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Point to Ponder

Indiscriminate, Inhumane and Irresponsible: Compound 1080 Is No Longer an Acceptable Form of Wildlife Management

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Abstract

Canada's mammalian and avian predators and scavengers are at risk of exposure to the inhumane and deadly Compound 1080 (sodium monofluoroacetate), a poison authorized by Health Canada's Pest Management Regulatory Agency to kill wolves (*Canis lupus*) and coyotes (*Canis latrans*) under the following circumstances: i) following instances of livestock predation; ii) where predation has been identified as the primary factor affecting survival of a specific wildlife population, or iii) where a serious threat to human safety exists. Misrepresentation of Compound 1080 as being a canid-selective or even canid-specific toxicant, in addition to victim dispersal due to delayed presentation of clinical signs, has led to an under-evaluation of the risk this poison poses in the environment and to the welfare of wild and domestic species. Compound 1080 causes evidence of pain and distress for prolonged periods before death. The severe suffering it induces upon its victims should be sufficient grounds for removing Compound 1080 from the Canadian landscape. Compound 1080 presents unacceptable risks to the health and safety of non-target individuals, including species at risk and domestic animals. The relatively slow toxic action of Compound 1080 allows poisoned individuals to disperse widely across the landscape, preventing accurate monitoring of primary and secondary poisoning. Data provided through a Freedom of Information request provide evidence that at least 36 of Alberta's Compound 1080 occurrence use records failed to indicate carcass/bait recoveries from poisoning sites between 2011–2016, and thus failed to demonstrate the legally required carcass/bait recovery. Records provided through a Freedom of Information request to the Government of Saskatchewan shows Ministry of Environment staff explaining that the lengthy time it takes an animal to succumb to Compound 1080 results in poisoned carcasses almost

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never being found. Where the intended outcome is preventing future conflict between wild canids and livestock, compared with poisons, safer and more effective alternatives exist. In response to multiple requests made by non-governmental organizations, toxicologists, veterinarians and members of the public, Health Canada initiated a re-evaluation of the cluster of predacides registered in the country in January 2021, including strychnine and sodium cyanide in addition to Compound 1080. Recent poll results indicate that most Canadians believe the risks of Compound 1080 and other predacidal poisons registered in Canada are unacceptable. It is imperative that the broader scientific community takes a participatory role in Health Canada's consultation periods around Compound 1080 to support the ban of this non-discriminating and inhumane poison from all future use in Canada.

Key Words: Animal Welfare, Canid, *Canis*, Compound 1080, Humaneness, Lethal Control, Livestock, Non-selective, Non-target Animals, Poison, Predacide, Secondary Poisoning, Species at Risk, Wildlife Management.

Introduction

Poison baits are often the subject of vigorous debate over the impact they have on non-target animals, including endangered species, domestic animals and companion animals (Defenders of Wildlife 1982; Hjertass *et al.* 1995; Sherley 2007; Canadian Veterinary Medical Association – CVMA 2014; Pest Management Regulatory Agency – PMRA 2014). Despite controversy regarding their use, deadly poisons continue to be registered and used in Canada to kill native carnivores when they come into conflict with farmed animals, including sodium monofluoroacetate, also called sodium fluoroacetate or more commonly referred to as Compound 1080.

Compound 1080 is currently classified as a restricted product in Canada and regulated under the Pest Control Products Act (PMRA 2015). It is used in Alberta and Saskatchewan under permits nos. 18300, 24512, 25857 and 28865 for the purpose of killing wolves (*Canis lupus*) and coyotes (*Canis latrans*) under the following circumstances: i) following instances of livestock predation; ii) where predation has been identified as the primary factor affecting survival of a specific wildlife population, or iii) where a serious threat to human safety exists. Compound 1080 is available in 2 forms: 1) 5 mg tablets which are placed in meat baits, and 2) 60 ml livestock protection collar (LPC) devices (10 mg/ml of Compound 1080). LPCs are placed around the neck of sheep (*Ovis aries*) or goats (*Capra aegagrus hircus*), and are designed to rupture when bitten by a predator. However, they can also be punctured by a conspecific animal chewing on them, or by a sharp object such as barbed wire, bramble or branch (Randall 1981).

In this Point to Ponder, we address scientific and ethical implications of using Compound 1080 as a predacide in wildlife management programmes.

Unacceptable Environmental Risk

Impact on Biodiversity

Compound 1080 is labeled as a “super poison” by the US Environmental Protection Agency (EPA 1995) and listed a Category 1A– the most toxic category–by the World Health Organization (2009). This broad-spectrum pesticide kills via metabolically blocking the Krebs cycle (Kun 1982; Atzert 1971), inhibiting an important pathway to cell energy production, which results in loss of cell function and eventually cellular death, causing gross organ failures and organ system failures (Atzert 1971). Compound 1080 is toxic to most mammals and poses a serious risk to non-target species, including wild and domestic species (Burns and Connolly 1995; Canadian Cooperative Wildlife Health Center – CCWHC 1999; PMRA 2014).

Because canids are up to 10 times more susceptible to the poison compared to most other mammals (Atzert 1971; Eisler 1995; CCWHC 1999), it was previously believed that Compound 1080 could be used selectively to poison species in the Canidae family (Robinson 1953; Atzert 1971; Randall 1981). This misconception remains widely perpetuated, as indicated by PMRA's use-permits for Compound 1080 tablets (nos. 18300, 25857) which state the “predacide [is for] coyote control and wolf control”. However, differences in susceptibility to toxicity of poisons does not guarantee selectivity (Cain *et al.* 1972). Indeed, Alberta's use-permit for tablets (no. 18300) states that “*Sodium monofluoroacetate is toxic to all warm-blooded animals*” (Alberta Agriculture and Forestry 2015). Recognized as a systemic pesticide (EPA 1985), Compound 1080 has also been used around the world to kill rodents, rabbits, and non-canid carnivores such as mustelids and felids (CCWHC 1999).

Compound 1080 is historically believed to be at least partly responsible for the decline of several species at risk in North America, including the burrowing owl (*Athene cunicularia*) (Butts 1973), swift fox (*Vulpes velox*) (Burnett 1989; Ginsberg and MacDonald 1990; COSEWIC 2009), California condor (*Gymnogyps californianus*) (Hegdal *et al.* 1986), and black-footed ferret (*Mustela nigripes*) (Defenders of Wildlife 1982).

Prior to the 1972 ban on predator toxicant use on federal lands in the United States, a government program was initiated in 1969 in response to repeated claims against the state that people's pets were being poisoned on public lands (Randall 1981). Randall (1981) reported non-target carcasses of coyote, dog (*Canis familiaris*), black bear (*Ursus americanus*), badger (*Taxidea taxus*), bobcat (*Lynx rufus*), American marten (*Martes americana*), mink (*Neovison vison*), weasel (*Mustela* spp.), golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis*), magpie (*Pica hudsonia*), prairie falcon (*Falco mexicanus*), sharp-shinned hawk (*Accipiter striatus*), Canada jay (*Perisoreus canadensis*), and rough-legged hawk (*Buteo lagopus*) (Defenders of Wildlife 1982).

Unquantifiable primary and secondary poisoning

Compound 1080 is tasteless, colourless and odourless. Residual poison in the carcasses of Compound 1080 victims can poison other animals feeding on the contaminated carrion, a process termed "secondary poisoning" (Cain *et al.* 1972). Secondary poisoning occurs when an animal consumes unmetabolized Compound 1080 from the vomitus or gut of a victim, or during scavenging after Compound 1080 is absorbed into the bloodstream and distributed through skeletal muscle, soft tissues, and organs (CCWHC 1999; Eason *et al.* 2010). Although Compound 1080 does not bioaccumulate in animal tissue (Eason *et al.* 1994; PMRA 2014), it can persist in carcasses at hazardous concentrations that remain lethal to various scavengers, both mammalian and avian, for several months (Defenders of Wildlife 1982; Meenken and Booth 1997; Eason *et al.* 2010).

Compound 1080 poisoning has a long latent period, with initial clinical signs in canids being delayed for at least 2 h, although this period is often much longer (Atzert 1971). During this time, poisoned animals can travel several kilometers prior to dying (Randall 1981), precluding carcass detection and retrieval (ENV 2019), thus further distributing Compound 1080 to unknown areas and increasing the likelihood of secondary poisoning. The Government of Alberta's policy entitled "Use of Toxicants for Wildlife Management" acknowledged that it "*is very difficult to monitor its [Compound 1080's] effectiveness as it is slow acting; animals can travel long distances before succumbing to the toxicity*" (AESRD 2012). In fact, this observation

explains why some people mistakenly believe that Compound 1080 results in fewer non-target victims when compared to faster-acting poisons. The Government of Alberta toxicant policy further states that "*retrieval of carcasses is typically impossible and secondary poisoning of other wildlife species feeding on the carcass is a potential concern*" (AESRD 2012). Given these acknowledgements of risk, it is highly disconcerting that Alberta has continued to use Compound 1080 since their first permit was given by Health Canada in 1984, and without addressing the concern of secondary poisoning. Alberta government records indicate that between 2012 and 2018, a minimum of 9,450 tablets of Compound 1080 were deployed on the landscape, with the vast majority (92%) being placed by landowners (AF 2017; AF 2019; Animal Justice and Wolf Awareness 2020).

It is impossible to estimate the diversity and number of non-target animals killed by secondary poisoning from a single poisoned carcass that is not recovered. Data obtained via Freedom of Information requests indicate that poison baits and carcasses are not being recovered in an adequate or timely manner, posing significant risks of primary and secondary poisoning to non-target organisms. Between 2011–2016, there were at least 13 Compound 1080 occurrence reports from Alberta's Ministry of Environment and Parks showing that Compound 1080 baits were consumed but no carcasses were recovered (AEP 2018, Animal Justice and Wolf Awareness 2020). In addition, 23 occurrence reports from this period provided no further information following placement of 1080 baits, suggesting that neither baits nor poisoned carcasses were retrieved from the landscape. Similarly, correspondence obtained through a Freedom of Information request to Saskatchewan's Ministry of Environment showed Problem Wildlife Specialist staff explaining that "*you are never certain of your success for a carcass is almost never found*" (ENV 2019). The use of Compound 1080 in Alberta and Saskatchewan is of especially great concern for species at risk, including birds and mammals with At Risk status under the federal Species at Risk Act, which inhabit rural areas where this poison has been used in recent years to lethally control wild canids (Table 1).

Reducing conflict between carnivores and livestock

Where conflicts arise between predators and livestock, humane and ecologically sustainable alternatives to poisons can be employed. Knowledge continues to grow surrounding non-lethal alternatives aimed at preventing or reducing the chances of future conflicts between carnivores and livestock (Musiani *et al.* 2003; Shivik 2004; 2006; Shivik *et al.* 2003;

Table 1. Native species occurring in Alberta and Saskatchewan with At Risk status under the federal Species at Risk Act that have ranges overlapping areas where Compound 1080 was used as a predacide in the past decade. Species ranges were compared with Compound 1080 general use locations (municipal district) determined through records obtained through the Freedom of Information process (AF 2017, AF 2019, ENV 2017, and ENV 2019).

Species	Canadian Species at Risk Act, Schedule 1
<i>Mammals</i>	
American badger (<i>Taxidea taxus</i>)	Special Concern, Endangered
Black-footed ferret (<i>Mustela nigripes</i>)	Extirpated with recovery strategy involving reintroduction Saskatchewan
Brown (grizzly) bear (<i>Ursus arctos</i>)	Special Concern
Swift fox (<i>Vulpes velox</i>)	Threatened. Captive breeding programs, reintroduction efforts in AB and SK; previously extirpated from Canada (1978).
Wolverine (<i>Gulo gulo</i>)	Special Concern
<i>Birds</i>	
Burrowing owl (<i>Athene cunicularia</i>)	Endangered
Ferruginous hawk (<i>Buteo regalis</i>)	Threatened
Peregrine falcon (<i>Falco peregrinus anatum</i>)	Special Concern
Short-eared owl (<i>Asio flammeus</i>)	Special Concern

Treves and Naughton-Treves 2005; Barnes 2015; Miller *et al.* 2016; Treves *et al.* 2016; 2019; Eklund *et al.* 2017; Stone *et al.* 2017; Moreira-Arce *et al.* 2018; van Eeden *et al.* 2018a). Additionally, contemporary science suggests that lethal removal of carnivores can lead to no decrease in predation levels, or can backfire and lead to increased levels of conflict (Connor *et al.* 1998; Musiani *et al.* 2005; Wallach *et al.* 2009; Allen 2014; Peebles *et al.* 2013; Wielgus and Peebles 2014; Treves *et al.* 2016; van Eeden *et al.* 2018a; Santiago-Avila 2018; Natrass *et al.* 2019; Treves *et al.* 2019), which calls into question Health Canada's assumption that predacides have value because they adequately address livestock losses. Indeed, researchers should be concerned that Health Canada has never evaluated this purported value, despite claiming that the Pest Management Regulatory Agency is a science-based agency (S. Kirby— Director General, Environmental Assessment, Pest Management Regulatory Agency, Health Canada, personal communication 2018), which implies that their decisions are guided by scientific evidence.

Removing canids may provide a temporary reduction in conflicts with livestock, but it is by no means a solution that will prevent future negative interactions (Musiani *et al.* 2005; Lennox *et al.* 2018; Wielgus and Peebles 2014; Treves *et al.* 2019). The cycle of repeatedly killing canids can and must

be replaced by a combination of responsible husbandry practices and prevention-based techniques that are evidence-based (Treves *et al.* 2016; van Eeden *et al.* 2018a, b). The use of Compound 1080 under the guise of reducing conflicts among livestock is a distraction from taking necessary measures to prevent predation events and promote coexistence.

Ethical Considerations

Humaneness

It is ethically essential that the welfare of both target and non-target animals be considered when assessing the humaneness of Compound 1080 (Sherley 2007; CVMA 2014). An increasing sector of global society no longer tolerates human-caused suffering of animals (Dubois *et al.* 2017). An estimated 69% of Canadians say that the risks posed by using Compound 1080, strychnine, or sodium cyanide in wildlife management programs are unacceptable, with more than twice as many Canadians supportive of a ban of all 3 predacidal poisons than are unsupportive (Envionics 2020).

The CVMA has denounced the use of Compound 1080 in a position statement on pest control due to the severe pain and

convulsions it causes, also noting that risks to non-target organisms should be considered when evaluating the impacts of lethal management (CVMA 2014). Scientists, veterinarians, and wildlife managers familiar with Compound 1080 consider it “inhumane” (Randall 1981; CCWHC 1999; Sherley 2007; J. Smits – Professor Ecotoxicology & Wildlife Health, Faculty of Veterinary Medicine, University of Calgary, personal communication 2017). Compound 1080 creates organ disorders, which can be extremely painful as essential cellular processes break down. Over a period of a few to several hours, victims who ingest Compound 1080 experience both physical and psychological terror caused by the recurrence and repetition of violent convulsions and seizures (Randall 1981; Sherley 2007). In a review of the literature, Sherley (2007) cites that clinical signs of severe pain and distress are evident in animals poisoned with Compound 1080; these include retching and vomiting, trembling, fecal and urinary incontinence, severe and prolonged convulsions, unusual vocalizations/screaming, hyperactivity, muscular weakness, incoordination, hypersensitivity to sensory stimuli, and respiratory distress. Eventually death results from cardiac failure, central nervous system failure, or respiratory arrest.

In comparison to strychnine, which is largely recognized as an unethical and unacceptable wildlife poison (CVMA 2014; Proulx *et al.* 2016), Compound 1080 produces a longer duration of pain, distress and suffering; prolonging the agony and anxiety each victim experiences (Randall 1981; Sherley 2007). During this time, poisoned animals are vulnerable to injury from other factors as well (Randall 1981). Animals that ingest non-lethal doses of the poison have reduced survival after being weakened, as individuals depend upon alertness, agility, and coordination to survive (J. Smits, personal communication, 2017). If they recover, these animals may experience long-term effects of toxicity (Robinson 1953; Randall 1981; J. Smits, personal communication, 2017).

By hosting a public consultation on “Humane Vertebrate Pest Control” in 2019, the PMRA formally recognized that animal welfare is an important societal concern and responsibility. However, in 2021, PMRA concluded their consultation and announced that they had decided to ignore humane considerations during pesticide evaluation and re-evaluation processes (PMRA 2021a), despite stating that: “*affected animals may endure a period of pain and suffering before death...*” (PMRA 2021b). The statement goes on to say, “*These products may also pose risks to other animals through accidental exposure, either to uneaten baits or through eating a poisoned carcass*”. The use of the word “may” in the above statements provides a false sense of security given the nature of Compound 1080.

Risk to pets

Dogs are particularly susceptible to Compound 1080 (Goh *et al.* 2005). In New Zealand, possum (*Trichosurus vulpecula*) carcasses retrieved as follow-up to a poisoning program were shown to have enough residual Compound 1080 to pose a serious hazard to dogs for up to 75 d (Meenken and Booth 1997). Toxicology tests are expensive and time consuming, so under-reporting incidents of related dog-deaths is likely. Between 2019 and 2020, pathology reports confirmed Compound 1080 toxicity of dogs in the area of Cranbrook, British Columbia (B.C.) in 3 separate occasions (A. Skaeien—Director of Administration, Steeples Veterinary Clinic, personal communication, 2020). Note that B.C. has not had legal ‘use-permits’ for Compound 1080 for over 2 decades, which reinforces concerns surrounding misuse of this highly dangerous poison if it is available anywhere in this country.

Poisoning carnivores to temporarily increase prey populations

As noted previously, Alberta’s use permit for Compound 1080 (no. 18300) also includes instances where predation has been identified as the primary factor affecting survival of a specific wildlife population. However, we apply the same rationale to any use of this pesticide regardless of the intended outcome and maintain that allowing the use of a non-selective and inhumane pesticide to ostensibly benefit another wild species, whether At Risk or not, is unacceptable on both environmental and ethical grounds.

Conclusion

Compound 1080 poses a serious threat to wildlife, pets, and even people. It causes prolonged and extreme suffering and can no longer be accepted as an ethical wildlife management practice. Like strychnine (Proulx *et al.* 2016), we argue that Compound 1080 is unacceptable in light of its inherent inhumaneness and adverse effects on non-target organisms, both wild and domestic. We question the perceived value of the toxicant as a tool to prevent and mitigate livestock losses.

Furthermore, we are concerned that Health Canada continues to fail to address non-compliance with conditions set out in the use permits it provides to registrants, as evidenced in records obtained from the registrants, all of which are themselves government bodies. Health Canada has responded to recent concerns raised by public and non-government organization over the use of predacides by speeding up the regular 15-year re-evaluation of all 3 registered predacides, and began evaluating them as a “cluster” in January 2021.

Throughout the ongoing re-evaluations, we will continue to recommend that Health Canada immediately withdraws

and cancels active permits for Compound 1080, and bans future use. In addition, we encourage and promote the adoption of non-lethal prevention-based management techniques to eliminate reliance on poisons where livestock overlaps with native carnivores. Indeed, in the past, Health Canada has participated in Integrated Pest Management research to find effective alternatives to rodenticidal strychnine (PMRA 2020). It should be noted that there are numerous cases where livestock producers have initiated a combination of effective range management practices and non-lethal techniques which have resulted in reduced negative interactions between predators and livestock. One example includes the Waterton Biosphere Reserve's Carnivores and Communities Program in southwestern Alberta where vast areas with livestock share borders with wild/public lands of the eastern slopes of the Rockies. This program has achieved impressive success at reducing predation on cattle by community members changing their livestock management practices while working together with local conservation officers (Morehouse *et al.* 2020).

We suggest that the scientific community, conservation groups, livestock producers and wildlife managers have a responsibility to work with the public and policy makers to ensure that Compound 1080 and all of its derivatives are banned from use across Canada. Ending Canada's misguided reliance on inhumane and ineffective wildlife poison programs can be both simple and revolutionary. We encourage concerned scientists to subscribe to receive notifications of Health Canada's upcoming consultation opportunities during the re-evaluation period, and to report poisoning deaths discovered through their research efforts to Health Canada's Public Incident Database and the Canadian Wildlife Health Cooperative, which have so far failed to compile wildlife poisoning death data collaboratively.

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