

PO Box 58 613, Manukau City 2141, New
Zealand

T: +649 273 4333

www.connovation.co.nz

The field effectiveness of Feracol® bait at killing rats in the Urewera.

Dan Baigent⁺ , Lindsay Wilson⁺, Steve Boot⁺⁺ and Charles Eason⁺⁺

⁺ Department of Conservation, Opotiki

⁺⁺ Connovation Research, Auckland

December 2007

DATE: December 2007

Contents

1	Summary	.....	3
2.	Introduction	.....	3
3.	Objectives	.....	4
4.	Methods	.....	4
5.	Results	.....	5
6.	Conclusions	.....	6
7.	References	.....	6

1. Summary

The rodenticidal properties of Feracol®, a paste bait containing 0.8% cholecalciferol delivered in Philproof® and Striker® bait stations, have been assessed. Monitoring of rat numbers before and after application of Feracol® bait was undertaken at three trial sites in the Urewera national park, namely the Lions Hut, Mangaone and Pakoakoa. The sites were 34, 180 and 220 hectares respectively. Rat population density was assessed using tracking tunnels. Philproof® bait stations containing 200 gm Feracol® were placed 50 metres apart on grids at Lions Hut and monitoring was undertaken at one location per hectare using tracking tunnels. At Mangaone and Pakoakoa two Striker® bait stations containing 18 gm Feracol® were sited at 25m intervals on lines 100m apart, and monitoring was undertaken with 5 lines of 10 tunnels at 50 metre intervals. At all three locations Feracol® was extremely effective in reducing the % rat tracking rate. At Lions Hut rat tracking was reduced from 78% to 3%, at Mangaone the reduction in rat tracking was from 51% to 0% and at Pakoakoa from 36% to 0%. These trials demonstrate that Feracol® is effective at reducing both moderate and high concentrations of ship rats in the Philproof® and Striker® bait station delivery systems.

2. Introduction

The report covers field efficacy studies on Feracol® conducted by the Department of Conservation during 2006-2007. There has been increasing demand for alternatives to anticoagulant toxicants that are effective in rats as well as possums. Anticoagulant poisons, particularly second-generation anticoagulants, are very persistent and have been detected in a range of non-target species including game (i.e. pigs and deer) and native birds (e.g. kiwi). This contamination and secondary poisoning of wildlife has caused concern in New Zealand and overseas (Eason et al. 1999; Stone et al. 1999; Ticknell 1999; Eason et al. 2002; Dowding et al 2006). The Department of Conservation has been at the forefront of research to find less persistent alternatives to brodifacoum for extensive multispecies control to protect native birds. The present field trials were conducted to provide information on the rodenticidal properties of Feracol®, a potentially alternative tool for control of rodents as well as possums. These trials were conducted in parallel to cage trials which have confirmed that Feracol® (0.8% cholecalciferol) is effective in rats and mice (Morgan and Eason 1999, Morgan 2000, and Hix et al 2007).

Cholecalciferol (vitamin D₃) was developed in the 1980s as a rodenticide (Marshall 1984; Tobin et al. 1993). It is registered under the trade name of Quintox® in the USA, and in Europe it has been added to baits containing coumatetralyl (Racumin® plus) to overcome anticoagulant resistance in rats and mice (Pospischil & Schnorbach 1994). In 1999 it was registered in New Zealand in paste bait containing 0.8% cholecalciferol (Feracol®). This was based on work in the early 1990's which demonstrated the susceptibility of possums to cholecalciferol (Eason 1991, Eason et al. 1996), which was followed by extensive field trials.

Cholecalciferol has been used internationally as a rodenticide for approximately 25 years. In toxic doses it raises blood calcium levels (hypercalcaemia), and causes death from heart failure (Marshall 1984; Marsh & Tunberg 1986). These effects are comparatively rapid when compared with anticoagulant rodenticides (Marshall 1984; Marsh & Tunberg 1986; Jolly et al. 1995). The acute LD₅₀ of cholecalciferol is 43.6 mg/kg for Norway rats (Marshall 1984). Hence Feracol® which contains 0.8% (or 8 mg/gm) cholecalciferol should kill most rats that eat between 1 and 3 g, within approximately 3 days, depending on their weight (Hix et al, 2007).

Non-target risk is low compared with 1080 or brodifacoum. For example, toxicity to birds is low, as illustrated by the LD₅₀ for mallard ducks of 2000 mg/kg (Marshall 1984). The risk of secondary poisoning to non-target species is also low (Marshall 1984; Eason et al.

1996; Booth et al 2004). Cage studies have already demonstrated the effectiveness of Feracol® in Norway rats, ship rats and mice (Morgan and Eason 1999, Morgan 2000, Hix et al 2007). These present field trials were conducted to confirm the earlier results in both Norway and ship rats and ensure compliance with NZFSA guidelines by including choice and no-choice testing of toxic bait (NZFSA 2002).

3. Objectives

To assess the effectiveness of a bait product containing cholecalciferol at 0.8% (Feracol®) as a rodenticide in large scale field use.

4. Methods

The effectiveness of Feracol®, a possum control paste bait containing 0.8% cholecalciferol delivered in Philproof® and Striker® bait stations has been assessed as a rodenticide. Feracol® paste and prefilled Striker® bait stations were obtained from Connovation Ltd (Auckland). Commercially produced Feracol® was used. Batches of this bait are assayed to confirm the concentration of active ingredient at 3 monthly intervals. Laboratory reports corresponding to batches of baits used in these studies are provided in Appendix 1.

Monitoring of rat numbers before and after application of Feracol® baits was undertaken at three trial sites in the Urewera national park. The sites were chosen as they were known to have moderate to high populations of ship rats. The sites, namely the Lions Hut, Mangaone and Pakoakoa ranged from 34 to 220 hectares. Monitoring was undertaken using tracking tunnels (Black Trakka) for presence or absence of rats and the result expressed as a % of tunnels tracked. The % tracking rate prior to application of Feracol® baits ranged from 36 to 78%. The target was to achieve a <5% mean rat tracking rate per line.

Lions Hut: Field sites included paired treated areas and untreated areas. The treated area was 34 hectares and the untreated block was 40 hectares. Baseline monitoring was undertaken in both blocks on 15th September 2006. Follow-up monitoring occurred between the 9th and 11th January 2007 following prefeeding on the 24th November 2006 and placement of toxic baits on the 8th December 2006. Bait stations were placed 50 metres apart on a 50 metre grid with 200gm of bait placed in each bait station. Monitoring was undertaken using one location per hectare using tracking tunnels (Black Trakka). Appendix 2 shows the study site where Feracol® was dispensed including the bait stations sites and the location of the tracking tunnels for monitoring rat numbers. Monitoring sites were located with the same distribution in the untreated site.

Mangaone: The core area was 180 hectares in size. Baseline monitoring was undertaken on 8th August 2007. Follow-up monitoring occurred on the 11th September 2007 following prefeeding on the 10th August 2007 and placement of toxic baits on the 18th August 2007. Striker bait stations were placed 25 meters apart on a 150 x 25 meter grid. This provided control lines at 150m spacing. Monitoring was undertaken following the Department of Conservation (DoC) standard operating system with 5 lines of 10 tunnels at 50 metre intervals.

Pakoakoa: The core area was approximately 220 hectares in size. Baseline monitoring was undertaken on the 23rd August 2007. Follow-up monitoring occurred on the 18th October 2007 following prefeeding on the 7th September and placement of toxic baits on the 27th September 2007. Striker bait stations were placed 25 meters apart on a 150 x 25 meter grid. This provided control lines at 150m spacing. Monitoring was undertaken following the DoC standard operating system with 5 lines of 10 tunnels at 50 metre intervals.

5. Results

At all three sites Feracol® was extremely effective at reducing the mean tracking rate per line from 36-78% to <5%. At Lions Hut rat tracking was reduced from 77.9% (\pm 12.2% SEM) to 2.9% (\pm 2.9% SEM), at Mangaone the reduction in rat tracking was from 51.0% (\pm 8.0% SEM) to 0% and at Pakoakoa from 36.0% (\pm 6.5% SEM) to 0%. Further details are provided below

Lions Hut: Baseline pre-treatment monitoring undertaken on the 15th September 2006 revealed rat tracking rate of 92.5% (\pm 3.7% SEM) in the "control" untreated block compared with 77.9 % in the 34 hectare block designated for poisoning (see above). Follow-up monitoring on the 9th and 11th January 2007 approximately one month after toxic bait had been dispensed revealed rat tracking rate of 58.75% (\pm 6.67% SEM) in the "control" untreated block and 3% in the 34 hectare block poisoned with Feracol® which is below the target level of 5%. Tracking at 3% versus 59% represents a percentage tracking decline of approximately 96% in the tracking rate following control with cholecalciferol. The mean tracking rate did decrease by 34% in the untreated block; however, a rat tracking rate of 59% at the end of the study was still 10 fold greater than the acceptable target level of 5% indicating high rat numbers versus very low numbers in the treated area.

Mangaone: Baseline pre-treatment monitoring undertaken on the 8th August 2007 revealed rat tracking rate of 51%. Follow-up monitoring occurred on the 11th September 2007 approximately one month after toxic bait had been dispensed and revealed rat tracking rate of 0%. Hence rat tracking declined by 100% to below the target level of < 5% as in the Lion Hut trial.

Pakoakoa: Baseline monitoring undertaken on the 23rd August 2007 revealed rat tracking rate of 36%. Follow-up monitoring occurred on the 18th October 2007 approximately one month after toxic bait had been dispensed and revealed a rat tracking rate of 0%. Hence rat tracking declined by 100% to below the target level of < 5% as in the Lion Hut trial and Mangaone trial.

Table 1. Trial area size, treatment regimen, monitoring systems and % rat tracking rate before and after application of toxic bait.

<i>Name of site</i>	<i>Size of treatment area (hectares)</i>	<i>Use of a non-treatment area or pre and post (hectares)</i>	<i>Treatment Regimen. Number of bait station/amount of bait</i>	<i>Monitoring systems</i>	<i>% rat tracking results before treatment (non-treatment area in brackets)</i>	<i>% rat tracking results after treatment (non-treatment area in brackets)</i>	<i>% reduction in tracking (non-treatment area in brackets)</i>
Lions hut	34	yes 40	Philproof bait stations 50 x 50 metre grind. 200 gm	Randomly placed at approx one tunnel per hectare.	78 (93)	3 (59)	96 (34)
Manga one	180	No	2 Strikers containing 18 gm every 25 meters on lines 100	*Five lines of 10 tunnels at 50	51	0	100

			meters apart	metre intervals			
Pakoak oa	220	no	2 Strikers containing 18 gm each every 25 meters on lines 100 meters apart	*Five lines of 10 tunnels at 50 metre intervals	36	0	100

* Monitoring to DoC Standard Operating Procedures # Monitoring as per study plan (See Appendix 2 Thomas document attached)

6. Conclusions

This study confirms the findings of cage trials that have demonstrated the effectiveness of Feracol® in rats and mice (Morgan and Eason 1999, Morgan 2000, Hix et al 2007). Feracol® is confirmed to be an effective rodenticide, as well as a product that effectively kills possums. These field trials demonstrate that Feracol® is a product that can kill rats, and previous research shows that this will be achieved without residue concerns and secondary poisoning risks. The effective of Feracol® for controlling rats is consistent with the use of cholecalciferol in the USA as a rodenticide for 25 years.

It is therefore an alternative to anticoagulants or suitable for integrated use with anticoagulants to reduce reliance on these bioaccumulative poisons. Targeting rodents as well as possums will more effectively protect native fauna, and overcome any unexpected consequences of conventional control methods targeting single species (Tompkins & Veltman 2006). Expertise has been gained during these field trials to optimise the use of Feracol® in terms of the amounts required and bait station placement under New Zealand field conditions.

9. References

Booth, L.H.; Fisher, P.; Hepplewaite, V.; Eason, C.T. 2004. Risk of Feracol baits to non-target invertebrate, native skinks, weta. *Science for Conservation* 239: 18 p.

Dowding, J.E.; Lovegrove, T.G.; Richie, J.; Kast, S.E.; Puckett, M (2007) Mortality of Northern New Zealand dotterels following an aerial poisoning operation. *Notornis* 53: 233-239

Eason, C.T. 1991: Cholecalciferol as an alternative to sodium monofluoroacetate (1080) for poisoning possums. *Proceedings of the New Zealand Weed and Pest Control Conference* 44: 35–37.

Eason, C.T.; Wright, G.R.; Meikle, L.; Elder, P. 1996: The persistence and secondary poisoning risks of sodium monofluoroacetate (1080), brodifacoum, and cholecalciferol in possums. Pp. 54–58 in Timm, R.M.; Crabb, A.C. (Eds): *Proceedings of the 17th Vertebrate Pest Conference*, Davis, California, U.S.A.

- Eason, C.T.; Milne, L.; Potts, M.; Morriss, G.; Wright, G.R.; Sutherland, O. 1999: Secondary and tertiary poisoning risk associated with brodifacoum. *New Zealand Journal of Ecology* 23: 219–224.
- Eason, C.T., Murphy, E.C., Wright, G.R.G., Spurr, E.B. (2002). Assessment of risks of brodifacoum to non-target birds and mammals in New Zealand. *Ecotoxicology* 11: 35–48.
- Hix, S; MacMorran, D; Eason C. T. 2007. The effectiveness of Feracol® bait at killing rats. Connovation Report 6pp.
- Jolly, S.E.; Henderson, R.J.; Frampton, C.; Eason, C.T. 1995: Cholecalciferol toxicity and its enhancement by calcium carbonate in the common brushtail possum. *Wildlife Research* 22: 579–583.
- Marsh, R.; Tunberg, A. 1986: Characteristics of cholecalciferol. Rodent control: other options. *Pest Control Technology* 14: 43–45.
- Marshall, E.F. 1984: Cholecalciferol: a unique toxicant for rodent control. Pp. 95–98 in Timm, R.M.; Crabb, A.C. (Eds): Proceedings of the 17th Vertebrate Pest Conference, Davis, California, U.S.A.
- Morgan, D.R., Eason, C.T. (1999). Efficacy of FeraCol™ for the control of rats. Landcare Research Contract Report LC9899/142 (unpubl.) 6 p.
- Morgan, D. R. 2000. Efficacy against house mouse of Feracol® rodent paste bait – a cage trial. Landcare Research Contract Report, LC001/19 8pp.
- New Zealand Food Safety Authority (2002). ACVN Registration Standards and Guidelines for the Efficacy of Vertebrate Pesticides 15 p.
- Stone, W.B.; Okoniewski, J.C.; Stedelin, J.R. 1999: Poisoning of wildlife with anticoagulant rodenticides in New York? *Journal of Wildlife Diseases* 35(2): 187–193.
- Tompkins, D.M and Veltman, C.J. (2006). Unexpected consequences of vertebrate pest control: predictions from a four-species community model. *Ecological Applications* 16(3), 1050–1061.
- Ticknell, O. 1999: It's a rat trap: poison aimed at rodents is killing their predators instead. *New Scientist* 23: 4.