Emerging and Re-emerging Toxicities: Just Because It Is Old Does Not Make It Obsolete

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Bandit – The ‘calcitriol’ Eating Dog
Presented 3 Hours Post Ingestion

- Induced emesis, activated charcoal and sorbitol
- Plasmalyte fluid therapy, IV
- Serial measurements of P and Ca
- Prednisone
- Aluminum hydroxide, PO
- Bisphosphonate – if Ca and P became an issue
- Discharged 72 hours later
Must Know What You Are Dealing With!!

- **Calcitriol**: 1,25-dihydroxycholecalciferol: 72 hour or 4-6 hour half-life
  - Therapeutic dose: 2.5-3.5 ng/kg once daily
  - Hypercalcemia at that dose; very narrow margin of safety
- **Dovonex** (calcipotriol, calcipotriene): 1,25(OH)_2_-cholecalciferol analogue
  - Minimum toxic dose: 10 mcg/kg BW
  - Lethal dose: 65 mcg/kg BW (1.3 g Dovonex/kg BW)

1 IU vitamin D = 0.000025 mg cholecalciferol

Trigger dose cholecalciferol: 0.1 mg/kg BW or 4,000 IU/kg
Renal failure: 20,000 IU/kg or 0.5 mg/kg
Long half-life / blood work OK at 72 hours, good to go

Cats, puppies, kittens more sensitive: use 1/10 dog toxic dose
Mechanism of Action

- **Cholecalciferol** (rodenticide, vitamin/mineral supplements) → absorbed in small intestine → liver (25-OHcholecalciferol) → kidney (1,25[OH]$_2$cholecalciferol)

- Lag time from ingestion to signs (few hours to several days): metabolic activation + overcoming homeostatic mechanisms (vitamin D, parathyroid hormone, calcitonin)
Mechanism of Action

- Persistently elevated serum Ca + P levels: (P often rises first)
  - Enhances Ca + P absorption from GIT
  - Increases osteoclastic activity in bone
  - Increases Ca reabsorption by distal renal tubules
  - When Ca×P > 60 mg/dl persistently (> 80 in puppies)
Treatment Aims

- **DECONTAMINATE**
  - Emesis, AC (multiple) – keep eye on Na, cathartic

- **Lower Ca, P**
  - Calcitonin?: bone, GIT OR
  - Bisphosphonates – bone, kidney
  - Cholestyramine (Questran): 0.3-1 g/kg PO TID x 4 days, mix with food
  - Lipid emulsion therapy (20%)?: 1.5 ml/kg bolus over 15 minutes, then 0.25 ml/kg/min x 30-60 minutes – may repeat in 3-4 hours if no lipemia; don’t continue if no response in three tries
Treatment Aims

- **Physiologic saline**
  - No Ca
  - Na:Ca compete
  - Lasix

- **Prednisone**
  - Bone (Kidney, GIT)

- **Low Ca, P diet**

- **Low P**
  - Oral P binders

- **Monitor extensively! Ca, P, BUN, Cr at 12, 24, 48, 72 and 96 hours**

- **How long? If normal by 96 hours, all OK**

- **Out patient? Prognosis?**
1-year-old, M/C, Australian Shepherd mix ‘Truman’ – found seizing in back yard, evidence of digging in the compost pile!
Tremorgen – Penitrem A (mycotoxin)

- *Penicillium* spp. (*penitrem A, roquefortine?*)
- ***Tremorgenic mycotoxins***
- Foods, decaying organic material
  - *Garbage* - walnuts - cheese - bread
  - *Compost pile* – see egg shells, coffee grounds, carrot peels, corn, etc. in vomit, think…
- All species susceptible
  - *Dogs* / hard to estimate dose
- Signs: *excitation, intention tremors/twitching - cerebellar* component - nystagmus
Clinical Pathology / Lesions / Diagnosis

• **Nonspecific** – rule out other Ddx
• **Criteria:**
  – History and **LOOK** at stomach contents (source material)
  – Clinical signs
  – **Chemical analysis**
    • Stomach contents
    • Serum, bile, urine
Treatment (± Symptomatic)

• Aims
  – **Decontaminate**: Asymptomatic (emetic, AC, cathartic, lavage) vs. **Symptomatic** (gastric lavage, AC, cathartic – once sedated): weigh risks and benefits – think about hypersensitivity to external stimuli
  – **Control tremors / seizures** – length of sedation (diazepam, *methocarbamol*)
  – **Supportive**: IV fluids / acid-base / T / oxygen

• Prognosis – variable – 24 to 48 hrs / can be longer, up to 5 to 7 days, but should see gradual improvement
- 64-kg, M/N, mixed breed dog ingested bromethalin bait
- Estimated exposure dose: 0.3 mg / kg BW
- Implemented aggressive decontamination procedures:
  - Emesis: apomorphine, hydrogen peroxide
  - Multiple doses activated charcoal
- What type of rodenticide is this?
  - A, B, C(D), S, Z
Bromethalin

- Over the counter / restricted use
- Dog, cat (2°?) most commonly affected
- Long T½
- Takes quite a bit – but ANY decent exposure – AGGRESSIVE (decontamination)
- Big spike in reported cases over last few years!
Mechanism of Action

- **Uncoupler of oxidative phosphorylation** in mitochondria of CNS → drop in ATP → fluid filled **vacuoles** between myelin sheaths → pressure impairs nerve conduction → **paralytic syndrome** / **convulsant syndrome**
Clinical Signs

- **Lag phase to onset**
  - **Paralytic form (< LD_{50}):** lethargy, *hind limb paresis / paralysis* - **DIFFS** (ionophores, macadamia nuts, intermediate syndrome with organophosphates, methionine / tick paralysis, coonhound paralysis, botulism, myasthenia gravis)
  - **Convulsant form (> LD_{50}):** vomiting, muscle tremors, tonic/clonic seizures (*stimuli sensitive*)
  - Either one can lead to fatalities
Diagnosis and Treatment

- **Chemical analysis**
  - Brain, liver
- **DECONTAMINATION** – multiple doses of AC – long $T^{1/2}$ (worry about?)
- Control CNS excitation
- Correct temperature, hydration status, electrolyte balance; nutritional support; good nursing care; respiratory support
Name the Toxin

- Owner came home – found dog (3-year-old, male, Weimaraner) in kennel with stiff forelimbs – dragging hind limbs
- Out of kennel – fell to ground – worse when first got up – “warms out of it”
- **Myotonia** – severe
- **Urine**: + 2,4-D, bromoxynil, MCPA, dicamba
- Lots calls – reflects use
- Access to container / ? treated plant material
- Minor GI upset / rarely fatal
Meridian, ID

- 9-year-old, F/S, 3.7-kg Yorkie dog, ‘Princess’
- Owner returned home from work at 6:00 PM – let dog outside in fenced in yard
  - 6:30 PM: vomiting
  - 8:00 PM: anorexic, weak, lethargic
  - Found dead 9:00 PM
- Necropsy – no significant gross or histologic lesions – examination of the yard
- Owner had hired exterminators – came 1 day earlier than expected
- Five rodenticides
  - Anticoagulant rodenticides
  - Bromethalin
  - Cholecalciferol (vitamin D)
  - Strychnine
  - Zinc phosphide
Zinc (Al, Mg) Phosphide

- Liquid, meal, pellet – dyed / grain fumigant (pellets, strips)
- Concentrations: 2.5 – 66%
- All animals susceptible
  - Dogs
  - Underdiagnosed??
- Emetic / ammonia detector
  (inhale gas → pulmonary edema)
Mechanism of Action

• Contact with water + acidic environment of stomach: phosphine gas
• Phosphide and phosphine gas **severe irritants
• Block cytochrome C oxidase → multiple organ involvement (increase in vascular permeability) → CV collapse / toxic myocarditis
• Tx: symptomatic / supportive, lavage with sodium bicarbonate?
• Risk to you and staff! Work in ventilated area – be careful with decontamination procedures
Common History

- Great Pyrenees-mix, 5-month-old, M/I, dog presented for acute onset of ataxia and bilateral mydriasis
- PE: dog was **blind**
- Few hours earlier, client caught the dog chewing on two parasiticide tubes that had been in a bag, hanging on a hook in the barn
Ivermectin and Others

- Ivermectin!
- Treatment
  - Induce emesis, if possible
  - Activated charcoal, multiple
  - IV fluid therapy; other ‘supportive care’
- Common presentation: lethargy, obtundation
- Seizures may also occur – poorer prognosis

Other treatments:
- **IV lipid therapy** – 20% soybean oil in water
  - 1.5 ml/kg slow bolus, 0.25 ml/kg/min given over 30-60 minutes
  - Have repeated // work in MDR mutation dogs?
Organophosphates – Intermediate Syndrome

- 2-year-old, M/N, 74-pound Labrador dog
- **History**: Owner planting flowers, placed 1 tsp Advanced Rose and Flower Care at base of each flower
- Between 4-8 pm: dog dug up 3 plants
- **Progression**
  - 8:30 to 10:30 pm: twitching, vomiting
  - 10:45 pm: excessive urination, diarrhea
  - 11:00 pm to 1:30 am: continued / after one large vomit, signs subsided

- 8:00 am: small amount of loose stool / vomited / now extremely weak with mild tremors / wants to lay down and appears exhausted

1% disulfoton
Intermediate Syndrome

- Inhibition of acetylcholinesterase*

Classic: muscarinic, nicotinic, CNS signs

Intermediate syndrome
  - Follows 24-72 post exposure
  - Tolerance in cholinergic receptors
    - Lipophilic compounds

Pancreatitis!

- Signs include
  - Anorexia, diarrhea
  - Generalized muscle weakness
  - Muscle tremors
  - Lethargy
  - Abnormal posturing / behavior, convulsion, death

- Treatment: supportive care / 2-PAM
• 10-month-old, F/S, mixed breed dog escaped from yard
• Returned ‘shivering / shaking’, presented salivating and bradycardic
• Tx: response to atropine, IV fluids, supportive care
Reno, NV: *Lilium, Hemerocallis*

- Presented for vomiting
  - ‘Mowed down’ ½ of an Easter lily plant overnight
  - Vomit had leaves in it
- Do the math??????
  - All parts toxic, including pollen and water in vase! / just one bite! / toxin is thought to be water soluble / vomiting-anorexia-lethargy can occur within 2 hr (unrelated to renal disease)
  - Acute renal disease in 1-3 days (Cr often higher than BUN); prognosis favorable if treat within 18 hours of exposure
- D: Dexmedetomidine (or xylazine) – reverse with atipamezole if/when becomes too sedated; AC + sorbitol; endoscopic retrieval
- D: Plasmalyte, 2x maintenance, 48-72 hours
- M: initial chemistry and follow-up chemistry: unremarkable; urinalysis

9-year-old, 6.7-kg, M/N, DSH, with previous history of chronic nonsuppurative cholangiohepatitis
• Not lily-of-the-valley (Convallaria majalis)
• Not calla lily (Zantedeschia spp.)
• Not peace lily (Spathiphyllum spp.)
• Not Peruvian lily (Alstroemeria spp.)
Guess the Toxin!
Toxicity

- Varies – compound, species, route / low mammalian toxicity (popular)
- Cats very sensitive to high conc. products (up to 65% or greater; not use if > 1% in cats)
  - Don’t use on dogs with cats in house / if do, wait till dries
  - Cases where cats exposed by contact with dog bedding material
  - Cats sensitive due to deficiency of glucuronidase transferase and slower rate of ester hydrolysis
  - Permethrin is common problem: fat soluble synthetic pyrethroid
Clinical Signs

- Onset varies dose, product, route(s) – short (< few hrs if oral – dermal exposure can cause delay of up to 72 hours)
  - Salivation (irritant)
  - Muscle tremors, ataxia, hyperesthesia, epidermal paresthesia (and contact dermatitis with spot-on products)
  - Weakness, dyspnea
  - Vomiting/diarrhea – lethargy
  - Convulsions (high dose exposures, cat)
  - Blindness (12%)
  - Mydriasis (19%) – more common in cats
Treatment

• Patient based:
  – Decontamination – clinical presentation, route(s)
  – Control tremors/seizures (valium, methocarbamol)
  – Wash mouth (no atropine)
  – Intravenous lipid therapy: permethrin
  – Maintain hydration, electrolyte status, etc.
  – Control body T!! Lower to $103^5$ only, or run the risk of rebound hypothermia

• Prognosis: 😊 (24-72 hrs) – cats with high dose exposures
Test: Name the toxin!
• Long history: owner was on vacation in Colville, WA; two smaller breed dogs ate some anticoagulant rodenticide
• Did the math…well below the toxic dose….decontamination was employed with activated charcoal, twice (high end of dose range)…later that night one dog became ataxic
• As the client was headed back to Pullman, mentions that there is some EG in the cabin toilet (thought it was flushed out)
• Dog urinated during the car ride and in the exam room…..what thinking?? Mucous membranes tacky…soaked up urine and USG = 1.027
• Students pretty convinced dog was in Phase I of EG – ready to start diuresing
• Wise intern decided to run CBC and serum chemistry panel first – WHAT ABNORMALITY FOUND ON BLOODWORK??
From Famine to Feast: Foods That Are Toxic To Pets

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Common Complaint in WA

- Jasper, 12-year-old, M/C, Labrador mix
- Client left home for few hours and found Jasper exhibiting – ataxia, hypermetric gait, almost non-ambulatory/falling over, twitching, bradycardic, mydriasis, urinating excessively
- What was missing from the kitchen table?
  - Rice Krispie treat
  - Lemon bar
- Containing 250 mg marijuana each
Probably not going to be a problem....
So, So, So, Common........
Before Became Legal....
Marijuana

• THC content: can vary!

• Signs: 30-60 min
  – Lethargy, ataxia, mydriasis, bradycardia, agitation, vocalization, vomiting, diarrhea, salivation, tachycardia, hypo/hyperthermia, urinary incontinence / seizures, coma
  – Last: up to 5 days

• Dx: history, signs, test?

• Rx: decontamination options (e.g., emesis, multiple doses activated charcoal), IV lipid therapy, symptomatic care

• Prognosis: very good – fatalities have been reported

• Mixed exposures common!!!! Don’t forget potential for xylitol, macadamia nuts, grapes/raisins, methylxanthines (theobromine, caffeine)
Name the Plant!

- HI: Two dogs on walk on farm observed eating ‘dry microbrewery waste hops’ used as organic fertilizer. Owner thought it was manure. Two hours later placed in kennel – found both dogs dead in the morning. PM consistent with severe malignant hyperthermia

- Hops (*Humulus lupulus*)
  - Beer making: flowers of the female plant are used to impart the bitter flavor and pungent aroma

- **Persistent hyperthermia** (weakness, panting) – fresh or spent hops

- **Treatment**: decontaminate, IV fluids, cooling measures, cyproheptadine
"I Have a Drunk Puppy"

- **Case**: 8-month-old, F/S, Border terrier
  - ate #35-50 soft chew ‘treats’ called “Lawn Aid”
  - 24 hours later:
    - vomiting, ataxia, general ‘cerebellar signs’
  - Progressed to:
    - severe ataxia
    - ‘walking like a drunk’
    - hypermetric gait
  - IV fluid therapy; 24 hours later doing much better
**Ingredients:**
- brewer’s yeast
- dl-methionine (133-500 mg)
- cranberry extract
- *Yucca schidigera*

**Methionine** (and metabolites) (GI signs > 20 mg/kg within 3 hours; neurologic signs > 95 mg/kg within 6 hours)

- transient hindlimb weakness / abnormal posture
- vomiting, ataxia / acidosis, lethargy, diarrhea, weakness, PD, hypermetria, disorientation, tremors, anorexia, vocalization

**Recommended dose:** 1/day

**Any concern??**

- Tx: fluids, confinement, bicarbonate, emetics if asymptomatic within 2-4 hours, ?IV lipid therapy
- Complete recovery by 48 hours / no fatalities
• Signalment: small mixed breed dog ingested ‘salt bow’ from the Christmas tree / 2 hours later: tremors, excessive urination / 14 hours later: fine

• Signalment: 12-year-old, M/C, 8-pound Chihuahua dog

• Presentation: abrupt onset of seizures

• CBC / serum chemistry panel
  – Sodium: 184 mEq/l (148-159)

• After 40 hours of therapy – unable to drop sodium levels – euthanized

• Analysis
  – 4.5% sodium
  – ‘ate at least 1-2 cups’
Homemade and Commercial Play Dough

- 1 cup flour + 1 cup water + ½ cup salt
  ≈ 7.5 g salt / tbsp

- **Lowest toxic dose**: 2.0 g NaCl / kg BW
- **Lowest lethal dose**: 4.0 g NaCl / kg BW
  - 50# dog: 3/8 cup; ¾ cup

- Vomiting, PD, seizures / PU, tremors, ↑T

- Seizures: Na ≥ 180 mEq/l

- Tx: decontaminate if appropriate; control seizures; lower Na levels slowly; symptomatic / supportive
  - Barr et al. (2004) VECC; 2007 VECC - salt
March, 2016: Tilly, ate several cups of raw dough for cinnamon rolls - BLOAT
Fermented Raw Bread Dough

- Alcohol poisoning not uncommon
- Yeast – CHO to ethanol and CO₂
- Signs: vomiting, discomfort, burping, passing gas, tachycardia, ataxia, blindness, hypothermia, recumbency, acidosis

- **Risks:**
  - Ethanol depression
  - Gastric compression of caudal vena cava
  - Vascular compromise of gastric wall
  - Reperfusion injury
  - Cardiac arrhythmias
Treatment Options

• Cold water lavage – ice chips
• Monitor for hypothermia
• Prevent aspiration – maintain airway – ventilation
• IV fluids – maintenance and offset ethanol diuresis
• Correct for hypoglycemia, hypokalemia, acidosis
• Surgical intervention might be necessary
Tasty Treat

• Owners woke up in the morning to find their terrier on the bed – she could not get up
• She had urinated on the bed
• When placed on the floor – she could not stand – posterior paresis, with some forelimb weakness
• Owners had given her some ______________ as a treat the night before
Macadamia Nuts

- **Dogs**
- **Toxic dose:**
  - 0.70-4.9 g / kg BW (Aus)
  - 2.4-62.4 g / kg BW (US)
  - 1 nut = 2.5 g
  - 5-40 nuts / 20-kg dog

- **Toxin:** ?
Macadamia Nuts

• Clinical signs (6-24 hours):
  – Weakness
  – Lethargy
  – Vomiting
  – Ataxia
  – Tremors
  – Hyperthermia
  – Posterior paresis
  – Recumbency
  – Joint swelling / pain

• Excellent prognosis
• No fatalities
Lindsay and Baxter – onion enchilada!
Karen and Gilbert – the garlic eating cat!
Allium spp. – onions, garlic, chives

- Lot of pets find very palatable
- Toxins: sulfoxides and disulfides cause oxidative hemolysis
- All parts toxic – highest in bulb
- All forms toxic / toxic doses range depending on form (raw, cooked, dried)
  - 25 g/kg BW (dogs), 12.5 g/kg BW (cats) / > 0.5% BW
  - Garlic 5 times more potent
- Clinical signs and treatment – all associated with hemolytic anemia – peak in 3 to 5 days
Pretty Tasty Treat!

- **Signalment**
  - 30 pound, 8-month-old, F/S, Australian Shepherd dog

- **Presentation**
  - Acute onset of seizures, 1 hour after 2 dogs tore open the bottle – not sure who ate what

- **Plan**
  - Look at the label!
  - Did not match signs associated with melatonin
  - ‘Zero reading’ on glucosometer
  - Other dog in household asymptomatic

**Ingredients**

**Supplement Facts**

<table>
<thead>
<tr>
<th>Serving Size: 1 Tablet</th>
<th>Servings Per Container: 60</th>
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<tbody>
<tr>
<td><strong>Amount Per Serving</strong></td>
<td><strong>% Daily Value</strong></td>
</tr>
<tr>
<td>Melatonin</td>
<td>3 mg</td>
</tr>
</tbody>
</table>

† Daily Value not established.

Other Ingredients: Xylitol, Mannitol, Maltodextrin, Sorbitol, Magnesium Stearate, Natural Flavors, Modified Cellulose, Silica.
Xylitol

- Five carbon sugar alcohol
- Sugar substitute
- **Food products:** all kinds (gum, candy, peanut butter), toothpaste and oral hygiene products, dietary supplements, prescription medications, nasal sprays, gummy vitamins, deodorants, make-up remover, skin lotions, etc.. fruit??
- **Dogs (cats?):** ↓ glucose, liver disease
- **Example:** gum: 1-2 pieces can be a problem for 10-kg dog
Toxicity

• Rapid absorption!
• Nonspecific: diarrhea, gas
• K9
  – ↑ insulin release leads to ↓ glucose, ↓ K
  – liver disease; other species IV
• > 0.02-0.1 g/kg can lead to hypoglycemia
• > 0.03-0.5 g/kg can lead to liver abnormalities (may be an idiosyncratic event)
• Common signs: vomiting, lethargy / ataxia, seizures
Xylitol Toxicity Calculations – USE CAUTIOUSLY

- **Standard:** for gum
  - 0.3 g xylitol / piece, if xylitol is not the first sugar alcohol
  - 1.0 g xylitol / piece, if xylitol is the first sugar alcohol

- **May not work,** because apparently this is NOT CONSISTENT between gum manufacturers
  - Xylitol can range from 2 mg – 1.15 gm in gum per piece
  - PPH knows a lot of xylitol concentrations – confidentiality agreement

- **Bottom line** – do the best you can; may need to call the company or the PPH to find the xylitol concentration in whatever product you are worried about
Treatment

Any exposure should be a concern!

- Induce emesis if blood glucose normal and asymptomatic
- **No** activated charcoal – does not work well in-vitro
- Dextrose supplementation if hypoglycemic
- Baseline values: glucose, K⁺, Pi, liver values (bilirubin, ALT, AP, PT and PTT) – monitor frequently
- Liver protectants (2-4 weeks) – check liver values every 12 hours for 48 hours and repeat at 72 hours
- Patient should be normoglycemic for 6-30 hours without supplementation before discharging
- Glucose may be challenging to control – particularly with ‘delayed release’
Allison Otis and Harley

- *Popular* method to ‘control’ wolves
- Methodology now available
  - Source material
  - Stomach contents
Sadie’s Toxicology Story

• Baltimore: found Sadie (Boxer/Labrador cross) had found and ingested a box of raisins in a purse

• Remember the DDDM!
2-year-old Labradoodle: Ate 30 grapes

- **D:** Do the math? **NO!**
- **D:** Decontaminate
  - Emesis, activated charcoal, cathartic
- **D:** Diurese
  - 72 hours, start tapering fluids at 48 hours while...
- **M:** Monitor
  - Evidence of renal disease: chemistry panel, urinalyses

- Toxic dosages listed in literature are from case reports – unreliable when doing the math
- Small percentage of dogs appear to be susceptible (< 50%)
- Previous exposure and no response does not mean the dog is resistant
- Dogs that vomit within 2 hours without intervention appear to be more likely to succumb to renal disease
Cough Drops

- **Signalment**
  - 3-year-old, M-C, black Labrador
  - Ate 150 cough drops night before

- **Presentation**
  - Unable to rise, with severe abdominal discomfort
  - Explosive watery brown feces
  - Anxious, agitated
Cough Drops

- **Menthol + Sugar**
  - Menthol: wide margin of safety (LD$_{50}$: 3-4 g/kg BW)
  - *Sugar / sugar alcohols
  - Signs limited to gastrointestinal distress
  - Asymptomatic (emesis if huge exposures)
  - Menthol can affect kidneys, lungs, heart, nervous system

- **Candy, cigarettes, creams, gum, mouthwash, ointments, etc.**
Dr. Shawna Wedde - Valentine’s Day
The Chocolate Covered Espresso Bean Eating Beast
Toxicity - Methylxanthines

- All animals susceptible - *dog - holidays
- Variation in toxic / lethal doses: particularly theobromine
- 20 mg/kg – mild GI signs; 40-50 mg/kg – moderate to severe GI and neurologic signs; > 60 mg/kg possible seizures
- Rapidly absorbed – long T_{1/2} (theobromine) – enterohepatic recirculation – bile, urine
- ‘Gloms up’ / **delayed gastric emptying

- **Theobromine (and caffeine) levels vary in chocolate – more in the darker products - DO THE MATH – VIN chocolate calculator (are others available)
• Vasoconstriction (↑ HR) / enhanced muscular irritability + catecholamine release
• Overall: CNS excitation / diuretic
• Onset ± acute:
  – Vomiting, diarrhea, enhanced urination
  – Hyperactivity, restlessness
  – Tachycardia, ataxia, tremors, seizures
  – Death: cardiac arrhythmias, respiratory failure
  – Waxing / waning
Treatment Aims

- **Decontaminate** (Symptomatic + Asymptomatic) – clinical presentation:
  - Emesis, lavage, **AC** (repeated – \( \frac{1}{2} \) dose)
- **Control tremors / seizures**
  - Diazepam, others
- **Monitor** ECG
- **IV fluids / IV lipid therapy?**
- **Prognosis** – good – have been fatalities; 24 hours – waxing / waning
‘Treats’ That Aren’t So Tasteful, But Toxic!

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‘Desiccant Packs’ AND ‘Oxygen Absorber Sachets’

- Prolong shelf life, protect food (and other things) from discoloration, decomposition, spoiling
- Silica gel, and other ingredients (activated charcoal, iron carbonate, sodium chloride, ascorbate, citrus, etc.)
  - **Moisture/oxygen absorbents** – shoe boxes, lamps, medications, electronic equipment, foods
  - White powder / granular / liquid
  - Paper/plastic packets or cylinders
  - **Low toxicity** / mild *GI upset*
  - *Make sure they pass* – drink lots of water – case of dog that ate several and was constipated
  - Some have **iron (50-70%)** – discoloration to urine
  - Rare, but may require chelation for iron
• 1-year-old Australian Shepherd found chewing on two AA alkaline batteries

• Two types:
  – Dry cell batteries: acid (ammonium chloride, manganese dioxide) or *alkaline (K, Na hydroxide)
  – *Lithium disc/button batteries: no corrosives; alkaline on cathode side and acidic on anode side as current passes through battery

• **Both damage mucosal lining!!!**

• If not damaged, want to see them pass in *36 hours / should pass undamaged / go and retrieve if doesn’t

• Prolonged exposure and battery is damaged – cause problems over time – leaching of metals is not a big concern (such as Pb, Hg, Zn, Co, Cd)

• Tx:
  – Emesis? - NO
  – Activated charcoal? - NO
  – Dilution – yes!
  – Radiograph – may need to remove if suspect puncture or just is not passing (36 hours)
  – GI protectants: bulk cathartics, demulcents / protectants (sucralfate) / H₂-antagonists, proton pump inhibitors, analgesics, antibiotics? misoprostol
Mercury

• Not all forms are created equal
• **Calls:** dog ate a mercury containing glass thermometer / dog ate new energy saving liquid mercury light bulb Why???

• **Elemental mercury:** ingestion OK – **bulk** diet (bread, pumpkin), **GIT protectants for the glass** (watch for anorexia and blood in stool or vomit), **radiographs**, should pass in a day or so / inhalation not good
• **Inorganic mercury:** **BAD** – severe gastrointestinal damage and multisystemic effects
• **Organic mercury:** **BAD** – nervous system
Hand / Feet Warmers

- **Ingredients:** iron, water, cellulose, salt, vermiculite-pulverized wood-polyacrylate, activated carbon
- Poison Control: **GI upset** / rarely will you see iron high enough to be a problem (so chelation therapy not common) / liver, heart, vascular problems may occur at high exposure doses
- **Non-activated ones a risk**
- Activated – iron oxide
- Urine might be ‘brown-dark red’ color if exposure is high
- Tx: emesis, ± activated charcoal, milk of magnesia (bulk cathartic)
- Can typically see on radiographs!
Somewhere in WA
Glow Jewelry

- Dibutyl phthalate
- Risk: cats; others
- Acute onset:
  - Salivation
  - Behavior change: catnip-like
  - Unpleasant taste
  - Eye irritant as well
- Rinse (mouth, eye, bathe body) / dilute / resolve over few hours
- Zinc sulfide / strontium aluminate
  - Irritant, neurologic (ataxia, confusion), cardiac irregularities, acute respiratory arrest
Dryer Sheets

- A little pug dog was exhibiting GIT signs after ‘nibbling/chewing on a dryer sheet’
- Fresh ones (unused):
  - **Cationic detergents**: 25-50%, as high as 95%: coat the surface of the fabric to provide lubrication (feel soft) and conduct electric charges (reduce static): static is – charged, cationic substances are + charged
  - Fragrances: smells good
  - **Cationic detergents**: toxicity related to concentration + pH: GIT inflammation and necrosis
- Used – foreign body possibly but most will pass – rarely a problem
- **Tx**: options include: GI protectants, analgesics, anti-inflammatory, PEG tube, endoscopy, antibiotics
Vomit is Our ‘Friend’
Paintballs

• Lewiston, ID
  – 25#, mixed breed dog ingested ‘mound of paintballs’ – now showing neurologic signs

• Ingredients
  – Polyethylene glycol
  – Glycerin
  – Sorbitol
  – Dipropylene glycol
  – Mineral oil
  – Dye
  – Ground pig skin
  – Water

• Toxic dose?
  – 15 in a 41-kg dog

• False + EG kit
Paintballs

- **Osmotic agents**
  - Acid/base: acidosis
  - Electrolyte: $\uparrow$ Na

- **Clinical signs**
  - Vomiting, diarrhea, ataxia, tremors (< 60 minutes)
  - $\uparrow$ HR, weakness, hyperactivity, $\uparrow$ T, blindness, seizures

- **Treatment**
  - Emesis (AS) / IV fluids (slow), symptomatic + supportive / 2007 VECC
• Mushroom found in the lawn grass; high degree of suspicion that the dog had ingested some (pieces and parts scattered around)

• Patient presented: vomiting, diarrhea, ↑ ALT (387 – range: 14-151)

• Patient discharged < 12 hours later, following Tx anti-emetic, GI protectants
What To Think About and Do?

**DVM:**
- *Email images* – give location!
- *Maropitant* if vomiting – most start with this!
- *Decontamination* if appropriate: activated charcoal with sorbitol
- **IV fluid** therapy, in hospital for *24 hours*
- ISTAT: at least *chemistry panel*
- Send home with *liver* and *GIT protectants*, 1-2 weeks
- Request *follow-up biochemistry panel in 48 hours*
- *Clinician’s Brief, March 2015*

**Top categories of mushrooms:**
- **Gastrointestinal** distress – most all start this way
- **Muscarine** containing mushrooms
- **Hepatotoxic** (and renal)
- **CNS**: either excitation or obtundation
- **Nephrotoxic**

Can see fatalities, with hepatotoxic, nephrotoxic and CNS mushrooms
Not so tasty, but it is a dog....

- 10-year-old, F/S, 50#
- 3-year-old, M/C, 25#
- Both: presented “comatose” – emergency service (CA)
Heart beat regular, strong; normal rhythm; lungs clear; pupils pinpoint; no reflexes

- Both dogs running loose (few hrs)
- Within 30 min returning home
  - Staggering
  - Ataxia
  - Falling down
  - Tongues hanging out
  - Collapsed
  - 2 other dogs fine
• Frankie
  – CBC, panel: ok
  – Gastric lavage
    • Dog food, scrambled eggs
  – 120 ml AC + sorbitol
  – 15 min: cardiac and respiratory arrest
  – CPR: unsuccessful

• Cody
  – CBC, panel: ok
  – Gastric lavage
    • Dog food
  – 120 ml AC + sorbitol
  – ICU overnight
    • Warm blankets, heating pads (T↓)
    • O₂ nasal catheter
    • Rotated / Expressed bladder
    • IV LRS
• **Cody**
  - 3:45 PM next day (24 hrs) – no improvement
  - 5:00 PM
    - Slight anal tone
    - No palpebral reflex
    - No poisons
    - Shoots coyotes
    - No “bad” neighbors
  - O elected euthanasia
Running Around

• PM
  – Large chunks of “tripe”-type material, meat with skin and black hair attached

• Owner euthanized horse several weeks ago
  – Dug up by wild boars
  – Dead pigs, coyotes, birds

• Case in North Carolina: 110 hours!
Birth Control Pills

- Get this question A LOT!
- Estrogens / progesterones / placebos
- In general: < 1 mg/kg estrogen will cause no problem / progesterones may cause mild sedation
- Iron – may cause GI upset and discoloration to urine
Does ‘Natural’ Mean Safe??

- 3-year-old girl ‘moused up’ 2, 12-week-old, kittens (4-5#)
- Presented: HR:380 BPM, lateral recumbency, non-responsive, panting, tremors, ‘seizure-like’, miotic pupils
- Responded well to IV fluids, bathing
- Progesterone: decontaminate if exposure > 10 mg/kg / mild and self-limiting ataxia and lethargy, that can progress to recumbency and seizures
Laundry Detergent Pods

- Ionic and non-ionic surfactants
- Topical, ocular, and oral exposures are potential problems
  - Self-limiting **vomiting**; coughing, lethargy, nasal discharge, dyspnea (signs of respiratory irritation)
  - Rare to see more serious consequences
- **D for dilution** (no emesis, no activated charcoal, no cathartic)
- Symptomatic: anti-emetic, GI protectants, keep well hydrated, possible antibiotics, analgesia, scope?
Meat Package Padding – ‘Meat Diapers’

- **Silica gel**: super-purified sand
- **Cellulose**: super-purified plant fiber
- **POLYGEL**: gel based super absorbent sachet – various heat-bonded plastic materials
- **Non-toxic**: mild GI upset, make sure pass, absorb lots of fluid
Hot/Cold Gel/Ice Packs

- **Ingredients:**
  - Ammonium nitrate
  - Iron powder
  - Water, propylene glycol, urea, cellulose

- **Expect:** mild gastrointestinal upset

- **Tx:** induce emesis?, gastrointestinal protectants, symptomatic care / will cause false positive on EG kit

- **Contamination concern?** examples include ethylene glycol, diethylene glycol
Flares, Matches and Fireworks

- Nitrates – sulfates – phosphorus / potassium chlorate
- Gastrointestinal distress, CNS depression if high exposures?
- Large exposures - ?methemoglobinemia
‘My Neighbor Poisoned My Dog’ Syndrome: When TV and Reality Collide!

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Antemortem & Postmortem Diagnosis - Why Is It So Hard?

- Animal becomes acutely ill or large die-off, think “toxin”
- Do not present with label on forehead
- Common: ‘free roaming’ – outdoors – no one looking
- Methodical in your investigation - don’t rule out other possibilities (e.g., traumatic, neoplasia, infectious diseases, metabolic, nutritional)
- Get as much background information – reconstruct the exposure scenario

HISTORY, HISTORY, HISTORY
Antemortem & Postmortem Diagnosis

- Remember: Exposure ≠ Toxicosis
- It is the **Dose** that makes the poison
- Often an emotional moment – multiperson involvement:
  ★ communications are essential!
  ★ multidisciplinary approach / fine tune / avoid excessive cost and enhance probability of positive outcome / make it worthwhile
What To Sample??

- You can never sample too much!! – large volumes
- All specimens should be individually bagged and labeled
  - GI contents / vomitus
  - liver, kidney, muscle
  - fat, pancreas, lung
  - urine
  - serum / plasma / blood
  - eyeball (retina)
  - brain
  - skin / hair (dermal exposures)
  - feed / baits / water / soil: representative
- Preservation: chilled or frozen
Common Pitfalls

- Insufficient history
- Inappropriate sample for test requested
- Insufficient sample size
- Poor bagging, labeling, packaging
- Poor preservation

- When in doubt, **CALL!**
Approach #1 – Visual Inspection

- ID: 3 dogs in fenced in back yard
- Owner came home – found two dogs dead – with ‘this between the two of them’
- If you ever find yourself saying – looks like poppy seeds…..
- Helps to work with people who know the area
Visual Inspection
Visual Inspection
Visual Inspection
Approach #2 – Smell (be careful)

- Utah, 2015
- Canine presented because of acute onset of vomiting shortly after ingesting *rodenticide*; was exhibiting some ataxia
- DVM sedated patient; performed gastric lavage
- Vomit smelled like ‘garlic’
- Don’t smell for too long, but…..

- Some OP/carbamate pesticides – strong sulfur
- Ethanol smells like ethanol
Approach #3 – Freeze!

- Found in the middle of the forest outside of Elk City, ID
- Middle of December
- ‘Big pile of unfrozen meatballs’
- WA – client was finding pieces of raw steak meat near an area where people walk their dog
- Had put in freezer – not completely frozen – now testing for ??????
• Southeastern ID
• Canine, cattle/sheep dogs, 5 on premises, 3 dead over 3 day period
  – Dog #1: observed to be normal at 8 AM, found dead at noon
  – Dog #2: observed to be normal at 5 AM, found dead at noon
  – Dog #3: observed to be normal at 5 AM, seen seizing at noon

• Diagnostics
  • Histology: no cause for death
  • Carbamate insecticides -
  • Cyanide -
  • Chlorinated hydrocarbon insecticides -
  • Organophosphate insecticides -
  • Strychnine -
  • Zinc phosphide -
  • Sometimes it helps to know your area – ‘no coyotes howling’
1080 – Sodium monofluoroacetate

- Banned in US for general use – coyote control + rodenticide / extremely effective
- Widely used New Zealand
- All animals susceptible; 2° poisoning can occur; still see poisonings (not common – last on list) – cows, dogs, wolves, eagles
Approach #5 – Clinical Signs / Response to Treatment

- Owner found biscuits in backyard with cat – difficulty breathing
- rDVM observed: severe dyspnea, pale/cyanotic mucous membranes
- Started cat on O₂ therapy – pulled blood – noted ‘chocolate brown color to blood’
- Toxin?????
Clinical Signs

• Two adult boxer/terrier dogs wandering neighborhood for ½ hour
• Within 1 hour of returning home:
  – Vomiting
  – Excessive salivation
  – Diarrhea
  – Severe bradycardia
  – Seizures
• Other dogs in the county had responded to atropine and fluid therapy
• DUMBSLED
Clinical Signs / Clinical Pathology

- Adult, American Staffordshire terrier, F/S
- Out for morning run with owner in wooded area in SE Idaho – 1 hour later owner noticed seizure activity
- Owner noticed dog eating ‘meat-brown substance’ at one point in woods
- No history of previous seizure activity

Presentation
- No PLR
- T: 100°F
- HR: 110
- RR: 30
- Tacky mucous membranes
- **Glucose:** 46 – remained for 4 hours despite 5% dextrose IV
- ALT: > 1400 U/l, bilirubin elevated
- Died of liver failure few days later
What is Now a Popular Intentional Canine Killer? Taste?????

- Seen cases where trying to kill wolves, but have (un)intentionally killed coyotes and dogs (e.g., pile of butchered beef bones)
- Can test for xylitol in suspect source material or stomach contents
Approach #6: Necropsy – Gross and Histopathology

- Two adult Labrador retriever dogs spent the night in the garage
- Owners awoke in the morning to find one dog dead, one died on the way to the clinic
- Gross examination
  - **Dog A**: marked SQ edema, limited to feet/distal limbs, all 4 feet; brown discoloration to the urine
  - **Dog B**: severe submandibular SQ edema
- Histologic examination
  - **Dog A**: edema described above, renal granular casts and proximal tubules with intracytoplasmic pigment
  - **Dog B**: edema described above
Name the Toxin!

![Poison Symbol]

\[ \text{acetaminophen} \]
• **Signalment**: 3-year-old, M/C, 6.4-kg, mixed breed cat

• **Complaint**: ‘acute’ respiratory distress and inappetance following ingestion of a new brand of cat food – died shortly thereafter

• **Temporal relationship ≠ cause/effect**

• **Gross / Histologic Dx**: severe pyothorax and fibrinous pleuritic (most likely due to penetrating trauma)
• HI – 8 ‘pit bull mix’ dogs on premises – 2 are loose
  – Owner’s observed neighbor throwing food over fence to dogs
  – Within 10 minutes, female seizuring (died on way to clinic)
  – Returned home to find 2nd male dog dead
  – Found bread with white powder

• ID – owner came home to find Doberman in back yard with these things scattered around
Organic Toxicology Screen

- Organics only
- Not sensitive, not specific
- Digest: acidic, basic, neutral
- Gas chromatography / Mass spectrometry
- History of use: hundreds of compounds (e.g., pesticides, drugs)
Ten dead cats in a neighborhood in Lewiston, ID – found this material in a dish
 Sometimes You Just Get Lucky!

- Caught dog eating out of garbage can while cleaning old barn
- Had thrown class container of ‘pills’ away
- Became ill within 15 minutes – vomiting, with blood
- Next 3 days:
  - Vomiting never stopped / Hemorrhagic diarrhea began shortly thereafter and never stopped
  - Renal failure
  - Euthanized