From Indoors to Out: Plants Poisonous to Small Animals

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Introduction

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Minneapolis, Minnesota
Did you know?

- Incidence rate of poisonous plant ingestion in small animals
- VPI Pet Insurance receives

<table>
<thead>
<tr>
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<th>2012</th>
<th>2013</th>
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<tr>
<td>Fees</td>
<td>$389,320.74 in submitted fees</td>
<td>$538,336.37 in submitted fees</td>
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<tr>
<td>Average fee per pet</td>
<td>$507.85</td>
<td>$565.48</td>
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VPI® and Pet Poison Helpline® working together

- Shared mission in highlighting the importance of preparing for accidents and poisonings in small animals

- Addressing the cost of veterinary care
  - VPI covers the $39 Pet Poison Helpline fee when a pet is brought in to your hospital for care

- Enabling best medicine
  - Pet owners with VPI Pet Insurance spend twice as much on their pets (single events) than those without VPI Pet Insurance
VPI® and Pet Poison Helpline® working together

- Providing veterinary reviewed pet health information online
  - www.petpoisonhelpline.com/owners
  - www.petinsurance.com/healthzone.aspx

- Providing complimentary pet owner educational materials for your practice – available for ordering
  - First Aid for Your Pet brochure
  - Poisoning Emergencies brochure
  - Toxins in the Kitchen stickers
  - Toxic Human Meds stickers
  - Emergency Numbers stickers
Pet Poison Helpline

- Animal poison control
  - 24/7 availability
  - $39 one-time fee/case
  - Unlimited case follow-up
  - Access to multiple specialists (DVM and others)
    - Board-certified veterinary toxicologists (DABVT, DABT, Board-eligible ABVT & ABT)
    - Emergency/Critical Care (2 DACVECCs, ECC resident)
    - Internal Medicine (DACVIM)
    - Herpetology
    - PharmDs/clinical pharmacologists
Lecture Objectives

• Review the most common plants involved in small animal poisonings
  • Identification
  • Mechanism of action
  • Decontamination
  • Treatment
  • Prognosis
Most plants aren’t this bad…
Lily basics

- True lilies
  - *Lilium* and *Hemerocallis* species
  - Easter lily, Tiger lily, Stargazer lily, all Asiatic lilies; Day lily
  - Common sound-alikes

- Cats only

- Toxic dose
  - 1-2 leaves or petals

- Toxic portion
  - All of the plant, even pollen!
  - Water from vase

Day Lily (*Hemerocallis spp.*)
Lilium sp. Examples (true lilies)

Easter Lily
Lilium longiflorum

Tiger Lily
Lilium tigrinum

Asiatic Lily
Very common in cut-flower bouquets (Lilium spp.)
Not all “lilies” are “true lilies”!

- These plants are NOT true lilies (\textit{Lilium} sp.)
- Do NOT cause renal failure in cats but do have other toxic principles

Calla Lily \textit{(Zantedeschia spp.)}

Peace Lily \textit{(Spathiphyllum genus)}

Lily of the Valley \textit{(Convallaria majalis)}
Peruvian lily (*Alstroemeria* spp.)

Non-toxic!
Lily Toxicosis

• Clinical Signs
  – 0-3 hours post-ingestion
    • Vomiting, anorexia, depression
  – 12-24 hours post-ingestion
    • Beginning of renal failure
    • Crystals do NOT form
  – 1-5 days post-ingestion
    • Dehydration develops
    • Stop producing urine
    • Death due to acute renal failure

• Prognosis
  – Good if early and treated aggressively
  – Grave if no treatment
  – Poor if IVF not started within 18 hr or anuria has developed
Treatment

• Aggressive decontamination
  – Emesis induction
    • Xylazine 0.4-0.6 mg/kg IM once
  – Activated charcoal + cathartic x 1

• Fluids, fluids, fluids X 48-72 hours

• Gastrointestinal support:
  – Antiemetic
  – H₂ blocker
  – Phosphate binders
  – Nutritional support
Treatment

• Appropriate monitoring
  • Blood pressure
  • Urine output
    – Normal: 1-2 ml/kg/hour
    – Measuring ins and outs

• Monitoring baseline blood work
  – Recheck PCV/TS, renal panel q 24 X 2-3 days; repeat in 3-5 days

• Peritoneal or hemodialysis

Outcome following gastrointestinal tract decontamination and intravenous fluid diuresis in cats with known lily ingestion:
25 cases (2001–2010)
AJ Bennett, BVSc, and EL Reineke, VMD, DACVECC
JAVMA, Vol 242, No. 8, Apr 15, 2013
INSOLUBLE OXALATES
Insoluble oxalates

- Insoluble vs. soluble
- *Araceae* family
- 200 species
- Common house plants:
  - Little water
  - Little light
  - Non-green thumb
Insoluble oxalates

• Very common house plants
  – Philodendron (*Philodendron* spp.)
  – Calla lily (*Zantedeschia* spp.)
  – Peace lily (*Spathiphyllum* spp.)
  – Umbrella plant (*Schefflera* spp.)
Insoluble oxalates

• Arrowhead vine
• Dumbcane, Mother-in-law’s tongue
• Sweetheart vine
• Pothos, hunter’s robe, devil’s ivy
• Elephant’s ear
Raphide (Ca oxalate) structure

The Ca oxalate crystals (raphides) appear as a bundle of needles within an idioblast cell.

Crystals are released when leaves are chewed.

Li X et al. Plant Physiol. 2003;133:549-559

http://www.life.illinois.edu/ib/335/Monocots/Monocots.html
Clinical signs

• Look terrible!
• Hypersalivation
• Pawing at mouth
• Oropharyngeal edema
• Ocular irritation
• Dermal irritation
Treatment

• R/O soluble!

• Generally treated at home

• For once, milk is OK!

• Flush mouth
Treatment

• If in the clinic:
  – Flush mouth
  – Anti-emetic
  – Fluid therapy (SQ)

• Monitor:
  – Rare: upper airway obstruction

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**Case Report**

Airway obstruction in a dog after *Dieffenbachia* ingestion

Katherine Peterson, DVM; Jessica Beymer, DVM; Elke Rudloff, DVM, DACVECC and Mauria O’Brien, DVM, DACVECC
SOLUBLE OXALATES
Soluble oxalate-containing plants

- Oxalic acid and oxalate salts
- Very different from insoluble (not absorbed)
- Examples:
  - Rhubarb
  - Starfruit
  - Shamrock
Soluble oxalate-containing plants

• More of a large animal problem
• Acute renal failure (ARF) with large ingestions
• Chronic renal insufficiency patients?
MOA

• Absorbed from GIT → bind with systemic calcium → acute hypocalcemia

• Calcium oxalate crystals accumulate → nephrosis → ARF
Soluble oxalates: clinical signs

- Hypersalivation
- Anorexia
- Vomiting
- Diarrhea
- Lethargy
- Weakness
- Hypocalcemia:
  - Tetany/tremors

- 24-36 hours post-ingestion:
  - PU/PD
  - Oliguria
  - Oxaluria
  - Hematuria
Soluble oxalates: treatment

- Decontamination
  - Emesis induction
  - Activated charcoal + cathartic X 1

- Clinicopathologic monitoring
  - Hypocalcemia
  - Oxaluria
  - Azotemia

- Fluid therapy
- Anti-emetics
- Symptomatic supportive care

CARDIAC GLYCOSIDES
Prototypes: Digoxin from the foxglove plant (*Digitalis* spp.)

Group includes:
- Lily of the Valley (*Convallaria majalis*)
- Foxglove (*Digitalis pupurea*)
- Wooly foxglove (*Digitalis lantana*)
- Kalanchoe (*Kalanchoe* spp.)
- Oleander (*Nerium oleander*)
- Yellow oleander (*Thevetia peruviana*)
- Desert rose (*Adenium obesum*)
- Dogbane (*Apocynum* spp.)
- Giant milkweed (*Calatropis* spp.) — large animal
- Milkweed (*Asclepias* spp.) — large animal
- Star of Bethlehem (*Ornithogalum umbellatum*)

**Foxglove**

*(Digitalis pupurea)*

**Pet Poison HELPLINE**
Lilly of the Valley (Convallaria majalis)

Foxglove (*Digitalis pupurea*)
Kalanchoe (Kalanchoe spp.)

Cardiac Glycosides

• Range of toxicity
  • *Nerium oleander*—2-3 leaves
    • Common in CA
  • 1.5 gram dried foxglove (child)
  • Dogs with ABCB1 more sensitive to CNS effects
  • Cats may be more sensitive than dogs

A. Cardiac glycosides inhibit the Na\(^+\)-K\(^+\)-ATPase, causing a rise in intracellular Na\(^+\).
B. Ca\(^++\) is prevented from exiting cell via antiporter.
C. Elevated intracellular Ca\(^++\) causes release of Ca\(^++\) from the sarcoplasmic reticulum.
D. And enhances cardiac inotropy.
Cardiac Glycosides

• Clinical Signs
  – Vomiting (+/- blood), diarrhea (+/- blood), abdominal pain, hypersalivation
  • Depression, weakness, mydriasis
  – Bradycardia (most common), tachycardia, weak/irregular pulses, AV block, arrhythmias, asystole
  – CNS signs (Kalanchoe)

• Time Frame
  • Depends on amount ingested
  • GI signs as early as 30-45 minutes
  • May persist 4-5 days
Cardiac Glycosides: Treatment

- Early emesis and multiple doses of activated charcoal
- Continuous ECG monitoring (24 hrs)
- Blood pressure monitoring
- Monitor electrolytes:
  - Hyperkalemia: Treat aggressively if it occurs
    - IV sodium bicarbonate or glucose/insulin
  - Rarely, hypokalemia

Foxglove
Cardiac Glycosides: Treatment

- **Arrhythmias**
  - Atropine, beta-blockers, lidocaine
  - Temporary pacemakers

- **ANTIDOTE: Digibind®** (FAB portions of digoxin specific antibodies)
  - Used in humans
  - 1-2 vials needed in pets
  - $600/vial

- **Supportive care**
  - Oxygen therapy
  - IV fluids as needed
  - Correct acid base abnormalities and other electrolyte changes
By Monica Trevino
CNN

(CNN) -- More than 20 horses became ill when they were intentionally poisoned with toxic leaves in southern California this week, authorities said Friday.

The horses were given oleander bush leaves between Wednesday night and early Thursday morning at their ranch in San Diego, the county sheriff's department said in a news release.

The leaves were found in the stalls in the morning by employees arriving to work, according to officials.

"We found bits and pieces of carrots and chopped up apples along with multiple leaves," ranch owner Bill Tomin told CNN television affiliate KFMB.

"This is horrible, it's scary why would someone do such a thing," he said. "If they were angry with me, burn my house down, slash my tires, confront me."
Oleander in the news
Australia, 2011

Supposed to contain 12 Candle Nut seeds. (*Aleurites moluccana*)
Instead, contained Yellow Oleander seeds! (*Thevetia peruviana*)
YEW (*TAXUS SPP.*)
Yew (*Taxus spp.*)

- **Japanese Yew (*Taxus cuspidate*)**
  - Very dangerous cardiotoxin! “Tree of Death”
  - Common evergreen shrub; most toxic in winter; dried plant retains toxin
  - Toxin: Taxines A & B
    - Directly block myocardial Ca and Na channels
    - Negative inotrope (weaker contraction), AV conduction delay
  - Canine minimum lethal dose = 2.3 grams leaves/kg
  - Equine and livestock risk if wreath hung in stable/discarded in pasture

  Toxic doses:
  - 0.1% body weight in horse
  - 0.5% body weight in ruminant

Japanese Yew

All parts toxic (including seed) except flesh of the aril (fruit).
BULB BRIGADE!
Daffodils & Paper whites

- *Narcissus* spp.
- Most concentrated in **bulb**
- Severe gastroenteritis (+ hemorrhagic)
- Possible CNS signs (depression)
- Possible GI obstruction
Tulips

- Glycosides, lectins, glycoproteins
- Fleshy plant = GI upset
- More severe signs such as CNS signs seen with bulb ingestion
Hyacinth (*Hyacinthus* spp.)

- All parts of plant especially bulb
- Calcium oxalate raphides
- Strong gastric irritant
Amaryllis (*Hippeastrum*)

- Amaryllis (*Hippeastrum*)
  - Contain alkaloids (lycorine and tazetine)
  - Concentrated in bulb and leaves (up to 0.5%)
  - CS: Vomiting, diarrhea, anorexia, salivation, hepatopathy, restlessness, tremors, dyspnea, hypotension, seizures
SAGO PALM
Sago palm (Cycad)

- Found everywhere!
  - Ornamental plants
  - Houseplants
  - Tropical/subtropical plants

- *Cycas* and *Macrozamia sp.*

- Toxic agents:
  - Cycasin
  - Neurotoxin
  - Unknown

Photo courtesy Dr. Karyn Bischoff
Sago palm (Cycad)

- All parts of plant toxic!
- Seed most toxic
- Results in: centrolobular and midzonal coagulative hepatic necrosis
- Deadly in dogs: 50% survival*

Sago palm (Cycad)

- Severe clinical signs
  - GIT (e.g., GI hemorrhage)
  - Hepatotoxicity
  - Long-term cardiotoxicity?
- Signs seen within hours
- Increased LFT: 24-48 hours
Sago palm: Treatment

• Decontamination
  – Emesis induction?
  – Activated charcoal: multiple doses

• Baseline blood work
  – CBC
  – Chemistry
  – PCV/TS/BG/liver panel q 24 hours X 3 day
  – PT/PTT
  – Repeat blood work once discharged
Sago palm: Treatment

• Antiemetics

• Coagulopathy
  – Vitamin K₁ SQ
  – Fresh frozen plasma

• Hepatoprotectants
  – SAMe
  – N-acetylcysteine
Handy References Books

• Toxic plant Bible
  • *Toxic Plants of North America, 2nd ed.*, © 2013
  • George E Burrows, DVM, PhD and Ronald J Tyrl, PhD

• Toxic plant mini-Bible
  • *Handbook of Toxic Plants of North America*, © 2006
  • George E Burrows and Ronald J Tyrl

• Other
  • *A Guide to Poisonous House and Garden Plants*, © 2006
  • Anthony P Knight, BVSc., MS, DACVIM
Handy on-line references

• Pet Poison Helpline
  • Website–petpoisonhelpline.com
    • Listing of toxic and non-toxic plants with photos
    • Videos for pet owners
    • Alphabetical list of common names
  • iPhone App – details 200+ toxins, $1.99

• Cornell University Poisonous Plants Information Database
  • Plant listing as well as general plant toxicology information
  • http://www.ansci.cornell.edu/plants/index.html
When in doubt, call for assistance!

- Something you’re not familiar or comfortable with
- Human drugs
- Large drug overdoses
- Mixed drug ingestions
- Severe clinical signs
- Animals with preexisting disease
2014 PPH Free Webinars

UPCOMING FREE CE WEBINARS

PLANTS POISONOUS TO SMALL ANIMALS
Date: April 1, 2014

RODENTICIDES... IT’S MORE THAN JUST VITAMIN K!
Date: June 10, 2014

FOODS TOXIC TO PETS
Date: October 7, 2014

TEACHING MOMENTS IN TOXICOLOGY
Date: December 2, 2014

ALL WEBINARS WILL BE GIVEN AT AND PRESENTED BY:

TIME: 12:00-1:00PM CENTRAL TIME (1:00-2:00PM EASTERN)

SPEAKER: AHNA BRUTLAG, DVM, MS, DABT, DABVT

REGISTER AT WWW.PETPOISONHELPLINE.COM/VEGETINARIANS/WEBINARS

Course meets the requirements for 1 hour of continuing education credit per lecture in jurisdiction which recognizes AAVSB RACE approval; however, participants should be aware that some boards have limitations on the number of hours accepted in certain categories and/or restrictions on certain methods of delivery of continuing education.
Spring goodies!

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**CE credit FAQs**

1. **When will I get my CE certificate?** We’ll email it to you within 24 hrs.

2. **I attended the webinar but wasn’t the person who logged in. Can I still get interactive CE credit?** Yes. Send your name and email address to info@petpoisonhelpline.com by 1 pm central time, April 2, 2014 (strict deadline).

3. **Can I watch the recorded webinar online for CE credit?** Yes. You can receive non-interactive CE credit. Go to the “For Vets” page on our website, www.petpoisonhelpline.com for more info.

Comments? Questions? Email us! info@petpoisonhelpline.com
Acknowledgements

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