

**Epro Deer Repellent for Baits Used in Possum Control:
Review of Development and Use 2001–2007**

G.A. Morriss

Landcare Research
PO Box 40, Lincoln 7640
New Zealand

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PREPARED FOR:
West Coast Regional Council
PO Box 66
Greymouth

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Reviewed by:

Approved for release by:

Bruce Warburton
Scientist
Landcare Research

Phil Cowan
Science Leader
Pest Control Technologies

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Summary

Project and Client

A deer repellent that could be applied to 1080 possum baits was identified in 2001, and subsequent research confirmed its suitability for field use. The following report summarises research carried out by Epro and Landcare Research for the Animal Health Board (AHB) from 2001 to 2007. Operational data and non-target species monitoring recorded during Tb vector control are also included. Landcare Research reviewed these data for the West Coast Regional Council, in April–May 2007 (Project WCRC33). This report was funded by the Foundation for Science, Research and Technology, Envirolink fund, and is designed to provide information for Tb vector managers within New Zealand so they can consider whether to use the Epro deer repellent (EDR) for vector control operations in their region.

Main Findings

Possum kill

- Possums have been controlled using aerially sown EDR carrot and cereal bait over 157 041 ha and 3672 ha respectively.
- The resultant RTCIs were below operational targets and no contracts have required reworks.
- There is no evidence from trial and operational results reported here that possum kill is affected by the addition of EDR to standard carrot or cereal 1080 baits.

Deer kill

- In the 160 713 ha poisoned with aerially sown EDR 1080 baits only 10 red deer, including two hybrid red/sika (in 104 667 ha treated), 7 sika deer (in 54 046 ha treated), and no fallow (in 2000 ha treated) have been found dead during searches following poisoning.
- Where comparative trials have been undertaken with standard 1080 operations in similar habitat it is clear that deer bykill has been high (17 red deer found dead in 3446 ha treated with carrot and cereal bait).

Non-target kill

- The three trials on birds to date suggest use of EDR 1080 baits should not change the overall impact on native birdlife compared with standard carrot or cereal 1080 baits. Individual species found dead in carcass searches are similar to those found in standard aerial 1080 operations and is further evidence that bird mortality is very low.
- The limited trial work to date suggests effective rat control can be achieved with EDR 1080 carrot or cereal bait, but further monitoring is required.
- The impact on pigs of using EDR 1080 baits is likely to be similar to standard 1080 baits, but further monitoring is required. Limited evidence suggests EDR may be an effective repellent for sheep, but further research is required to substantiate this.

EDR on prefeed

- The limited trial work suggests that in possum control operations using aerially applied EDR-treated 1080 carrot:
 - EDR is required on carrot prefeed to minimise deer bykill,

o not using EDR on prefeed may increase loss of resident deer from 5% to 25%, but further monitoring is required.

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Registration of EDR

- EDR is registered for use on aerially applied 1080 carrot possum baits.
- EDR is currently being modified so that it can be registered for use on 1080 cereal possum baits.

1. Introduction

A deer repellent that could be applied to 1080 possum baits was identified in 2001, and subsequent research confirmed its suitability for field use. The following report summarises research carried out by Epro and Landcare Research for the Animal Health Board (AHB) from 2001 to 2007. Operational data and non-target species monitoring recorded during Tb vector control are also included. Landcare Research reviewed these data for the West Coast Regional Council, in April–May 2007 (Project WCRC33). This report was funded by the Foundation for Science, Research and Technology, Envirolink fund, and is designed to provide information for Tb vector managers within New Zealand so they can consider whether to use the Epro deer repellent (EDR) for vector control operations in their region.

2. Main Findings

2.1 Identifying a repellent for carrot baits

Why use the Epro deer repellent? Why not other repellents?

In 2001, Epro contracted Landcare Research to identify a deer repellent for application on carrot possum baits. Nine repellents were identified from a literature search as potentially suitable, but two of these were unable to be sourced. The remaining seven repellents were applied to non-toxic carrot and presented to farmed red deer (*Cervus elaphus*). Only one repellent (hereafter called EDR) was considered to repel deer sufficiently to justify further investigation (Forsyth 2002). Further evaluation of EDR was funded by the AHB.

2.2 Efficacy of EDR-treated baits against possums

Does adding EDR to bait alter the possum kill?

Cage trials with EDR bait

The palatability of EDR was tested in a feeding trial using forty captive possums (*Trichosurus vulpecula*) with EDR being applied to non-toxic and 0.08% 1080 carrot baits. There was no significant difference in palatability (Paired $t = 1.58$, d.f. = 19, $P = 0.13$) or mortality (Fisher's exact test, $P = 1.0$) between EDR carrot bait and standard carrot bait (Forsyth 2002).

The effect of EDR on the palatability to possums of non-toxic cinnamon-lured and unlured cereal bait was compared using a choice test with 40 captive possums. The efficacy against possums of 0.15% 1080 cereal bait cinnamon-lured and unlured with and without EDR was also compared using 40 captive possums. Possums ate similar amounts of non-toxic or toxic cereal bait with and without EDR. There was no significant difference in mortality ($\chi^2_1 < 0.01$, $P = 0.99$) of samples of 10 possums given cinnamon-lured toxic baits with EDR (80% kill) and without EDR (90% kill), or with unlured toxic baits with EDR (40% kill) and

without EDR (30% kill). Mortality was significantly lower ($\chi^2_1 = 11.03$, $P < 0.001$) when unlured bait was used (Morriss et al. 2003).

Field trials with EDR bait

The following table summarises the efficacy of aerially applied EDR carrot (0.08% 1080) and EDR cereal (0.15% 1080) possum baits when field tested in six control operations. All trials, except for Hatepe (June 2003) and Tatarakina (September 2004), were paired comparisons where standard control operations were monitored in parallel. In all paired trials there was no significant difference in the Residual Trap Catch Indices (RTCI) results achieved with EDR bait compared with standard 1080 baits (Table 1) (Lorigan et al. 2002; Speedy 2003, 2004; Nugent et al. 2004; Morriss et al. 2003, 2005).

Table 1 Possum control results of field trials using EDR 1080 bait

Date toxic bait applied	Location	Area treated with EDR bait (ha)	EDR 1080 bait		Non-EDR 1080 bait	
			Possum RTCI pre %	Possum RTCI post %	Possum RTCI pre %	Possum RTCI post %
Carrot						
June 2002	Hampden, North Otago	720	14.6	0.0	10.0–12.0	1.6
June 2003	Hatepe, Central NI	1073	21.2	0.2	NA	NA
July 2003	Tatarakina, Hawke's Bay	1700 ¹	21.0	0.8	16.0	0.2
September 2004	Tatarakina, Hawke's Bay	1760	NA	2.9	NA	NA
Cereal						
July 2003	Te Wera, Taranaki	1000 ²	20.9	0.7	23.6	1.0
July 2005	Pohokura, Hawke's Bay	1074	NA	0.0	NA	0.0

NA = Not assessed

¹2000 ha was reported in Nugent et al. 2004 but only 1700 ha was actually treated.

²Two 500-ha blocks combined with RTCI pre and post averaged. No deer were present in this block.

Operational results with EDR baits

From 2001 to 2006 a total of 160 051 ha in 25 separate operations (including field trials described above) have been treated by Epro with aerially applied EDR 1080 possum baits (Table 2). None of these have failed to reach their operational targets. All have been prefed with EDR coated bait at a sowing rate of 2–5 kg/ha. While most of these operations (98%) were with carrot baits, one operation at Mt Tauhara, near Taupo, the two cereal field trials reported above, and a rodent control trial at Wharetoto, Central North Island, used No. 7 cereal bait surface-coated with EDR (0.15% 1080 at 2 kg/ha).

Table 2 Possum control achieved with EDR 1080 baits, 2001–2006. All carrot operations were prefed with EDR-coated non-toxic carrot bait (2–5 kg/ha) followed by EDR-coated 1080 (0.08%) carrot bait (3–5 kg/ha). Cereal operations were prefed with EDR-coated non-toxic cereal bait (2 kg/ha) followed by EDR-coated 1080 (0.15%) cereal bait (2–3 kg/ha). This table does not include the field trials reported in Table 1.

Date control carried out	Location	Area (ha)	Bait type	Operational Target (RTCI %)	Post Operational Result (RTCI %)
July 2001	Kiangaroo, Central NI	1500	Carrot	5.00	1.03
October 2003	Pohokura, Hawke's Bay	4900	Carrot	3.00	1.10
September 2004	Te Tapui, Waikato	2000	Carrot	5.00	4.67
September 2004	Tataraakina and Ngatapa, Hawke's Bay	10 360 ¹	Carrot	3.00	1.51
April 2005	Mt Tauhara, Central NI	998	Cereal	2.00	0.00
May–June 2005	Hauhangaroa, Central NI	23 000	Carrot	2.00	0.04
June 2005	Hatepe Sector 3, Central NI	11 300	Carrot	2.00	1.05
August 2005	Takahiapo, Central NI	3720	Carrot	2.00	0.67
August 2005	Waipunga, Hawke's Bay	16 626 ²	Carrot	2.00	0.03
August 2005	Kinleith Forest, Central NI	2000	Carrot	5.00	1.92
September 2005	Ngamatea, Central NI	800	Carrot	3.00	0.90
February 2006	Wharetoto, Central NI	1810 ³	Carrot/Cereal	1.00	0.60
February 2006	Ngamatea, Central NI	2120	Carrot	3.00	0.20

¹ The EDR carrot bait field trial area (1760 ha) has been subtracted from the total operational area but contributed to the post-operational RTCI.

² The EDR cereal bait field trial area (1074 ha) has been subtracted from the total operational area but contributed to the post-operational RTCI.

³ 600 ha was treated with EDR cereal bait as part of a rodent control trial (see Section 2.4). The balance of the area was treated with EDR carrot bait.

Table 2 cont.

Date control carried out	Location	Area (ha)	Bait type	Operational Target (RTCI %)	Post Operational Result (RTCI %)
May 2006	Te Urewera Sector 7, Hawke's Bay	6162 ¹	Carrot	3.00	1.7
May 2006	Willowflat, Hawke's Bay	2882	Carrot	3.00	0.27
May 2006	Raupunga, Hawke's Bay	3185	Carrot	3.00	0.40
May 2006	East Taupo, Central NI	28 000	Carrot	2.00	0.80
July 2006	Turangi, Central NI	4350	Carrot	2.00	0.33
August 2006	Hatepe Sector 4, Central NI	11 968	Carrot	3.00	0.33
September 2006	Te Kopia, Central NI	2464	Carrot	5.00	1.40
September 2006	Aorangi, Wairarapa	13 241	Carrot	Specification based ²	2.20

¹2000 ha of this operation was an EDR prefeed trial (see Section 2.5).

²This contract was assessed by the contractor meeting specifications of bait coverage, quality of bait and ability to carry out the operation over a 2-day period.

2.3 Repellency of EDR to deer

Does EDR really repel deer?

Farm deer trials with EDR bait

A trial compared the amount of non-toxic carrot bait surface-coated with EDR and plain carrot bait eaten by deer over a 7-day period. These deer had no prior exposure to carrot. All the untreated carrot was eaten within 24 h. None of the carrot treated with EDR was eaten for 6 days, but all was then consumed by 7 days. This result suggests the repellency of EDR to deer is limited to at most 6 days (Forsyth 2002). This decline in repellency is unlikely to be important operationally because most baits will be eaten by the target species (possums and rodents) in the first few days, leaving little bait available for deer. Such a conclusion is supported by the field trial results that have shown very low deer mortality when EDR is used on possum baits.

Six types of non-toxic cereal bait with various combinations of cinnamon lure, and/or EDR incorporated or applied to the outer surface, were presented to farmed red deer hinds or stags in separate 4-day trials. These deer had experience with various forms of supplementary feed including pellets. A second trial compared the consumption of four types of non-toxic cereal

bait with and without EDR and cinnamon by farmed deer that had no prior experience with pelleted feed. In the first trial, farmed deer ate very little cereal bait when it was surface coated with EDR (both with and without cinnamon lure), but ate all the bait with no EDR or with EDR incorporated. All subsequent trials therefore used only surface-coated baits. In the second trial with farmed deer, little bait of any sort was eaten until the fourth day, but the stag group then ate significantly more non-EDR than EDR bait (Morriss et al. 2003).

Field trials with EDR bait

The impact on deer of using EDR on 1080 possum baits has been formally monitored during six field trials (five of which are outlined in Table 3). The sixth trial (Epro 2006) examined whether or not EDR needs to be applied to prefeed bait, and is dealt with separately in section 2.5. Several methods have been used to measure changes in the resident deer population within the baited areas. Pre and post control live deer sightings by professional hunters were used in three trials (Hampden, and both Tatarakina trials) but variables such as disturbance of deer by hunters and monitoring staff, and seasonal changes in visibility of deer made this method inconsistent when used as the sole monitoring method. Fake dead deer were used as a monitoring tool in all five field trials. These were large paper bags stuffed with leaf litter and fern that were placed on the forest floor to represent dead deer. The bags were placed during pre-assessment and a percentage of these were found during the subsequent searches by hunters unfamiliar with the bags' locations. The percentage of bags found was compared with the number of real deer carcasses found and from this an estimate of the total number of deer killed and total area searched was derived. The total area searched calculated from bag recovery in each field trial ranged from 10 to 42% (42%, 13%, 10–15%, 25%, 31% in order listed in table below) (Lorigan et al. 2002; Speedy 2003, 2004; Nugent et al. 2004; Morriss et al. 2005).

The fifth field trial at Pohokura (Morriss et al. 2005) used only post-control monitoring (split into two consecutive surveys) to assess the overall impact of using EDR and thereby maximized the time spent searching for carcasses. In the first survey, eight professional hunters walked set transects to search for carcasses, place fake dead deer, record fresh deer tracks, record live deer sightings, and carry out faecal pellet count plots (of deer). In a second survey immediately following the first, the hunters walked transects perpendicular to those in the first survey and recorded any fake dead deer they found, and again searched for carcasses, recorded fresh tracks and live animal sightings, and carried out pellet counts. The pellet counts were correlated with live animal sightings to derive a population estimate.

The most compelling evidence of whether the repellent worked or not, was the presence or absence of deer carcasses. No carcasses were found in three of the EDR trial areas and where a non-EDR block was monitored in parallel, significantly more deer mortality was observed (17 deer in two non-EDR blocks vs. 0 deer in the paired EDR blocks). When viewed in conjunction with live deer sightings the overall evidence shows a significant reduction (if not elimination) of deer bykill in the EDR trial areas.

Table 3 Deer monitoring results from five field trials (June 2002–July 2005). Deer density was subjectively assessed by professional hunters who carried out the monitoring in the blocks: high ≈ 10 deer/km², medium ≈ 5 deer/km², and low $\approx < 5$ deer/km².

Date toxic bait applied	Location	Deer species present (density)	EDR 1080 bait		Non-EDR 1080 bait	
			Deer carcasses found	Estimated deer kill %	Deer carcasses found	Estimated deer kill %
Carrot						
June 2002	Hampden, North Otago	Red (Medium)	0	0–35	NA (18) ¹	NA
June 2003	Hatepe, Central NI	Sika (High)	6 ²	13	NA	NA
July 2003	Tataraakina, Hawke's Bay	Red (High) ³	0	0–18	4	>50
September 2004	Tataraakina, Hawke's Bay	Red/Sika (Medium-High)	2 ⁴	0–5	NA	NA
Cereal						
July 2005	Pohokura, Hawke's Bay	Red (Medium)	0	0–6	13	59

NA = Not assessed

¹Eighteen dead deer were found in the surrounding area poisoned with non-EDR bait.

²Five dead deer found during formal searches and one dead deer found incidentally.

³Deer density was high in the EDR block but low in the non-EDR block

⁴One red deer and one hybrid red/sika deer. Another red deer was found dead but it was well decayed and no 1080 residue was detected when a tissue sample was analysed, so it was omitted.

Informal deer monitoring during possum control using EDR

There has been high hunter interest in operational use of EDR and consequently much informal searching by local hunters who wanted to see for themselves whether EDR was effective at reducing deer kills (Table 4). Most of the areas (90%), excluding the trial blocks, have been searched informally with only three reports of deer mortality (1 sika deer (*Cervus nippon*) at Wharetoto, Central North Island, 1 hybrid red/sika deer at East Taupo, Central North Island, and 1 red deer at Aorangi, Wairarapa). The intensity of these searches is unknown. Most operations have been carried out where either red and/or sika deer were present, but fallow deer (*Dama dama*) were present in a 2000-ha block poisoned with EDR carrot bait at Te Tapui in the Waikato. No dead deer were found when local hunters searched the block, suggesting fallow deer might also be effectively repelled by EDR.

Table 4 Impact on deer of EDR used on possum baits 2001–2006. This table does not include the field trials reported above. Deer density was subjectively assessed by Epro who liaised with landowners and local hunters: high ≈ 10 deer/km², medium ≈ 5 deer/km², and low $\approx < 5$ deer/km².

Date control carried out	Location	Deer species present (density)	Comments
July 2001	Kiangaroo, Central NI	Red (Low)	Wide swath trial block
October 2003	Pohokura, Hawke's Bay	Red (High)	Informal carcass searches. No dead deer found; many live deer observed
September 2004	Te Tapui, Waikato	Fallow (Medium)	Informal carcass searches by local hunters. No dead deer found
September 2004	Tataraakina and Ngatapa, Hawke's Bay	Red/Sika (High)	Informal carcass searches by local hunters. No dead deer found
April 2005	Mt Tauhara, Central NI	Red (Medium)	Informal carcass searches by local hunters. No dead deer found
May–June 2005	Hauhangaroa, Central NI	Red (Low)	Informal carcass searches by local hunters. No dead deer found
June 2005	Hatepe Sector 3, Central NI	Sika (Medium)	Informal carcass searches by local hunters. No dead deer found
August 2005	Takahiapo, Central NI	Red/Sika (Medium)	Informal carcass searches by local hunters. No dead deer found
August 2005	Waipunga, Hawke's Bay	Red (High)	High hunter use. No poisoned deer reported
August 2005	Kinleith Forest, Central NI	Red (Medium)	Native gullies excluded from the operation
September 2005	Ngamatea, Central NI	Sika (High)	Game Safari hunting area. No poisoned deer reported
February 2006	Wharetoto, Central NI	Sika (High)	Informal carcass searches by local hunters. One dead deer found but many live deer observed
February 2006	Ngamatea, Central NI	Sika (High)	Game Safari hunting area. No poisoned deer reported
May 2006	Te Urewera Sector 7, Hawke's Bay	Red (High)	Six dead deer found in 2000-ha prefeed trial ¹
May 2006	Willowflat, Hawke's Bay	Red (High)	No dead deer found
May 2006	Raupunga, Hawke's Bay	Red (Medium)	No dead deer found

¹The prefeed trial is reported in section 2.5.

Table 4 cont.

Date control carried out	Location	Deer species present (density)	Comments
May 2006	East Taupo, Central NI	Red/Sika (High)	Informal carcass searches by local hunters. One hybrid red/sika deer found dead; many live deer observed.
July 2006	Turangi, Central NI	Red/Sika (Medium)	Informal carcass searches by local hunters. No dead deer found; many live deer observed
August 2006	Hatepe Sector 4, Central NI	Red/Sika (Medium)	Informal carcass searches by local hunters. No dead deer found; many live deer observed
September 2006	Te Kopia, Central NI	Red (Medium)	No dead deer found
September 2006	Aorangi, Wairarapa	Red (Medium-High)	Informal carcass searches by local hunters. One dead deer found; many live deer observed

2.4 EDR and impacts on other non-target species

Does EDR alter the impact of 1080 possum control operations on non-target species?

The impact of EDR 1080 bait on non-targets other than deer was assessed incidentally during carcass searches during four of the five field trials reported above. Bird carcasses were collected, identified to species, and submitted whole for 1080 residue analysis (Table 5). The species of birds found dead were similar to those expected in standard aerial 1080 operations. Formal bird monitoring was carried out during the Tatarakina field trial (July 2003) and also during the Aorangi possum control operation in the Wairarapa (September 2006).

Table 5 Non-target species other than deer found dead during formal searches after possum control operations using EDR 1080 bait.

Location and date	Native species (<i>n</i>)	1080 residue confirmed	Introduced species (<i>n</i>)	1080 residue confirmed
Hatepe, June 2003	Tomtit (3)	Yes	Blackbird (2)	NA
			Ship rat (2)	NA
			Stoat (1)	NA
Tatarakina, July 2003			Blackbird (1)	Yes
			Feral sheep (3)	NA
			Pig (1)	NA
Tatarakina, September 2004	Tomtit (1)	Yes	Blackbird (5)	NA
			Morepork (2 ¹)	Yes/No
Pohokura, July 2005	Tomtit (2)	Yes	Blackbird (4)	Yes
			Ship rat (2)	NA
			Mouse(1)	NA

NA = Not assessed

¹Only one of two moreporks tested positive for 1080

Non-target birds

There have been three trials that formally monitored the impact of EDR bait on selected native bird species.

At Tatarakina (2003) hunters carried out 5-minute bird counts of three easily recognisable native bird species (kererū *Hemiphaga novaeseelandiae*, tomtit *Petroica macrocephala*, and robin *Petroica australis*) before and after poisoning. There was no evidence of major changes in the populations of any of these species, but the statistical power in these comparisons was low (Nugent et al. 2004).

Bird responses to cereal and carrot bait surface-coated with EDR were assessed with free-ranging robins and tomtits in the Maruia Valley, Buller and Mount Bruce Forest, Wairarapa respectively (Ross et al. 2006). The baits tested were fresh dyed cereal bait with cinnamon and EDR versus fresh dyed cereal bait with cinnamon, and fresh dyed carrot bait with cinnamon and EDR versus fresh dyed carrot bait with cinnamon. This was followed by testing in which robins were offered aged (3-week-old) undyed cereal bait with cinnamon and EDR versus aged undyed cereal bait with cinnamon, and aged undyed carrot bait with cinnamon and EDR versus aged undyed carrot bait with cinnamon, to determine the quantity of bait eaten. Video recordings of bird activity were examined to determine first the percentage of encounters at feeding boards that resulted in bait interference, and second the number of pecks at each bait treatment.

There were no significant differences in the numbers of pecks directed at cereal bait with-and-without EDR, irrespective of whether the repellent had been recently applied or aged for 3 weeks. Significantly less carrot bait coated with EDR was pecked at by robins than carrot without EDR whether it was fresh or aged. Tomtits did not interfere with any of the bait treatments presented.

This trial indicates the use of EDR on cereal bait will probably not alter the poisoning risk for individual robins during operations using broadcast 1080 bait to control possums. The use of EDR on carrot bait may reduce the risk to robins during 1080 operations to control possums. This reduced risk may be the result either of lower carrot bait palatability due to accelerated biodegradation, or of changes in bait colour when carrot is surface coated with repellent.

In September 2006 19 373 ha of the Aorangi Forest Park were aerially treated with 1080 bait. Of this, 1214 ha were treated with non-EDR 1080 carrot bait (0.08%), 13241 ha were treated with EDR 1080 carrot bait (0.8%), and the remaining 4918 ha were treated with standard 1080 cereal bait (0.08%). The first two areas were pre-fed with non-toxic carrot bait at a rate of 3 kg/ha, 12 days before the application of toxic bait.

Changes in tomtit abundance were estimated from counts of territorial males along transects pre-and-post poisoning. Twenty transects were located in each of the non-EDR and EDR-treated areas. Each transect was 250 m in length and the position of male tomtit seen or heard within 40 m either side of each line was recorded relative to 50-m interval markers. Changes in the average numbers of tomtit counted (pre-and-post control) indicated a small overall increase for the EDR block. This increase was not significant and there was no significant difference between trial areas (bootstrap $t = 0.872$, d.f. = 38, $P = 0.428$) (Ross 2007).

Non-target mammals

The range of mammal species found dead after EDR 1080 field trials indicates similar impacts to standard 1080 baiting operations. Rats have been the most common mammalian species found dead but the Department of Conservation (DOC) required further evidence of effective rodent control, as rats are often a desired bykill of aerially applied 1080. Limited tracking tunnel data collected at Hatepe (June 2003) suggested EDR 1080 carrot bait significantly reduced rat density (Speedy 2003). Further tracking tunnel data were collected at Pohokura (2005). The manager of the private land where the EDR field trial was carried out monitored rodents and stoats in an area immediately adjacent to the trial blocks that were poisoned with EDR 1080 carrot baits as part of the same overall operation (Peter Shaw; unpubl. data). In rodent and stoat tracking tunnels set for 1 night and baited with peanut butter, rat-tracking indices reduced from 38% (95% CI = 18–58%) immediately before poisoning to zero approximately 1 month after the operation, and from 52% (95% CI = 29–65%) to zero in the same tunnels set for a further 3 nights and baited with meat (to attract stoats). Stoat tracking rates were low (4% for both tracking treatments), but also reduced to zero after control.

The impact of EDR on rats was also assessed at Wharetoto, Central North Island, as part of a possum control operation during summer 2006. Two sites were selected, one of 600 ha was poisoned with EDR cereal bait (0.15% 1080), and the second unpoisoned (also c. 600 ha). Rat density was assessed before and after control using tracking tunnels. The mean rat tracking indices were similar between treatment and non-treatment sites prior to bait application (18% and 23% respectively). The mean corrected rat tracking index declined to 4% at the treatment site compared with an increase to 63% at the non-treatment site showing evidence of a significant treatment effect. Application of 1080 cereal pellet baits treated with EDR was effective at significantly reducing rat abundance at the treatment site but did not reduce rat indices to zero. The summer timing of bait application in this operation may mean that the results of this study do not represent the potential rodent kill that might be achieved using EDR baits during more typical winter operations (Lorigan 2006).

Only one pig has been found dead after aerial application of EDR 1080 bait (Tataraakina 2003), and two pigs were seen live after that operation. During the second Tataraakina field trial (September 2004) there were 18 and 23 sightings of live pigs before and after poisoning respectively, suggesting minimal impact. Though pig monitoring has had low priority, indications are that the impact of EDR bait on pigs is similar to that of standard 1080 baits.

The impact of EDR on carrot baits on feral sheep was assessed incidentally at Tataraakina (2003). Professional hunters recorded sightings of 54 sheep before application of EDR 1080 carrot bait and 56 sheep after poisoning. Three dead sheep were found in post-poisoning searches but these were not analysed for 1080 residue, and may have died from unrelated causes. Further research is required to determine if sheep are effectively and consistently repelled by EDR.

2.5 EDR on prefeed

Does EDR need to be put on prefeed to maximise repellency to deer?

All possum control with EDR bait to date has been prefeed with EDR-coated non-toxic bait. This in turn increases the cost of control, so vector managers have questioned whether this is

a necessary step in the control operation, and whether (cheaper) untreated prefeed can be used prior to application of EDR toxic bait.

A series of trials were carried out to assess whether not applying EDR to the prefeed bait would affect the impact on deer, and possum control (Speedy 2005; Epro 2006). Initial farm deer trials showed that deer would not eat EDR-coated non-toxic carrot bait after two prefeeds with plain carrot (Speedy 2005). Field testing was carried out at Maungataniwha, Hawke's Bay where two 1000-ha blocks were selected in habitat likely to have a high density of red deer (subjectively estimated at 10 deer/km²). One block was treated with EDR-coated prefeed carrot and the other received plain carrot prefeed before toxic bait application (both blocks treated with EDR 0.08% 1080 carrot bait). The impact on deer was assessed from live deer sightings before and after control by two professional hunters who also placed out fake deer carcasses (see section 2.3 Field trials with EDR bait) in the pre-assessment. Comparing the proportion of fake dead deer found with the actual carcasses gave an estimate of the total number of deer killed in each block. As with previous trial work, sightings of live deer gave a poor indication of the relative impact of poisoning on deer, due to changes in deer behaviour caused by human disturbance and the different weather pattern experienced in the post-assessment period (weather was extremely bad). Five dead deer were found in the non-EDR prefeed block compared with one in the EDR prefeed block. All tested positive for 1080. Comparing the real carcasses found with the fake deer carcasses found (non-EDR prefeed 40/200 sacks found, and EDR prefeed 35/200 sacks found) suggest a total kill of 18–32 deer in the non-EDR prefeed block compared with 4–8 deer in the EDR prefeed block. Possum kills were not significantly different, with 1.7 % RTCI in both trial blocks. Results from this trial suggest deer kill is likely to be higher if EDR is not used on prefeed (25% vs. 5% loss of deer). If such a loss is acceptable to concerned parties, then a saving of approximately \$2/ha can be realised by not using the EDR on the prefeed for carrot operations. These findings should be treated with caution as results are likely to vary from place to place and so further replication is needed.

2.6 Registration and future availability of EDR

How can we get EDR baits and what will they cost?

What's happening with EDR cereal baits?

A variation to registration of the 1080 stock solution was gained from the New Zealand Food Safety Authority (NZFSA) in early August 2006 to allow use of EDR on carrot possum baits (2005/2006 AHB Annual Research Report). A similar variation is being sought for cereal baits, but application of EDR in its current form onto cereal bait changes the bait colour to dark brown, which is outside the specification of 1080 bait registration. Trial work is currently being carried out to change the colour of EDR-treated cereal bait to green and preliminary results are positive. A second variation to registration for cereal baits is expected to be gained in 2007.

The use of EDR on aerially applied carrot bait currently costs an additional \$6–8/ha, which includes one prefeed and the toxic both treated with EDR. Not treating the prefeed with EDR and accepting a potentially higher deer bykill could save approximately \$2/ha.

Vector managers considering using EDR in their possum control operations should contact:

Roger Lorigan
Epro Ltd
283 Broadlands Rd
Taupo
Ph (07) 378 4852

Full contract reports summarised here are available from the AHB, contact:

Penny Fairbrother
The Animal Health Board
PO Box 3412
Wellington
Ph (06) 474 7805
Email: fairbrotherp@ahb.org.nz
Website: www.ahb.org.nz

3. Conclusions

3.1 Possum kill

- Possums have been controlled using aerially sown EDR carrot and cereal bait over 157 041 ha and 3672 ha respectively.
- The resultant RTCIs were below operational targets and no contracts have required reworks.
- There is no evidence from trial and operational results reported here that possum kill is affected by the addition of EDR to standard carrot or cereal 1080 baits.

3.2 Deer kill

- In the 160 713 ha poisoned with aerially sown EDR 1080 baits only 10 red deer, including two hybrid red/sika (in 104 667 ha treated), 7 sika deer (in 54 046 ha treated), and no fallow (in 2000 ha treated) have been found dead during searches following poisoning.
- Where comparative trials have been undertaken with standard 1080 operations in similar habitat it is clear that deer bykill has been high (17 red deer found dead in 3446 ha treated with carrot and cereal bait).

3.3 Non-target kill

- The three trials on birds to date suggest use of EDR 1080 baits should not change the overall impact on native birdlife compared with standard carrot or cereal 1080 baits. Individual species found dead in carcass searches are similar to those found in standard aerial 1080 operations and is further evidence that bird mortality is very low.

- The limited trial work to date suggests effective rat control can be achieved with EDR 1080 carrot or cereal bait, but further monitoring is required.
- The impact on pigs of using EDR 1080 baits is likely to be similar to standard 1080 baits, but further monitoring is required. Limited evidence suggests EDR may be an effective repellent for sheep, but further research is required to substantiate this.

3.4 EDR on prefeed

- The limited trial work suggests that in possum control operations using aerially applied EDR-treated 1080 carrot:
 - EDR is required on carrot prefeed to minimise deer bykill,
 - not using EDR on prefeed may increase loss of resident deer from 5% to 25%, but further monitoring is required.

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3.5 Registration of EDR

- EDR is registered for use on aerially applied 1080 carrot possum baits.
- EDR is currently being modified so that it can be registered for use on 1080 cereal possum baits.

4. Acknowledgements

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