Poison baiting of carnivores

Introduction

In the 2003, RSPCA hosted a seminar on humane vertebrate pest control. This event marked the beginning of a much needed discussion about welfare issues in so-called pest control, as noted by RSPCA (1, p.5): "*In terms of the numbers of animals killed, and the cruelty of the methods used, vertebrate pest management is probably the biggest welfare issue in Australia.*"

The existence of extensive and severe suffering is not surprising, given the historical focus on killing as many so-called pest animals as cheaply as possible (2).

This attitude is slowly changing, for example, with the publication in 2011 of *A Model for Assessing the Relative Humaneness of Pest Control Methods* (2). In the Foreword to this document, the authors acknowledge (2, p.5): "*There is a worldwide trend towards ethical and moral concern for the welfare of animals regardless of their status. This trend cannot be ignored*."

In 2017, international consensus principles for ethical wildlife control were published (3). This document focused not only on welfare aspects of control measures, but also the broader context in which control occurs, asking, for example: Is the control necessary, justified, effective in achieving its goals, and are non-lethal approaches available?

With increased public awareness of animal welfare, it is not acceptable to continue to demonise certain animals in order to exclude them from welfare considerations. Vertebrates of similar emotional and cognitive complexity share a similar capacity for suffering regardless of their circumstances, so wild rodents, rabbits, cats and dogs, among others, should be given the same welfare consideration as their domestic counterparts. This requirement is embedded in RSPCA policy and is recognised by animal welfare experts (3-5).

This introductory statement in a PestSmart document must be applied to all vertebrate animals labelled as "pests" (5, p.1):

> "*There is an expectation that animal suffering associated with pest management be minimised. The most humane methods that will achieve the control program's aims must be used.* ***Consideration of animal suffering should occur regardless of the status given to a particular pest species or the extent of the damage or impact created by that pest****. While the ecological and economic rationales for the control of pests such as the feral cat are frequently documented, little attention has been paid to the development of an ethical framework in which these pests are controlled. An ethical approach to pest control includes the recognition of and attention to the welfare of all animals affected directly or indirectly by control programs*." (emphasis added)

Cruel killing methods have been used to control so-called pests. However, very little attention has been given to the outcomes of the killing, whether it has reduced the target population, whether it has benefitted protected species, and whether the outcome could have been achieved by more humane methods. These issues will be examined in subsequent sections.

Killing methods – focus on 1080 poison

So-called pest control has traditionally relied on lethal methods, but these days the killing is referred to as "humane". Humane killing, according to RSPCA Australia, is when "*an animal is either killed instantly or rendered insensible until death ensues, without pain, suffering or distress*."

Consistent with this definition, Sherley (6) proposed a set of criteria to systematically evaluate humaneness:

1. Speed of action

2. Symptoms, as evidenced by behaviour/appearance

3. Human accounts of poisoning

1. Speed of action

Foxes, like other canids, are particularly susceptible to 1080 poisoning. In two separate studies, they were administered a lethal dose and observed. In the first study (7), there was a lag of 4.05 ± 0.86 hours between ingestion and the appearance of the first symptoms, and from there it took 1.57 ± 0.46 hours to die. In the second study (8), the time to first symptoms was reported as 205 ± 28 minutes and the time from then to death was 103 ± 16 minutes. This is not a rapid death.

These foxes were administered a lethal dose in a controlled experiment. In another laboratory study (9), cats were administered a median lethal dose, that is, one intended to kill only half the animals. In this case the time for symptoms to appear was 1.0 – 5.6 hours, and the total time to death was 20.7 – 21.0 hours, a very drawn out death. This result is relevant to field trials, where it is much harder to control the dose of poison consumed than under laboratory conditions.

> "*Despite efforts to ensure that baits contain a lethal dose, in the field there is limited control over the intake of poison. The initial concentration of poison in baits can be controlled, but environmental conditions affect the rate of degradation and loss of 1080 over time. The number of baits, or the amount of bait material, taken by individuals cannot be completely controlled, hence the speed of onset and time to death may be variable*." (7: p. 453-4)

2. Symptoms

According to Sherley (6), most studies focus on the difficulty of evaluating pain in the final stages of poisoning, and fail to address potential distress in the earlier stages. Sherley (10) notes that there are similar neurological disturbances across species in the early stages, including retching and vomiting, trembling, hyperactivity, uncoordination, hypersensitivity to stimuli and respiratory distress. Muscle twitches are followed by spasms of the tail or limbs, and finally convulsions interspersed with periods of lucidity prior to death by respiratory failure.

Common symptoms among poisoned foxes were retching, paddling with all limbs and tetanic stretching while lying on the back or side (7,8). The paddling was violent enough to propel the foxes across the floor in an uncoordinated way. The researchers suggest that it is during the period of retching and coordinated hyperactivity that pain and anxiety are more likely to be perceived (8). They conclude:

> "*The anxiety that may be experienced by animals before loss of consciousness, or in periods of lucidity after collapse, has yet to be considered as a significant component of the possible suffering experienced during 1080 toxicosis.*" (8: p.99)

With regard to the later stages of poisoning when convulsions occur, it is often argued that animals are unconscious and therefore unable to suffer. However, muscle spasms can occur independently of generalised convulsions that involve the whole brain, and such spasms are likely to be painful. As Sherley concludes (6: p. 452) :

> "*Gregory (1996) ignores the fact that focal convulsions (those affecting only part of the brain and body) are not typically associated with unconsciousness. Even generalised convulsions are not always associated with loss of consciousness; patients remain fully conscious during the generalised tonic spasms associated with strychnine poisoning. Both localised muscle spasms and tonic convulsions are frequently described in 1080 toxicosis prior to the onset of clonic-tonic convulsions.* ***It is therefore inappropriate to suggest that all convulsive episodes observed in dogs poisoned with 1080 are generalised seizures, and that they are reliably associated with unconsciousness and a pain and distress free state.***" (emphasis added)

3. Human accounts of poisoning

Those wishing to argue that there is no pain associated with 1080 poisoning often refer uncritically to a presentation at a 1996 pest control organised by the Department of Natural Resources and Environment in Melbourne (11). Sherley (6) examined the three human cases referred to by Gregory in this conference paper. In one case a toddler was already comatose when admitted to hospital, in another case an 8 month old girl suffered mild poisoning, but like the toddler was not in a position to report her symptoms. In the third case a researcher inhaled some powder and then experienced a headache and tingling. These cases cannot be used to argue that a lethal dose of 1080 does not cause pain.

It is not clear why Gregory did not refer to other studies available at the time, which showed that patients experienced headache and epigastric pain (8).

More recently, researchers in Taiwan examined 38 cases of deliberate ingestion of 1080 (12). The most frequent symptoms were nausea and vomiting, followed by diarrhoea, agitation and anxiety, subjectively reported respiratory distress and abdominal pain. Symptoms were similar between those who survived and those who did not, except for respiratory distress and seizures, which were much more common among those who subsequently died.

4. Conclusion on 1080

Sherley concluded the evaluation of humaneness using her three criteria as follows (6: p. 456):

> *"Sodium fluoroacetate does not clearly meet these criteria and it is inappropriate to claim that 1080 is a humane poison based upon prior reviews that fail to consider wider welfare impacts and do not use a consistent framework for assessing humaneness."*

As previously discussed, there has been a gradual trend towards considering the welfare impact of control methods. The 2011 *Model for Assessing the Relative Humaneness of Pest Control Methods* (2) was produced based on discussions with experts on a Humaneness Assessment Panel. In relation to 1080 baiting of foxes, this document states (2, p.98):

> *"The latent period is likely to be associated with minimal pain or distress. After the onset of clinical signs when animals are retching, displaying manic running and there is little or no CNS disturbance,* ***it is likely that they will suffer and could experience distress, confusion, anxiety and pain.***
>
> *In the later stages, when severe CNS dysfunction has developed, it is unknown if animals are perceiving pain. The objective assessment of pain by an observer is difficult since CNS disruption appears to alter the normal behavioural indicators of pain. Also, perception of pain by the animal requires that it is conscious. With 1080 poisoning it is difficult to assess if animals are conscious after collapse and during convulsive episodes. During periods of prolonged convulsions* ***it is possible that animals are lucid between fits****. If animals are conscious during the convulsive episodes or if they become conscious afterwards* ***it is possible that they may experience pain and/or anxiety.***
>
> *There is also the potential for injuries to occur after the appearance of clinical signs."*

RSPCA has a policy against the use of 1080 because it is not humane (13). Similarly, the Invasive Species Council concludes "*that animals poisoned with 1080 are highly likely to suffer pain and distress*" (14, p.8). It should be noted that New Zealand and Australia are the main users of 1080. It is not approved in other countries apart from Mexico, Japan, Korea and Israel (15).

It is disturbing that many government departments deny the suffering caused by 1080 and refer to it as humane. For example, here is a typical example from the SA Department of Primary Industries and Regions (16):

> "*1080 kills pest animals by starving calcium and energy from cells, disrupting the central nervous system, which leads to unconsciousness. After the poison takes effect, the dog or fox is initially disorientated and then becomes unconscious and cannot feel pain*."

Such statements amount to misleading the public. Social acceptability is an important factor in animal management. The Humaneness Assessment Panel (2) noted that the public generally accepted management of so-called pests, as long as methods were humane and justified. The public is not in a position to make an informed decision about the acceptability of 1080 baiting while government departments provide inaccurate information.

5. Is PAPP more humane than 1080?

Given the gradual increase in concern for the welfare implications of control measures, researchers have investigated whether the poison para-aminopropiophenone (PAPP) is more humane than 1080. PAPP reduces the capacity of haemoglobin to carry oxygen to tissues in the body, and is considered by some to produce a humane death (17, p. 5):

> "*One of the key drivers for developing PAPP has been animal welfare. When delivered at a lethal dose, rapid induction of high levels of methaemoglobin can quickly induce unconsciousness and death minimal symptoms of distress. Rapidly induced anoxia is the cause of death and appears to be without appreciable pain or discomfort in much the same way as anoxia induced by carbon monoxide induces carboxaemia*."

These reviewers also noted that PAPP has an antidote, whereas 1080 does not, and that it is rapidly broken down and so poses less risk of secondary poisoning.

PAPP seems to produce a more rapid death than 1080, which is one of the humaneness assessment criteria proposed by Sherley (6). Among 16 feral cats who died after eating meat baits, it took an average of 40.8 minutes for the first symptoms to appear, and an average of 40.6 minutes from the appearance of symptoms to death (18). However, there was considerable variation between cats.

A more recent study investigated the effect of the commercially available Curiosity bait, where the PAPP and meat are presented in a hard shell, which dissolves in stomach acid, but serves to deter native predators (19). The following average times were observed, but again there was considerable variation between cats (19):

Ingestion to first signs of poisoning	242 minutes (digesting the hard shell)
First signs to collapse	74 minutes
Collapse to death	114 minutes

The first signs of poisoning include head nodding, as if falling asleep, lethargy and loss of coordination. Some animals vomit (19). Once they collapse, they can no longer move voluntarily, but may paddle, arch the back or roll onto the side involuntarily (19). The level of awareness at this time is not clear. The Humaneness Assessment Panel evaluated these responses as follows (20, p. 3):

> " *… after the onset of clinical signs when cats cannot coordinate body movements it is likely that they will experience some distress, confusion and anxiety as they cannot perform normal behaviours … Lethargy and weakness are also potential sources of distress*."

While loss of consciousness is not immediate and there is some level of suffering before death, the humaneness model classifies death by PAPP poisoning in cats as “mild”, which may involve mild breathlessness, and mild degree of sickness, for example, vomiting, retching, diahorrea, lethargy or weakness” (2). The only method that is considered more humane is a shot to the head.

PAPP produces a relatively rapid death in foxes, an average of 43 minutes after ingestion. Death was 7.7 times faster than with 1080, with less symptoms prior to death (21). In another study, time to death was longer (average 121 minutes), but again the foxes showed no signs of distress and just fell asleep (22). However, wild dogs did not die so peacefully, showing rapid breathing and signs of distress and anxiety before they died, an average of 84 minutes after ingesting baits (22).

The RSPCA summarises the effects of PAPP as follows (23):

> “ *Baits containing PAPP appear to be more humane than 1080 as the toxin acts faster and appears to be less aversive, but PAPP still has the potential to cause some suffering*.”

The justification of control programs

As an indication of evolving attitudes towards so-called pest control, some researchers are beginning to consider ethical questions. For example, is it ethical to cause pain in one animal species in order to conserve another (24)? This dilemma is further described as follows (25, p.17)

> “*Culling of pest animals to protect biodiversity raises complex dilemmas. Prioritising the conservation of species over the value of individual animals is often used to justify culling programs. But this logic is challenged when culls fail to have a positive impact on the species they aim to protect, or worse, cause more damage than good.”*

Unfortunately, the outcomes of culling programs are often not monitored at all. Reddiex et al (2006) conducted an examination of the extent of monitoring (26). ‘Operational monitoring’ refers to estimating the change in abundance of the target species, whereas ‘performance monitoring’ refers to estimating the change in abundance of the species to be protected. Half or more of the actions carried out between 1990 and 2003 involved neither operational or performance monitoring (fox 49%, wild dog 52.4%, feral cat 64.6%). A small minority of actions involved both (fox 8.9%, wild dog 6.7%, feral cat 10.8%). However, only a handful of actions involved comparison of a treatment area with a control area, where no culling was undertaken (27). A control area is essential to take into account the effect of factors outside the program, such as rainfall. Very little information can be extracted from these operations given the inadequate way in which they were carried out, providing no basis for more effective action in future, and no justification for their performance.

When actions are monitored, outcomes may fail to meet intended objectives. For example, cat baiting is often ineffective and fails to reduce numbers (28-31). Bait uptake may be low because many baits are removed by non-target animals such as corvids, emus, brushtail possums and bush rats (29-32). Ineffective baiting meant that there was no difference in the abundance of small mammals and reptiles between baited and unbaited areas (25). However, some cats will have taken baits and died a painful death, for no ecological gain.

Another problem may be that cats are killed but the population is not reduced due to migration. On Kangaroo Island, 6 cats were poisoned, but within 20 days another 5 cats moved into the area (32). Periodic trapping of cats at 2 sites in Tasmania led to increases in the population, while numbers at a control site were stable. The increase was probably due to migration (33).

Culling may not benefit the species intended to be protected. Examination of data from 64 sites over 23 years showed that there was little benefit from fox baiting to mallee fowl populations, leading the authors to conclude (34, p.319):

> *"… malleefowl population growth did not benefit from baiting, suggesting that fox baiting is generally not a cost-effective management action for the conservation of this species. This study provides a powerful example of why management decisions should be based on evidence, rather than ecological intuition."*

In another example, dingoes were routinely poisoned to protect calves. However, when a study was undertaken of calf losses in a treated area compared to a control area where no baits were laid, calf losses were higher in the baited area (35). It had been assumed, incorrectly and without evidence, that the presence of dingoes was a problem. Not only that, dingo numbers returned to pre-baiting levels within 8 months, so the deaths were in vain.

Baiting that fails to produce any positive outcomes has been called "*senseless killling*" (3), and according to the Invasive Species Council "*it is unethical to kill animals if no conservation benefit is achieved*" (14).

Discussions of introduced predators sometimes make it seem that they are entirely responsible for any decline in native species. However, changes made to landscapes by humans leave native animals more vulnerable to predation. For example, in the Kimberley small mammals were more abundant when there was less frequent and less intense burning, plus no grazing by cattle. These two factors together resulted in more grass cover to give greater protection to small animals, and allowed them to coexist with predators (36). Larger, continuous areas of native vegetation also provide greater protection since predators such as cats tend to hunt on the fringes of these remnants, leading researchers to conclude that "*conservation practitioners should consider habitat protection, revegetation projects, and grazing and fire management as crucial and complementary components of predator abatement plans*." (25, p.18)

In conclusion, it is unacceptable to continue using a cruel poison like 1080, to continue killing introduced predators in programs that fail to achieve significant results, and to view predator baiting in isolation from environmental factors that make native animals more susceptible to predation.

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