COMPARISON OF HANDMADE AND MOLDED RUBBER TRANQUILIZER TABS FOR DELIVERING TRANQUILIZING MATERIALS TO COYOTES CAPTURED IN LEG-HOLD TRAPS

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Leg-hold traps are an important tool in selectively capturing coyotes (*Canis latrans*) causing agricultural depredations. Because animals captured in leg-hold traps may incur injury and trauma to their feet and legs, there has been growing opposition to use of such traps. Each year, state or federal legislation is proposed to restrict the use of traps and considerable research effort has been devoted to the examination of trap improvements or alternatives.

A variety of trap modifications have been suggested to reduce foot injuries and make the technique more generally acceptable, including use of padded jaws (Linhart et al. 1986, Olsen et al. 1986, Linhart et al. 1988) or attachment of tranquilizer tabs to traps (Balser 1965, Linhart et al. 1981). A tranquilizer tab consists of a measured amount of tranquilizer in some form of small pouch or nipple attached to the trap jaw. When a coyote is captured in a tranquilizer tab-equipped trap, it chews on the tab and ingests some or all of the tranquilizer, resulting in reduced: 1) anxiety, 2) struggling, and 3) secondary injuries to the coyote's foot and leg. In addition, tranquilization may (4) serve to improve trap efficiency by reducing escapes.

In initial tranquilizer tab tests, Balser (1965) used diazepam as a tranquilizing agent, a Class IV controlled substance (Seal and Kreeger 1987) that requires Drug Enforcement Administration supervision of users. Propiopromazine hydrochloride has been used in more recent tests (Linhart et al. 1981). This material is not a controlled substance and does not require registration of individuals for its use. As with any veterinary drug, Food and Drug Administration registration would be required to permit commercial development of the technique. Linhart et al. (1981) tested a tranquilizer tab using a prototype molded rubber nipple manufactured by Rancher's Supply, Inc.[1], Alpine, Texas, which was available commercially. They used 600 mg of propiopromazine hydrochloride dissolved in water as the tranquilizer and checked traps daily or held coyotes in traps over a 48-hour period. The capacity of the device precluded increasing the tranquilizer dose and the water medium was subject to

spillage when the tab was punctured and to freezing at low temperatures. Linhart et al. (1981) also investigated the use of vaseline-based formulations to overcome these problems and improve mouth contact with the tranquilizer by trapped animals. Handmade tranquilizer tabs currently in use include a vaseline carrier mixed with tranquilizing drug to increase the volume of active material and increase mouth contact with it. Fabrication of such tabs is labor intensive and requires: 1) filling a small balloon with tranquilizing drug mixed with vaseline; 2) covering the balloon with 4 layers of gauze; 3) tying the gauze and balloon at the base of the balloon with twisted piano wire, and 4) dipping the tab 2 to 3 times in melted paraffin to reduce odors and provide a weather-proof covering. A larger prototype of the molded rubber nipple has been produced by Rancher's Supply that contains approximately twice the volume as the tab tested by Linhart et al. (1981).

The purpose of our study was to examine materials and formulations for preparing tranquilizer tabs to establish the effectiveness of this drug delivery system for coyotes captured in traps. Although we used propiopromazine hydrochloride as a prototype tranquilizer, we expect our findings to be generally applicable to other materials.

STUDY AREA AND METHODS

We conducted our study at the Predator Research Facility at Millville, Utah, between 25 October and 4 December 1990. Thirty adult coyotes (15 males and 15 females) were obtained from the Millville coyote colony. From within each sex grouping, animals were randomly assigned to 1 of the 3 treatments, resulting in 10 animals per treatment with equal numbers of each sex. Ultimately 1 female was eliminated from the handmade tranquilizer tab treatment as a result of a non-trap related injury; an additional female and male were added to the rubber tranquilizer tab with powder treatment when the original animals did not puncture the tabs.

The 3 treatments were: 1) handmade tranquilizer tab with 600 mg of propiopromazine hydrochloride (Savarie and Roberts 1979) mixed with vaseline (Linhart et al. 1981), 2) molded rubber tranquilizer nipple with 600 mg propiopromazine hydrochloride mixed with vaseline, and 3) molded rubber tranquilizer nipple with 600 mg propiopromazine hydrochloride powder with no carrier. The molded rubber nipples were obtained from Rancher's Supply, Inc. and prepared with the tranquilizer formulation at the Millville Predator Research Facility. The handmade tranquilizer tabs were similarly prepared before tests commenced. Victor 3N traps with offset jaws and 0.9-m chains were used in the tests. The tranquilizer tab was attached on the side of the jaw that was restrained by the trigger near the end opposite the chain attachment. Traps were staked to the ground in a pen. To standardize capture position on the foot and to minimize trap closure injuries, each coyote's foot was placed in the trap with the trap springs manually restrained. The springs were released slowly to allow the jaws to close gently on the coyote's foot just above the primary foot pad.

Observations included degree of tranquility at specified times post "capture" and superficial foot or leg injuries at the end of the test period. Degree of tranquility categories were: 1) alert, active, with no apparent drug effect, 2) quiet, unable to maintain attention, 3) eyes dull, animal drowsy, 4) sleepy but could be aroused, and 5) could not be aroused. For the first hour, observations were made at 10-minute intervals, and thereafter, at hours 2, 4, 12,

and 18 post-"capture." Each coyote was removed from the trap after 18 hours and evaluated for foot or leg injuries by a licensed veterinarian. Foot or leg injury categories were: 1) no obvious damage, 2) swollen foot/leg, 3) minor cut (<25.4 mm inch long/deep), 4) major cut (≥25.4 mm long/deep), 5) broken toe(s), tendon damage, 6) simple fracture above toes, and 7) compound fracture above toes.

Trap tab condition was evaluated after each 18-hour trial and assigned to 1 of the 5 following categories based on the condition of the attachment mechanism (wire on handmade tabs and plastic ties on rubber tabs) and the tab: 1) attachments and tab both intact on the trap, 2) attachments intact, part of tab missing, 3) attachments intact, tab shredded, 4) attachments intact, tab missing, and 5) attachments broken, tab missing. Missing tabs or pieces were presumed to have been ingested by the test animals.

We assessed relative coyote tranquility at each observation period by comparing the mean degree of tranquility for each treatment. Tranquilizer tab condition and foot or leg injuries for each treatment were compared by examining the percent of coyotes within each category. A log-linear model from a Bio-Medical Data Package (BMDP) (Dixon 1983) was used to compare foot and leg injuries.

RESULTS AND DISCUSSION

There was appreciable variation about each mean for the degree of tranquility of each treatment at each of the 10 observation periods (Fig. 1), but curves among treatments were similar. The greatest degree of tranquility was noted at 2 hours for all treatments.

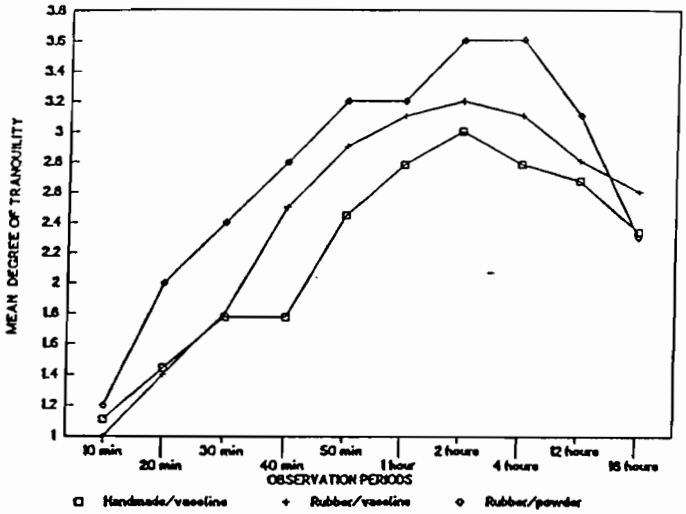

Fig. 1. Mean degree of tranquility of coyotes within each treatment at 10 observation periods following "capture."

Variation was also noted in the condition of the tranquilizer tabs at the end of each trial (Fig. 2). The handmade tranquilizer tabs had the highest percentage with attachments intact and tab missing (Category 4) and the lowest percentage in Categories 1, 2, and 5. The rubber tranquilizer tab had highest percentage in Category 2 (rubber/vaseline) and was the only tab in Categories 1 and 5 (rubber/powder).

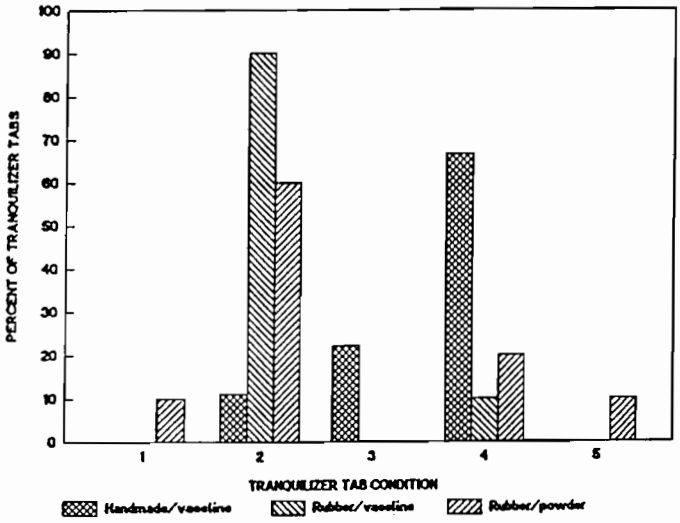

Fig. 2. The percentage of tranquilizer tabls with different conditions related to 3 categories for the condition of the attachment and tab were: 1) both attachment and tab intact; 2) attachment intact but part of tab missing; 3) attachment intact but tab shredded; 4) attachment intact but tab missing; and 5) attachments broken and tab missing.

Statistically, there were no differences among treatments (X^2 = 3.11, 6 df, P = 0.795) with regard to foot or leg injuries (Fig. 3). No broken toes or bone fractures were noted among any of the test animals. Most coyotes sustained a swollen leg or foot (Category 2). Foot injury categories 1 and 2 (no injury or only a swollen foot) included 67%, 70%, and 60% of the coyotes exposed to handmade tabs with vaseline, rubber tabs with vaseline, and rubber tranquilizer tabs with powder, respectively. In these tests the rubber tranquilizer tab appeared to function as well as handmade tabs, but the results must be interpreted cautiously. Small samples provided low statistical power for discriminating differences. That 2 of the 22 animals did not puncture the rubber tabs and had to be removed from the study after 4 hours suggests the need for further study of the frequency of coyote punctures of tabs under field conditions. In addition, observation of a small sample of coyotes trapped in the field (F. F. Knowlton, pers. commun.) suggested that wild coyotes may treat the rubber tabs more viciously and may sustain more severe injuries than were noted with the pen-reared animals in this study.

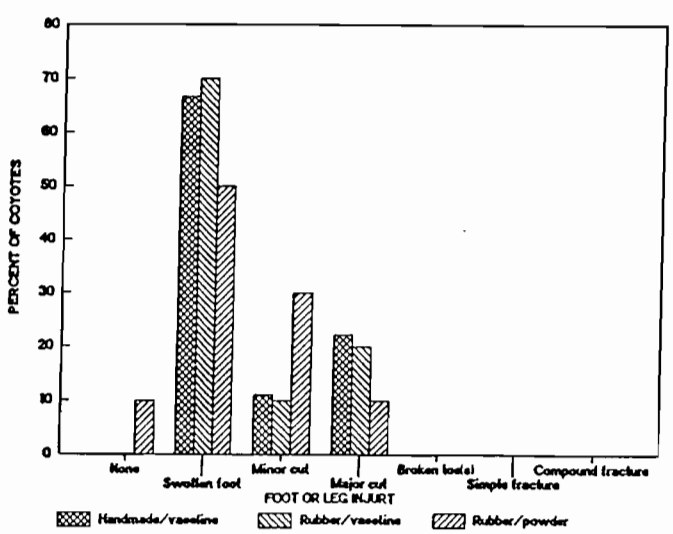

Fig. 3. The percentage of coyotes with foot and leg injuries related to 3 tranquilizer tab treatments in 5 condition categories.

Additional evaluations will be needed under field conditions before final recommendations can be made on the most effective materials and procedures for using tranquilizer tabs on traps. However, the similar performance of the powdered drug formulation in these tests suggests an approach that may substantially simplify the formulation process.

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[1]Mention of a manufacturer's name for identification does not imply endorsement by the U.S. government.