

Anticoagulant poisons for rats and possums

Your questions answered

What are anticoagulants?

Anticoagulants are sometimes called “blood thinning agents”. They slow down the tendency of the blood to clot.

One well known anticoagulant, warfarin, is a drug (Marevan®) used to treat humans with clotting problems.

Other more potent anticoagulants used for pest control.

When used to kill pests the amounts used in baits cause bleeding and death. The main use of anticoagulants worldwide has been for rodent control.

Poisons used for controlling rats and possums are classified as :-

- (i) anticoagulants - which include warfarin, pindone, diphacinone, coumatetralyl, bromodialone, flocoumafen and brodifacoum
- (ii) non-anticoagulants - all others such as cyanide, and cholecalciferol.

First generation anticoagulants warfarin, pindone, coumatetralyl and diphacinone were developed between the 1940s and 1960s.

Second generation anticoagulants such as brodifacoum, flocoumafen and bromodiolone were developed in the 1970s and 1980s.

Product examples

| Type | Name of chemical | Target | Bait trade name | Source |
|----------------|------------------|--------------|-----------------|-----------------|
| Anticoagulants | Diphacinone | Rat | RatAbate® | Connovation Ltd |
| | Coumatetralyl | Rat | Racumin® | Bayer |
| | Brodifacoum | Rat & possum | Pestoff® | ACP |
| Others | Cyanide pellets | Possum | Feratox® | Connovation Ltd |
| | Cholecalciferol | Rat & possum | Feracol® | Connovation Ltd |



Eggs and young are easy targets for a rat.

Tips on using anticoagulants

- Anticoagulant baits should be integrated with traps and other poisons.
- Use low residue options for sustained rat and possum control. These would include a mix of trapping, first generation anticoagulants like diphacinone, with cyanide and cholecalciferol.
- Use brodifacoum baits sparingly (ie. not more than once or twice in two years and not if game species are being hunted).

Where do they come from?

Naturally occurring anticoagulants were discovered in the 1940s in mouldy sweet clover hay causing bleeding disorders in cattle. Related compounds were then synthesized by pharmaceutical companies between the 1940s and 1980s to produce the range of anticoagulant drugs and poisons that are still used today.

Who makes the baits?

As these compounds were developed some time ago they are no longer protected by patents. Hence products are made locally by New Zealand based companies such as Connovation Ltd in Auckland, Animal Control Products in Wanganui as well as multinationals such as Bayer.

How do anticoagulants work?

After baits are eaten the poison is absorbed and makes its way to the liver. It interferes with the synthesis of vitamin K-dependent clotting factors to the point where no clotting occurs. This process takes several days in rats and several weeks in possums.



Use traps and cyanide first, then consider an anticoagulant

What is the difference between first and second generation anticoagulants?

Second-generation anticoagulants are more potent than first-generation, related to their greater tendency to bind to the liver. Unfortunately second-generation also persists and builds up in the environment, whereas first generation do not. The second generation anticoagulants were synthesized in response to rodenticide resistance in some parts of Europe and the US. Both types are effective at killing rats, and brodifacoum is also effective against possums.

What is anticoagulant resistance in rodents?

In a few areas in Europe and the USA where warfarin was used continuously for 20-30 years new generations of rats and mice evolved that could eat poisonous bait without dying. The biochemical response to the poisons did not occur. This has not occurred to date in New Zealand and **can be avoided** by using different types of poisons and traps alongside anticoagulants.

What is the difference between bait shyness and resistance?

Resistance is nature's response to continuous exposure. Just as antibiotic resistance can occur with over-prescription of drugs and doctors are encouraged to use antibiotics prudently, "*Environmental Doctors*" should avoid over reliance on a single tool. Bait shyness is a short-term effect that is brought about by a negative response in an animal, for example to an unpleasant taste in bait, so not enough is eaten to be lethal and baits are avoided. It differs from resistance and is not usually a problem with anticoagulant baits.

Should resistance be a concern?

Over-use of anticoagulants over several decades in Europe led to resistance in rats which in turn encouraged the development of more and more potent anticoagulants, such as brodifacoum, sometimes termed "Superwarfarin". Resistance can be avoided by the use of a variety of baits and tools.



Possum damage to a mamaku fern

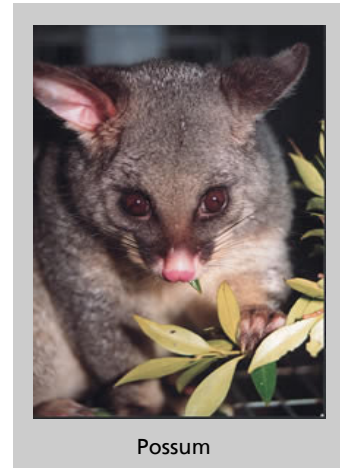
Are anticoagulants safe?

This depends on how they are used. No poison is completely safe. Good pest control minimises the risks to non-targets species. Your goal is “no pests, no hassles”.

Are there health risks to humans?

Follow simple precautions and there should be no risks to human health:

- Wear gloves
- Don't expose yourself to dust from baits
- Don't eat game from areas where poisons are used—particularly brodifacoum or other second-generation anticoagulants.



What are the risks to non-target wildlife?

These depend on the properties of the poisons used, bait design and their deployment, and what non-target species are present. The risk to non-target wildlife will depend on the inherent toxicity of the pesticide (i.e., hazard) and the potential exposure of the animal to toxic bait or residues. Second-generation anticoagulants are more toxic than first-generation anticoagulants to rats and possums, but also to many non-target species by both primary and secondary poisoning, and present a greater risk to wildlife.

What is primary versus secondary poisoning?

Primary poisoning refers to poisoning resulting from eating a bait. Secondary poisoning occurs when eating another animal that has been poisoned, such as an owl eating a rat containing residues of a rodenticide.

How do we reduce the risk of primary or secondary poisoning?

Primary poisoning can be reduced by the use of bait stations and smart baiting strategies. Secondary poisoning is prevented by choosing poisons that are non-persistent. Cyanide, cholecaliferol and diphacinone do not usually cause secondary poisoning. Brodifacoum does so special care with its application is important.

Does the place where poisons are used affect risk?

Yes, the use of toxic bait for rodent control in confined areas such as homes, factories, farmhouses, or grain stores, and their application in bait stations, reduces the risk of primary poisoning of birds, reptiles, or invertebrates. Field use of poisons potentially puts a wider range of non-target species at risk, but this can be managed.

The advantages and disadvantages of anticoagulants

| Advantages | Disadvantages |
|---|---|
| Generally available and no licence required | High risk of secondary poisoning of non-target species |
| Effective for rodent control, and brodifacoum kills both rats and possums | 2nd generation anticoagulants persist >9 months in liver of animals. Can enter food chain and put meat for human consumption at risk |
| Antidote is available | |

How long does the poison take to work?

The period between the time of ingestion of anticoagulants by rats, the onset of symptoms and death is usually up to a week. However, in possums this may take between one and four weeks. Poisoned animals die of multiple causes related to anaemia or loss of blood.

What happens to anticoagulants in soil and water?

They are not mobile in soil and not very soluble in water. When baits disintegrate, the poisons will remain in the soil and degrade slowly over several months. Baits used in bait stations are most unlikely to contaminate waterways.



Weka are inquisitive birds; keeping baits from weka requires extra skills!

Which birds are at risk?

The risk of poisoning is greatest for predatory and scavenging birds such as the weka, harrier, morepork, and southern black-backed gull.

How do we balance risk versus benefit?

When using anticoagulants the detrimental effects on some individuals need to be weighed against potential improved survival and breeding success of the non-target species in the absence of rodents and possums. Where brodifacoum is used on just one occasion for island eradication of rodents to provide wildlife sanctuaries the risks will be outweighed by the benefits. Where it is used on the mainland it is important to think ahead and consider the effects and fate of all residues in evaluating risk. Establishing whether or not the extent of anticoagulant transfer through the food web can be

contained is important. Potential exposure of non-target species to the poison should also be considered and reduced by smart pest control practices.

How to minimise residues in the environment?

Use a low residue option for *sustained* rat and possum control, such as a combination of a first-generation anticoagulant like diphacinone, with trapping, cyanide and cholecalciferol. Brodifacoum or other second-generation anticoagulants have a place but should not be over used. They are more potent but also more persistent in the environment. For example use brodifacoum only intermittently in pulses, alongside other less persistent vertebrate pesticides and traps. Start with knocking back the population with cyanide or cholecalciferol, then use anticoagulants discerningly. Keep the most potent weapon in reserve.

Summary of Poison Properties

| Tool | Type | Target | Properties | Residues |
|-----------------|---------------------------------|--------------|--|---------------------|
| Diphacinone | First-generation anticoagulant | Rat | Low risk primary & secondary poisoning. Rapid breakdown. Antidote available | Low |
| Coumatetralyl | First-generation anticoagulant | Rat | Moderate risk primary and secondary poisoning. Rapid breakdown. Antidote available | Moderate |
| Brodifacoum | Second-generation anticoagulant | Rat & possum | Higher risk of primary and secondary poisoning. Rapid breakdown. Antidote available. | High |
| Cholecalciferol | Acute toxin | Rat & possum | Low risk secondary poisoning. Must keep baits away from pets and working dogs. | Minimal |
| Cyanide pellets | Acute toxin | Possum | Low risk of secondary poisoning. Keep baits away from ground dwelling birds. | None after 12 hours |
| Traps | Knock-down tool | Possum | Position traps to avoid ground dwelling birds | None |