diagnostics	PE + history, Chemistry
Treatment	Wash, thermoregulation, tremor management, BG management
Antidotes	Lipid therapy
Nursing Care	Thermoregulation, IVF, Neurologic checks, Nutrition

## Technician: Monitoring and Nursing

Shifting from “monitor the patient” to  
**“RUN STRUCTURED PROTOCOLS, TRACK TRENDS, and INTERVIENE EARLY!”**

## Focus Areas

ICU monitoring	Neurologic trending
Fluid therapy management	Renal monitoring
Glucose surveillance	Cardiac monitoring
Pain management	TLC

## Client Communication and Education

- Client education is one of the highest-impact interventions in veterinary toxicology, as most exposures are preventable.
- The goal is to translate complex risks into simple, actionable behaviors, for owners to self identify and prevent.

Medication safety protocols      Food toxin prevention

Topical & product safety      Environmental hazard control  
Home risk assessment checklist   Early warning signs  
Emergency preparedness



ASPCA Practice Resources



VetGirl Toxicology Guide

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