How I treat rodenticide toxicity

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Rodenticide poisoning in dogs has become a common clinical condition in mixed practice largely due to the increased intensification of the Dairy Industry and the use of feed pads and silage bunkers. Rat baits are commonly laid under silage wrap and near bunkers to vermin proof these animal feeds.

These baits are classified as either: first generation, intermediate or second generation rodenticides. Regardless of the product all the anticoagulants have the basic coumarin or indanedione nucleus. This nucleus acts as a vitamin K antagonist blocking the recycling of Vitamin K in the liver.

'First generation' Rodenticides – Warfarin, pindone, coumafuryl, coumchlor and isovaleryl indanedione all require multiple feeding to induce toxicity. Warfarin has a half life of 15 hours. Toxic levels 5-50mg/kg.

The 'intermediate' rodenticides, chlorophacinone and diphacinone require less feedings and are more target nonspecific.

The 'second generation' rodenticides, brodifacoum and flocoumafen are far more potent, commonly used and require only a single feed to become extremely toxic to non targets species such as dogs and cats. Brodifacoum has a half life in plasma of 6 days and may be detectable in serum for up to 24 days following a single feed. Suppression of coagulation factors has been seen with two days of ingestion.

LD 50 levels are 0.25-3.6mg/kg

Following ingestion of an anticoagulant rodenticide Vitamin K levels rapidly fall in the liver due to the blocking the Epioxide cycle and the failure of the normal Vitamin K recycling.

Rodenticides specifically block the action of the enzyme **Vit K Epioxide reductase** and the normal carboxylation and production of coagulation factors #2, 7, 9 and 10 are impaired.

Factor 7 which has the shortest half life of all the coagulation factors (6.2 hours) seems to be the most critical and susceptible clotting factor, functioning to promote the conversion of prothrombin to thrombin.

Clinical presentation

The clinical presentation of poisoned dogs can be **extremely variable** and **very nonspecific**. Lethargy, with or without coughing can often be the only presenting sign however the clinical signs generally reflect some manifestation of haemorrhage.

If you are lucky, you may see pallour, epistaxis, haematamesis, haematomas, meleana and haematuria. In a case seen several years ago, the owner just noted profound lethargy and as a passing comment stated that the faeces looked blue/green in colour. Rodenticide baits are generally dyed to permit easy identification.

Owner information is invaluable in the making of a diagnosis, therefore questioning about the use and laying of baits or unsupervised access to farm and poultry sheds is important.

Diagnosis

We use the Prothrombin lab test (PT) on citrate blood however it is of interest to note that the test can be performed on ETDA.

ACT (activated clotting time) tubes can provide a quick in clinic emergency estimation of clotting ability.

Treatment

Vitamin K1 systemic therapy is essential in the management of rodenticide poisonings. Vitamin K3 is totally unsatisfactory.

Vitamin K1 takes 6-12 hours to take effect so the use of plasma or whole blood transfusions must be made depending on the clinical state of the animal. In house PCV evaluation can assist with decision making.

Recent ingestion – induction of vomiting and PT blood test at least 48 hours later. Treat with Vitamin K1 where required.

1. Vitamin K dose rates

First generation rodenticides

2.5 mg/kg s/c in several sites, then 1-2.5mg/kg in divided doses per os q 8-12 hour for 5-7 days.

Second generation (brodifacoum)

5mg/kg in several sites. Then 2.5mg/kg every 12 hours for three-four weeks. Evaluate the coagulation status (PT test) 1-3 weeks following the cessation of therapy.

Inandione (diphacinone)

Initially 2.5-5mg/kg s/c in several sites, then 2.5mg/kg in divided doses per os q 8-12 hour for 3-4 weeks.

2. Supportive Therapy

Frozen plasma – thawed and given IV with colloid administration + Vitamin K1 which supplies coagulation factors. Quick, convenient and always available.

Blood transfusion (10-15 ml/kg) + Vitamin K1 at 2.5-5mg/kg

Oxygen Therapy

3. Monitoring

Response to treatment by using PT (citrate or EDTA) at least 48 hours following cessation of Vit K therapy.

References

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