

## Problem Based Approach to CNS Toxicities

### Excitation or Seizures

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### CNS

#### SEIZURES, EXCITATION

Differential diagnoses:

- Sodium fluoroacetate Compound 1080
- Metaldehyde
- Lead (Mixed CNS effects)
- Pyrethrins & Pyrethroids (mixed CNS)
- Ryegrass staggers

### CNS

#### SEIZURES, EXCITATION

Differential diagnoses:

- Salt poisoning (water deprivation/Na)
- Chocolate (Mixed CNS effects)
- Organochlorine insecticides (DDT)
- Strychnine
- Herbicides: MCPA and 2,4-D

#### CNS Excitation Toxicities

1080 (sodium monofluoroacetate)

Sources of 1080:

Pesticide to control possums and other pests

- ∞ Pelleted bait or
- ∞ Impregnated carrots
- ∞ dyed black or green
- ∞ poisoned carcasses



## CNS Excitation Toxicities

### 1080 TOXICITY

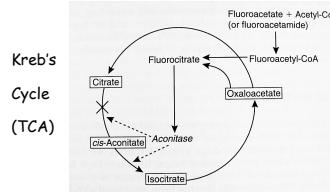
#### TOXICITY:

- Extremely toxic
- < 1 mg/kg oral lethal dose for:
- cats, dogs, rabbits, pigs
- cattle, sheep, goats
- horses

## CNS Toxicities

### COMPOUND 1080

#### Mechanism of Action: (classical theory)



## CNS Excitation Toxicities

### COMPOUND 1080

Toxic effects are variable:

- Primates and herbivores
  - Primarily a Cardiac dysfunction
- Cats, sheep and pigs
  - Cardiac and nervous effects
- Carnivores (e.g. dogs)
  - Primarily nervous signs/effects

## CNS Excitation Toxicities

### COMPOUND 1080

Clinical Signs/effects in the dog:

- Vocalisation, Running
- Tetanic-like seizures
- Frequent defaecation, urination
- Metabolic Acidosis
- Hyperthermia
- ↑ Blood glucose, ↓ Calcium (ionised)

CNS Excitation Toxicities

**COMPOUND 1080**

Clinical Signs/effects in herbivores:

- Stagger, tremble
- Signs of gastrointestinal upset
- May resemble hypocalcaemia in dairy cattle
- Cardiac arrhythmias
- Stress or exercise precipitates death
- Terminal convulsions

CNS Excitation Toxicities

**1080**

Clinical Pathology:

- Hyperglycaemia (2 fold or greater)
- Hypocalcaemia (ionised calcium)
- Increased serum citrate
- Metabolic acidosis

CNS Excitation Toxicities

**1080 TREATMENT:**

- Decontaminate if no clinical signs
- Anticonvulsants (diazepam or barbiturates)
- Metabolic Acidosis
  - Sodium Bicarbonate (fluids)
  - Acetamide (fluids)
- Supportive Care

CNS Excitation Toxicities

**1080 Post mortem & Diagnosis:**

- Non-specific changes
- Agonal heart changes
- Rapid onset of rigor mortis
- Analysis of stomach contents \*\*
- History of exposure

## CNS Excitation Toxicities

### 1080 Summary:

- Clinical signs for dogs - excitation
- Effects on herbivores - cardiac
- Metabolic acidosis - Sodium Bicarb
- Rapid onset of rigor mortis
- Clin Path changes (glucose, Calcium)
- Symptomatic care & acetamide

## CNS Excitation Toxicities

### Metaldehyde



#### Sources of Metaldehyde:

- ∞ Slug or snail bait
- ∞ Pelleted mixture
- ∞ dyed blue-green or
- ∞ non-dyed pellets



## CNS Excitation Toxicities

### Metaldehyde

#### Toxicity of Metaldehyde:

- ∞ Dog: 200 mg/kg (but variable)
- ∞ Cattle, sheep: 200-300 mg/kg
- ∞ Bittering agent added to deter ingestion
  - ∞ But it is not 100% effective in stopping ingestion (eg dogs)

## CNS Excitation Toxicities

### Metaldehyde

#### Mechanism of Action:

- ∞ Unknown - only partly understood
- ∞ Affects CNS neurotransmitters
- ∞ Onset can be minutes after ingestion, but may be after 1-2 hours

#### CNS Excitation Toxicities

##### Metaldehyde

Clinical signs - dogs, cats:

- Anxiety, grimacing, restlessness
- Depression
- Vomiting and diarrhoea
- Salivation
- Muscle tremors "shake and bake"
- Incoordination

#### CNS Excitation Toxicities

##### Metaldehyde

Clinical signs - dogs, cats:

- Blindness
- Metabolic Acidosis
- Excitation to narcosis
- Tachycardia, Tachypnoea
- Cats-nystagmus, convulsions stimulated
- Surviving animals may develop liver/renal disease

#### CNS Excitation Toxicities

##### Metaldehyde

Clinical signs - Herbivores:

- Ataxia, tremors
- Colic, diarrhoea
- Blindness
- sweating
- hyperthermia
- Tachycardia, Tachypnoea
- Salivation

#### CNS Excitation Toxicities

## METALDEHYDE

### Clinical Pathology

Metabolic Acidosis - check acid/base

In cases of moderate to severe toxicity:

Liver enzymes may increase

Renal tests (urea nitrogen, creatinine) increase

Diagnosis:

Submit frozen stomach contents (or vomit)

#### CNS Excitation Toxicities

##### METALDEHYDE

###### TREATMENT

- Metabolic Acidosis  
(corrects itself when tremors are controlled)
- Symptomatic and Supportive Care
- Anticonvulsants (as needed)
  - Diazepam
  - Methocarbamol (Robaxin)\*\*
  - Barbiturates

#### CNS Excitation Toxicities

##### CHOCOLATE

- methylxanthine
  - theobromine
- chronotropic and inotropic cardiac effects
- causes diuresis (like coffee)
- dark chocolate more toxic than milk chocolate



#### CNS Excitation Toxicities

##### CHOCOLATE

- Hyperactive, restless, vomiting
- Hyperthermia
- Urinary incontinence
- Hyperreflexive
- Cardiac arrhythmias
- Ataxia, seizures and coma



#### CNS Excitation Toxicities

##### CHOCOLATE TREATMENT

- Anticonvulsants
- Symptomatic and supportive care
- Premature Ventricular Contractions - lignocaine
- Tachycardia - beta blockers if persist

CNS Excitation Toxicities  
**RYEGRASS STAGGERS**

SOURCE

- ∞ Mycotoxin - Lolitrem B  
(Neotyphodium lolii)
- ∞ Ryegrass pastures  
(Lolium perenne)



CNS Excitation Toxicities  
**RYEGRASS STAGGERS**

*Clinical Signs*

- ∞ Trembling, twitching of muscles
- ∞ Head nodding, jerky movements
- ∞ Incoordination, ataxia
- ∞ Severe - opisthotonus

CNS - MIXED EFFECTS  
**PYRETHRINS OR PYRETHROIDS**



CNS - MIXED EFFECTS  
**PYRETHRINS OR PYRETHROIDS**

- Numerous sources      popular  
'safe' insecticides



#### CNS - MIXED EFFECTS

#### PYRETHRINS OR PYRETHROIDS

Clinical Signs:

- Cats - very sensitive to permethrin
- Ear twitching
- Muscle tremors
- Dyspnoea
- Hyperthermia (muscle activity)

#### CNS - MIXED EFFECTS

#### PYRETHRINS OR PYRETHROIDS

Mechanism of Action:

- Act on sodium channels (Na in/ K out)
  - "open channel blockers"
- Results in repetitive nerve impulses
- Type II - GABA, glutamic acid receptors
  - leads to hyperexcitability of nervous tissue

#### CNS - MIXED EFFECTS

#### PYRETHRINS OR PYRETHROIDS

##### Treatment:

- Decontaminate
  - Dermal - thoroughly wash animal
  - Oral - activated charcoal & laxative
- Symptomatic & Supportive therapy
  - watch body temperature
- Anticonvulsants - prefer methocarbamol (Robaxin®) 55-220mg/kg to effect

#### CNS - MIXED EFFECTS

#### PYRETHRINS

##### SUMMARY:

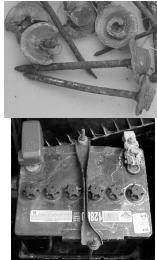
- Common and 'safe' insecticides
- Reversible effect on sodium ion channels
- Thoroughly decontaminate!
- Symptomatic care - anticonvulsants
- DO NOT use dog products on CATS

#### CNS - MIXED EFFECTS

##### LEAD

Sources:

- Paint
- Leaded gasoline
- Lead shot
- Roofing nails etc
- Batteries



#### LEAD POISONING

Toxicity:

- Variable as lead is poorly absorbed
- Toxicity increased in young animals
- Most species - esp dogs and calves
- All species are susceptible
- Acute oral dose from 50-900mg/kg

#### CNS - MIXED EFFECTS

##### LEAD

Mechanism of Action:

- Exact mechanism not known
- Toxic to enzymes, tissues, organs
  - Inhibits delta-amino levulinic acid dehydrase
- Nervous, gastrointestinal and haematopoietic tissues affected

#### CNS - MIXED EFFECTS

##### LEAD - Dog

Clinical Signs:

- GI signs: vomiting, anorexia, colic
- Lethargy
- Seizures (& chomping fits)
- Hysterical barking, hyperexcitable
- Paraplegia, loss of coordination
- Blindness
- Megaeosophagus

#### CNS - MIXED EFFECTS

##### LEAD - Cat

###### Clinical Signs:

- GI signs: vomiting and anorexia
- Lethargy
- Depression

#### CNS - MIXED EFFECTS

##### LEAD - Cattle

###### Clinical Signs:

- Acute poisoning (calves):
  - Sudden death or stagger, vocalise, chomping, eye rolling, frothing
- Subacute (usually adult):
  - anorexia, ataxia, blindness, salivation, muscle tremors and hyperaesthesia
  - abdominal pain, rumen atony, constipation

#### CNS - MIXED EFFECTS

##### LEAD

###### Clinical Pathology:

- Basophilic stippling of RBCs
- Blood lead levels
- Urinary lead
- Delta-aminolevulinic acid (urine)
- Radiographic evidence of lead

#### CNS - MIXED EFFECTS

##### LEAD

###### TREATMENT:

- Decontamination (magnesium sulphate)
- Chelation therapy
  - Calcium EDTA - parenteral
  - D-Penicillamine - oral
- Anticonvulsants
- Supportive therapy
- Thiamine in cattle

## CNS - MIXED EFFECTS LEAD

### SUMMARY:

- Numerous environmental sources
- Decontamination MUST remove lead
- Gastrointestinal and neurological signs
- Chelation therapy
- Anticonvulsants
- Supportive therapy

## CNS Toxicities

### SUMMARY

- Decontamination & Elimination
- "Treat the patient not the poison"
- Good nursing care is IMPORTANT!

## OTHER LESS FREQUENTLY SEEN TOXICITIES

STRYCHNINE no longer sold in NZ

ORGANOCHLORINE PESTICIDES

ILLEGAL DRUGS

Amphetamines and Cocaine

## CNS Excitation Toxicities

### STRYCHNINE

(aka nux vomica)

Infrequent poisonings as no longer sold in NZ as  
a rodenticide

Nux vomica is used as a stimulant in Ketovet®

- Muscle rigidity
- Sawhorse stance
- Opisthotonus
- Violent seizures (stimulated)

CNS Excitation Toxicities

**STRYCHNINE TREATMENT**

- Anticonvulsants
- Symptomatic and supportive care
- Dark, quiet environment

CNS Excitation Toxicities

**ORGANOCHLORINE PESTICIDES**

Limited availability in NZ

- Behaviour: agitated and aggressive
- Spastic gait
- Blepharospasms
- Muscle fasciculations (head first)
- Continuous chewing
- Tonic-Clonic convulsions
- Other signs: weakness, paraesthesia

CNS Excitation Toxicities

**ORGANOCHLORINE TREATMENT**

- Light sedation with anaesthetics
- Symptomatic and supportive care
- Oxygen