

Avoiding Bait Shyness in Possums by Improved Bait Standards

R.J. Henderson and D.R. Morgan¹
Landcare Research

P.O. Box 69, Lincoln
New Zealand

C.M. Frampton
Lincoln University
P.O. Box 84, Lincoln University
Canterbury, New Zealand

¹ Author to whom correspondence should be addressed

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1. Summary

1.1 Project and Client

This study aimed to identify factors that cause possums to eat sublethal amounts of bait, with a view to recommending improved specifications for baits used during possum control. The work was done by Landcare Research and Lincoln University during 1997–1998 under contract R1457 to the Animal Health Board.

1.2 Objectives

To further develop bait specifications (for palatability, size, texture, toxicity, stability, prefeeding) aimed at avoiding sublethal 1080 poisoning and induction of bait shyness in possums, by:

- evaluating the toxicity of 1080 to possums in different bait types (cereal, paste, carrot, gel, apple, swede) and comparing results with published estimates of the acute toxicity of 1080 (administered in water);
- assessing the effect of 1080 concentration on the percentage of possums sublethally poisoned, and factors likely to affect the 1080 concentration in baits (variance in 1080 concentration during bait manufacture, bait storage, exposure to rainfall);
- assessing the effect of bait palatability on the percentage of possums sublethally poisoned, and factors likely to affect bait palatability (carrot variety, storage of carrot, soil residues on carrot, freezing of carrot, bait type, storage of manufactured baits, hardness of cereal baits, moisture content of cereal baits, lure concentrations, loss of cinnamon from baits, dyes);
- assessing the amount of bait eaten by possums and the effect of prefeeding on bait consumption;
- predicting the efficacy of baits used in bait stations by modelling the susceptibility of possums to 1080, concentration of 1080 in bait, possum body-weights, and amounts of bait eaten with and without prefeed;
- identifying bait factors that affect the efficacy of aerial control, from a database of aerial operations.

1.3 Methods

- Captive possums were used to assess the acute toxicity of 1080, bait palatability, and bait consumption. Wild possums' consumption of baits at bait stations was monitored using electronic scales and dataloggers.
- Predictions of bait efficacy at bait stations was modelled by randomly combining data on possums' susceptibility to 1080, variation of 1080 content in baits, possum bodyweights, and possums' consumption of baits.
- Bait factors that affect the success of aerial control operations were evaluated from a database of 209 aerial operations.

1.4 Results

Acute toxicity

- The LD₉₅ of 1080 to captive possums was 3.6–4.7 mg/kg in different bait types.

Toxin concentration

- Although many (>35%) possums survived baits containing 0.08% 1080 during cage studies and bait station control, few (<10%) survived baits containing 0.13% 1080. High 1080 concentrations (i.e., >0.15%) that are not adequately masked were aversive to possums, and caused 20–42% of possums to eat sublethal amounts of bait.
- Toxin concentrations were below specification because poorly calibrated equipment had not mixed appropriate amounts of poison throughout carrot bait, 1080 had biodegraded in stored baits, or rainfall had leached 1080 from baits.

Bait palatability

- Without prefeeding, baits of low palatability (i.e., <30%) sublethally poisoned many (>35%) possums. Between 10% and 30% of possums survived baits of moderate palatability (i.e., 30–45%).
- Palatability was dependent on bait type, the variety of carrot used to make baits, the moisture content of cereal baits, cinnamon or orange concentration, bait hardness, and the duration of storage.
- Cinnamon was rapidly lost from bait, but tended to stabilise at about 25% of the nominal concentration after 2 days on carrot, and at 40% of the nominal concentration after 8 weeks in cereal baits.

Amount of bait eaten

- The amounts of bait eaten by captive possums were extremely variable, but not affected by the weight of possums, or whether pens contained 1, 2, or 3 possums. The amounts eaten by wild possums were affected by site factors, season, bait palatability, aversion to 1080, and prefeeding.
- Prefeeding significantly increased amount of bait eaten from bait stations, reduced neophobia, and increased kills.

Aerial control results

- Percentage kills during aerial control are significantly affected by bait palatability. Although concentrations of 1080 in bait had no measurable effect on the percentage kill, this result is assumed to be a consequence of aversions to 0.15% 1080 in existing baits. Prefeeding significantly increased kills with aerially broadcast carrot.

1.5 Recommendations

That the revised specifications recommended in the Appendices be adopted as industry standards.

Management

To meet the updated specifications developed through this research:

a) Manufacturers of commercial baits should be advised to consistently produce:

- cereal baits with a cinnamon concentration of 0.2% wt/wt;
- individual baits with 1080 concentrations within $\pm 25\%$ of the nominal concentration;
- baits with a palatability exceeding 40% compared to recently manufactured RS5 baits. (Note: palatability trials should always compare baits of equivalent size);
- a label on all possum baits that clearly shows the date of manufacture and a recommended use-by date. (Note: baits are likely to be of substandard palatability after gel bait has been stored for 12 months, Pestoff® paste has been stored for 8 months, RS5

cereal bait (12% moisture) has been stored for 6 months, and when No.7 cereal bait (14% moisture) has been stored for 3 months);

- cereal baits with a moisture content that does not exceed 14% wt/wt;
- cereal baits of a hardness whereby a pointed 2-mm probe will penetrate baits when 2–7 kg pressure is applied to small (i.e., 1.5 g) and 5–12 kg pressure applied to large (i.e., 6 g) baits.

b) Control operation managers should be advised to:

- increase the concentration of cinnamon oil used on carrot baits to 0.3% wt/wt;
- use bait with 0.15% 1080 and routinely measure the toxin concentration of baits;
- use Royal Chantenay carrot in carrot operations, and ensure that they are harvested before they weigh 200 g or within 6 months of sowing;
- store unwashed carrot in a ‘heap’ for no more than 1 month and, if overnight frosts are likely, ensure that carrots are covered by tarpaulins;
- not use the Gibson carrot cutter for preparation of baits;
- adequately screen carrot baits;
- use prefeed before bait station control with 1080, cholecalciferol, and cyanide.

Research

In order of priority, future research is needed to assess:

- the persistence of 0.20% and 0.40% cinnamon in cereal and carrot baits; the effectiveness of higher cinnamon concentrations at masking the standard 1080 concentration (i.e., 0.15% 1080) and baits such as carrot that on occasions are inadvertently manufactured with a higher concentration (e.g., 0.20% 1080); the effects of packaging on the persistence of cinnamon in baits; the amount of non-target interference (e.g., captive and wild birds) with baits (carrot and cereal) containing higher cinnamon concentrations;
- factors influencing the quality and efficacy of baits containing brodifacoum, cholecalciferol, and cyanide, and to then develop specifications for these products;
- the long-term cost/benefits of prefeeding before aerial and ground control;
- the effectiveness of carrot at sowing rates lower than those currently used (c. 11.5kg/ha);
- the non-target risks when aerial control with 1080 baits follows a previous application of prefeed;
- the accuracy and precision of 1080 concentrations in individual RS5, No.7, and carrot baits that are currently used during possum control;
- the effectiveness of prefeeding unfamiliar baits (e.g., carrot and apple) to mitigate bait shyness caused by sublethal amounts of cereal bait;
- dyes with greater persistence than Bayer V200 for use on carrots to ensure baits comply with colour specifications;
- the efficacy of elevated bait stations (i.e., out of reach of livestock), following the application of prefeed;
- the reasons for naive possums eating different per capita amounts of bait at different locations;
- the proportions of baits of different hardness that fragment on the spinner of a sowing bucket.