

VETS BE AWARE!

Iron EDTA Complex

A new active ingredient for safer snail and slug pellets.

INTRODUCTION

Snail and slug pellets are very important contributors to pet poisoning and deaths in Australia. Basically there are three types of active ingredients that are used to control snails and slugs, metaldehyde, methiocarb and the recently released Iron EDTA Complex. There are about thirty different branded metaldehyde pellets (coloured green) and two methiocarb based pellets (blue) on the Australian market. All metaldehyde and methiocarb snail and slug pellets contain 2% or less active ingredient. The original Iron EDTA Complex pellets on the Australian market contained 9% active ingredient (khaki colour) whereas the improved product currently on the market contains 6% active ingredient (rusty brown colour). These are sold under the trade name MULTIGUARD® by Multicrop (Aust.) Pty Ltd.

MULTIGUARD® Snail and Slug Killer is the biggest breakthrough in gardening for years. Developed to provide more effective slug and snail control with less danger to animals. Multiguard® is a welcome relief for garden lovers and pet lovers alike. MULTIGUARD® was introduced to the Australian market after several years of research, to provide a low toxic, more effective slug and snail specific alternative to existing products. MULTIGUARD® is the least toxic of all effective snail and slug killers. Nearly all snail and slug pellets contain a high proportion of bran and/or flour and are consequently attractive to domestic pets and native wildlife.

IRON EDTA

Multiguard® is a flour and bran-based, rust coloured pellet that's applied in exactly the same way as ordinary slug and snail pellets. Unlike ordinary pellets though, it contains a revolutionary new active ingredient called Iron EDTA Complex.

Iron EDTA Complex is considerably less toxic than either methiocarb or metaldehyde. MULTIGUARD® has been specifically designed to reduce animal poisoning and is much more environment -friendly than other snail and slug pellets.

Iron EDTA Complex is widely used in agriculture as a trace element supplement for plant nutrition. Iron EDTA Complex is also used as a treatment of iron deficiency in humans.

Extensive trials have been undertaken in connection with the use of iron EDTA complex as a food additive and there are patents on its use in various types of foods. Iron EDTA complex, when used as a food additive has the advantage over the widely used iron supplements that it does not have a detectable taste or a browning effect on the food. The disadvantage is that it is not particularly well absorbed in the human gut. (Munro, 1993).

TOXICITY, LD₅₀

The toxicity of Iron EDTA complex, metaldehyde and methiocarb to domestic pets can be gauged from the LD₅₀ values for rats reported by Lewis in SAX's Dangerous Properties of Industrial Materials. The LD₅₀ values are 5000, 227 and 15 mg/kg respectively. The toxicity of the snail and slug pellets can be estimated from the percentage of active ingredient and these LD₅₀ values.

Obviously "extrapolating" from a rat to a dog or cat involves considerable uncertainty. Furthermore, it is to be expected that toxicity even on a "per kilogram" basis will depend somewhat on breed and will vary for different species of animal.

The LD₅₀ value for the commercial pellets, in the case of metaldehyde and methiocarb, can be estimated from the percentage of active ingredient and the respective LD₅₀ value. However, it is necessary to take into account other factors when estimating of LD₅₀ values for Iron EDTA Complex pellets.

First, it is well known that the absorption of iron from foods is reduced in the presence of grain products such as flour and bran. Essentially, these foods contain materials, such as phytates, which lock up iron by chelation and reduces absorption into the blood stream from the gut. (This is one of the major reasons why iron deficiency is so common in nations where the diets are principally grain based). Second, it is also well known that the amount of iron absorbed is regulated by a feedback mechanism which reduces the percentage of available iron absorbed from the food as the total percentage of iron in the food increases. This is often referred to as the "mucosal block" mechanism. These two factors reduce the actual LD₅₀ of the pellets to less than that calculated from using the LD₅₀ of the active ingredient alone by the proportion of active in the pellets.

TOXICITY	LD ₅₀	(Based on rats)		
	LD ₅₀ of Pure Active Ingredient	Level of Active Ingredient in pellets	LD ₅₀ for Pellets	Dog (20 kg)
Methiocarb	15 mg/kg	20 g/kg	0.75 g/kg	15 g
Metaldehyde	227 mg/kg	15 g/kg	15 g/kg	300 g
Fe EDTA	5000 mg/kg [#]	60 g/kg [#]	96 g/kg	1950 g*

The level in the pellet is based on the trihydrate whereas the LD₅₀ is based on the anhydrous salt.

* Based on assumption that there is no feed back mechanism in the adsorption of iron and maximum amount of Fe EDTA in pellets.

Average daily food intake (dry basis) of a 20 kg dog is approximately 500 g.

The toxicity of Iron EDTA Complex is basically due to the iron it contains and due to the fact that there is a possibility that other trace metals can be "extracted" from the body by virtue of the chelating properties of EDTA. The second factor would be expected to be a chronic effect but not of paramount importance in acute poisoning. In mammals it appears that most Iron EDTA Complex is not absorbed in the gut and typically 90% is excreted in the faeces. Of that absorbed most is absorbed as ferric or ferrous ions chelated with natural binding substances in food. The small amount that is absorbed as Iron EDTA Complex is almost completely passed in the urine within 24 hrs, the majority being passed within 4 hrs.

SPECIFICITY

Comment [COMMENT1]:
LD50 Fe EDTA > 5 g/kg (according to Colin=s figures 6.4 g/kg) . 3 January, 1997

Therefore 90/1000 g/kg x Y g of pellets/kg = 5 g/kg (LD50 value)
2 . Y = 55 g of pellets/kg need to be eaten to reach the LD50 value.
So a 10 kg dog or child needs to eat 550 g of pellets to reach this value at one attempt. (Daily food intake of a 10 kg dog is approx. 250 g).
Or an 80 kg human needs to eat 4400 g of pellets at one attempt.

However, bran and flour (from the pellet) decrease the absorption of iron from the gut by a factor of 2 to 4 and the mucosal block (feedback mechanism) by a factor of 2 to 5. Hence the overall decrease in absorption is of the range 4 to 20. Assume 5.

More realistically,
a 10 kg dog or child needs to eat 550 g x 5 = 2750 g of pellets to reach this value at one attempt.
Or an 80 kg human needs to eat 4400 g x 5 = 22,000 g of pellets at one attempt.

With Colin=s figures :

So a 10 kg dog or child needs to eat 640 g x 5 = 3200 g of pellets to reach this value at one attempt.
Or an 80 kg human needs to eat 5120 g x 5 = 25,600 g of pellets at one attempt.

It has been known for many years that iron compounds are toxic to molluscs, but it is only fairly recently that it has been appreciated that some iron and aluminium compounds are highly toxic to molluscs but of low toxicity to other organisms. The reason for this specificity is associated with the fact that the oxygen carrier in molluscs and crustacea is haemocyanin based whereas mammals, of course, have haemoglobin as the oxygen carrier and insects have no general circulating oxygen carrying fluid.

SYMPTOMS

Iron poisoning symptoms include gastro-intestinal irritation, nausea, vomiting and diarrhoea. Symptoms should be apparent within a few hours of consumption of the iron compound. Animals may also appear depressed and lethargic. Appetite in most cases is not suppressed. In extreme cases of iron overload haemorrhage and circulatory failure may occur after 12-24 hours. Ferrous sulfate is the most common cause of iron poisoning, but the results of ferrous sulfate consumption are iron poisoning AND specific effects due to the corrosive nature of ferrous sulfate. The strongly acidic nature of ferrous sulfate causes specific effects not necessarily always associated with iron poisoning. It is unlikely that an extreme overload could occur by normal voluntary ingestion of Multiguard by animals. It is to be expected that the effects of pets consuming large amounts of Iron EDTA Complex based pellets will be similar to those of typical iron poisoning. However it must be pointed out that Iron EDTA Complex is not corrosive like ferrous sulfate so symptoms observed with ferrous sulfate poisoning such as blood stained vomit and faeces are considerably less likely to result from eating Iron EDTA Complex pellets. The iron EDTA complex in Multiguard is the ferric EDTA oxo- dimer which is alkaline. As Multiguard is slightly alkaline it may cause dogs to vomit.

TREATMENT

Speed of treatment is essential. If material is removed from the stomach before much is absorbed little harm will occur. Severe problems are only likely to occur if the animal has eaten more than a typical meal in weight and has not vomited.

Consumption of a few pellets by a cat or dog would not be expected to lead to any detectable symptoms. Any noticeable reaction is probably due to the taste deterrent incorporated in the pellets to deter children from eating them. Iron is an essential trace element and is often added to pet food.

Consumption of a larger amount of pellets, up to 40% of a typical meal, may lead to vomiting and possibly diarrhoea. If the majority of the pellets have been brought up there is no need for further action other than to monitor recovery. If some pellets are thought to remain in the stomach, induce vomiting as soon as possible. The animal should be kept calm and not subject to undue stress. Due to the nature of the active ingredient and the composition of the pellet itself, long term disturbance of the digestive systems are not expected.

If more than an average meal has been ingested then induce vomiting as soon as possible unless this has already taken place (which occurred in all but 3 cases reported to Multicrop (Aust.) Pty. Ltd.). This should be done using apomorphine at a rate of 0.04mg/kg by intravenous injection or 0.08 mg/kg by intramuscular injection.

Recovery from even a significant consumption of pellets is quite rapid with the animal generally returning to normal activity within 24 to 48 hours. **No long term complications are to be expected.**

In extreme cases it may be necessary to treat with deferoxamine. This should only be used as a last resort if signs of systemic iron toxicity are observed. To date, the author is only aware of one

case in which there appeared to be symptoms which could reasonably be linked with iron toxicity (a case where a medium sized dog had eaten about 1 kg of the 9% product) Products currently on the market are only 6% and no case has come to the author's notice of probable systemic iron toxicity since their introduction. Deferoxamine has toxic side effects. The preferred route is by intramuscular administration at a rate of 40 mg/kg every 4 to 8 hrs depending on the animals clinical status. The total dose should not exceed 6 gm/day and should not be continued for more than 4 days or when the serum iron levels are below 300:ug/dl. Intravenous infusion of deferoxamine at the rate of 15 mg/kg/hr can be administered but the intramuscular route is considered safer.

For more details on treatment the reader is referred to the AVA Information sheet 11 June 1997.

TREATMENT SUMMARY:

TREATMENT PROTOCOL			
AMOUNT OF PELLETS CONSUMED	FOR A MEDIUM DOG (20 kg)	FOR A SMALL DOG (2 kg)	TREATMENT
Less than 5% of typical meal	250--450 pellets	25-45 pellets	Not needed
Up to 40% of typical meal	200 g of pellets(2,400 pellets)	20 g of pellets (240 pellets)	Dog will normally vomit if not induce vomiting using apomorphine if animal has retained majority of pellets in stomach.
More than typical meal	>750 g of pellets (>9,000 pellets)	>75 g of pellets (>900 pellets)	Induce vomiting using apomorphine if animal has retained majority of pellets in stomach.
More than four times typical meal	3 kg of pellets (36,000 pellets)	300 g of pellets (3,600 pellets)	Induce vomiting using apomorphine. If signs of systemic iron toxicity are observed treat with deferoxamine

Multicrop (Aust.) Pty. Ltd. have received in excess of forty reports of dogs having eaten pellets (over three spring seasons). The most common symptom is vomiting, with a lethargy and general malaise for one or two days in about fifty percent of cases. There have been no substantiated cases of significant problems which could be attributed to iron EDTA poisoning. The one reported death proved to be false, the vet involved admitting that there was no conclusive evidence that the dog had eaten any snail and slug pellets of any kind. Autopsy failed to establish the cause of death. In the other reported case there was no scientific evidence produced for the claim of iron poisoning and a retraction was made by the veterinarian.

Since the bait formulation in the Multiguard product is flour/bran based it is not unattractive to dogs, it is inevitable that Veterinary Clinics will be presented with cases where dogs have consumed significant quantities of pellets. Such situations could arise in cases of deliberate poisoning attempts and where the product has been left in the open rather than being stored out of the reach of children and pets as per the directions. In the absence of direct toxicity studies on the formulated product on dogs, caution should always be exercised in treatment. The above is only recommended treatment based on scientific studies on rodents and experience with domestic animals. Multicrop (Aust.) Pty. Ltd are committed to the introduction and monitoring of new environment-responsible products to the home gardener. They have sought advice and received support from the AVA,

NASAA and a number of veterinarians. They are keen to receive any observations or information or comments on the effect of consumption of Multiguard by domestic animals.

EFFECTIVE

The active ingredient in MULTIGUARD® is quite different to either metaldehyde or methiocarb. Because it does not depend on paralysis or dehydration for its effect and works exceptionally well in the cool, damp conditions slugs and snails love. They're unable to recover in wet conditions as sometimes occurs, after eating metaldehyde pellets. Many scientific trials have shown that MULTIGUARD® is more effective than other slug and snail killers. In fact a series of Australian trials showed that MULTIGUARD® killed 50% more snails than metaldehyde and 20% more snails than methiocarb in spring and autumn, the seasons when plants are most vulnerable.

ENVIRONMENT-FRIENDLY

MULTIGUARD® is also kind to the environment. It doesn't harm earthworms or other beneficial insects and has no noticeable detrimental effect on birds that eat slugs and snails. Even plants benefit from MULTIGUARD®. Apart from being protected from the ravages of slug and snail damage, they can use the iron released from disintegrating pellets as a valuable nutrient source.

Multicrop (Aust.) Pty. Ltd. can be contacted on 03 8720 2100 or 926 Mountain Highway, Bayswater, Victoria, 3153.

1. Australian Veterinary Association Information Sheet Multiguard snail and slug bait, June 11, (1997).
2. Munro, I.C. "Sodium iron EDTA" in toxicological evaluation of certain food additives and contaminants. WHO food Additive Series: 32. World Health Organisation, Geneva, pp195-222. (1993).