SAVING PETS' LIVES, 24 HOURS A DAY, 7 DAYS A WEEK

PET POISON HELPLINE

VPI SM

From Indoors to Out:
Plants Poisonous to Small Animals

April 1, 2014

Ahna Brutlag, DVM, MS, DABT, DABVT
Associate Director of Veterinary Services
Pet Poison Helpline
abrutlag@petpoisonhelpline.com
&
Adjunct Assistant Professor
Dept. Veterinary Biomedical Sciences
College of Vet. Med., University of Minnesota

Introduction

Ahna G. Brutlag, DVM, MS, DABT, DABVT

Associate Director

Pet Poison Helpline
Minneapolis, Minnesota


CENSORED

Did you know?

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

2012	2013
$389,320.74 in submitted fees	$538,336.37 in submitted fees
Average fee per pet = $507.85	Average fee per pet = $565.48

VPI® and Pet Poison Helpline® working together

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

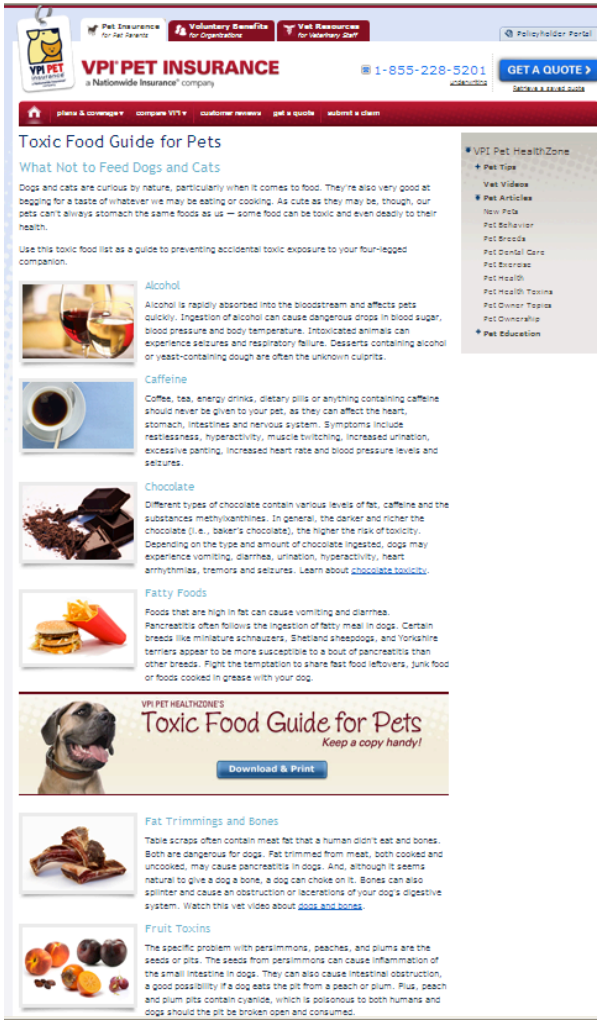
- Addressing the cost of veterinary care
  - VPI covers the $39 Pet Poison Helpline fee when a pet is brought in to your hospital for care

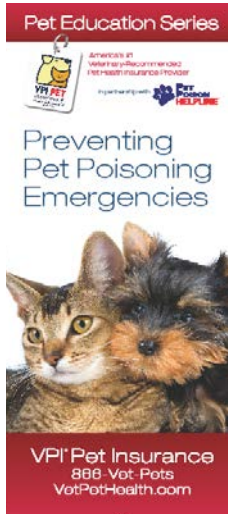
- Enabling best medicine
  - Pet owners with VPI Pet Insurance spend twice as much on their pets (single events) than those without VPI Pet Insurance

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
800.213.6680
www.petpoisonhelpline.com

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

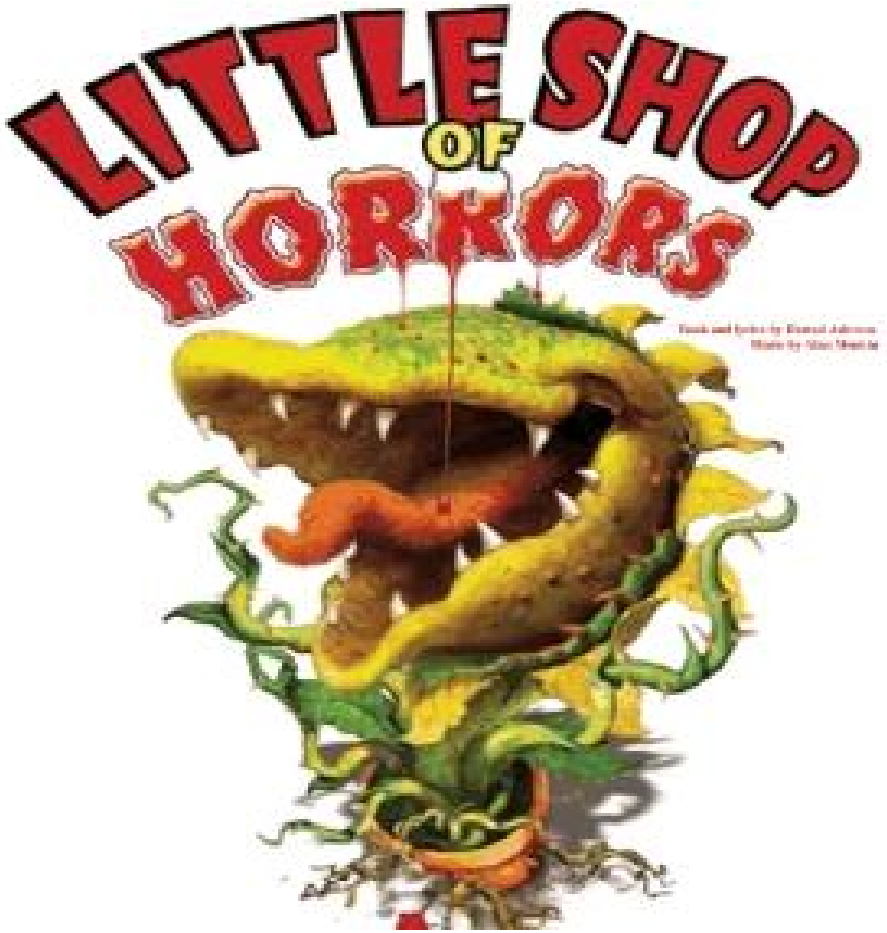
PET POISON HELPLINE®
800.213.6680
www.petpoisonhelpline.com

PET POISON HELPLINE
800.213.6680
www.petpoisonhelpline.com

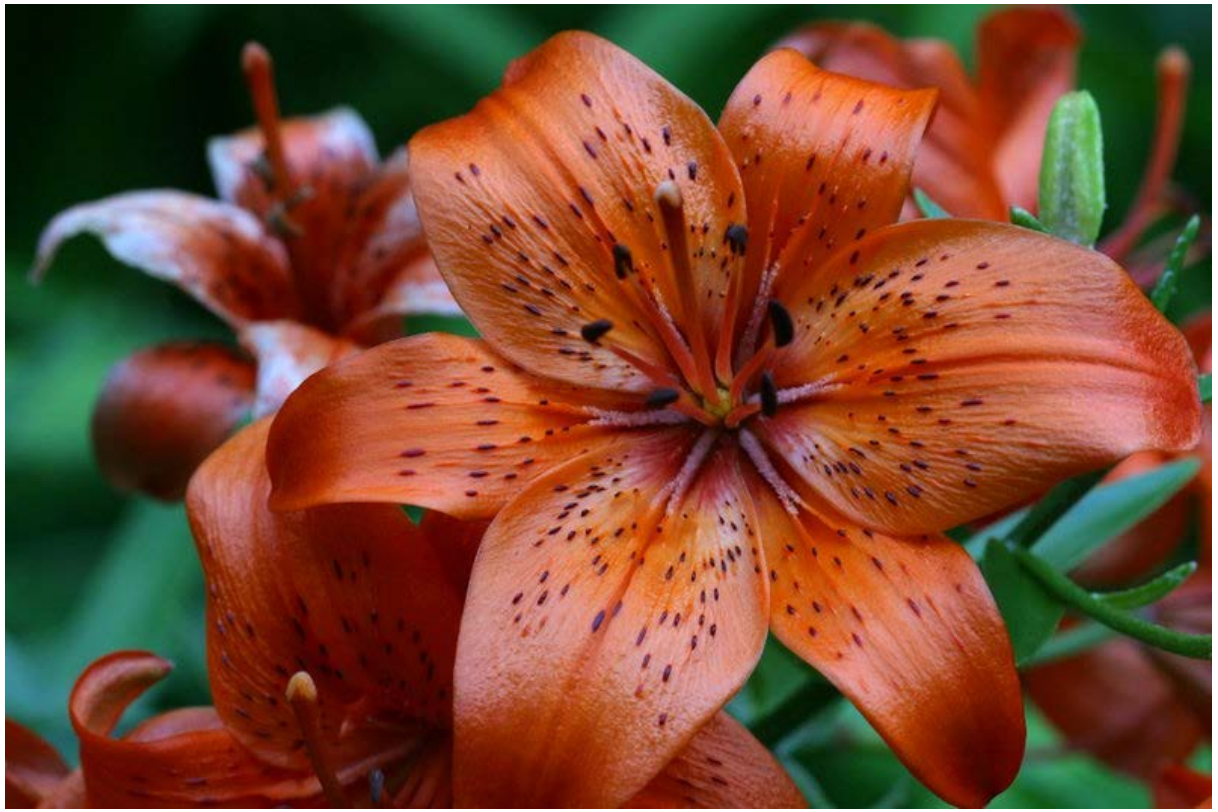
Lecture Objectives

- Review the most common plants involved in small animal poisonings
  - Identification
  - Mechanism of action
  - Decontamination
  - Treatment
  - Prognosis

Most plants aren't this bad…



PET POISON HELPLINE



LILIES

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 (*Lilium* sp.)
- Do NOT cause renal failure in cats but do have other toxic principles

Calla Lily
(*Zantedeschia* spp.)

Peace Lily
(*Spathiphyllum* genus)

Lily of the Valley
(*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 x1

- Fluids, fluids, fluids X 48-72 hours

- Gastrointestinal support:
  - Antiemetic
  - H_2 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)

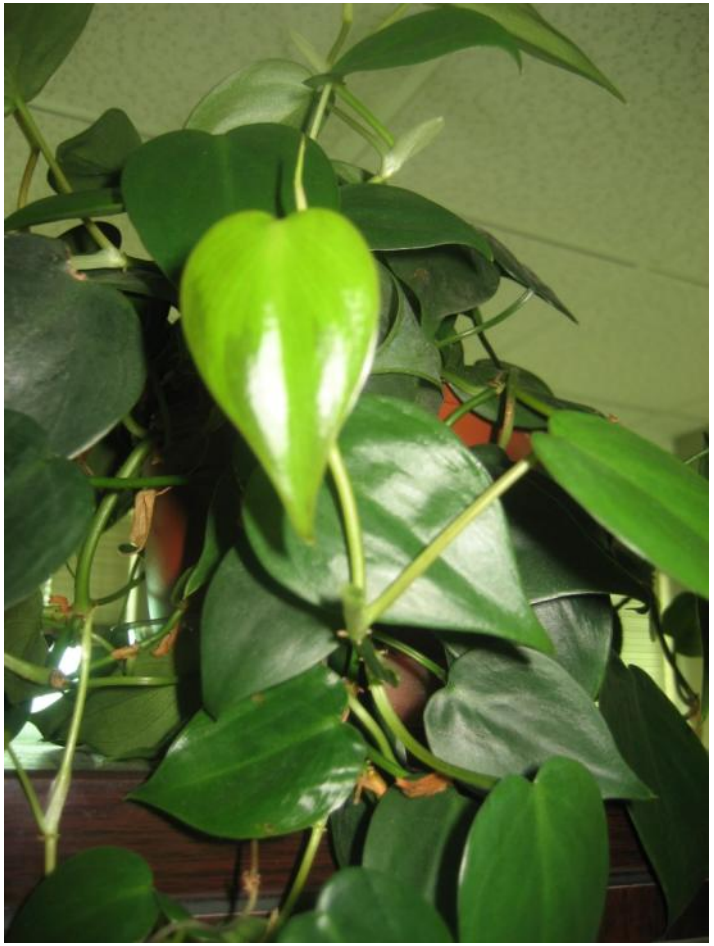
AJ Bennett, BVSc, and EL Reineke, VMD, DACVECC

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

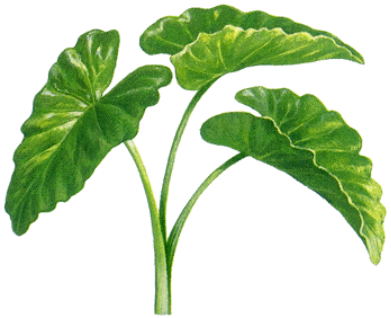


Insoluble oxalates

- 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

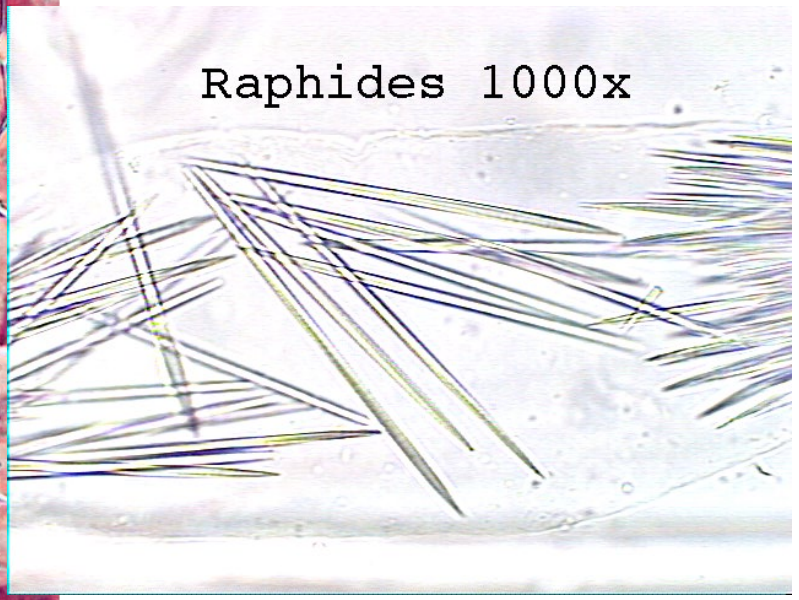


Raphide (Ca oxalate) structure

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

Case Report

Journal of Veterinary Emergency and Critical Care **19**(6) 2009, pp 635–639
doi: 10.1111/j.1476-4431.2009.00486.x

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

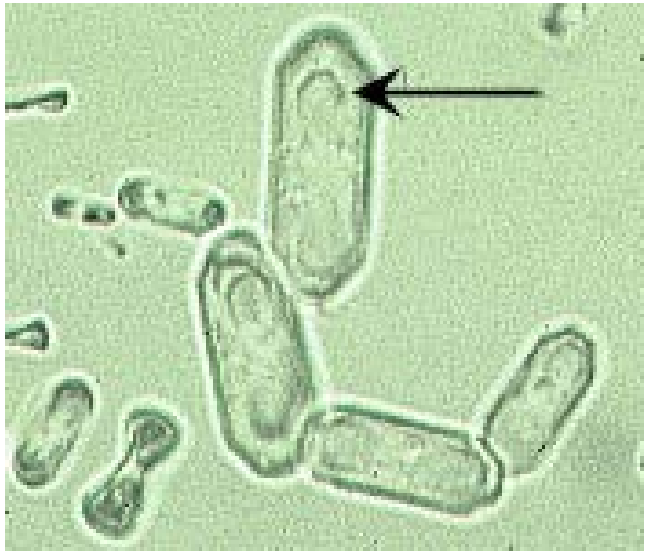
Soluble oxalate-containing plants

- 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 X1
- Clinicopathologic monitoring
  - Hypocalcemia
  - Oxaluria
  - Azotemia
- Fluid therapy
- Anti-emetics
- Symptomatic supportive care

http://virtuavet.wordpress.com/2010/07/15/the-best-cat-i-v/

PET POISON HELPLINE

CARDIAC GLYCOSIDES

Cardiac Glycosides

- Prototype: 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 obsesum*)
  - Dogbane (*Apocynum* spp.)
  - Giant milkweed (*Calatropis* spp.) – large animal
  - Milkweed (*Asclepias* spp.) – large animal
  - Star of Bethlehem (*Ornithogalum umbellatum*)

Foxglove
(*Digitalis pupurea*)

Lilly of the Valley (*Convallaria majalis*)

Suggested read: Atkinson, KJ et al. Suspected lily-of-the-valley (*Convallaria majalis*) toxicosis in a dog. JVECC 2008; 18(4)

Foxglove (*Digitalis pupurea*)

Kalanchoe (*Kalanchoe* spp.)

Suggested read: Smith G.. **Kalanchoe species poisoning in pets** Vet Med 2004; 99(11)

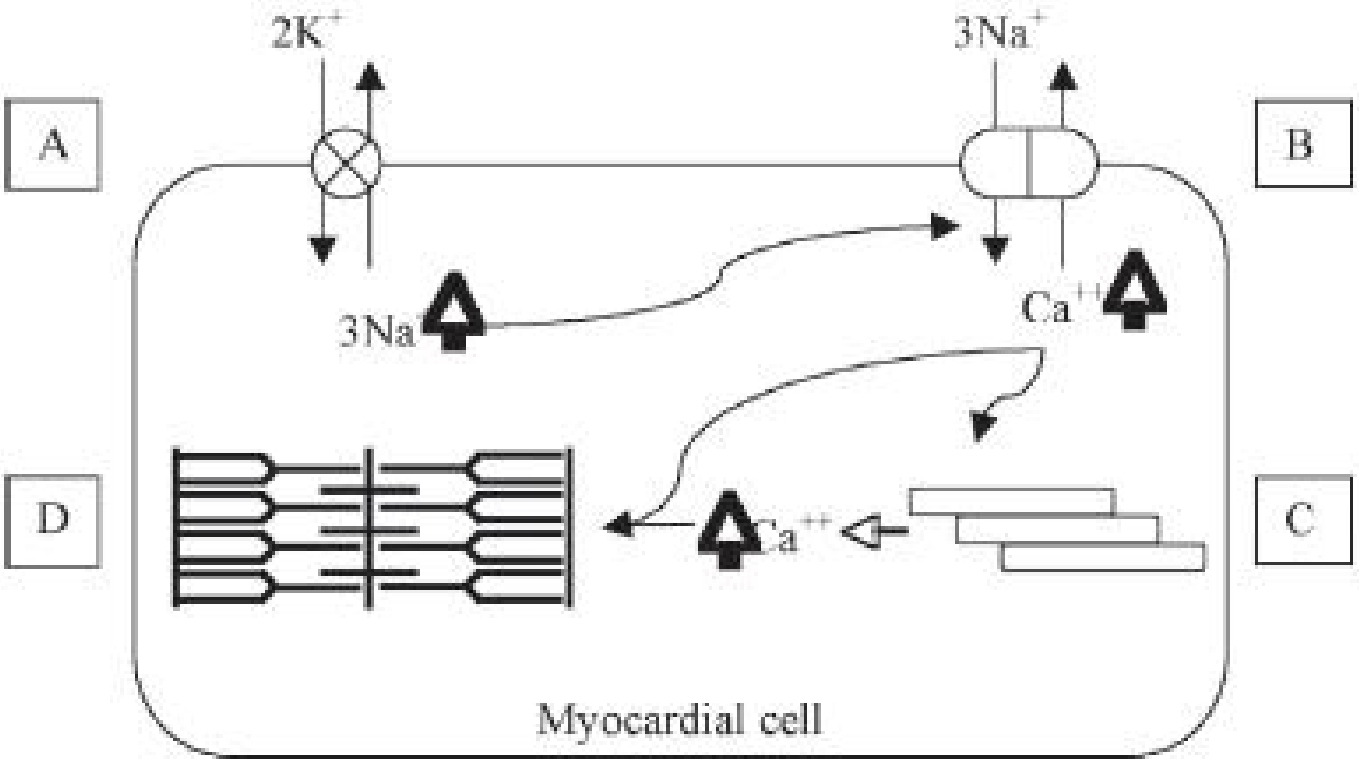
Cardiac Glycosides

- 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

Nerium oleander

Suggested read: Cargill & Martinson. Cardiac glycosides. In: Osweiler GD, Hovda LR, Brutlag AG, Lee JA, eds. *Blackwell's Five-Minute Veterinary Consult Clinical Companion: Small Animal Toxicology*. Ames, IA: Wiley-Blackwell, 2011

Figure 2. Mechanism Of Cardiac Glycosides.



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.

http://www.ebmedicine.net/topics.php?paction=showTopicSeg&topic_id=91&seg_id=1750

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

Oleander poisoning 23 horses, SanDiego, CA in 2009

Dozens of horses poisoned at California farm

STORY HIGHLIGHTS

- At least 20 horses were deliberately poisoned on farm, authorities say
- Toxic oleander leaves were found with apples, carrots in horses' stalls
- No word yet on possible motive or sickened horses' prognosis

updated 8:00 a.m. EDT, Sat August 1, 2009

Next Article in Crime »

By Monica Trevino
CNN

TEXT SIZE

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

These oleander bush leaves, toxic to horses, were found in a San Diego, California, stable.

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

- **Cope RB, et al. Fatal yew (Taxus sp) poisoning in Willamette Valley, Oregon, horses. *Vet Hum Toxicol*. 2004 Oct;46(5):279-81.**
- **Wilson CR, Sauer J, Hooser SB. Taxines: a review of the mechanism and toxicity of yew (*Taxus spp.*) alkaloids. *Toxicon* 2001;39:175-185.**

PET POISON HELPLINE

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*

*Survival and prognostic indicators for Cycad intoxication in dogs. Ferguson, et al. *J Vet Internal Med* 2011; 25:831-837

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

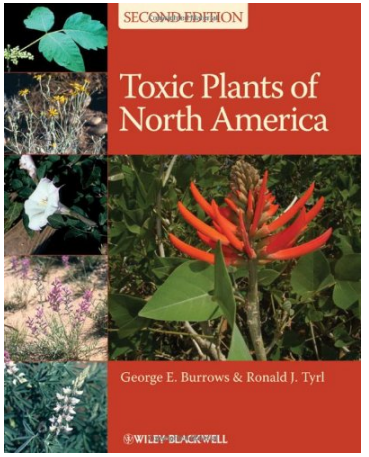
- Baseline blood work
  - CBC
  - Chemistry
  - PCV/TS/BG/liver panel q 24 hours X 3 day
  - PT/PTT
  - Repeat blood work once discharged

Sago palm: Treatment

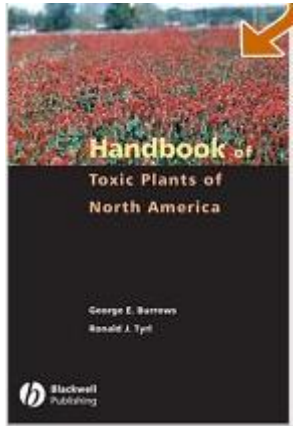
- Antiemetics
- Coagulopathy
  - Vitamin K_1 SQ
  - Fresh frozen plasma
- Hepatoprotectants
  - SAMe
  - N-acetylcysteine

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

SAVING PETS' LIVES, 24 HOURS A DAY, 7 DAYS A WEEK

PET POISON HELPLINE

2014 PPH Free Webinars

PET POISON HELPLINE®
800.213.6680
www.petpoisonhelpline.com

UPCOMING FREE CE WEBINARS

ALL LECTURES ARE 1 HOUR OF RACE-APPROVED CE

VPI℠

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

NYSED
Approved as a New York State sponsor of continuing education for veterinarians and veterinary technicians

REGISTER AT WWW.PETPOISONHELPLINE.COM/VETERINARIANS/WEBINARS

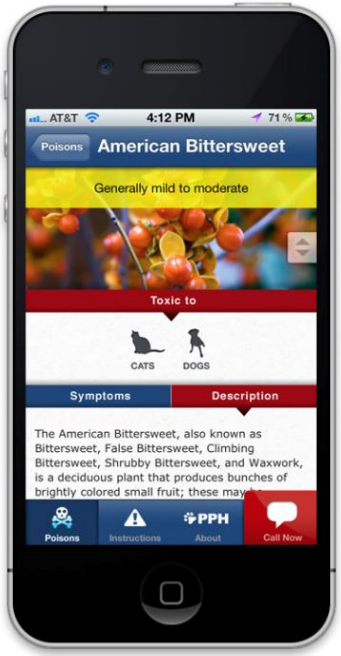
COURSE MEETS THE REQUIREMENTS FOR 1 HOUR OF CONTINUING EDUCATION CREDIT PER LECTURE IN JURSITICTION WHICH RECOGNIZE AAVSB RACE APPROVAL; HOWEVER, PARTICIPANTS SHOULD BE AWARE THAT SOME BOARDS HAVE LIMITATIONS ON THE NUMBER OF HOURS ACCEPTED IN CERTAIN CATEGORIES AND/OR RESTRICTIONS ON CERTAIN METHODS OF DELIVERY OF CONTINUING EDUCATION.

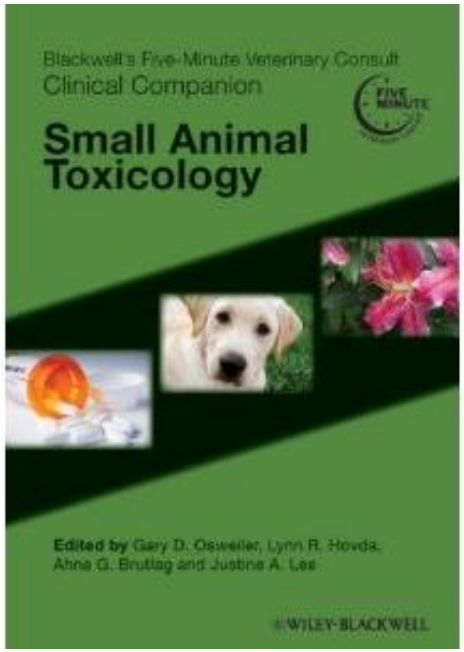
PET POISON HELPLINE

Spring goodies!

Free for clinics!
Request one via email
info@petpoisonhelpline.com

Our iPhone app
Details 200+ toxins
$1.99





100+ chapters for general and ER practices.
Practical and clinical!
Order from PPH for only $75 (25% savings).
info@petpoisonhelpline.com

Did you get your "wheel of vomit"?

info@petpoisonhelpline.com

For veterinary clinics only – one per clinic!

PET POISON HELPLINE™
800.213.6680
www.petpoisonhelpline.com

VPI SM

Thank you for attending!

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 1pm 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

Tyne Hovda – plant photos

Lynn R. Hovda, RPh, DVM, MS, DACVIM – editorial commentary