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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

APR 28 1981

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

DATE:

SUBJECT: 6704 EUP-14 Sodium fluoroacetate (1080) in Livestock Neck Collars to Kill Depredating Coyotes
CASWELL NO. 770

FROM: Ray Landolt
Review Section #1
Toxicology Branch/HED (TS-769)

TO: William Miller PM 16
Insecticide-Rodenticide Branch
Registration Division (TS-767)

Registrant: U.S. Department of the Interior
Fish and Wildlife Service

Action Requested:

To broaden the research effort from a tightly controlled intensive study (1977-1980) to documentation of results under conditions of practical operational use.

Use:

Sodium fluorocetate (10 mg/ml) in the McBride toxic collar secured to the neck area of sheep and goats to control coyote depredation.

Conclusion:

1. This experimental use permit has proposed to expand the use of the 1080 livestock collar from a tighly controlled study to a practical use situation. What provisions have been made for the certification and licensing of those responsible for handling a highly toxic pesticide?

2. With long term exposure of the livestock collar and the reduced frequency of monitoring the collared animals, the improvements in collar design cited in further research recommendations would not be applicable to this permit. Will this be a separate project?

3. If registration of 1080 for use in livestock protection collars is anticipated then the following acute toxicity studies would be necessary on the formulation (less dye) at the time of registration. a) Dermal LD_{50} and eye and skin irritation studies.

4. The disposition of contaminate livestock should be changed to read. No contaminated animal will be used for food consumption.

Background Information:

The original experimental permit was issued to Fish and Wildlife Service (FWS), Federal Register October 20, 1977 and expired October 30, 1978. FWS requested an extension first to November 1979, then to November 1980 and the present request for November 1981.

Experimental Design:

1. Test Sites - Texas, Idaho, Montana and Utah. The states of Oregon and California listed as test sites in the last permit have been deleted from this request.

2. Number of Tests - Ten field trials of which five will consist of continued or renewed work on prior test sites and five new test may be started.

3. Procedure

   a. Collar reservoirs to be filled by Denver Wildlife Research Center (DWRC) personnel, who will maintain inventory control over all collars.

   b. Research personnel will supervise selected ranchers and Animal Damage Control (ADC) personnel in the routine attachment, adjustment and removal of collars.

   c. All collars used will be property of the U.S. Government.

d. Number of collars per test. Use of up to 60 collars in any one pasture, maximum of 120 collars per square mile (640 acres) of test area.

e. The experimental permit allows a total of 800 collars and 0.66 pounds (299 g) of toxicant.

f. Collars - two sizes each made of rubber.
   i. Small collars: two toxicant reservoirs 1.5 x 2.25 inches each containing 15 ml toxicant with 30 ml per collar.

   ii. Large collars: two toxicant reserviors 1.5 x 3.75 inches containing 30 ml of toxicant with 60 ml per collar.

g. The solution contains 11.1 mg/ml technical 1080 or 10 mg/ml of fluoroacetate plus 0.5 mg/ml Rhodamine B dye (as a safety indicator) in deionized water.

4. Protective Clothing

   a. Mixing and filling personnal to wear face protection, rubber gloves and removable outer clothing.

   b. Routine application, inspection or removal of intact collars would not require protective clothing.

   c. Punctured or leaking collars would require rubber gloves to be worn.

5. Dispostion of Contaminated Livestock

   a. Retain contamined animals for observation. No contaminated animal will be sold for human consumption.

6. Other Predation Controls

   Will be used in conjunction with the collar, to assess the use of the collar as a supplement to other methods rather than a replacement for other methods.

7. Radiotelemetry of monitoring of collars not part of this experimental use.

Related Actions:

Texas A and M University experimental use permit 35899-EUP-5.

Acute Oral Toxicity - Coyotes Accession No. 243665

A. Procedure

Four group of two male and two female adult coyotes were dosed orally with 0.09, 0.11, 0.13 and 0.16 mg/kg with a 1080 solution of 1080 dissolved in deionized water. Survivors were observed for 14 days.

B. Results

1. LD_{50} (conbined male and female) 0.12 mg/kg (0.10-0.14)
   LD_{100} 0.16 mg/kg

2. Pharmacotoxic signs:
   All deaths occurred within 24 hours.

C. Conclusion

1. Data Classification - Core minimum

2. Toxicity Category -I

Data Submitted with this Request: Accession No. 243665
Use of Compound 1080 in Livestock Neck Collars to Kill Depredating Coyotes
A Report of Field and Laboratory Research - Nov. 1978 to March 1980
by E. Connolly, June 30, 1980 125 pages plus addendums. U.S. Dept. of the Interior, Fish and Wildlife Service, Denver Wildlife Research Center.

Summary:

1. Field Studies with Livestock Protection Collars.

During the period October 1978 - April 1980 fourty-two coyote attacks were recoreded in seven tests. Thirty attacks or 71% of total resulted in punctured collars. This is similar to the 69% puncture rate reported prior to 1978. The use of the collar presents a trade off to sacrifice a few kids or lambs to get rid of coyotes that have killed livestock for a reduction in the total number of livestock that could be destroyed by the predators. Outstanding advantage of the McBride collar is the selectively for removal of individual coyotes that attack livestock. Captive coyotes that received sublethal doses of the toxicant in attack on collard sheep or goats showed a remarkable lack of learned avoidence by subsequently attacking more livestock. During the 1979-1980 period the total amount of toxicant loaded into collars was 97 gram of sodium fluoroacetate. Of this amount 16.1 grams was actually used through bitten collars by coyotes, punctured accidentally or lost. Compound 1080 requires 1 to 2 hours to produce symptoms of intoxication and approximately 4 hours to cause death. When a coyote was found it was no more than 400 yards from the collared animal. However, not many coyotes were found near the attack site. It is apparent that neck collars containing 1080 are not the only control needed to reduce predation. Other methods of predation control are necessary to be used in conjunction with this protection collars to control those killer coyotes that elude the 1080 collar. No accidental poisoning have occured in the course of this research.

2. Secondary Hazard from the Use of 1080 Collars.

The primary concen here is a secondary hazard assessment of the toxic collars and the significance of scavengers feeding on tissue from poisoned coyotes or on dead collared livestock. Encountered under field condition were turkey vultures and black vultures scavenging on the soft tissue of coyote carcassess. Coyote killed collared livestock were known to have been scavenger by turkey and black vultures magpies, ravens, red-tailed hawks, caracaras, a skunk and a coyote. No scavenger was known to have been poisoned. Scavengers ignored the collars and fed upon viscera and muscle exposed by the killer coyote. From the literature cited the magpie is more sensitive to compound 1080 than most other potential scavengers. In controlled studies where captive magpies were confined so to fed on the carcass of a coyote that died after attacking a 1080 collared lamb (ingesting 2-10 ml of FAC) showed no ill effects immedialely or during the seven day observation period. In another test, magpies and dogs were allowed to fed on dead collared livestock with punctured collars without evidence of intoxication. Both dogs and magpie ignored the collar but fed on the exposed tissue. Considering the 1080 levels in tissue of poisoned coyotes that died after biting a 1080 collar and the toxicity data for 1080 in various species of animals, calculations on the amount of poisoned coyote tissue a scavenger or would have to eat in order to ingest a lethal dose would be more than the animals could consume from a acute exposure. For example, a magpie would have to eat 194 grams of coyote muscle containing 0.93 ppm of 1080 to receive an LD_{50} dose. Magpie eat approximately 90-100 grams of food per day. The average concentration of 1080 in the muscle of poisoned coyotes was reported to be 0.31 ppm. Compound 1080 does not concentrate in any specific tissue or organ of poisoned animals. However the preferred tissues for analysis to determine 1080 poisoning are muscle, liver and kidney.

3. Stability of compound 1080 in Livestock Protection Collars.

To determine whither solutions of 1080 deteriorate under conditions of storage three groups of 20 mice were injected IP with doses of 1080 from previous filled collar that were stored out of doors, in the laboratory and in the refrigerator. This bioasay was determined monthly at a level to obtain 20-40% mortality. No difference in the toxicity was observed between these stored solutions and freshly prepared solution containing 10 mg/ml of toxicant.

4. Toxicity Data.

The precise mode of action of sodium fluoroacetate (FAC) is not completely understood, it is accepted that the compound itself is not toxic. The lethal action of FAC is due to its conversion in animal tissue to (-) erythrofluorocitiric acid. The toxicity of fluorocitrate is directly correlated to (a) covalent binding of fluorocitrate to two proteins (molecular weight 171,000 and 71,000) and (b) a selective inhibtion of citrate transport through the inner mitochondrial membrane. Both (a) and (b) represent two phases of the same mechanison except (a) is on a macromolecular and (b) at an organelle level. Agents that will prevent protein binding of (-) erythrofluorocitrate are agents that will dissociate the fluorocitrate protein thioester and therefore are potential antidotes. If, after ingestion of FAC, the poisoned animal receives organic disulfides that penetrate mitrochondra of the central nervous system, then lethal toxicity should be preventable. Oxidized glutathione can completely prevent protein fluoro-citrylation in vitro. Those observations have not been adapted to trails with live animals. Once FAC has been converted, to (-) erythro-fluorocitric acid, it is no longer susceptible to detection by the current analytical methods for FAC. An animal could die from a minimum lethal dose of 1080 that would not have detectable amounts of 1080, if all of the ingested dose was converted to fluorocetrate before the animal died. The detection of 1080 in tissues of a poisoned animal means the animal received an overdose and the residue measured after death constitutes that fraction of the absorbed dose not converted to fluorocitrate.

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