REPORT TO THE MINISTER OF HEALTH

A critical review of the science Health Canada uses to justify the use of Compound 1080, Sodium Cyanide and Strychnine

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Date

December 9, 2020

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INTRODUCTION:

The purpose of this report is to examine the reasons given by Health Canada for cancelling the use of Strychnine to control Richardson's Ground Squirrel (RGS) populations and to determine whether those reasons would apply to other species of animals for which Strychnine is permitted. In addition, the report will examine the scientific material acquired through an Access to Information (A-2019-001232) request that Health Canada uses to justify the additional use of Compound 1080, Strychnine and Sodium Cyanide.

The purpose of doing so is to attempt to determine whether the same data can be used to justify the cancellation of the use of all three poisons against wildlife.

A comprehensive assessment of these poisons has already been made by Health Canada, specifically, its subsidiary body which regulates pesticides, the Pest Management Regulatory Agency (PMRA). In this Report, Animal Protection Party of Canada (APPC) has evaluated the research PMRA uses to uphold their current regulatory decisions. APPC presents the PMRA's own evidence which we believe clearly demonstrates the necessity of permanently cancelling the registrations of Strychnine, Sodium Cyanide and Compound 1080 in the interests of animals, people and the planet.

Available scientific data has confirmed that even when the applications of Strychnine, Sodium Cyanide and Compound 1080 are used according to regulations, they pose significant risks to non-target species. Deaths of bears, foxes, owls, hawks, eagles, crows, mice, ground squirrels, as well as other animals and birds resulting from use of these poisons have been documented.

Further, even when these poisons only kill target animals, Strychnine, Sodium Cyanide and Compound 1080 still pose serious harm. Experts, like the Canadian Veterinary Medical Association, classify strychnine and Compound 1080 as inhumane because of the prolonged suffering and pain they cause.[1] Animals that ingest these poisons can experience excruciating pain for several hours; sometimes even longer than 24 hours, before finally losing consciousness.[2]

The integral role these animals play within our ecosystem may also be compromised or lost. Wildlife management strategies need to move beyond the use of these poisons. This paper is designed to provide the government with the evidence needed to transition to ethically, scientifically and ecologically motivated wildlife policies.

The Animal Protection Party of Canada urges that the same scientific rationales and reasoning that led to the 2020 cancellation of Strychnine to control Richardson's Ground Squirrels be applied when considering the advisability of licensing Strychnine to control predators (or any

[1] CVMA (Canadian Veterinary Medical Association). 2014. Pest control. Position statement. http://www.canadianveterinarians.net/documents/pest-control

[2] Eason and Wickstrom. 2001. Vertebrate Pesticide Toxicology Manual (Poisons). Department of Conservation Technical Series No. 23. Wellington, New Zealand: Department of Conservation.

wildlife species), as well as Sodium Cyanide and Compound 1080 for the same or similar purposes.

BACKGROUND:

Strychnine

Strychnine is a dangerous pesticide that has been registered in Canada since 1928 as a "rodenticide/predacide to control northern pocket gophers, ground squirrels (Richardson's, Columbian, Franklin's and thirteen-lined), skunks, pigeons, wolves, coyotes and American black bears." [3]

Products containing Strychnine are formulated in particulates, freshly mixed baits or pellets.[4] For the control of ground squirrels, pellets are placed into burrows by hand or are buried underground.[5] Tablets containing Strychnine, used for the purpose of controlling predators, are mixed with tallow, meat or fish and covered in loose dirt. [6]

The above-mentioned products are available for use by farmers, by persons authorized by government approved pest control programs where a record of sales is maintained, and by licensed pest control operators.[7]

Strychnine, used to control coyotes, wolves and American black bears in Alberta, is registered for handling and use by authorized employees of the Alberta Department of Sustainable Resource Development.

The province of Alberta is one of the largest users in Canada, where this poison is commonly used to kill wolves in an effort to protect caribou herds in areas where the ability of the environment to support caribou has increasingly been degraded by resource extraction and industrial development.

In addition to Strychnine being an inhumane poison, another serious concern is the effect it has on non-target species. In 1992, in their new regulatory decision, Agriculture and Agri-Food Canada reported that Strychnine has a "high potential for causing secondary poisoning of non-target species" and that the "product's mode of action (acute toxicant) and the lack of a good antidote make this pesticide treatment undesirable by current standards." [8]

This was 28 years ago.

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[3]PMRA Proposed Acceptability for Continuing Registration, PACRS 2005, Re-evaluation of Strychnine. file:///C:/Users/MrsBl/Downloads/PMRA%20strychnine%20re%20evaluation%20proposal%202005%20(1).pdf
[4] PMRA Proposed Acceptability for Continuing Registration, PACRS 2005, Re-evaluation of Strychnine. file:///C:/Users/MrsBl/Downloads/PMRA%20strychnine%20re%20evaluation%20proposal%202005%20(1).pdf
[5] Ibid,
[6] Ibid.
[7] Ibid.
[8]Food Production and Inspection Branch: Note to CAPCO. 1992. file:///C:/Users/MrsBl/Downloads/PMRA%20(C92-09)%20Strychnine%20Reduction%20of%20Allowable%20Use%20Pattern%201992.pdf

In 1992, a regulatory decision was made and the use of Strychnine for field rodent control was restricted from 2% to the 0.3- 0.4% found in "ready to use bait," although the use of Strychnine in previous amounts for "predator-control programs" by provinces was allowed to continue. [9]

(NOTE: Predacidal strychnine used to be 50% and now it's 38.6%, although there appears to be not documentation as to when or why the change happened.)

In 2005, PMRA re-evaluated the use of Strychnine and found that its current use for northern pocket gophers, skunks, pigeons, wolves, coyotes and American black bears was acceptable and should be maintained, as it did not raise concerns for the environment or human health. [10]

At the same time, PMRA stated that the use of Strychnine to control ground squirrels is a concern from an environmental perspective.[11] PMRA suggested that because of a lack of practical alternatives and recommendations for mitigation strategies, the use of Strychnine to control ground squirrels would continue for a period of three years until progress was made on an RGS pest management strategy.[12]

In 2007, the PMRA reiterated that the use of Strychnine was a concern from an environmental perspective for use against ground squirrels, but not when it is used for the purpose of controlling other species, such as skunks, pigeons, wolves, coyotes and American black bears.[13] At the time, the PMRA suggested that the use of this poison against these species was acceptable, with the implementation of mitigation measures from a 2005 evaluation; specifically, more labeling requirements. [14]

In March 2020, the PMRA announced the cancellation of the use of Strychnine and all of its end-use products for the purpose of controlling Richardson's ground squirrels. After a re-evaluation of all of the available science the PMRA concluded that the threat to the environment (non-target and endangered species) when using Strychnine for this purpose is no longer acceptable.[15]

The PMRA stated that because a re-evaluation of Strychnine was conducted in 2007, regarding its use on other types of ground squirrels, predators and northern pocket gophers, this most recent regulatory decision and cancellation only applies to Richardson's ground squirrels. The PMRA also reported that the use of Strychnine for the purpose of controlling other ground squirrel species was discontinued by the manufacturer and no longer registered. [16]

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[9] Ibid.
[10]PMRA, Reevaluation of Strychnine, 2005.
file:///C:/Users/MrsBl/Downloads/PMRA%20strychnine%20re%20evaluation%20proposal%202005%20(2).pdf
[11] Ibid.
[12] Ibid.
[13] PMRA, Update on the Reevaluation of Strychnine, 2007. https://central.bac-lac.gc.ca/.item?id=rev2007-03-e&op=pdf&app=Library
[14] Ibid.
[15] PMRA, Re-evaluation Decision RVD2020-06, Strychnine and Its Associated End-use Products (Richardson's Ground Squirrels. https://www.canada.ca/en/health-canada/services/consumer-product-safety/reports-publications/pesticides-pest-management/decisions-updates/reevaluation-decision/2020/strychnine.html
[16] Ibid.

The U.S EPA cancelled the use of Strychnine to control predators in 1972.[17]

Strychnine has been banned for use as a pesticide in the European Union since 1968 and was banned as a rodenticide in 2006.[18]

Sodium Cyanide

Sodium Cyanide is another deadly, inhumane poison that has been registered in Canada since 1984.[19] It is registered in Canada, although only in Alberta, as a vertebrate pest control product to target coyotes deemed likely to prey upon livestock.[20]

To use this poison, Sodium Cyanide capsules are placed in spring-loaded M-44 ejector devices that are pushed into the ground with bait placed on top. Once an animal attempts to take the bait, the device propels a dose of Sodium Cyanide into the mouth of the animal, resulting in cardiac arrest and respiratory failure.

M-44 devices are also indiscriminate and will kill any animal who tugs on the bait placed on top of this device including domesticated dogs, as has happened on numerous occasions, as well as other animals.

The US EPA classified Sodium Cyanide in Toxicity Category 1, indicating the greatest degree of acute toxicity to humans and the environment.[21]

In 2006, the Canadian PMRA "Reevaluation of Sodium Cyanide" outlined that the PMRA relied on the US EPA reevaluation decision in 1994 as the basis for the Canadian reevaluation; however, it was concluded that the registration of Sodium Cyanide would continue with mitigation measures in place, such as further labelling requirements detailing precautions and environmental hazards. [22]

Compound 1080: Also known as Sodium Monofluoroacetate

Compound 1080 is registered for use by provincial personnel of the Alberta and Saskatchewan government. It is used in tablet form, pushed into meat-baits, or in liquid form in collars placed around the necks of livestock. Both forms of this poison are used to kill coyotes and wolves.[23]

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[17] US EPA, Registration Eligibility Decision (RED) Strychnine, 1996. https://archive.epa.gov /pesticides /reregistration /web/pdf/3133.pdf

[18]Parker AJ, Lee JB, Redman J, Jolliffe L. Strychnine poisoning: gone but not forgotten. *Emerg Med J*. 2011;28(1):84. doi:10.1136/emj.2009.080879

[19] PMRA, Proposed Acceptability for Continuing Registration: Reevaluation of Sodium Cyanide, 2006.https://central.bac-lac.gc.ca/.item?id=pacr2006-01-e&op=pdf&app=Library

[20] Ibid.

[21] Sodium Cyanide: Reregistration Eligibility Decision (RED) Fact Sheet | US EPA ARCHIVE DOCUMENT

[22] Proposed Acceptability for Continuing Registration PACR2006-01

[23]PMRA Re-evaluation Decision RVD2014-03, Special Review Decision for Compound 1080, 2014. https://www.canada.ca/en/health-canada/services/consumer-product-safety/reports-publications/pesticides-pest-management/decisions-updates/reevaluation-decision/2014/document-compound-1080-rvd2014-03.html#a2

When a wolf or coyote attacks the neck of a goat or a sheep, the collar is designed to release the poison when the animal's teeth puncture the collar. The predator will subsequently die an excruciating death after they ingest the liquid.

The US EPA restricts the use of Compound 1080 to a solution used in livestock collars only, while Canada registers this poison for use in tablets as well as in livestock collars.

This poison is highly toxic to mammals and birds who ingest it directly or indirectly. It is possible that birds or mammals can ingest tablets when attracted to bait/meat-stations. There is also a risk of secondary poisoning of scavengers who ingest contaminated tissue from a carcass of a target species.

Compound 1080 can take from 30 minutes to 2.5 hours to reach a lethal dose or for animals to exhibit symptoms, depending on the weight of the species and the amount of the dose ingested.[24]

In 2004, the PMRA cited a 1995 US EPA Regulatory Decision as the basis for continuing the registration for Compound 1080, despite the documented risks to secondary species associated with using this poison.[25]

In 2014, the PMRA suggested that additional measures such as labelling requirements and further directions on labelling regarding how this poison should be used is sufficient to mitigate these risks.[26]

One of the proposed labeling changes in 2014 was to prohibit the use of these poisons in areas where there are species at risk; however, this statement was later revised after a comment (2.0) was suggestive that that this statement inferred that Compound 1080 could not be used at all in provinces where there were endangered species.[27] The statement was modified to read that users must contact their local Fisheries and Wildlife branch of the Alberta or Saskatchewan Environment and Resource Management office to ensure there are no species at risk in the area where this poison is being used. [28]

<u>These Poisons are Inhumane</u>

Strychnine:

Like Sodium Cyanide and Compound 1080, Strychnine is an inhumane killing method that is in contravention to the Canadian Council on Animal Care (CCAC) definition of a humane death:

> "According to the Canadian Council on Animal Care (2003), a killing method is humane if it causes rapid (immediate) unconsciousness and subsequent death without pain or distress. Death by strychnine ingestion is inhumane, as it causes

[24] Government of the Province of Alberta, Department of Agricultureand Forestry: Sodium Monflouroceracetate label. 2015.
[25] PMRA Proposed Acceptability for Continuing Registration: Re-evaluation of Sodium Monofluoroacetate (Compound 1080) June 18 2004
[26] Special Review Decision for Compound 1080
[27] Ibid.
[28] Ibid.

> frequent periods of tetanic seizures, occasional cessation of breathing, hyperthermia, extreme suffering, and death from exhaustion or asphyxiation, which typically occurs within 1–2 hours of the onset of clinical signs." [29]

Because of this, and the numerous documented cases of secondary poisonings from the use of Strychnine, Proulx *et al.* have determined "that the use of strychnine poisoning in wildlife conservation should be prohibited and condemned by the scientific community, governments, and conservation groups." [30]

Despite this information being available to Health Canada, the registration of Strychnine has continued to persist.

Sodium Cyanide:

This poison inhibits enzyme reactions in mammals that stops oxygen flow to the blood. [31] Ingestion causes violent convulsions, severe anxiety and a lack of bodily control before death.[32] [33]

Sodium Cyanide (and Compound 1080) cause excruciating pain and distress through tectonic seizures, severe and prolonged convulsions, vomiting, unusual vocalizations, excessive salivation, muscular weakness and respiratory distress. [34] [35]

Compound 1080:

This poison can affect the central nervous system or cardiac system of animals who ingest this poison. Fluoroacetate reduces cellular metabolism and immediately stops blood flow to all organs, including the brain, causing progressive lethargy, sudden convulsions, seizures and, as McIlroy (1982) reported when observing 1080 poisoning in Bennett's wallabies (*Macropus rufogriseus*), kicking and running movements while lying on the ground.[36] In addition, victims can suffer from injuries and tissue trauma if they come in contact with rigid objects during their uncontrollable muscle spasms.

These poisons are inhumane and cause target and non-target animals to suffer painful and prolonged symptoms before death.

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[29] Proulx, Brook, Cattet, and Paquet. 2015. Poisoning wolves with strychnine is unacceptable in experimental studies and conservation programmes. Environmental Conservation 43:1-2.
[30] Ibid.
[31] Health Canada PMRA Memorandum to Marissa Romano. June 10, 2005.
[32] Centre for Disease Control and Prevention:https://www.cdc.gov/niosh/ershdb/emergencyresponsecard_29750036.html#:~:text=DESCRIPTION%3A%20Sodium%20cyanide%20releases%20hydrogen,cyanide%20can%20be%20rapidly%20fatal.https://www.cdc.gov/niosh/ershdb/emergencyresponsecard_29750036.html#:~:text=DESCRIPTION%3A%20Sodium%20cyanide%20releases%20hydrogen,cyanide%20can%20be%20rapidly%20fatal.
[33] Sodium Cyanide - an overview
[34] CCWHC (Canadian Cooperative Wildlife Health Center). 1999. 1080 Review. Unpublished report prepared for the Wildlife Branch BC Ministry of Environment, Lands and Parks, Victoria. 8 pp
[35] Sherley. 2007. Is sodium fluoroacetate (1080) a humane poison? Animal Welfare 16: 449-458.
[36] "Humaneness and Vertebrate Pest Control. The proceedings of the seminar held 27th March 1996, pg 62-64, Ed P.M. Fisher & C.A. Marks, Report Series Number 2, Dept of Natural Resources and Environment, Victoria"

As long as these poisons are available in Canada, they will continue to harm animals

EVALUATION OF RESEARCH:

Strychnine

1.1 U.S Environmental Protection Agency (EPA)-Reregistration Eligibility Decision (RED)-July 1996, Strychnine. [37]

- This is the re-registration eligibility decision for the use of Strychnine below ground, where the EPA evaluated studies regarding the toxicity and threat of Strychnine to non-target species and found that as long as Strychnine is used underground, that it does not pose an unacceptable risk to non-target species.
- However, studies also found that the exposure of Strychnine to non-target and endangered species is expected, even when Strychnine is applied correctly. [38] The EPA refers to three mammalian field-studies that they draw information from in this report in addition to one laboratory rat study; however, they do not indicate which information comes from what study. The three studies that EPA refers to as mammalian studies where the below information is drawn from are [39], [40] and [41].
- In one of these studies that the EPA examined, Strychnine poisoned bait was placed in an artificial burrow underground and the burrow was sealed. Despite burying the poisoned bait, three non-target species were found dead including a Brewer's blackbird, a striped skunk and a horned lark. Researchers believed this was because of spillage of Strychnine-treated bait when the burrow was pulled from the ground. It is important to note that these results do not account for avian or other species who may have left the area before succumbing to the poison.
- According to the EPA, risks to non-target species (avian and possibly mammals) are reported in previous studies (Hegdal and Gatz, 1978; Fagerstone et al., 1980; Matschke et al. 1991, and Evans and Campbell, 1989) with similar results.
- This same study (again, not referred to by name in this document, but most likely a study from Footnotes 30, 31 and 32-mammalian studies; EPA RED p.19) found that the levels of Strychnine in the gastrointestinal tract of pocket gophers exceeded the EPA's unacceptable risk criteria (when an acceptable and regulated amount of Strychnine was applied to the artificial burrow), meaning their carcasses would likely kill secondary consumers.

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[37] US EPA Reregistration Eligibility Decision (RED) Strychnine. July 1996. https://archive.epa.gov/pesticides/reregistration/web/pdf/3133.pdf

[38] Evans, J.; Campbell, D. (1990) Strychnine Laboratory and Field Data Collection for Continued Registration of Strychnine Grain Bait for Forest Pocket Gopher (Thomomys spp.) Control. [Part] II: Radio Telemetry Field Trial: Lab Project Number: QA-44. Denver Wildlife Research Center. 26 p.

[39] Record, C. (1987??) Test To Determine the Lowest Effective Dose of Strychnine Alkaloid in Whole Chicken Eggs to Striped Skunks (Mephitus mephitus): Laboratory LO. No. 111. Unpublished study prepared by Summit Laboratories. 14 p.

[40] Record, C. (1987??) Tests To Determine the Dietary LC-50 of Strychnine Alkaloid to European Ferrets (Mustela putorius furo): Laboratory 1.D. No. 112. Unpublished study prepared by Summit Laboratories. 19 p.

[41] Record, C. (1987??) Tests To Determine the Dietary LC-50 of Strychnine Alkaloid to Red Foxes (Vulpes fulva): Laboratory 1.D. No. 113. Unpublished study prepared by Summit Laboratories. 19 p.

- Regardless of this threat, the EPA found the risk of secondary poisoning acceptable with labelling instructions and further safety requirements; such as requiring operators to apply Strychnine underground and to collect spilled bait. However, five years later in McKinnon *et al.'s* research (2001) researchers found that the exposure of poisoned-bait on the soil occurred "irrespective of whether the entrance to the burrow was covered or not, during application." [42]
- The toxicity of Strychnine to two fish species (rainbow trout and bluegill sunfish) was also measured in two studies in this decision. [43] [44] Their results indicate that Strychnine ranges from "moderately-highly toxic to freshwater fish on an acute basis." [45]
- In this RED, the US EPA also mentioned the lack of data available regarding the risk of accidental exposure incidents: between 1986-1994 approximately 100 cases were reported of accidental exposures, which, according to the EPA, underestimates the true extent of poisonings.[12]

1.2. Donald McKinnon, 2001. [46]

- This study was designed to evaluate the potential for fresh-mixed 0.4% Strychnine grain bait in poisoning non-target species when used to control Richardson's Ground Squirrels. The same data can be extrapolated to any wildlife species to which this formulation is applied.
- The potential for non-target species to be poisoned was measured by the amount of Strychnine-laden kernels found on the surface of the soil in two scenarios: when the surface of the burrow was left open (contrary to label instructions) and when the burrow entrance was covered with soil (in compliance with label instructions).
- To accomplish this, "eight study areas were clustered in three areas," with 75 burrows in each study area that were assigned a treatment at random. In addition:
  - ◊ "Fifty burrows were baited with 3 teaspoons, the maximum dose of strychnine treated wheat per burrow allowed by the instructions on the label."
  - ◊ "A spade was used to plug the entrance of 25 burrows with soil ("covered burrows"); 25 burrows were not covered ("open burrows"). In an attempt to account for removal of seeds and to measure the ability of field workers to detect seeds on the surface of the soil, fifty kernels of dyed, untreated wheat were scattered on the surface of the soil within 2 m of 25 burrows ("calibration burrows") on each study area."
- This study found that Strychnine grain kernels were exposed on the surface of the soil "irrespective of whether the entrance was covered during application."

[42] Donald McKinnon, 2001. "Potential for primary poisoning of non-target species from the use of strychnine-treated wheat bait to control Richardson's Ground Squirrels."
[43] Bowman, J. (1989) Acute Toxicity of Strychnine to Bluegill Sunfish (Lepomis macrochirus): Project ID: 37645. Unpublished study prepared by Analytical Bio-chemistry Laboratories, Inc. 79 p.
[44] Bowman, J. (1989) Acute Toxicity of Strychnine to Rainbow Trout (Salmo gairdneri): Project ID: 37646. Unpublished study prepared by Analytical Bio-chemistry Laboratories, Inc. 89 p.
[45] U.S Environmental Protection Agency (EPA)-Reregistration Eligibility Decision (RED)-July 1996 Decision-Strychnine.
[46] Donald McKinnon, 2001. "Potential for primary poisoning of non-target species from the use of strychnine-treated wheat bait to control Richardson's Ground Squirrels."

- "Overall, an average of 22 kernels were found on the surface of the soil surrounding 18% of burrows, baited according to label instructions."
- McKinnon *et al.* asserts that this is an estimate, as researchers were not able to correct for bait visibility; by the time the counting of kernels took place, the animals could have already removed them.
- Researchers reported 6 kernels represent a dose that could kill 50% of an exposed population of medium sized birds (the size of a Mourning Dove) and a lethal dose for smaller bird species (such as a Horned Lark) is likely to be a single kernel.
- Secondary exposure in this study occurred when poisoned bait was scattered on the surface of the soil and thus exposed to consumption by other animals.
- Further, after being exposed to a lethal dose of this poison, that animals' carcass would also be available to other scavengers.
- In summary, the application of poisonous kernels used to control Richardson's ground squirrels and other species, increases the availability and exposure of these poisons to other animals, such as songbirds, mice and other grain-foraging animals, and in turn, the exposure of their carcass to scavengers.
- This is the same result and risk that can be estimated when Strychnine treated bait and grain is used to control other wildlife species.

1.3. Donald McKinnon, 2002. [47]

- This study was designed to measure the number of carcasses on the surface of the soil when Strychnine-treated grain was placed in the burrow of Richardson's ground squirrels.
- Researchers affirmed that Strychnine is a secondary hazard to non-target species because of its acute toxicity.
- They found that the potential for the exposure of carcasses to non-target species is significant: 86% of RGS carcasses and 62% of pheasant carcasses were removed from testing sites after a period of three days.
- In another study cited in this research, Fagerstone and Hegdal (1998), found

> "8 Homed Larks, 21 Brewer's Blackbirds, 21 Mourning Doves, 18 Red-winged Blackbirds, 6 Yellow-head Blackbirds, 4 Vesper Sparrows, 2 Brown-headed Cowbirds, 1 Common Crow, 1 Starling, 1 Savannah Sparrow, 1 Western Meadowlark, and 4 unidentified species of bird, for a total of 129 dead birds (6.6 carcasses/ha)."

- Researchers suggest that the higher number of carcasses found in Fagerstone and Hegdal (1998) could have been the result of baiting being done above ground and also because Fagerstone and Hegdel (1998) conducted carcass searches for 11 days longer.

[47] Donald McKinnon, 2002. "Potential for secondary poisoning from the use of 2 % strychnine-treated wheat to control Richardson's Ground Squirrels."

- Based on their findings, researchers also estimated that during the emergency registration of Strychnine in 2001 in Saskatchewan that "an estimated 1800 (95%CI: 300 to 3600) to 1950 (95%CI: 450 to 3750) songbirds died as a result of the baiting."
- Although exact exposure to other mammals could not be determined as there was no research conducted to evaluate the level of Strychnine in each RGS carcass, the potential impact of exposure to other scavengers such as the American crow, burrowing owl, hawks, eagles, coyotes and foxes is unacceptably high.
- This research affirms the risk to non-target species, even when Strychnine is applied according to label instructions. If applicators are not cleaning up bait kernels that are strewn above ground, are not picking up carcasses, and stop inspecting the treated area too soon, there are further risks.
- Not only does the evaluated science measure the potential of these poisons to infect non-target species, but researchers such as McKinnon (2002) and Proulx [48] assert that because the expected low efficiency of searching and retrieving poisoned carcasses, in addition to high scavenging rates by animals, it is probable that researchers are underestimating the impact of Strychnine in relation to the mortality of non-target species.

1.4 Donald T. McKinnon, 2004. [49]

- In 2004, Donald McKinnon examined the effectiveness and impact of using Strychnine as well as zinc phosphide, in controlling RGS in Saskatchewan. To accomplish this, 120 Japanese quail carcasses were placed randomly around study plots, where all available burrows had been baited with Strychnine or zinc phosphide.
- The high-rate of scavenging in this study (78% of quail carcasses and 39% of RGS carcasses) suggests the impossibility to protect non-target species from being exposed to Strychnine when this poison is applied.

  "No songbird carcass attributed to either strychnine or zinc phosphide was found in this study. That should not be interpreted to mean that no birds were poisoned. Although substantial effort was put into carcass searches, the high scavenging rates and poor search efficiency indicates that the probability of finding a carcass during this study was very low."
- Researchers estimate:

  "In this 2002 study, a total of 4,522 burrows were treated with strychnine-treated grain bait. Based on binomial probabilities, as many as 16 to 47 songbird carcasses may have been present on the 12-1 ha plots. In SK in 2002, 1,811,200 burrows (1,132 cases X 24 vials/case X 1000 g/15g) were treated if all burrows were treated with the maximum dose per burrow of 0.4% strychnine-treated bait

[48] Gilbert Proulx 2007-2009. "Field Evidence of Non-Target and Secondary Poisoning by Strychnine and Chlorophacinone Used to Control Richardson's Ground Squirrels in Southwest Saskatchewan."

[49] Donald T. McKinnon. "Effectiveness and non-target impact of zinc phosphide and various concentrations of strychnine in controlling Richardson's Ground Squirrels in Saskatchewan." Resource Stewardship Branch, Saskatchewan Environment, Regina, SK and Pierre Mineau, Pesticides Wildlife Toxicology Division, Canadian Wildlife Service, Environment Canada, Ottawa, ON

allowed by the instructions on the label and as many as 3,622,400 burrows (1132 cases X 24 vials/case X 2000g/15g) were treated if all burrows were treated with the minimum dose per burrow of 0.22% strychnine-treated bait. Therefore, there remains a 5% probability that the 2002 control measures killed as many as 6,412 to 12,823 songbirds (0.354 carcasses/100 burrows; all died one day before search day) to 18,818 to 37,637 songbirds (1.039 carcasses/100 burrows; all died three days before search day) without detecting a single carcass. This shows the limitations of relying on carcass searching to detect non-target mortality. Given the high scavenging rates and low search efficiency it is possible that a large number of carcasses could have been present and gone undetected."

- The opportunity for other animals to come in contact with this poison is high and the impact on other wildlife species is difficult to quantify because of search limitations and high-scavenging rates.

1.4. Gilbert Proulx, 2007-2009. [50]

- This paper adds to the body of evidence about secondary non-target poisoning from the use of Strychnine to control Richardson's ground squirrels and aims to:

  "1. report primary poisoning of non-target species and secondary poisoning of predators in southwest Saskatchewan, and
  2. raise concerns about the negative impact of such poisoning on the survival of species at risk and predators in general" (129).

  - Over two years Proulx collected field evidence that demonstrates "that both strychnine and chlorophacinone kill ground squirrels but also a diversity of songbirds, small mammals, and predators including raptors, American badger (*Taxidea taxus*), and long-tailed weasel (*Mustela frenata*) (128).
  - In this study, researchers used bait-stations with Strychnine-treated hulled oats and "canary seeds" during two test periods, spring (13 April-I June, 2007-2009) and summer (14 June-2 July, 2008-2009).
  - Results indicates that "non-target species found dead on surface were frequent during both seasons, in 2008 and 2009" (131).
  - Species found dead on the surface of the soil include horned larks, common grackles, deer mice, vesper sparrows, western meadowlarks, and a white-tailed jackrabbit (130-132). Horned larks, vesper sparrows and western meadowlarks are protected under federal legislation.
    - "Many Richardson's Ground Squirrels and other small mammals poisoned by strychnine and anticoagulant baits were found on surface. Small mammals are important prey of terrestrial carnivores (Proulx et al. 2009) and raptors

[50] Gilbert Proulx 2007-2009: Field Evidence of Non-Target and Secondary Poisoning by Strychnine and Chlorophacinone Used to Control Richardson's Ground Squirrels in Southwest Saskatchewan.

(MacCracken et al. 1985, Schmutz and Hungle 1989), and secondary poisoning may be significant in landscapes with greater use of ground squirrel poison baits."

- "Because farmers fail to find carcasses after poisoning, they usually claim that non-target species poisoning is infrequent (G. Proulx, pers. observ.). Carcass detection rates may be low due to scavenging or difficulty in finding small animals in vegetation (McKinnon et al. 2002, G. Proulx, pers. observ.)" (132).

- Proulx also found that burrowing owls and other predators may preferentially select animals who demonstrate slow and abnormal behaviour, indicative of poisoning (132).
- Further, researchers found that the likelihood of secondary poisoning of birds is greater because farmers do not always disclose when there are nesting sites in areas where they are using poison, in fear of "losing control over the management of their property" (132-133).
- The PMRA cannot rely on agricultural producers for accurate reports of secondary poisoning. It may very much be in the interest of agricultural producers not to report.
- Poisoning of non-target species and secondary poisoning is a grave probability even when using Strychnine according to label instructions. This study asserts that in the interests of all predators and species at risk, an Integrated Pest Management Program must be put in place:
    - "involving farmers, government agencies, conservation groups and professional wildlife managers."
    - "This is a long-term proactive program where monitoring, preventive cultural practices, and various control methods (mechanical, physical, biologi-cal and chemical) must be strategically coordinated to maintain rodent population at acceptable density levels (Witmer and Proulx 2010)" (133).

1.5 Gilbert Proulx, 2014.[51]

- This research aimed to measure the efficacy of Strychnine and Chlorophacinone in controlling fossorial rodents and demonstrated that these poisons often fail to control northern pocket gophers and Richardson's ground squirrels effectively and that they also may significantly affect other wildlife communities. Proulx states:

> *"Engeman et al. (1993), Proulx (1998) found that control levels obtained by hand-baiting burrow systems with 0.4% strychnine-treated oats were less than 17% in spring and fall, and 36% in summer. Considering that poison baits must kill at least 70% of Northern Pocket Gophers in order to effectively control populations (Fagerstone et al. 1981), control levels obtained with 0.4% strychnine-treated oats were inadequate. Proulx's*

[51] Gilbert Proulx, 2014. "On the Misuse of Pesticides to Control Northern Pocket Gophers and Richardson's Ground Squirrel in Agriculture and the Pressing Need for Sustainable Solutions."

(1998) findings were in agreement with studies carried out on Botta's Pocket Gophers (Thomomys bottae) in the United States (Table 1). Lee et al. (1990) demonstrated that Botta's Pocket Gophers acquired physiological tolerance to strychnine, i.e., after they ingested a series of sub-lethal doses, they could tolerate increasingly higher doses of strychnine."

- Further, in Proulx et al. (1995a) research showed that northern pocket gophers spent a considerable amount of time maintaining their burrow system thereby disrupting the efficacy of the poison:

> *"whether producers are baiting burrow systems by hand, with a mechanical applicator, or with a burrow builder, Northern Pocket Gophers recognize areas of their burrow system that have been modified, even slightly, by the introduction of the poison bait. Then they often mix or cover the poison bait with soil, or use bait and soil to plug the disturbed portion of the tunnel (Proulx 1998)."*

- In corroboration with other science in this report, this research also found that the regulated use of Strychnine kills secondary non-target species.

> *"Since Northern Pocket Gopher burrow systems are inhabited by several small mammal species (Vaughan 1961; Whittaker et al. 1991), many of them are poisoned (Proulx, personal observations) and may be eaten by scavengers and predators."*

- In this study Proulx et al. also asserted that the use of rodenticides broadly, are poorly monitored by the PMRA and provincial inspectors who do not verify that:

"l) concentrated solutions are properly mixed with grains or seeds

2) poison baits are properly used in burrow systems instead than on [*sic*] surface

3) bait stations (if such stations are allowed) are adequate

4) bait mixtures are not modified by adding unregistered products or mixing more than one rodenticide together

5) farmers use poison baits in a responsible manner, with concerns for Species-at-Risk"

- Further, Proulx draws further attention to the value of Strychnine as a rodenticide:
    - "Northern Pocket Gophers are mainly herbivores and do not favor seeds and grains used in the production of poison baits (Proulx 2002a). Therefore, strychnine baits are not in sync with Northern Pocket

Gophers' feeding ecology. These baits will, however, be eaten by non-target species such as mice and voles, which will be eaten by carnivores and scavengers. Strychnine baits used for the control of Northern Pocket Gophers therefore has an impact on the whole community food web."

- "Forty years ago, in their 1973 review of Northern Pocket Gopher biology and management, Turner et al. (1973) stated that this rodenticide was no longer acceptable for use against Northern Pocket Gophers and recommended that more effective and safer compounds be sought. My findings in Canada {Proulx 1998) supported their conclusion that strychnine is not a valuable rodenticide for the control of Northern Pocket Gophers."

- This report provides significant reason to halt the indiscriminate and ineffective use of Strychnine to control any wildlife species. This research also continues to highlight concerns over the inappropriate management of these poisons that puts many different species at risk.

1.6 Labeling from the Alberta Environment and Sustainable Resource Development 2013/2014 Labelling for Strychnine.

- Labeling reads that baits must be checked "at least" every 7 days. The regulated and inadequate monitoring of all three of these poisons allows for more time for other species to be at risk from secondary poisoning.
- Further, upon the termination of a program, users are expected to bury baits at a reasonable depth "no less than 46 cm, (approximately 18 inches deep) and then covered to prevent non-target poisonings." There are also risks associated with this direction. There is no guarantee or oversight to stop users from keeping bait in place longer than instructed, until a target species is killed.
- Labeling instructions also read that tablets must be inserted into meat and buried with snow, logs or other natural debris. This is not sufficient to protect non-target scavengers from accessing poisoned meat and carcasses. Further, there are higher recommended dosages when using Strychnine to kill American black bears and yet American black bears, coyotes and wolves often share the same habitat along with many other scavenging species. There is nothing to stop a wolf or coyote from eating a carcass, with more Strychnine tablets inside, that was meant for bears. This would result in immense suffering for a non-target (in addition to target) animals and would make their carcass more dangerous to the next scavenger.
- As we know, even in cases where secondary poisonings are being recorded, the searches are often late, episodic and incomplete; birds could have flown away before dying or dropped poisonous grain/kernels/tablets for others to consume; carcasses could have been eaten or dragged away before accurate counting could take place.

<u>Sodium Cyanide</u>

1.1 U.S Fish and Wildlife Service Biological Opinion March, 1993

The document asserts that the risk of killing non-target species when using Sodium Cyanide in an M-44 device is high.

> *"During 1976-1986, M-44s were used in 14 western states, killing 103,255 animals. This total includes 4,868 non-target animals (Connolly 1988). Non-target species reported killed include grizzly bear, black bear, mountain lion, badger, kit and swift fox, bobcat, ringtail cat, feral cat, skunk, opossum, raccoon, Russian boar, feral hog, javelina, beaver, porcupine, nutria, rabbit, vulture, raven, crow, and hawk. It is reasonable to believe birds deaths are underestimated in non-target kill reports because the bird's flight response on activation of an M-44 could easily remove them from the vicinity of the device in a few seconds."*

- When explaining why M-44s should not be used in the territory of the" Louisiana Black Bear" the US EPA suggests that black bears have a large home range and will search outside of their range for prey; further, they note that young bears will disperse to create their own territory.
- The US EPA suggests that M-44 devices should not be used if black bears are anywhere in the general vicinity and in the habitat of Florida panther, grizzly bear and grey wolf.

1.2 United States Environmental Protection Agency (EPA) Reregistration Eligibility Decision (RED) for Sodium Cyanide-1994.

- This 1994, RED document outlines, that because Sodium Cyanide has an extremely high risk of toxicity for terrestrial vertebrates including with non-target animals such as dogs and endangered birds, the EPA has further regulated this poison.
- New regulations (in 1994) include reporting non-target kill data and prohibiting the use of Sodium Cyanide in areas where endangered species could be jeopardized as well as regulating where this poison can be used. The states of Florida, California, Texas, Mississippi and Louisiana prohibit the use of this poison as of 1994.
- However, the EPA also asserts that even with the (26) new restrictions, endangered species are still not adequately protected from the use of Sodium Cyanide.
- Further, the US EPA determined that Sodium Cyanide is acutely toxic through both dermal and oral exposure. This poison can be easily absorbed into the skin and can be inhaled rapidly through the respiratory tract.
- The PMRA cited this report as the basis for their 2006 regulatory decision on Sodium Cyanide (SC): that the use of SC should be continued with mitigation measures in place.[52] These proposed regulatory actions include the use of warnings on labels to

[52] PMRA Proposed Acceptability for Continuing Registration: Sodium Cyanide, 16 March 2006.https://central.bac-lac.gc.ca/.item?id=pacr2006-01-e&op=pdf&app=Library

reduce the risk for human or bystander poisoning. Precautionary warnings also include the following:

> *"This pesticide is TOXIC TO WILDLIFE. Keep out of lakes, ponds or streams. Do not contaminate water by cleaning of equipment or disposing of wastes."*
>
> *"Use of this product is prohibited in areas where it might jeopardize the existence of endangered, threatened, vulnerable, special concern or indeterminate status species. Contact the local office of the Canadian Wildlife Service to determine locations of habitats occupied by these species occurring in or near the intended area of use."*
>
> *"To allow the natural movements of endangered, threatened, vulnerable or indeterminate status species that may venture outside provincial or national parks or conservation areas, a buffer zone of 400 meters must be strictly obeyed."*

1.3 Health Canada: PMRA Memorandum to Marisa Romano Regarding the Re-evaluation of Sodium Cyanide, June 10, 2005.

- This memorandum reviewed existing information on Sodium Cyanide, including the US EPA Re-evaluation Decision in 1994, for re-evaluation of the current use of Sodium Cyanide in Canada.
- The PMRA determined that any risks the US EPA found, to human or animal health, could be mitigated with further label instructions.
- The PMRA is relying on data that were evaluated 11 years ago in order to make a new re-evaluation of a highly toxic poison.
- In 2005, the PMRA announced that registered users must remove M-44 cartridges after 30 days and check on M-44 devices every 3 days. If the M-44 device ejects sodium cyanide on the first day it is ready for use, this means that carcasses could sit for almost 3 full days, available to scavengers and thereby poisoning other species, before they were collected.
- The delay in collecting poisoned carcasses is a factor of concern with regard to the labeling requirements for all three of these poisons, that creates an irresponsible scenario where more wildlife species are put at risk.

<u>Compound 1080; Also known as Sodium Monofluoroacetate</u>

1.1 US EPA Reregistration Eligibility Decision (RED) Sodium Fluoroacetate (Compound 1080) 1995

- This document was published in order to explain the re-registration status of Compound 1080 in 1995.

- The data evaluated in this document measured the acute and subacute toxicity of Compound 1080 exposure to non-target organisms
- Compound 1080 is “very highly toxic” to avian species and to mammals on an acute oral basis (12). It is slightly toxic to coldwater fish species and “practically " non-toxic to warm-water fish species (27).
- Evidence evaluated in this document confirms that the use of Compound 1080 poses a risk to birds and mammals, including non-target species who consume contaminated tissue from the carcasses of livestock with broken or punctured collars; Compound 1080 also poses a threat to non-target animals when toxicant is spilled on the ground.
- The typical behaviour of scavengers demonstrates how they tend to optimally feed upon wounds or openings in the carcass where skin has been torn away. Connolly (1980) found that this behaviour may limit the exposure of non-target scavengers to the poison which is concentrated to the neck area (20).
- However, the data also suggest that it is likely that carcasses will vary in the amount of poison that they contain but still expose any scavengers to contaminated tissue (22). Again, there remains the issue that birds who have ingested contaminated tissue could fly from the study area.
- This research also indicates that there have not been adequate studies conducted to measure the degree to which Compound 1080 leaches into the soil. Because of this, researchers measured the leaching absorption-desorption of Compound 1080 by assessing the solubility of Compound 1080 in water. They found that “undergraded fluoroacetate” (below standard grade) may leach, although this can be affected by the absorption capacity of soil and other organic matter (17).
- Knowlton and Ebert (1991) found that an average of nearly 33% of the total amount of poison in a 30ml collar is spilled on the ground; the US EPA does not believe this poses a substantial hazard to non-target organisms (21).
- 1080 collars are not an efficient method to control wildlife. This study reports that over a period of three years monitoring in Wyoming, Montana, Texas and New Mexico, only 13% of collars used, or 294 out of 2,257 collars were punctured and had released their contents. 108 of the collars were punctured by coyotes and 80 were punctured by vegetation and unknown causes (25).
- The data that were presented convinced the US EPA to continue their registration of Compound 1080.
- In March 2004, a PMRA Memorandum [53] cited this RED document as the basis for the continued registered use pattern of Compound 1080 in Canada. However, as stated in the Background section of this document, Compound 1080 tablets are not registered for use in the U.S; the US EPA RED only evaluated the risks associated with using Compound 1080 in collars.
- This research is therefore not relevant to the registration decisions of the PMRA regarding Compound 1080 re-evaluation of tablets.

[53] Health Canada. March 22, 2004. PMRA Memorandum to Virgine Bergeron.

- The requirements regarding monitoring bait-poisons as well as poison-filled collars is also a concern; in this 2004 Memorandum the PMRA details:
  - "The baits must be removed and destroyed within 15 days of initial placement in Saskatchewan and removed and destroyed within 30 days of placement in Alberta between April 1st and October 31st and within 90 days of placement between November 1st and March 31st." [54]
- Leaving poisonous baits from 15-90 days poses an unacceptable threat to Canada's wildlife, who will die in an excruciating manner as a result of indiscriminate bait poisons.
- In a Special Review of Compound 1080 in 2013 [55] the PMRA stated that non-target species could come into contact with punctured collars within a few hours between the moment a coyote attacks a collared lamb and the producer retrieves the carcass. It is reasonable to suggest that a carcass could be available to scavengers, for days before it is retrieved.
- In April 2004, a PMRA Memorandum [56] to Virgine Bergeron, Manager of Health Canada, stated that Compound 1080 poison-laden collars must be checked by "livestock owners" every 48 hours. When tablets are used, baits must be inspected "at least every 7 days." These times are too long as it leaves poisoned flesh available for secondary poisoning.

CONCLUSION:

Strychnine, Compound 1080 and Sodium Cyanide have been used for decades and yet the problems they present continue to persist. Not only are these poisons inhumane and indiscriminate, they are ineffective. We need ecologically compatible, science-based wildlife management strategies in place of the ongoing renewal of harmful poisons that are inhumane, raise environmental concerns and fail to protect Canadian wildlife.

The science repeatedly demonstrates that the use of Strychnine, Compound 1080 and Sodium Cyanide have had significant impacts on wildlife communities. These conclusions can be gleaned from the evidence presented in this report that demonstrates the appreciable amount of these poisons being available to non -target species, the number of estimated non-target mortalities associated with the use of these poisons, as well as the inefficiencies of accurately accounting for secondary poisonings all together.

-The U.S EPA Re-evaluation Decision (1995) reiterated that Compound 1080 is "very highly toxic" and that birds and other scavengers could ingest poisonous tissue before a carcass is removed. This document did not evaluate the risk of Compound 1080 tablets (not registered in the United States, but registered for use in Canada) that are also attractive to birds and other scavengers.

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[54] Ibid.
[55] Health Canada. 2013, Re-evaluation Notice: Special Review of Compound 1080.
[56] Health Canada. April 4, 2004. PMRA Memorandum to Virgine Bergeron.

-A PMRA decision in 2005 [57], suggested that Sodium Cyanide used in M-44 devices should be checked every three days; if an M-44 device is activated on day one, this leaves over 2.5 days for scavengers to consume poisoned tissue. Further, M-44 devices are indiscriminate and will eject poison upon contact with any animal.

-Proulx 2007, 2009 and 2014 as well as McKinnon et al. 2001- 2004 (see above research), document the numerous non-target species in their studies who died as a result of Strychnine poisoning, even when this poison was used according to regulatory standards. When all three of these poisons are used incorrectly the risk is even greater.

Further, labelling instructions are not sufficient mitigation or risk reduction measures. An example of this is the PMRA Compound 1080 Re-Evaluation Decision in 2014.[58] In the Re-Evaluation Special Review, the PMRA suggested that further labelling restrictions, such as covering carcasses (that had tablets inserted into them) with snow, would help to minimize the risk to non-target species coming into contact with Compound 1080 tablets.

After two comments were received suggesting that burying multi-dose bait would not be useful in ensuring the target animals takes the bait, the PMRA made the below changes:

After the following text:

> "Place up to six tablets into a carcass at a coyote control site and then cover with 30 cm of snow or 15 cm of loose soil."
>
> The following statement was added:
>
> "Place up to 3 tablets into a coyote killed carcass at the predation site." [59]

While the PMRA may be attempting to protect non-target species, they are also helping to ensure that target species are killed. This incongruence cannot be rectified when using these harmful poisons. There is no safe or effective manner to employ them.

Further, even when there are stronger mitigation measures on the label, officials have found that issues of non-compliance can often be attributed to the user's failure to read or to follow label instructions. [60]

In addition, the continual renewal of these poisons causes excruciating pain and suffering to both target and non-target animals. Protection of vulnerable animals from the risks posed by improper human conduct is a fundamental value in Canadian society.[61] That it remains legal to use these poisons in Canada fails to satisfy the public's expectations of the government to prohibit animal cruelty.

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[57] Health Canada: PMRA Memorandum to Marisa Romano Regarding the Re-evaluation of Sodium Cyanide, June 10, 2005.
[58] Health Canada.PMRA: Re-Evaluation Decisions Environmental Assessment Directorate: Special Review of Compound 1080. 2014.
[59] Ibid.
[60] 2013 and 2014 On-Farm Inspections of users of 2% Liquid Strychnine Concentrate-FOI Request Document.
[61] R v DLW, 2016 SCC 22 at para 69.

RECOMMENDATIONS:

The PMRA and US EPA have reiterated that Strychnine, Compound 1080 and Sodium Cyanide are toxic to all forms of life. Our review of the scientific evidence used by Health Canada to justify continued use of Compound 1080, Sodium Cyanide and Strychnine demonstrates that risks to human safety, to the environment, and to non-target species are unacceptable.

Therefore, we strongly urge the Minister to:

1. **initiate a special review with the intent of banning the use of Strychnine, Compound 1080 and Sodium Cyanide products for use in Canada;**

2. **rescind all associated end product permits during the special review; and**

3. **enact a nationwide ban on the use of all three pesticides.**