Metaldehyde poisoning (in the dog)

Metaldehyde is a common ingredient of molluscicide pellets for the control of slug and snail infestations, usually incorporated at between 3-8% by weight. A retrospective analysis of telephone enquiries to the Veterinary Poisons Information Service found 772 cases with follow-up concerning suspected metaldehyde slug bait ingestion in dogs between 1985 and 2010. Half the enquiries occurred between May and July, which is when slug bait is in use. Fatal outcomes ensued in 16% of the 762 cases where data were available (Bates et al., 2012).

Data on ingested doses are variable. LD50 values for dogs cover a wide range, the lowest published value being 60mg/kg bodyweight with many much higher levels also in the literature: with a bait of 8% w/w strength, then the fatal dose in dogs would be 750mg bait/kg bodyweight (Campbell and Chapman, 2000).

For a 30kg labrador, the amount required to achieve this level of ingestion could be in the order of 20g – about four teaspoonsfuls of pellets. However, most commercial (and agricultural) baits are 3%, which more than doubles the quantity of bait that would have to be ingested to almost 60g.

The mechanism of toxicity is not completely understood. Metaldehyde is hydrolysed by gastric acid to acetdehyde which is toxic, and which is then quite rapidly metabolised to carbon dioxide.

More recent experimental work has also identified a decrease in the levels of the inhibitory neurotransmitter gamma-aminobutyric acid (GABA), noradrenaline and of 5-HT as well as gamma-aminobutyric acid (GABA), of treatment.

A suspected case is often presented to veterinary practice. It may be that a reduction in the inhibition of GABA accounts for the symptoms seen in metaldehyde poisoning, of hyperaesthesia leading to opisthotonus and convulsions, collapse, dyspnoea, respiratory depression and death from respiratory failure.

The most comprehensive advice on treatment is available from the VIPS (Campbell and Chapman, 1990; also online and by phone via the subscription service) and consists of the use of emetics, gastric lavage, control of seizure by sedation or the induction of anaesthesia with the use of other appropriate supportive therapy such as fluids. Symptoms may last for 24 hours or more.

Treatment can be successful in many instances. Factors which will affect the outcome include quantities of metaldehyde ingested, success of emesis/gastric lavage, the time between ingestion and the instigation of treatment.

A suspected case is often presented with little information as to the quantities ingested. However, the potential toxicity of the ingredient is such that any suspected case should be taken seriously.

If the dog is still bright then the use of an emetic such as apomorphine can quickly establish whether or not there is any tell-tale blue material in the stomach contents, as well as reducing the toxic load.

Treatment thereafter is symptomatic, with the primary presenting signs being convulsions, hypersalivation, twitching, tremor, hyperaesthesia, ataxia, vomiting and hyperthermia.

An essential part of treatment appears to be seizure control: there are several different regimes in use, as with the control of status epilepticus of any other cause. It must be remembered that the symptoms can take several hours to manifest themselves and also that the tendency to seizure can continue for 24 hours or more.

Why does metaldehyde poisoning arise?

Metaldehyde-based pellets are commonly formulated with milling and pasta wheat in order to entice target species – slugs and snails – to consume the pellet in preference to the surrounding wheat, oilseed rape, vegetable or salad crop.

Those same palatability characteristics appear to render them attractive to dogs.

However, used in accordance with the label instructions, the risk to dogs from distributed product is virtually nil.

Slug bait pellets are designed to be spread thinly over areas to control slugs: typical distribution levels for brands available for both private and commercial use are at less than 1g of bait per square metre.

So: a 30kg dog would have to ingest all the slug bait over an area of around 20m² to achieve anything approaching toxic levels of 20g of bait at 8% concentration or 55g for 3% bait.

It seems very unlikely that a dog would be able to acquire and eat such a quantity if the bait is applied according to the label.

The risk, therefore, appears to arise in two circumstances:

1. Poisoning incidents generally arise when the dog can get access to stored material prior to distribution. In the author’s experience, it is evidence in the form of open or damaged packaging that first leads the owner to suspect the dog has accessed metaldehyde.

2. Other cases come to light because of the highly suspicious presenting signs such that the owner is sent to look for possible opportunities for the dog to have gained access to stored slug bait, which is then found to be the case.

In agricultural and field-scale applications, bait is broadcasted using specialist machinery calibrated to optimise control over a large area using minimum amounts of active ingredient.

However, in domestic applications some gardeners have a habit of leaving bait in little piles: this does not increase the effectiveness of the application but simply increases the toxic risks associated. Such behaviour is strictly contrary to all written instructions and guidance.

Environmental considerations and effects on other species

Metaldehyde is a simple compound made up of four molecules of the naturally occurring substance acetdehyde.

Acetdehyde is found widely in nature, for example in fruits and, beer and composts.

It is a selective molluscicide. When used as directed it has no adverse effect on beneficial organisms such as earthworms, carabid beetles and honey bees (Nolte, 2012).

Research over the past 25 years, summarised in a recent review on the topic (Nolte, 2012) has confirmed that:

1. Wild birds and rodents avoid fodder that contains metaldehyde.

2. The health risk to birds preying on snails containing metaldehyde is slight to negligible.

Hedgehogs can consume up to 200 contaminated worms without experiencing any negative effects.

There is also evidence to suggest that hedgehogs avoid contaminated snails or worms.

Reducing incidence of metaldehyde poisoning in the future

Regulatory changes have recently been introduced in the labelling of amateur and commercial garden pesticide products, including slug pellets, in efforts to reduce the risk of accidental poisoning in children and pets.

These products already carry the warning “Since this product contains metaldehyde, which can kill if eaten, it must be kept away from children and pets” and must be supplied in child-resistant containers.

From the end of 2011, these products must also be supplied in packaging that restricts the flow of pellets from the container and will have to have a clear “scatter diagram” or picture illustrating the correct method of application, with information on how the recommended rate equates to the number of pellets applied over the required area.

It is also suggested that an image showing incorrect use (i.e. a pile of pellets) accompanied by a cross, with a tick accompanying the correct use diagram, should also be provided if...
possible. In addition, pellets size will be highlighted and should normally be in the form of mini-pellets to limit the risk of serious exposure through accidental ingestion (HSE, 2010).

While educating users remains a regulatory objective, manufacturers of some metaldehyde-based baits are also taking action to reduce the attractiveness of pellets to dogs using bittering and olfactory agents.

Little impact
In Belgium, however, efforts to reduce the frequency of canine exposure by addition of a bittering agent, changing packet instructions and providing a leaflet for correct usage had little impact (van Pelt and Mostin, 2010).

In the opinion of the author, owners and their gardening neighbours must be educated on the correct use of these products and, more importantly, on the appropriate and secure storage of the product. If used properly, the risks associated with metaldehyde are low: it is improper usage that is to blame.

For the purposes of completeness, liquid metaldehyde-based preparations are also available, generally at around 20% concentration.

No references have been located reporting toxicity from the liquid concentrate, which is sprayed onto vegetation: discussion has been limited therefore to the use of the pelleted form.

References


Help, advice and education available from poisons information service
THE Veterinary Poisons Information Service (VPIS) is an internationally renowned poisons information service, advising on the management of poisoned animals. The service was officially launched in 1992 and has since assisted with over 150,000 cases. It provides 24-hour telephone advice for veterinary professionals on the diagnosis and management of poisoned animals – 02071 880200.

In addition to operating the telephone advice line, it also publishes reviews and reports using data collected from poisons enquiries in scientific journals and magazines, performs toxicosurveillance and teaches at various universities and veterinary colleges.

The VPIS is a division of Medical Toxicology and Information Services Ltd (MT&IS Ltd), formerly part of Guy’s and St Thomas NHS Foundation Trust based in London. MT&IS Ltd (formerly known as Guy’s Poisons Unit) was established in 1963. The VPIS is a subscription-based service and does not take enquiries from members of the public or pet owners, who are encouraged to call their local veterinary practice for advice.

The VPIS runs CPD day courses aimed at keeping veterinary professionals up-to-date in toxicology. The next one will be held in London on 11th November and cover such topics as: Getting the best case history for potential poisons cases, Decontamination for poisons cases – science v. myth, Common or tricky poisonings in cats and dogs, and What’s new in toxicology.

For details see www.vpisuk.co.uk. The website also lists common poisons covering the 10 most frequent enquiries to the service: NSAIDs; anticoagulant rodenticides; chocolate; paracetamol; permethrin; metaldehyde; lilies; grapes, raisins and sultanas; batteries and adders.

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