



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

PET POISON HELPLINE



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Vitamins, Minerals, and Herbal Supplements:

The Good, the Bad, and the Very, Very Bad

September 20, 2016



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What is Pet Poison Helpline?

- **24/7 animal poison control center**
- **Veterinary & human expertise**
 - 20 DVMs, 50 CVTs
 - DABVT, DABT
 - DACVECC
 - DACVIM
 - 7 PharmDs
- **Case fee of \$49 includes**
 - Unlimited consultation
 - Fax or email of case report
- **Educational center**
 - Free webinars (archived)
 - Tox tools
 - Wheel of Vomit
 - Pot of Poisons (toxic plants)
 - Textbook
 - iPhone app
 - Newsletters for vet professionals
 - Free resources for clinics
 - Videos
 - Electronic material
 - Clings

Email us for info!



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Whole Pet from Nationwide

Carol McConnell, DVM, MBA
 Chief Veterinary Officer
 September 2016



ONE

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 COMPANY
 2016/09/18
 09/18/16

The best pet insurance plan ever!



90% reimbursement with \$250 annual deductible

90% back on all veterinary bills

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Clients get back 90% on **everything** from Bordetella to bilateral ACL surgeries; from dental cleanings to dysplasias. It's serious coverage—which means serious business for you.

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- All injuries, illnesses, and cancer including hereditary and congenital conditions
- All diagnostic testing including xrays, MRIs, CAT scans and ultrasounds
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Speaker Introduction



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Vitamins and Supplements

Why is this topic important?

- Exposure to supplements is common.
- As the public becomes more health conscious, pet exposures have increased exponentially.
- Supplements contain ingredients that can cause life threatening signs or death if not treated




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Regulatory requirements for vitamins and supplements

- U. S. Food and Drug Administration
- Manufacturer is *not* required to prove safety and effectiveness prior to marketing
- Permitted to say that a dietary supplement addresses a nutrient deficiency, supports health, or is linked to a certain body function (e.g. immunity)
- Manufacturers are expected to follow "good manufacturing practices"
- Once on market, FDA monitors safety and product information; 15 day reporting requirement for serious AE's (humans only)



Commonly used units

- Milligram (mg)
- Micrograms (ug, mcg)
- Grams (g)
- Grains (gr)
- International units (IU)
- 1X, 2X, 3X, 1C, 2C, 3C (homeopathic)



Where do we go from here?



Supplement Facts

Serving Size 2 Scoops (46 g)
Servings Per Container approx. 20

Amount Per Serving

Calories 160

% Daily Value*

Total Fat 2 g 3%

Saturated Fat 1 g 5%

Trans Fat 0 g 0%

Cholesterol 60 mg 17%

Sodium 60 mg 4%

Total Carbohydrate 17 g 6%

Dietary Fiber 4 g 8%

Soluble Fiber 4 g 8%

Insoluble Fiber 2 g 4%

Sugars 22 g 44%

Protein 22 g 44%

Vitamin A 1250 IU 25%

Vitamin C 15 mg 25%

Vitamin D 300 IU 25%

Vitamin E 7.5 IU 25%

Vitamin K 20 mcg 25%

Thiamin 0.38 mg 25%

Riboflavin 0.43 mg 25%

Niacin 5 mg 25%

Vitamin B6 0.5 mg 25%

Folic Acid 100 mcg 25%

Vitamin B12 1.5 mcg 25%

Biotin 75 mcg 25%

Pantothenic Acid 2.5 mg 25%

Calcium 160 mg 16%

Iron 4.5 mg 25%

Phosphorus 150 mg 15%

Colline 37.5 mcg 25%

Magnesium 110 mg 28%

Zinc 9.8 mg 25%

Selenium 17.5 mcg 25%

Copper 0.5 mg 25%

Manganese 0.5 mg 25%

Chromium 30 mcg 25%

Molybdenum 18.6 mcg 25%

Potassium 400 mg 11%

* Percent Daily Values are based on a diet of 2,000 calories per day. Your daily values may be higher or lower depending on your diet.

Total Fat Less than 20 g 20 g

Saturated Fat Less than 10 g 10 g

Cholesterol Less than 300 mg 300 mg

Total Carbohydrate Less than 240 g 240 g

Dietary Fiber 25 g 25 g

Calories Per Gram 4 4

Calories 160 160

Protein 22 g 22 g



Learning objectives

- Recognize which ingredients are potentially toxic
- Calculations / conversions
- Clinical signs / treatment



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Iron

Check for xylitol in chewable vitamins!

- Essential heavy metal
- Multivitamins, prenatal vitamins, iron supplements, birth control pills
- Hand warmers, "safe" slug/snail bait, oxygen absorbers, heat wraps



Xylitol 1g/tablet
Iron (tris-glycinate) 5 mg/tablet
Chewable!

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Examples of available forms

- Ferrous fumarate 33% elemental iron
- Ferric hydroxide 63%
- Ferrous gluconate 12%
- Ferric phosphate 37%
- Ferrous sulfate (anhydrous) 37%



100 tablets/bottle
28mg Elemental iron/tablet

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Iron calculations

- Convert to **elemental iron** to calculate the dose in mg/kg
 - Example: 10 kg dog ingests five 324 mg ferrous fumarate.
$$1,620 \times 0.33 = 534.6 \text{ mg elemental iron}$$

$$53.5 \text{ mg/kg}$$



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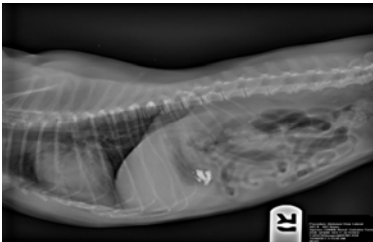
Diagnosis

- History of exposure
- Severe GI signs
- Radiographic evidence
 - Not all iron tablets appear as radiopaque densities, so don't r/o based of lack of radiographic evidence
 - Can radiograph vomitus
- Elevated serum Iron levels (3 and 8-10 h post ingestion)
 - Normal 94-120 mcg/dl




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Oxygen Absorber (Iron) Ingestion





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Hand Warmer (Iron) Ingestion




Iron - Range of Toxicity

- < 20 mg/kg elemental iron - low toxicity
- 20-50 mg/kg – moderate toxicity
- 50-60 mg/kg – severe toxicity
- >200 mg/kg Lethal



Clinical Signs

Four Stages of Toxicity

- Stage 1: Up to 6 hours post ingestion
 - GI signs. Bloody vomiting and diarrhea
 - Mild to moderate toxicities do not progress beyond this stage
- Stage 2: 6-24 hours post ingestion
 - Apparent recovery phase / quiet phase



Signs of Toxicity

- Stage 3: 12-96 hours post ingestion
 - Lethargy, Continuing GI signs
 - Cardiac signs: hypotension, tachycardia, CV collapse
 - Metabolic acidosis, shock, hepatic necrosis, death
 - Seizures, coagulopathy, oliguria, anuria
- Stage 4: 2-6 weeks post ingestion
 - GI ulcers heal with scarring and stricture



Treatment

< 20 mg/kg and asymptomatic

Can monitor at home for GI signs

OTC H2 blocker

Magnesium hydroxide (Complexes iron $\rightarrow$ $\text{Fe}(\text{OH})_2$ which is less available + has a cathartic effect)

Dogs: 5-45 ml q6-8 h

Cats: 5-10 ml q6-12 h



Treatment

• 20 – 50 mg/kg and asymptomatic

- Induce vomiting with H_2O_2 (if time frame is appropriate and patient is asymptomatic)
- If emesis is unsuccessful at home, induce vomiting with apomorphine
- Milk of magnesia
- H2 blocker, sucralfate
- Monitor for GI signs. Treat symptomatically

AC does not bind iron



hospitalize patient

Treatment

• > 50-60 mg/kg

- Induce vomiting with apomorphine
- Radiograph abdomen after emesis to be sure pills were not left behind to form bezoar
- Milk of magnesia
- Whole bowel irrigation (eg GoLYTELY® osmotically balanced PEG, 30 ml/kg) OR Enema (5ml/lb warm water)
- Antiemetics; GI protectants (sucralfate, H2 blocker) x 7-10 days
- IV fluids
- Chelation: Desferal® (deferoxamine) if SI > 350 mcg/dL



To chelate or not to chelate?



Indications: Serum iron levels **> 350 mcg/dl** or if SI levels are unknown, dosage ingested is **> 50-60 mg/kg**, patient is showing signs consistent with iron overdose.



Chelation

Deferoxamine Dose:

40 mg/kg q 4-8 h **IM** (preferred route). Repeat as needed until urine changes from vin rose color to clear. Rarely given IV due to arrhythmias, hypotension and pulmonary edema.



Most effective within the first 24 hour (before iron moves into tissues)



Chelation

•**Contraindications:** Patients with renal compromise

•**IV route** of administration can cause arrhythmias, hypotension, and pulmonary edema

•**Vitamin C** enhances excretion if given **AFTER** iron has removed from GIT. 10-15 mg/kg q 4-6 h IV, IM, SQ, PO



Calcium Supplements

- Calcium alone is poorly absorbed and rarely a problem in healthy animals
- May see transient increase in calcium
- Obstruction from bezoar or wrappers possible
- Always check for xylitol and vit D



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Vitamin D3

- Other important sources of vitamin D3 or analogs:
 - Rodenticides
 - Human topical psoriasis medications - calcipotriol/calcipotriene
 - Certain plants (mostly problems in grazing animals)



Calculate the dose of vitamin D ingested

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Calculating a dose / toxic dose

- 40,000 IU of D3 = 1 mg or 1 IU = 0.000025 mg
- > 0.1 mg/kg can result in signs
- > 0.5 mg/kg hypercalcemia
- Cats, puppies, and kittens more sensitive than adults. Use 1/10th dog toxic dose
- Fat soluble vitamin, concentrates in milk; nursing kittens and puppies are at risk for toxicosis
- Animals with pre-existing hepatic or renal disease may show signs at much lower doses



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Diagnosis / Clinical signs

- GI signs initially
- Calcium and phosphorus levels rise 12-72 hours.
 - Serum calcium > 12.5 mg/dl (3.12 mmol/L - UK&Canada)
- Phosphorus level may increase 12 hours before serum calcium
 - Ionized calcium >5.4 mg/dl (1.33 mmol/L - UK&Canada)
- Elevations in BUN and creatinine
 - Normal reference range ionized Ca 4.5-5.4 mg/dl (1.13 – 1.33 mmol/L)
- Hyposthenuria



Diagnosis / Clinical signs

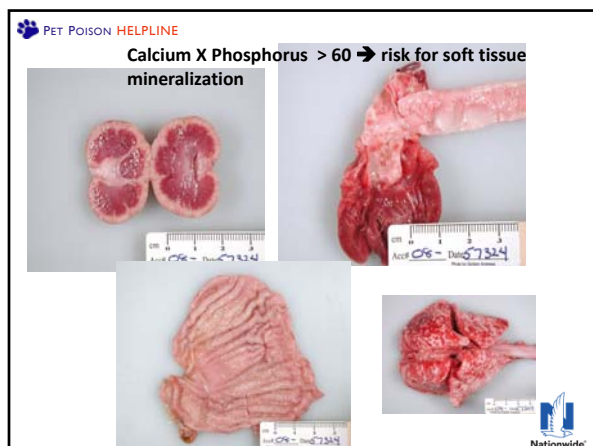
- Hypercalcemia $\uparrow$ Ca⁺⁺
 - Serum calcium > 12.5 mg/dl (3.12 mmol/L - UK&Canada)
- Hyperphosphatemia $\uparrow$ P
- Soft Tissue Mineralization
- Acute Renal Failure (ARF)
 - Ionized calcium >5.4 mg/dl (1.33 mmol/L - UK&Canada)
 - Normal reference range ionized Ca 4.5-5.4 mg/dl (1.13 – 1.33 mmol/L)



Calcium Phosphorus Solubility Index (CPSI)

- CPSI= Calcium (total) x Phosphorus
- Adult dogs and cats: CPSI <60
- Growing puppies: CPSI <80





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Treatment

- Decontamination
 - Early emesis or gastric lavage
 - Toxiban with sorbitol X1
 - Two additional doses of AC (no sorbitol) 8 hours apart
 - Enema (warm water, 5ml/lb bw)

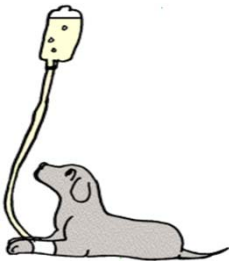


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Treatment

- Baseline serum calcium, phosphorus, BUN, creatinine; monitor at 12, 24, 48, 72 and 96 hours. If calcium is normal in 96 hours, no additional treatment is necessary
- IV fluids: Normal saline (**0.9% NaCl**) at 2-3X maintenance. (Avoid calcium containing fluids such as LRS and Ringer's solution)
- Maintain fluid diuresis until calcium levels have stabilized



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Increase calcium excretion

- Furosemide after patient is well hydrated
 - 5 mg/kg IV bolus followed by 0.1-1 mg/kg/hr CRI
 - or 3-5 mg/kg IV bolus every 8 hours depending on hydration status
- Prednisone
 - 1-2.2 mg/kg every 12 hours



Decrease calcium resorption

- Aredia[®] (pamidronate disodium): Preferred method
 - Blocks dissolution of calcium hydroxyapatite
 - Inhibits osteoclastic bone resorption
 - Decreases activity of 1-alpha-hydroxylase
 - 1.3 – 2 mg/kg IV diluted in saline over 2 hours
 - Serum calcium should decrease in 24-48 hours
 - Repeat in 5-7 days if hypercalcemia not responsive or rebounds
- Salmon calcitonin
 - 4-6 IU/kg SQ q 2-3 h until serum calcium is below 12.4 mg/dl. Increase dose to 10-20 IU/kg if no effect



Treatment

- Amphogel[®], Alternagel[®], or Epakitin[®] for hyperphosphatemia
- GI support: Cerenia[®], Ondansetron, GI protectants (H2 blocker or PPI)
- Low protein diet



Treatment

- Once calcium levels have stabilized
 - Calcium and phosphorus should be checked q 24-48 hours for 7 days, then every few days up to two weeks
 - Re-institute fluids and pamidronate if calcium starts to rise
 - Long term prognosis will depend on extent of renal tubular and myocardial damage



Joint Supplements

Chewable → large ingestions

Possible hepatotoxicity with large ingestions -

Letter to editor in JAVMA, published in the 1 March 2010 edition, pp 509-510, regarding liver changes seen after large ingestions of joint supplements



Joint Supplements – summary of letter to editor (21 cases, 2008 - 2009)

Main ingredients of the involved supplements (20 to 240 tablets ingested)

- Glucosamine hydrochloride (450 to 1000 mg)
- Dimethyl sulfone (MSM) (400 to 600 mg)
- Creatine monohydrate (250 to 400 mg)
- Docosahexanoic acid (6 to 12 mg)
- Eicosapentaenoic acid (9 to 18 mg)
- Ascorbic acid (5 to 50 mg)
- Vitamin E (25 to 50 IU)
- Thiocctic acid (75-200 mg)
- Chondroitin (0 to 100 mg)
- Minor ingredients: zinc, manganese, selenium, glutathione, flavors, fillers



Cause of hepatic damage

- Contaminant
- Idiosyncratic
- Interaction between ingredients or other medications?
- Pre-existing health issues?
- Manganese

Unknown!



Joint Supplements

- Possible role of Manganese
- Borchers A, Epstein SE, Gindiciosi B, Cartoceti A, Puschner B.
Acute enteral manganese intoxication with
hepatic failure due to ingestion of a joint
supplement overdose.

J Vet Diagn Invest. 2014 Sep;26(5):658-63



Treatment

- Emesis if recent and patient is asymptomatic
- Anti-emetic, one dose a/c/c and SQ fluids
- Biochemical profile
- SAME for 5-7 days (longer if re-check blood work shows elevated liver enzymes)
- Re-check chemistry in 3-5 days, or sooner if patient is showing signs (vomiting, lethargy, anorexia)



Ephedra / Ma Huang

- Found in various herbal products used for weight loss, herbal decongestant, body building



Ephedra/Ma Huang

Supplement Facts	
Serving Size: 1 Capsule	
Servings Per Container: 100	
Amount Per Serving	%DV
Pantothenic Acid (Calcium pantothenate)	25 mg
Ma Huang Extract (leaves)	25 mg
Bitter Orange standardized to synephrine	75 mg
Guarana Extract standardized to caffeine	150 mg
Proprietary Fat Burning Blend	400 mg
White Willow Bark Extract (standardized to 7.5 mg salicin), L-Tyrosine, Ginger Root, Magnesium Phosphate, DMAE (2-dimethylaminoethanol), Acetyl-L-Carnitine, Green Tea Extract, Acetyl-L-Tyrosine, Acacia Rigidula Extract (leaves), Theobromine, Phenylethylamine HCL, Yohimbe Extract (bark),	
Other ingredients: Gelatin.	

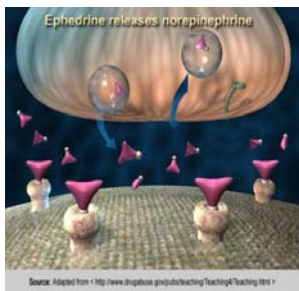
- Many also contain guarana (which contains caffeine) which may potentiate its effects
- Look for guarana and green tea extract if label says "ephedra free"

EPHEDRA WAREHOUSE



Mechanism of action

- Sympathomimetic alkaloids
- Stimulates alpha and beta adrenergic receptors → norepinephrine at synapses of brain and heart → CV/CNS stimulation



Source: Adapted from < a href="http://www.drughouse.gov/pubs/teaching/Teaching.html">http://www.drughouse.gov/pubs/teaching/Teaching.html < /a >



Ephedrine sulfate

- Therapeutic dose for dogs - bronchospasm 1-2 mg/kg; urinary incontinence, 4 mg/kg q 8 – 12 hours
- Therapeutic dose for cats – bronchospasm 2-5 mg; 2-4 mg urinary incontinence

Narrow safety margin



Ma huang / guarana toxicity

In products combining ma huang and guarana:

- Minimum dose causing **clinical signs** was 4.4 mg/kg guarana and 1.3 mg/kg ma huang.
- Minimum dose causing **death** was 19.1 mg/kg guarana/caffeine and 5.8 mg/kg ma huang/ephedrine
- Khan SA, Ooms TG, Means C. Acute guarana and ma huang toxicosis in dogs following ingestion of herbal supplement. 45 cases



Narrowed in combination with ephedrine

Caffeine

- OTC caffeine stimulant tablets and gums
- Diet pills - in their proprietary blend, which may also list green tea extract
- Herbal products containing guarana (3-5% caffeine)



Aeroshot Energy 100 mg caffeine per shot (4-6 shots)



200 mg caffeine



Caffeine -Mechanism of action

- Causes CNS stimulation, myocardial contraction, diuresis, and smooth muscle relaxation by antagonizing adenosine receptors and inhibiting cellular phosphodiesterases
- Stimulates catecholamine release, primarily norepinephrine



How much caffeine is toxic?

- Clinical signs start at about 15 mg/kg
- Moderate signs: > 25 mg/kg
- CNS/CV signs: > 50 mg/kg
- Oral LD50 (dog) 110-220 mg/kg (Beasley)
- Oral LD50 (cat) 80-150 mg/kg (Beasley)



Clinical signs

- Restlessness, agitation, pacing
- Vomiting
- Hyperthermia
- Disorientation, vocalization
- Mydriasis
- Tachycardia, hypertension, PVC's
- PU/PD
- Muscle tremors / fasciculations
- Seizures
- Death



Treatment

- Emesis if asymptomatic or Gastric lavage
- Anti-emetic; Toxiban with sorbitol (one dose)
- Baseline CBC, chemistry, electrolytes, UA. Monitor for hypokalemia $\downarrow K^+$
- Monitor HR and BP
- Monitor EKG prn
- IV fluids 1.5 to 2.5 X maintenance
- Treat agitation with Acepromazine 0.05 mg/kg IV or Torbugesic



Treatment

- Beta blocker, antihypertensive (e.g. hydralazine), lidocaine as needed
- Methocarbamol for tremors
- Phenobarbital (3-16 mg/kg IV to effect) or Propofol for seizures
- Monitor acid base status, electrolytes, renal values
- Monitor potassium, glucose, CK and renal indices.
- Monitor for development of DIC and rhabdomyolysis



Yohimbine

- Found naturally in *Pausinystalia yohimbe* (yohimbe) and also *Rauwolfia serpentina* (indian snakeroot)
- Found in a variety of supplements / herbal products
- Used for xylazine reversal in dogs/cats, 0.1 mg/kg IV



MOA / clinical signs

- Blocks alpha-2 adrenoreceptors → CNS and CV stimulation
- CNS stimulation : hyperactivity, agitation, tremors, seizures
- CV: hypertension, tachycardia. Once CNS stimulation is controlled, may see **hypotension** secondary to profound alpha-2 blockade
- GI: Drooling, vomiting, diarrhea, abdominal pain
- Hypoglycemia (may occur due to facilitation of insulin release)



Treatment

- Induce vomiting if patient is asymptomatic
- Toxiban with sorbitol (one dose)
- Methocarbamol for tremors
- Diazepam, Phenobarbital or Propofol for seizures
- IV fluids
- Monitor BP!
- For hypotension: Norepinephrine is used in humans (epinephrine and dopamine are contraindicated)
- Monitor BG – IV dextrose as needed



5-Hydroxytryptophan (5-HTP)

- Found in supplements marketed for depression, weight loss, body building, etc.
- Typically 50-500mg 5-HTP per capsule (alone or in combination with other ingredients)
- Also called **griffonia seed extract**

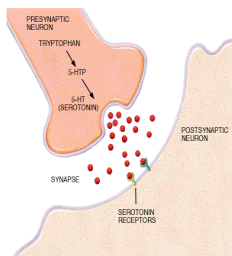


5 Hydroxytryptophan from Griffonia Simplicifolia Seeds
50 mg per tablet



Mechanism of action

- 5HTP is a precursor to serotonin
- Serotonin is a CNS neurotransmitter with potent effects on the CNS, CV, GI, and respiratory system
- Animals are sensitive



How much 5-HTP is toxic?

- One retrospective study (21 dogs) revealed:
2.5 mg/kg to 23.6 mg/kg: No clinical signs developed
- Minimum toxic dose = 23.6 mg/kg
- Minimum lethal dose = 128 mg/kg (dogs)
- Any exposure >3mg/kg - decontamination, monitoring

Gwaltney-Brant SM, Albertsen JC, Khan SA, 5-Hydroxytryptophan toxicosis in dogs; 21 cases (1989-1999). JAVMA 2000; 216, 1937-40



5-HTP Clinical signs

Usually occur within 1 hour of exposure (but may be delayed up to 4 hours)

Usually resolve in 12 hours, but may take up to 36 hours

Neurological: hyperesthesia, hyperreflexia, ataxia, disorientation, tremors, seizures

GI: drooling, abdominal pain, v/d, bloat

Autonomic dysfunction: hyperthermia, mydriasis, transient blindness, tachycardia, tachypnea



 **Avoid Valium** **Treatment**

- Emesis at home with recent ingestion (within 15 minutes) and patient is asymptomatic
- Toxiban with sorbitol (single dose)
- Enema with ingestion of large amount of pills
- Monitor in hospital – HR, RR, BP, Temp, ECG prn
- IV fluids 1.5 – 2X maintenance to maintain perfusion



 **Treatment**

- Thermoregulation
Monitor body temperature (to prevent organ damage and/or DIC)
– Cool water blankets, fans
- Cyproheptadine - serotonin antagonist
(dogs: 1.1 mg/kg PO or rectally; cats: 2-4mg q4-8hrs)
- For CNS stimulation: 0.05-0.30 mg/kg acepromazine or torbugesic
- If HR is > 180-200bpm, consider use of beta blocker



 **Treatment**

- Phenobarbital, Propofol, Gas Anesthesia – for seizures
- Avoid Benzodiazepines (No diazepam or midazolam)
- Severe cases with life-threatening signs (esp depression)
– consider Intralipid therapy



Alpha Lipoic Acid

- Fat-soluble, sulfur-containing antioxidant
- Synonyms: thioctic acid, acetate replacing factor, biletan, lipoicin, thioctaid, thioctan
- Frequently sold as 100 or 300 mg capsules
- Often found at various concentrations in supplements
- Has been used in veterinary medicine to treat diabetic polyneuropathy, cataracts, glaucoma, and ischemia-reperfusion injury
 - Therapeutic dose used in dogs: up to 200 mg/day; cats 1-5 mg/kg (do not exceed 25 mg/d)



Toxic dose

- MTD in cats is 13 mg/kg. 30 mg/kg has caused neurologic signs and mild hepatocellular damage (Hill, 2004).
- Decontaminate and monitor healthy cats at >5 mg/kg
- MTD - 80 mg/kg large breed dogs (Wynn, 2003)
- MLD in dogs (anecdotal): 331 mg/kg
- Decontaminate and monitor healthy dogs with ingestion of >50 mg/kg

Cats considered 10x more sensitive



Clinical signs

- Drooling
- Vomiting
- Ataxia
- Hypoglycemia
- Elevated liver enzymes
- Tremors / seizures
- ARF?
- Sudden Death!



Treatment

- Emesis within 1-2hrs if asymptomatic
- Toxiban with sorbitol (one dose)
- Monitor blood glucose, liver enzymes, BUN, creatinine, electrolytes
- Control hypoglycemia with IV dextrose bolus followed by CRI
- Manage seizures: diazepam, phenobarbital
- Fluid diuresis
- Liver protectants: SAM-e, Denamarin, NAC



Oregon Grape Root (*Mahonia aquifolium*)

- *Mahonia aquifolium*, family Berberidaceae (Berbis) – not a Vitis sp
- No data to indicate any renal concern with this species
- Found in vitamin and nutritional supplements



Oregon Grape Root (*Mahonia aquifolium*)

• State Flower of Oregon

• "Mahonia aquifolium" by Meggar at en.wikipedia



Rarely a problem with an acute exposure in healthy dogs

- Magnesium (mg)
- Melatonin (mg)
- Vitamin A (IU)
- Vitamin E (IU)
- Vitamin C (mg)
- Vitamin B complex
- Fish oil / omega 3 fatty acids / DHA, EPA



Selenium

- Level of concern (dogs, cats): 0.5mg/kg
- MLD (dogs): 1-3mg/kg
- MLD (cats): 1.5mg/kg
- LD₅₀ approx 4mg/kg
- Clinical signs: GI upset (potentially corrosive), CV abnormalities, pulmonary edema, respiratory failure, tetanic spasms, sudden death.
- Breath may have garlic odor



Onions and Garlic

- Genus *liliaceae*, family *Alliaceae*, species *Allium*
- Onions, garlic, shallots, chives, scallions, leeks
- Heinz body hemolytic anemia, methHb
- **Onions:** Ingestions > 5 g/kg (cats) and 15-30 g/kg (dogs)
- **Garlic:** 5X more toxic than onions



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Xylitol

- Sugar alcohol commercially derived from acid hydrolysis of hard woods such as birch bark
- Check ALL labels in supplements, nasal drops, toothpaste, oral rinses, breath mints.....



Nutrition Facts
Serving Size 1 Teaspoon (4 grams)
Servings Per Container 113
Ingredients: Xylitol (from birchwood).

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1,200 mg xylitol per chew!

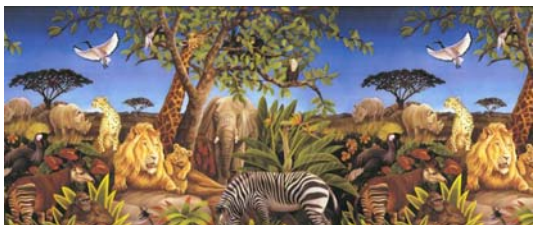


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Hope You Have Enjoyed Your Brief Tour of the OTC Jungle



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When in doubt, call 800-213-6680



- Something you're not familiar or comfortable with
- Odd clinical signs
- Animals with preexisting disease

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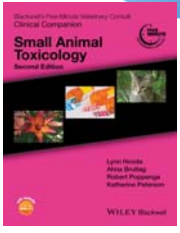
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