

# PESTICIDE POISONING AND ITS TREATMENT IN SMALL ANIMALS

ANDREA VINAIXA CASTILLO - JUNE 2022

## INTRODUCTION & OBJECTIVE

Pesticides are the main poisoning agents among dogs and cats in Europe. Among them, insecticides are the principle cause of small animal poisoning in most European countries whereas anticoagulant rodenticides are dominant in Italy. In addition, strychnine is still associated with poisonings in several Mediterranean countries though it was banned in 2006. Molluscicides are also a big concern in the UK and the Czech Republic, being also an increasing problem in other countries.

The aim of this final degree project is to research the main updates regarding the fast diagnose and treatment of the highest incidence pesticides in Europe.



Insecticides



Rodenticides



Molluscicides

## CARBAMATES & ORGANOPHOSPHATES (OP)

→ **WHAT DO THEY DO?** → Inhibit the acetylcholinesterase enzyme (AChE)

**ANTIDOTE** → **ATROPINE**

- Only works relieving muscarinic signs
- Risk of atropinization
- Better stabilization observed when administered with MICROPUMP

**GLICOPIRROLATE** → Antimuscarinic. Potential alternative to atropine

- Less solubility → Less risk of atropinization
- Associated with more complications

**OXIMES** → Cause toxic agent - AChE dissociation. Its use is still controversial

- New oximes → KO-27 & BI-6
  - Long lasting effect
  - Regain cardiorespiratory function
- Oximes combination → Greater efficiency
  - Reactivating AChE
  - Controlling seizures
  - Decreasing neurological damage

**CURCUBITURIL** → Can incorporate molecules inside it

- Increase cerebral AChE protection
- Decrease
  - Toxic entrance through brain barrier
  - Intestinal toxic absorption

**ANTI HISTAMINES** → Prevent excessive nicotinic receptors stimulation

- Difenhidramine
- Prometazine
- Similar sign control as atropine
- Decrease cardiotoxicity

## PYRETHRINS & PYRETHROIDS

→ **WHAT DO THEY DO?** → Increase time between opening/closing voltage - gated sodium channels

**HIGHLY TOXIC IN CATS**

**IVERMECTINE** → Chloride voltage gated channel agonist

- Decrease muscarinic signs & muscular discharges
- Able to recover vagus membrane potential

**LIPIDIC INFUSION** → Known for many years but little used

- Prevent pyrethroid distribution by binding to it
- Effective reduction of signs and few adverse effects

**PYRETHROIDS CAUSE OXIDATIVE DAMAGE**

- Brain
- Heart
- Liver
- Kidneys

→ **MELATONINE & SPERMIDINE** → Neuroprotective  
Cardioprotective

→ **α LIPOIC ACID** → Neuroprotective  
Increases Vitamin C and glutation

→ **A.CAMPESTRIS ESSENTIAL OIL** → Hepatoprotective  
Increases SOD, CAT & OP

## ANTICOAGULANT

→ **WHAT DO THEY DO?** → Vitamin K<sub>1</sub> hidroquinone depletion

**ANTIDOTE** → **VITAMIN K<sub>1</sub>**

- Relieves symptoms in 6-12 hours
- Coagulation values can't be assessed during therapy
- Doesn't increase toxic elimination

## COLESTIRAMINE

- Bind biliar acids, preventing enterohepatic toxic circulation
- Increase survival rate up to 11% & decrease total therapy time

## VITAMIN K<sub>1</sub> THERAPY DURATION

- Traditional
  - Stop treatment after 3-4 weeks & assess coagulation values
  - Risk of bleeding if toxic concentration > 10 mg/ml
- New proposal
  - Determine toxic concentration 3 times in a week
  - Suppose a 1st order kinetics and estimate therapy's duration

## STRYCHNINE

→ **WHAT DOES IT DO?** → Post synaptic glicine receptor antagonist  
→ Banned in 2006 in Europe, but there are still cases

## IVERMECTINE

- Glicine receptor agonist
- Protective effect after 14h → No utility in acute poisoning

## SARCOPINE

- Glicine receptor antagonist
- Acts rapidly
- Decreases mortality and delays seizures onset

## METALDEHYDE

→ **WHAT DOES IT DO?** → Decreases GABA concentration

## HEMODIALYSIS

- Same mortality rates
- Decrease
  - Anesthesia time to control seizures
  - Hospitalization times
  - Aspiration pneumonia

## CONCLUSION

- No fast diagnostics methods available to diagnose pesticide poisoning in the veterinary clinic
- Same traditional treatment for insecticides, anticoagulants, and metaldehyde. Consists in gastric decontamination, symptomatic treatment for seizures, muscular tremors, and complications
- Symptomatic treatment for anticoagulants: vitamin k and blood transfusions
- Carbamates and OP
  - New oximes and combinations → Toxic effect protection, decrease mortality
  - Curcubituril → Increase treatment efficacy
  - Antihistamines → Similar results as atropine, cardiotoxicity protection
- Pyrethroids
  - Lipidic infusion → Fast symptom resolution, few adverse effects
  - Ivermectine → Sialorrhea treatment, recovers vagus membrane potential
  - Antioxidant compounds → Great protection against oxidative damage
- Anticoagulants
  - Cholestiramine → Decreases toxic permanence in the body
  - Treatment estimation of duration → Decreases bleeding risk
- Strychnine → Sarcopine → Decreases strychnine inhibitory potential, more studies are needed
- Metaldehyde → Hemodialysis → Decreases anesthesia and hospitalization times, decrease aspiration pneumonia incidence