

# Spring and Easter Toxins

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# Easter and Spring Toxins

- Palm Sunday palms
- Easter lilies
- Easter basket goodies
  - Chocolate
  - Xylitol and other candy
  - Easter egg dyes
  - Easter grass
- Lawn and garden products
  - Fertilizers
  - Herbicides
  - Insecticides
- Antihistamines



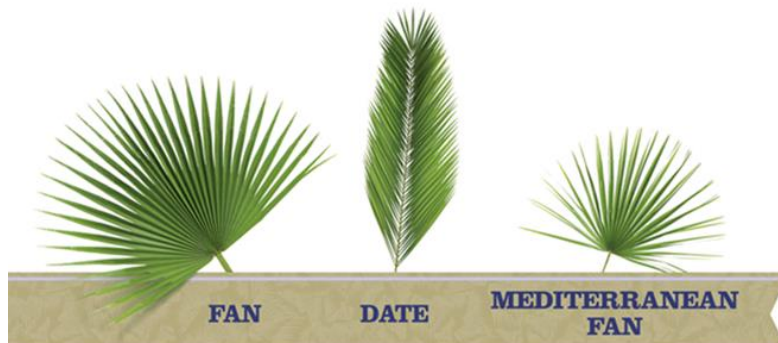
# What are these flowers and plants??

- Florist
- Master gardener
  - <http://www.extension.umn.edu/garden/master-gardener/contact/county/>
- University horticulture or botany department
- Extension service
  - <http://www.extension.umn.edu/garden/ask/>
- Garden center



# Palm Sunday Palms

- Many are non-toxic or just a GI irritant concern
  - Fan palms (various spp, *Arecaceae* family)
  - Cabbage palmetto (*Sabal palmetto*)
  - Date palms (*Phoenix dactylifera*)
  - Mediterranean fan palms (*Chamaerops humilis*)



# Palm Sunday Palms - Sago

- *Cycas revoluta*
- Ancient plant and not a true palm
- Also sold as a houseplant, bonsai
- All parts of the plant are toxic
  - Seeds are considered most toxic
  - Mortality ranges from 32-50% (Albretsen; Ferguson)



# Sago Palm: 3 major toxins

- Cycasin (major glycoside): Converted by beta-glucosidases found in GIT to aglycone methylazoxymethanol (MAM).
  - MAM may cause centrilobular and midzonal coagulative hepatic necrosis
  - MAM may also cause GI irritation
  - Carcinogenic, mutagenic, teratogenic, neurotoxic, hepatotoxic
- Beta-methylamino-L-alanine (BMAA): Neurotoxic amino acid
  - Ataxia in rats
  - Implicated in development of Guam disease in human beings (signs similar to ALS or Alzheimer's)
- Unidentified HMW (high molecular weight) toxin:
  - Associated with hindlimb paralysis in cattle
  - Axonal degeneration in CNS and ataxia in rats

# Sago Clinical Signs

- GI signs develop rapidly, usually within 8 hours
- Liver toxicity develops within 48-72 hours
- Vomiting (+/- blood), lethargy, diarrhea (melena, hematochezia), anorexia
- Less common signs: Hyperthermia, abdominal pain, tremors, ataxia, mentation changes, seizures, icterus
  - Seizures thought to be related to hepatic damage/failure (e.g., hepatic encephalopathy)
  - Coagulopathy secondary to liver failure can occur

# Sago Treatment

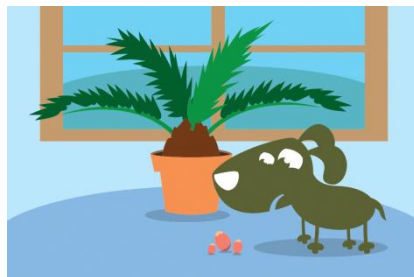


- Induce emesis if recent
- Multiple doses of AC q 8 h x 24 hours
- Baseline bloodwork and recheck liver at 24, 48, and 72 h then as needed until normalized/plateaued
- Monitor electrolytes, blood glucose, coags as needed while hospitalized



# Sago Treatment

- IVF
- GI support: antiemetics, GI protectants
- Hepatic support
  - SAM-e (Denosyl, Denamarin)
  - NAC 140 mg/kg IV or PO followed by 70 mg/kg every 6 hours IV or orally for 7-17 doses



# Sago Treatment

- Treatment of liver failure
  - Transfusion as needed if coagulopathic and/or if enough GI blood loss
  - Treatment of hepatic encephalopathy
  - Anticonvulsants if seizures develop



# Easter Lilies



# Lilies – which are which???

- *Lilium* species
  - Easter lilies, tiger lilies, stargazer lilies
- *Emerocallis* species
  - Day lilies
- Calla lilies
- Peruvian lilies (*Alstromeria*)
- Lily of the valley
- Peace lilies



# *Lilium and Hemerocallis species*

- Renal toxin in cats
- All parts of the plant are toxic
- *All exposures* should be considered serious, including pollen and vase water exposures



# Clinical Signs and Course of Toxicity

- **0-12 hours post ingestion**
  - Salivation, vomiting, anorexia, depression
- **12-24 hours post ingestion**
  - Polyuria, dehydration
  - Azotemia with creatinine often disproportionately higher than BUN
- **24-72 hours post ingestion**
  - Renal failure
  - Continued anorexia, vomiting, depression, weakness, anuria, death if untreated



# Treatment of Lily Poisoning

- Emesis if recent
- Bathe if pollen exposure
- Activated charcoal x 1 dose if recent
- Baseline lab work and recheck q 24 hours for at least 48 hours or until normalized
- IV crystalloids x 48 hours minimum
- GI support with antiemetics, GI protectants as needed
- Excellent prognosis if treatment within 18 hours





# Calla Lilies and Peace Lilies

- Contain insoluble calcium oxalate crystals
- Can cause self-limiting drooling, oral irritation, vomiting, vocalizing, pawing at the mouth
- Treatment is symptomatic:
  - Rinse mouth, dilute milk or yogurt
  - Antiemetics, fluids, GI protectants prn





# Peruvian Lilies or Alstromeria

- Mild and self-limiting GI upset
- Treatment is symptomatic and supportive
  - Anti-emetics, fluids if needed



# PPH/MVMA Educational Campaign

- [www.noliliesforkitties.com](http://www.noliliesforkitties.com)
- Download free graphics/lily info
- Free video
- List of safer flower alternatives

**NO LILIES FOR KITTIES!**



**Cats and lilies don't mix!**  
*Lilium* species ("true lilies") such as Easter, tiger, Asiatic, Oriental, etc., and daylilies ( *Hemerocallis* ) are highly toxic to cats (not dogs or people). **Ingesting petals, leaves, pollen, or even water in the vase can result in kidney failure and death.** If your cat eats any part of a lily, call Pet Poison Helpline, your local emergency clinic or your veterinarian immediately.  
**Early treatment is imperative!**

SEE BELOW FOR SAFER FLOWER CHOICES FOR CATS

Other lily varieties shown here such as peace (*Spathiphyllum*), Peruvian (*Alstroemeria*) and calla (*Zantedeschia*) are much less dangerous and cause only minor symptoms when eaten.



**SAFER\* cut flower choices include:** Roses, sunflowers, tulips, irises, carnations, mums, baby's breath, hyacinth and daffodils.

\*These flowers may cause vomiting and diarrhea but are not considered life threatening.

[www.noliliesforkitties.com](http://www.noliliesforkitties.com)

 **PET  
POISON  
HELPLINE**  
800.213.6680  
www.petpoisonhelpline.com

 **MVMA**  
Minnesota Veterinary  
Medical Association

# What is in that Easter basket?



# Easter Chocolate

- What kind of chocolate?
  - Unsweetened > semi-sweet > dark > milk > white
- What brand and product?
- What is the weight or amount? Hollow or solid or filled?
- What other ingredients?
  - Xylitol, nuts, raisins, coffee, alcohol, more chocolate, marijuana
  - Recipes for baked goods?
- Foreign body potential?



# Chocolate Signs

- Mild signs  $>20$  mg/kg theobromine
  - Vomiting, diarrhea, excitability, increased thirst
- Moderate signs  $>40$  mg/kg theobromine
  - Tachycardia, hypertension
- Severe signs  $>60$  mg/kg theobromine
  - Arrhythmias
  - Tremors
  - Seizures





# Chocolate Treatment

- Induce emesis up to 6 hours after ingestion
- Activated charcoal
  - 1 dose if mild/low moderate and multiple doses if high moderate/severe
- Antiemetics
- Fluids – IV vs SQ
- Frequent walks to keep bladder empty
- Monitoring HR, BP, CNS status



# Chocolate Treatment

- Sedation (acepromazine 0.02-0.04 mg/kg, butorphanol 0.2-0.4mg/kg IV)
- Beta blockers if persistent tachycardia HR > 180
- Methocarbamol 55-220mg/kg IV to effect for tremors
- Benzodiazepine or other anticonvulsants for seizures
- Monitor for pancreatitis



# Xylitol

- Naturally occurring sugar alcohol found in hardwoods such as birch and present in low amounts in many fruits and vegetables
- Usually produced using corncob remnants from ethanol plants
- Discovered in 1891 and approved by the FDA in 1986 as a food additive and has unlimited restrictions regarding its safety
- Metabolism occurs independent of insulin in humans but causes stimulation of pancreatic islet cells and insulin release in dogs



# Xylitol Uses



- Sweetener
- Anticariogenic
- Antimicrobial for oral bacteria
- Low glycemic index, ideal for diabetics
- Cooling effect in oral and nasal cavities
- Humectant
- Prevents fermentation and molding
- Ear infections
- Wound bandaging
- Return of post-operative intestinal motility

# Xylitol



- Sources
  - Gums, mints
  - Sugar free, low calorie, and/or low carb foods
  - Dental products - toothpaste, mouthwash and dental floss
  - Lotions, cosmetics, deodorants, many other products
- Other sugar alcohols
  - Sorbitol, mannitol, erythritol, maltitol, isomalt
  - GI signs only

# Xylitol Signs

- Hypoglycemia > 0.1 g/kg
  - Rapid and dose dependent rise in serum insulin causes hypoglycemia
- Liver toxicity >0.5 g/kg
  - MOA unknown
  - ALT may rise within 12 hours, peaks within 1-2 days
- Rapid onset of signs
  - Vomiting
  - Hypoglycemia: lethargy, ataxia, recumbency, tremors, seizures
  - Hepatic necrosis: elevated ALT and tbili, vomiting, lethargy, anorexia, icterus, secondary coagulopathy



# Xylitol Treatment – 0.1-0.5 g/kg

- Check BG before inducing emesis!
- Activated charcoal does not bind xylitol well
- Monitor blood glucose q 2-4 h prn for at least 12 hours or until normal
- Dextrose supplementation if hypoglycemia develops
- Small frequent meals and antiemetics prn
- Monitor electrolytes for hypokalemia
- Patient should maintain euglycemia for at least 6 hours without supplementation before discharge



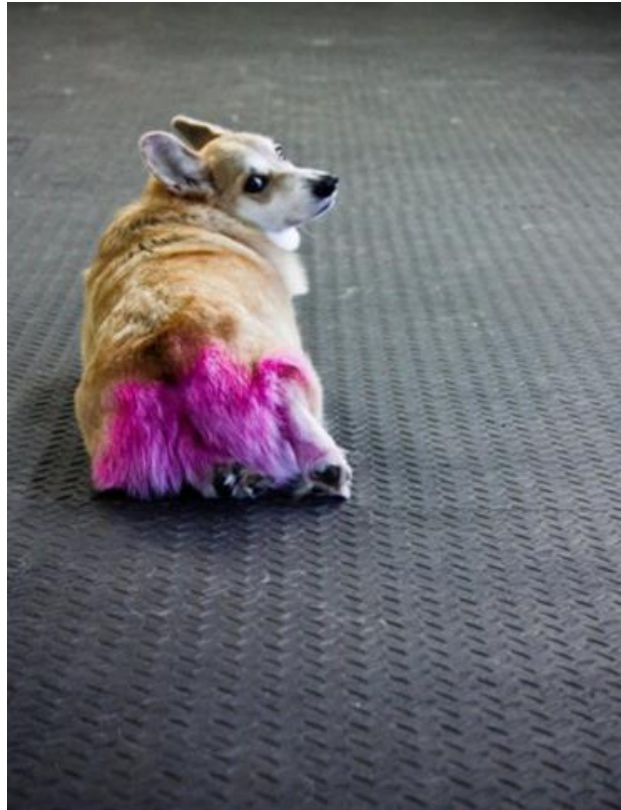
# Xylitol Treatment >0.5 g/kg

- Same initial treatment as for lower ingestions
- Pre-emptive dextrose supplementation for hepatic support
- Hepatoprotectants +/- N-Acetylcysteine if liver enzymes are elevating or if a very high dose ingested
- Monitor liver values – baseline and recheck q 12-24 h x 72 h or until normalized
- Treatment for coagulopathy if indicated
  - Vitamin K1
  - Transfusion



# Easter Egg Dyes

- Non-toxic however...



# Easter Grass

- Non-toxic but foreign body concern
- Consider paper, edible candy grass, green coconut, or actual grass instead



# Spring Lawn and Garden Products

- Fertilizers
- Compost
- Herbicides
- Insecticides





# Household Fertilizers

- Most home yard/garden fertilizers are low order toxicity, especially once applied, watered in, and dried
  - Poorly absorbed by a dog's stomach but can cause GI upset
- Blood meal
  - Dried, ground and flash-frozen blood containing a large amount of nitrogen
- Bone meal
  - Defatted, dried and flash-frozen animal bones ground in to a powder
- GI upset, pancreatitis and FBO possible with large ingestions
- Possible mycotoxins if old and moldy



# Milorganite

- Sewage sludge-based fertilizer
- Increased risk of GI signs
- Potential for self-limiting muscle pain, stiffness, myalgia within 24 hours of ingestion
- Contains iron but in an insoluble form
- Treatment is supportive with fluids, antiemetics, analgesia as needed



# Compost

- Commonly contains tremorgenic mycotoxins
- Signs
  - GI signs, especially vomiting
  - Tremors, ataxia, seizures, hyperthermia
- Treatment
  - Induce emesis vs gastric lavage
  - AC if recent
  - Antiemetics prn
  - IVF
  - Methocarbamol, anticonvulsants for tremors and seizures
  - Monitor vitals and blood glucose



# Home Lawn and Garden Herbicides

- Generally low order toxicity to mammals, especially if applied and allowed to dry as directed
- Low risk from ingesting treated grass once dry
  - Typically absorbed into plants quickly
- GI upset possible with ingestion of wet product



# Household and Yard Insecticides

- Pyrethroids
- Organophosphates and carbamates
- Neonicotinoids – imidacloprid, dinotofuran
- Fipronil
- Hydramethylnon
- Avermectins
- Insect growth regulators – s-methoprene, pyriproxifen
- Boric acid and other borates
- *Bacillus thuringiensis* – mosquito dunks
- May come in various forms
  - Sprays – RTU vs concentrates
  - Granules
  - Baits
  - Dusts
- Check concentration
- Look at the package!
- Was it wet or dry?
- When and where was it applied?
- How was the pet exposed?

# Wider Margin of Safety Insecticides

- Neonicotinoids
- Fipronil
- Hydramethylnon
- Low concentration avermectins
- Insect growth regulators
- Low concentration borates
- *Bacillus thuringiensis*



- Only mild GI upset expected unless a massive exposure or high concentration product
- Symptomatic and supportive treatment
- Rule-out GI FB if packaging ingested
- *Bacillus thuringiensis* is not pathogenic in mammals

# Pyrethroids

- Most are low concentration in household products and therefore lower risk even for cats
- GI upset is most common if ingested
- Tremors and seizures are less common unless a high concentration product, massive exposure, or bifenthrin granules
  - Treat with decontamination, fluids, methocarbamol, anticonvulsants, GI support prn

# High vs Low Concentration Pyrethroids

- Canine flea/tick spot-on
- RTU home insect barrier spray



<b>ACTIVE INGREDIENTS:</b>	
Permethrin*	45.00%
Pyriproxyfen**	1.90%
<b>OTHER INGREDIENTS:</b>	<b>53.10%</b>
<b>TOTAL</b>	<b>100.00%</b>

## ACTIVE INGREDIENTS

Gamma-Cyhalothrin	0.025%
Other Ingredients	99.975%
<b>Total</b>	<b>100.00%</b>



# Organophosphates and Carbamates

- Less common in household products
- Some compounds are more potent than others
- Inhibit AChE at cholinergic sites
  - Depolarizes postsynaptic membrane causing stimulation
- Clinical signs seen as early as 30 minutes
  - Muscarinic
    - SLUDGE
    - Bradycardia
    - Dyspnea
  - Nicotinic
    - Weakness
    - Muscle tremors
    - Paralysis
    - Seizures
    - Tachycardia
    - Ataxia

# OP and Carbamate Treatment

- Induce emesis if early and asymptomatic
- Activated charcoal if recent and asymptomatic
- IVF
- Muscarinic signs
  - Atropine
    - 0.1-2mg/kg  $\frac{1}{4}$  IV, remainder IM, SQ
  - 2PAM (pralidoxime chloride) Hard to find and expensive
    - 20mg/kg IV, SQ q 12 hours slowly over 15-30 min
- Nicotinic signs
  - Diphenhydramine 1-2mg/kg IM q 8 hours
  - Anticonvulsants

# Antihistamines

- 1<sup>st</sup> generation antihistamines
  - Lipophilic and cross blood-brain barrier
  - More sedating
  - Shorter acting
  - Diphenhydramine (Benadryl)
  - Clorpheniramine
  - Dimenhydrinate (Dramamine)
  - Doxylamine (NyQuil)
  - Hydroxyzine
- 2<sup>nd</sup> generation antihistamines
  - Less lipophilic and less likely to cross blood-brain barrier
  - Less sedating
  - Longer acting
  - Loratadine (Claritin)
  - Cetirazine (Zyrtec)
  - Fexofenidine (Allegra)
- Have the owner bring the package to verify no other ingredients and to verify no decongestant (pseudoephedrine)!



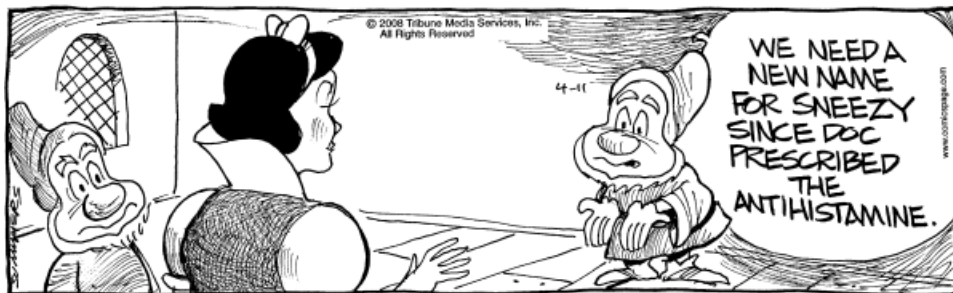
# Antihistamines MOA

- Inhibit effects of histamine at H1 receptors thereby inhibiting physiological effects which occur as a result of histamine release
- Other possible activities
  - Drying
  - Antipruritic
  - Sedating
  - Antitussive
  - Antiemetic
  - Anticholinergic



# Antihistamine Toxicity Signs

- Sedation vs hyperactivity
- Vomiting, mydriasis, ataxia, tremors, seizures, tachypnea are possible with high doses
- There appears to be individual variations in sensitivity and also signs and severity may vary depending on the specific agent



# Antihistamine Toxicity Treatment

- Induce emesis and give AC x 1 if recent
- Monitor CNS, HR, RR, temperature
- Treatment is symptomatic and supportive
  - Fluids for hydration
  - Antiemetics
  - Sedation for agitation
  - Methocarbamol for tremors
  - Anticonvulsants for seizures



# Pseudoephedrine



- Sympathomimetic drug with alpha-adrenergic properties used as a decongestant
- Both regular and extended release formulas
- May be in combination with antihistamines or other drugs (Claritin D, Zyrtec D) or alone
- Federal regulations require it to be sold behind the counter because it can be used to illegally manufacture methamphetamines

# Pseudoephedrine Signs

- Tachycardia, hypertension, reflex bradycardia
- Agitation
- Hyperthermia
- Mydriasis
- Vomiting
- Seizures, tremors
- Moderate signs >5-6 mg/kg
- Death at >10 mg/kg
- Signs may last for 18-24 hours with regular release and 24-72 hours if sustained release





# Pseudoephedrine Treatment

- Induce emesis if recent
- AC – possibly multiple doses if XR version
- Monitor CNS, BP, & HR
- IVF for hydration and perfusion
- Sedation if agitated and/or hypertensive
  - Acepromazine or butorphanol – avoid benzos
- Anticonvulsants, methocarbamol prn
- Beta blocker if persistently tachycardic



# Questions



# Pet Poison Helpline

## Thank you!

[www.petpoisonhelpline.com](http://www.petpoisonhelpline.com)

