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Abstract: Foot-hold traps can be used to selectively capture coyotes (*Canis latrans*) and wolves (*C. lupus*). However, injuries to captured animals sometimes occur when they struggle to escape. Tranquilizer trap devices (TTDs) reduce struggling and injuries but prototype TTDs were too expensive for widespread use by Animal Damage Control (ADC) operational personnel. For this reason, the Pocatello Supply Depot (PSD) and the National Wildlife Research Center (NWRC) are investigating alternative TTD designs. A molded-rubber TTD will be available from the PSD for coyotes, and the NWRC continues to explore other cheaper TTD designs. A practical TTD design is now available for use with wolves, and evaluation of foot and leg injuries shows >90% of wolves captured in TTD equipped foot-hold traps had only minor injuries. Conversely, 57% of wolves captured in traps without the tranquilizer had more severe injuries. A training handbook is being developed by ADC operations and NWRC personnel for the operational use of TTDs. The development of efficient, economical tranquilizer delivery systems continues to be an important priority for the NWRC.

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Key Words: Animal Damage Control, *Canis latrans*, *Canis lupus*, coyote, foot-hold trap, injury, Tranquilizer Trap Device, TTD, wolf

The Animal Damage Control (ADC) operational program uses traps to selectively capture coyotes (*Canis latrans*) and wolves (*C. lupus*) causing agricultural depredations. The trapping event can result in struggling and injury, particularly to the feet and legs. As a result, public opposition to foot-hold traps is increasing. Various groups are investigating ways of reducing injuries to animals caught in foot-hold traps (Linhart 1990).

Injuries caused by foot-hold traps have been assessed for coyotes (Englund 1982; Tullar 1984; Linhart et al. 1986; Olsen et al. 1986, 1988; Onderka

et al. 1990) and wolves (Van Ballenberghe 1984 and Kuehn et al. 1986). Teeth, gum, and tongue injuries were reported by Onderka et al. (1990) for coyotes and by Kuehn et al. (1986) for wolves. Two types of trap modifications have been tested to make foot-hold traps more acceptable. One involves use of padded jaws on foot-hold traps (Linhart et al. 1986, Olsen et al. 1986, Linhart et al. 1988, Phillips et al. 1992); the other uses tranquilizer trap devices (TTDs) attached to traps (Balser 1965, Linhart et al. 1981).

Modification of steel traps by adding a TTD reduces struggling and foot damage (Balser 1965, Linhart et al. 1981, Zemlicka and Bruce 1991), making traps more humane. A TTD consists of a measured amount of tranquilizer in the form of a small packet attached to the trap jaw. When a coyote or wolf is captured in a TTD-equipped trap, it typically chews on the packet, and ingests some or all of its contents. Tranquilizer ingestion results in reduced struggling and secondary injuries to the foot, leg, and mouth.

Various drugs have been tested for use in TTDs, including diazepam (Balser 1965) and propiopromazine hydrochloride (PPZH) (Savarie and Roberts 1979, Linhart et al. 1981). Diazepam is a controlled substance (Seal and Kreeger 1987, Savarie et al. 1993) which requires Drug Enforcement Administration (DEA) and state registrations or licenses for individual applicators. Conversely, the Food and Drug Administration (FDA) has approved the use of PPZH in TTDs for capturing coyotes and wolves in foot-hold traps under an Investigational New Animal Drug (INAD) permit (INAD 9528). This permit is administered by the U.S. Department of Agriculture, Animal and Plant Health Inspection Service (APHIS), ADC program. The INAD allows APHIS, ADC to develop TTDs for uses with other species. Currently PPZH is the preferred drug of choice because DEA registration is not required and literature reviews and contacts with pharmaceutical companies have not identified alternate, suitable replacements, in terms of why PPZH was chosen.

Our objectives are to describe the current status of TTDs, research in progress, and future uses by ADC operations.

COYOTES

The TTD was first fabricated for coyotes by Balser (1965). Diazepam was originally used as the tranquilizer. Non-availability of this drug and licensing restrictions in the early 1970s caused the Logan Field Station of the National Wildlife Research Center (NWRC) to switch to PPZH in TTDs on traps used to catch coyotes to be fitted with radio-collars and released. Field Station personnel fabricated TTDs containing PPZH with a vaseline carrier, wrapped in gauze cloth with 3 strands of wire twisted together, and dipped in paraffin. Subsequently, a balloon was used to contain the drug and carrier inside the gauze wrap but the fabrication process was labor intensive and impractical for large-scale field use (Linhart et al. 1981). When a patented molded-rubber TTD became available from the Livestock Protection Company (Livestock Protection Company, Alpine, Texas; reference to trade names or companies in this paper does not constitute endorsement), studies were initiated by the NWRC to test whether this TTD would adequately deliver PPZH to coyotes captured in TTD-equipped traps (Linhart et al. 1981, Zemlicka and Bruce 1991). This TTD, containing PPZH with and without a vaseline carrier, was tested with captive-reared coyotes in pen situations (Zemlicka and Bruce 1991). Although results were encouraging, initial field tests suggested additional development was necessary.

In 1995, personnel at the Pocatello Supply Depot (PSD) explored a new TTD design that was less expensive and easier to manufacture. The prototype consisted of PPZH in vaseline contained in a low-density polyethylene 6-inch transfer pipet. The pipet was enclosed in tubular gauze. This device was tested at the Logan Field Station in November 1995. Although the TTD was functional and results were encouraging, attaching the device to padded-jaw traps proved cumbersome and time consuming. Other attachment techniques were explored but the attachment problem was not

resolved. Future plans by the NWRC include developing less expensive TTDs for coyotes.

WOLVES

For the past 2 years, the NWRC has been assessing the merits of using TTDs on foot-hold traps used to capture gray wolves in Minnesota. The 3 objectives of the study are:

1. Evaluate 2 types of TTDs;

2. Determine the efficacy of various doses of PPZH for reducing foot, leg, and tooth injuries to wolves caught in foot-hold traps; and

3. Assess the effect of TTDs on non-target species captured during wolf-capture operations.

In 1995, balloon TTDs (Linhart et al. 1981) fabricated with 4 different doses of PPZH (0, 500, 1000, and 1500 mg) were attached to No. 4 Livestock Protection Company traps (smooth, offset jaws) equipped with drags. Inadequate attachment of the TTDs to the traps allowed the wolves to either break or untwist the attachment wires securing the device to the trap. This attachment scenario was deemed unsuitable for use in capturing wolves and re-evaluation of TTD fabrication was undertaken.

During the 1996 field season, a larger version of the molded-rubber TTD (Livestock Protection Company, Alpine, Texas) than was tested on coyotes was evaluated. Preliminary results are very promising. Results reported here involve capture of adult gray wolves caught in traps attached to drags. Twenty-three wolves were caught in traps without TTDs, 15 were caught in traps equipped with placebo TTDs (0 dose of PPZH), 18 were caught in traps with 500 mg PPZH, and 19 were caught in traps with 1000 mg PPZH TTDs.

Statistical analyses are not complete but field evaluation of injuries suggest significant reductions in injuries to feet and legs of gray wolves with both 500 and 1000 mg PPZH TTDs compared to wolves caught in traps without TTDs or with placebo TTDs.

During the study, 33 non-target animals were captured in traps equipped with TTDs loaded with PPZH, including 15 red fox (*Vulpes vulpes*), 3 domestic dogs (*C. familiaris*), 2 bobcats (*Lynx rufus*), 5 raccoons (*Procyon lotor*), 4 skunks (*Mephitis mephitis*), 1 fisher (*Martes americana*), and 3 bears (*Ursus americanus*). None of the non- target animals captured in traps with TTDs loaded with PPZH succumbed from ingestion of the tranquilizer and injuries tended to be less severe than among non-target captures in traps without PPZH TTDs. The molded-rubber TTD appears to be a viable device for reducing leg injuries caused by traps used to capture gray wolves.

AUTHORIZATION FOR USING TTDS

Currently, the TTD is used under an INAD authorized by FDA for use on traps to capture coyotes and wolves. Certification and use of TTDs by ADC operational personnel should be available in 1997. Training manuals necessary for certification and reporting forms to be filled out by TTD users under terms of the INAD are being developed by APHIS, ADC operations and NWRC personnel. Kits containing 10 TTDs with 600 mg of PPZH in each TTD will be available from the PSD to ADC personnel or non-ADC personnel upon the authorization of the appropriate ADC State Director (F. Sherman Blom, pers. commun.).

The INAD also allows the use of TTDs for mammalian species other than coyotes and wolves where ADC has no interest in expanding the routine use within the INAD. Research and development activities for TTDs are also allowed under the INAD. These activities may include dose efficacy studies for additional species, evaluation of delivery devices, and formulation stability studies. TTD use guidelines and their approval process for research and development will be detailed in the training handbook. Development of efficient, economical tranquilizer delivery systems continues to be an important priority for the NWRC.

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