# final report

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# Aerial / ground baiting of canids to enhance red meat production

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# Executive Summary

Predation by wild dogs and foxes can be a significant burden on red meat production enterprises. Poison baiting programs are generally the most effective and efficient means of reducing this burden, but dog and fox baiting programs have been dependent on a single toxin (1080) for many years. Recently, new baiting products have been developed around a new toxin, PAPP. PAPP has many advantages to 1080, including the existence of an antidote and it is widely perceived as being humane, given its mode of action (oxygen deficit) is lethal in a way that is directly comparable to other euthanasia methods that are accepted as humane eg carbon dioxide/carbon monoxide induced euthanasia.

This project comprised two studies aiming to demonstrate means of adoption for the new PAPP baits into existing wild dog and fox management programs. The first study aimed to determine whether PAPP baits could be aerially distributed to improve the efficiency of fox control for prime lamb production. The second study aimed to demonstrate the effectiveness of PAPP baits in ground baiting programs for control of wild dog populations to improve the economics and welfare outcomes in cattle production.

An initial review of the potential risks and benefits of aerially distributing PAPP baits to improve prime lamb production found that aerial baiting would probably not be useful in the high rainfall sheep/wool production zone, but it might be useful in the inland sheep/wheat and pastoral zones. However, subsequent field trials indicated that PAPP baits for foxes laid on the ground surface posed a longer-lasting hazard for domestic dogs and some other non-target species than producers were willing to manage. This hazard was deemed unacceptable to all sheep producers surveyed, so the aerial baiting study was discontinued.

A ground baiting trial of PAPP baits for wild dog control was conducted at Quinyambie Station in the arid zone of north-eastern South Australia in 2011. The trial was necessarily conducted during extremely poor conditions for baiting due to high densities of native hopping mice and introduced house mice. Nonetheless, it demonstrated dogs will take baits and be killed by them, even under poor conditions. Enough dogs were killed to produce a substantial reduction in wild dog activity across the study site, both immediately after baiting, six weeks later and even months later.

Further work in this project has sought to collect further information to facilitate the adoption of PAPP products into wild dog and fox baiting programs. This has included social research to understand barriers and drivers of adoption, formal evaluation of the relative humaneness of PAPP products, and the dissemination of information to end users through workshops and publications.

PAPP products have now been approved by the Australian Pesticides and Veterinary Medicines Authority and will soon be launched into the Australian wild canid control market. Actions to make end users aware of the benefits and risks of using PAPP baits, many of which are known because of this project, as well as conventional 1080 baits will allow baiting programs to be tailored so that risks can be minimised and benefits maximised in promoting the adoption of these new control tools into conventional IPM programs.

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# 1 Background

This Project consisted of two studies to demonstrate means for adoption of the new canid PAPP baits into existing fox and wild dog management programs and how this adoption can contribute to the efficiency and sustainability of red meat production enterprises (prime lamb and cattle) under intensive and extensive production systems.

The first aspect of the Project was an aerial trial to demonstrate the potential for appropriate landscape application of fox control on prime lamb production. Previous research conducted by NSW Department of Primary Industries clearly demonstrated the beneficial production outcomes associated with greater coordination and landscape coverage. Aerial baiting of foxes, using 1080, has been successfully conducted in Western Australia. This strategy has not been employed in the central and eastern states (apart from a few restricted reserves). With the availability of the new toxin (PAPP) in manufactured baits, further investigation into the feasibility of this strategy was highly desirable.

The second aspect of the Project was to demonstrate ground deployment of PAPP baits to reduce wild dog abundance and their impacts on cattle production in the pastoral zone. To date nearly all wild dog baiting has encompassed the use of fresh meat baits injected with 1080. This aspect of the Project demonstrated the efficacy of manufactured baits containing PAPP in order to give cattle producers greater options for mitigating wild dog impacts, particularly closer to property homesteads where the risk to pet and working dogs is higher.

In late 2009, early 2010 the IA CRC and Queensland Biosecurity demonstrated the efficacy of PAPP baits in reducing wild dog activity in state forest managed land leased to cattle producers west of Toowoomba. This first field trial using PAPP baits provided encouraging results but the effects seen in this trial needed to be replicated at other sites across Australia to warrant a national registration approval by the APVMA. The South Australian Arid Lands Natural Resource Management (SAALNRM) Board had been coordinating a study for the previous 2-3 years that assessed the impact of 1080 baiting on wild dog populations and what this intervention achieved in reducing predation rates on cattle, respective wild dog diets and prey abundance. This foundation of benchmarking data made this an attractive study site and strategically a good one for leveraging additional results cost-effectively. The generally exceptionally good conditions in the arid zone north of the wild dog barrier fence were expected to result in an abundance of prey species in 2011 and wild dog abundance was expected to also increase commensurately.

This was expected to coincide with significant restocking of several of the stations and Quinyambie was one of these stations as well as an Australian Pesticides and Veterinary Medicines Authority (APVMA) approved PAPP field trial site. The convergence of high cattle restocking rates and increasing wild dog abundance, and the effects of wild dogs on cattle production under these circumstances, was an opportunity rarely presented and critical for determining future management practices for pastoralists to minimise wild dog impacts during re-stocking.

# 2 Projective Objectives

By March 2011:
1. Finalise contract and IP agreements with MLA.
2. Draft study protocols and sign up study investigators.

By June 2011:
1. Assess the efficacy of a wild dog management program using PAPP baits on wild dog abundance and activity.
2. Commence a detailed risk analysis for aerial application of PAPP baits across south eastern Australia (public and private lands).

By Nov 2015:
1. Assess the efficacy of fox management program using PAPP baits and aerial baiting on agricultural production in 'real world' situation IF the risk analysis indicates a trial can proceed and APVMA approval can be gained
2. Investigate land manager participation and the social implications of adopting these new, more humane management options.
3. Re-evaluate current best practice management techniques (eg. 1080) and evaluate potential alternatives (eg. PAPP, M44s) to ensure adoption of modified strategies by all land managers and agencies through participatory learning and education programs.
4. Promote knowledge (quantified benefits) of including PAPP baits in fox and wild dog management programs through stakeholder groups to landholders.
5. Use the information from field degradation studies to inform best practice and in consultation with PAPP bait product commercialiser incorporate relevant information into the label so that bait end-users are aware of poison longevity in these baits and the advantages/disadvantages this confers to these products.
6. Final report preparation and submission to MLA

# 3 Methodology

## 3.1 Aerial baiting for fox control

### 3.1.1 Risk assessment

An assessment of the risks and potential benefits of aerial distribution of PAPP baits for fox control was completed by NSW DPI in November 2011. This assessment followed the "Assessment of Significance" process defined in S94 of the Threatened Species Conservation Act 1995 (NSW). The Assessment of Significance (also known as the "Seven Part Test") contains seven factors which must be considered when making a determination on whether a proposed action is likely to significantly adversely affect threatened species, populations, communities or their habitat. Further methodological details are provided in Appendix 1: *Potential benefits and risks of aerial baiting using PAPP to reduce the impacts of foxes in eastern Australia.*

### 3.1.2 Field trials

Discussions with land managers indicated that reliable information on the longevity of PAPP baits in the field was needed before an aerial baiting trial could be conducted. Field trials were therefore conducted at two sites during different seasonal conditions. The results of these trials combined with subsequent landholder surveys indicated that aerial baiting would

not be acceptable to land managers, so further trials were halted. Further methodological details are provided in Appendix 2: *Degradation of PAPP fox baits at two sites in central NSW.*

### 3.2 Ground baiting for wild dog control

A field trial was conducted at Quinyambie Station, a 1.2 million hectare beef cattle property in South Australia's Arid Zone, in 2011. The trial followed on from a 3yr 1080 baiting trial at the same site. DOGGONE baits were laid twice annually (Autumn and Spring) as part of the original 1080 trial, and the PAPP trial essentially switched a DOGGONE-1080 bait for a DOGGONE-PAPP bait during the Autumn 2011 baiting. Survey methods used since the beginning of the 1080 trial were maintained and supplemented with additional methods during the PAPP trial. All survey methods were used both pre- and post-baiting. The PAPP trial was necessarily conducted during a plague of native and introduced rodents and in the presence of ample surface water (i.e. a 'worse case scenario' for detecting a knock-down effect of baiting). Further methodological details are provided in Appendix 3: *Efficacy of Para-aminopropiophenone (PAPP) to control dingoes (Canis lupus spp.) in the Strzelecki Desert of South Australia: Quinyambie Field Trial.*

## 4 Results

### 4.1 Aerial baiting for fox control

#### 4.1.1 Risk assessment

The report provided a review of current fox management practices for livestock protection in eastern Australia, the potential benefits of aerial baiting using PAPP, and a systematic assessment of the risks that this practice might pose to important non-target species in New South Wales. Four species were considered to be vulnerable to aerial baiting, and another three species potentially vulnerable. Aerial baiting using PAPP cannot currently be recommended for areas in which these species are found; however, most of these species are largely restricted to the high rainfall sheep / wool production zone. Aerial baiting should therefore be easier to implement in the inland sheep / wheat and pastoral zones. Risks to other threatened species were considered negligible or easily manageable. The full report is provided in Appendix 1.

#### 4.1.2 Field trials

Field trials estimated the degradation of PAPP in fox baits exposed to prevailing environmental conditions at one site in central New South Wales for 56 days during summer 2011/12 and two sites in spring 2013. In addition investment in this project leveraged further investment by the Queensland Department of Agriculture and Forestry that assessed the in-field stability of Dogabait (PAPP wild dog baits). All baits maintained relatively high PAPP content through the duration of the study. In buried baits PAPP degraded more rapidly than in baits left on the ground surface. PAPP in fox baits at the hotter and drier of the two sites degraded more rapidly than in baits at the cooler/wetter site. Detailed results are provided in Appendix 2.

### 4.2 Ground baiting for wild dog control

At the beginning of the trial bait take was low. Nonetheless, wild dog activity in the unbaited area further declined from April until late June probably due to alternate live-prey food, but increased again by August. In the baited area, wild dog activity (camera images, bait take and sandplot data) peaked in early June, was reduced after baiting, and was still similarly low in August. This suggests that: (1) wild dog activity was immediately reduced by baiting and was also (2) kept low for some time afterwards, relative to activity in unbaited areas.

The most reliable knock-down measure would be to compare the second pre-baiting count with the first post-baiting count (i.e. 2 weeks pre-baiting compared to 2 weeks post-baiting). This comparison shows that wild dog activity declined by 68% during this time. Adjusted for normal activity changes however, the net effect of PAPP baiting during this time was a 36% reduction in wild dog activity. However, only two of 13 collared wild dogs died after eating baits. Detailed results are provided in Appendix 3.

## 5 Discussion

### 5.1 Aerial baiting for fox control

The assessment of possible risks and benefits from aerial baiting with PAPP baits to control foxes was a necessary first step in evaluating the potential for this process to greatly enhance the benefits of fox control programs in eastern Australia. The assessment indicated that there were substantial risks to some threatened non-target species. These risks limited the potential area over which aerial baiting might be useful, but risks to non-target species across a large area of NSW were determined to be readily manageable.

Surveys of land managers who were initially keen to participate in aerial baiting field trials revealed that the longevity of baits in the field was a key concern and that aerial baiting would not be acceptable if baits remained hazardous to domestic dogs and other non-target species for more than 14-21 days. Field trials that were conducted to resolve this issue showed that baits were likely to remain hazardous to dogs for at least two months when they were left on the ground surface, consistent with aerial distribution. Planned aerial baiting field trials were therefore cancelled.

After consultation with MLA, it was decided that the aerial baiting side of the project should focus more on facilitating the adoption of PAPP products through four new objectives. Actions relating to these revised, final objectives are ongoing (Table 1). It is most appropriate to complete these as PAPP products enter the market.

## 5.2 Project Variation Milestones

**Table 1: Summary of actions towards achieving revised objectives**

| Objective | Actions |
|---|---|
| A. Investigate land manager participation and the social implications of adopting these new, more humane management options | A position has been created at NSW DPI for a Project Officer to conduct, analyse and report on an extensive survey of land managers. This work will identify typologies among land managers with respect to canid baiting practices and preferences, as well as identifying drivers and barriers to adoption of PAPP baits for wild dog and fox control. A suitable candidate with social research experience has been identified and is currently being appointed to the role. |
| B. Re-evaluate current best practice management techniques (e.g. 1080) and evaluate potential alternatives (e.g. PAPP, M-44's) to ensure adoption of modified strategies by all land managers and agencies through participatory learning and education programs | This work will necessarily be ongoing as PAPP products enter the market place. It will also be informed by the results of Objective A, above. Current work includes:<br>• A PestSmart factsheet addressing frequently asked questions about PAPP and PAPP products has been made available to help land managers and others understand the inherent opportunities and constraints of these products.<br>• The humaneness of PAPP bait products, including lethal trap devices, is currently being assessed. This will allow the relative humaneness of these products to be mapped against current control methods and will provide a foundation for refinement of codes of practice (Sharp & Saunders 2014a, b) and development of standard operating procedures (e.g. Sharp 2012).<br>• CPE TRAIN THE TRAINER WORKSHOPS Greg Mifsud (Invasive Animals CRC National Wild Dog Facilitator) organised a Canid Pest Ejector train the trainer course at Queanbeyan NSW on the 13th of October 2015 and attended by numerous state agencies. The course provided government authorities with the information, and technical support, they need to ensure safe and effective use of CPE's by end users. Rob Hunt (NSW National Parks and Wildlife Service) ran the two part training session which included both theoretical and practical demonstrations on their use. This workshop ensures that there are trained individuals that can train others in the effective and safe use of CPE's and precedes the market delivery of PAPP capsules for use in CPE's, which will be an additional control tool in Australia in the future now that PAPP is an approved agricultural chemical – pesticide. http://www.invasiveanimals.com/wp- |

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|---|---|
| | content/uploads/2015/12/IA_CRC_NRM_Notes_23.pdf (Appendix 4) |
| C. A communication plan to promote awareness of the results of the project of including PAPP baits in wild dog and fox management programs through stakeholder groups to landholders | • This milestone was achieved and encompassed within the National Wild Dog Management Plan 2015 that CRC staff contributed towards and the IA CRC's Communications Plan PAPP Products (DRAFT - Appendix 5) that is in draft currently and will be finalised by 25/3/2016. |
| D. Development activities for registration of PAPP for dog and fox control including label instructions | • PAPP as a new agricultural chemical as well as fox (FOXECUTE) and wild dog (DOGABAIT) baits were approved by the APVMA on the 21st of January 2016. A market launch is planned prior to May 30 2016 incorporating the Minister of Agriculture Barnaby Joyce. In preparing for the market launch 3 product booklets (extension/promotional materials – Appendix 6) have been prepared in consultation with all relevant stakeholders by the commercialiser ACTA and the IAL. These extension materials set out the benefits, risks, and methods for incorporating PAPP baits into integrated pest management strategies for wild canid control programs. One of these booklets is aimed at Australian veterinary professionals and those responsible for teaching new veterinarians about the mode of action of PAPP, its clinical signs and treatment modalities so that PAPP product adoption can be maximised in areas that present the greatest risk to pet and working dogs (periurban zones and around homesteads), where PAPP product use should be focussed given the equivalent risks of conventional bait use. |

While the project team did not achieved all of its original objectives in this project it did produce data/results that were not originally agreed as well. The additional results will greatly assist end users to understand the risks and benefits of using the new baits containing PAPP and relate to best practice using these new tools consistent with the originally envisaged outputs from this project.

# 6 Conclusions/Recommendations

## 6.1 Best Current Practice - Wild canid management

This project's outputs will achieve the primary aim of this project – to promote adoption of these new tools and maximise their integration into conventional control programs such that the new PAPP baits will be used as well as not instead of 1080 baits. This is the key message that needs to be communicated to the Australian public so that end users can be promoted as responsible land and animal managers and their products promoted using a similar message to Australian and international consumers.

# 7 Key Messages

## 7.1 PAPP and 1080 are complimentary toxins for wild canid control

PAPP and 1080 are now approved actives for use in baits to control foxes and wild dogs.

- 1080 is available in manufactured baits and as a concentrate to add to meat chunks.
- PAPP is only available in manufactured baits
- 1080 and PAPP work differently but both are highly effective
- ACTA 1080 manufactured baits (Foxoff and Dogone) now contain red marker beads to help vets diagnose accidentally poisoned animals and endusers confirm bait consumption
- ACTA PAPP manufactured baits (Foxecute and Dogabait) now contain yellow marker beads to help vets diagnose accidentally poisoned animals and endusers confirm bait consumption
- 1080 is more and less toxic to Australian native species, while PAPP is more and less toxic to a different range of Australian native species
- A majority of Australian native species are more tolerant to PAPP than wild canids
- PAPP does have an effective antidote that is effective, even if a pet/working dog is close to death
- The earlier the PAPP antidote is administered the better so seek veterinary attention as soon as you suspect a pet or working dog has taken a bait
- For pet/working dogs that accidentally eat 1080 or PAPP baits vomiting can be induced by orally administering 3-5 washing soda crystals (sodium bicarbonate), generally available in supermarkets.
- PAPP is an expensive chemical and > 100x the dose of 1080 is needed to effectively kill wild canids so Foxecute and Dogabait baits are necessarily more expensive but the availability of an antidote means that PAPP baits are recommended for use where risks to pet and working dogs is higher eg baiting closest to homesteads and peri-urban zones.

# 8 Bibliography

## 8.1 Report References

Sharp, T. (2012) 'DOG004: Ground baiting of wild dogs with 1080.' (Invasive Animals Cooperative Research Centre: Canberra.)

Sharp, T. and Saunders, G. (2014a) 'Model code of practice: humane control of foxes.' (NSW Department of Primary Industries: Orange.)

Sharp, T. and Saunders, G. (2014b) 'Model code of practice: humane control of wild dogs.' (NSW Department of Primary Industries: Orange).

# 9 Appendix

## 9.1 Appendices

9.1.1 Appendix 1: *Potential benefits and risks of aerial baiting using PAPP to reduce the impacts of foxes in eastern Australia.*

9.1.2 Appendix 2: *Degradation of PAPP fox baits at two sites in central NSW*

9.1.3 Appendix 3: *Efficacy of Para-aminopropiophenone (PAPP) to control dingoes (Canis lupus spp.) in the Strzelecki Desert of South Australia: Quinyambie Field Trial.*

*9.1.4* Appendix 4: *IA CRC/NRM Notes 23 – CPE Train the trainer workshop*

9.1.5 Appendix 5: *Communications Plan PAPP Products*

*9.1.6* Appendix 6: *Foxecute/Dogabait and Veterinary Technical Booklets*