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Immobilization of Porcupines with Tiletamine Hydrochloride and Zolazepam Hydrochloride (Telazol®)

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ABSTRACT: Immobilization of North American porcupines (*Erethizon dorsatum*) with tiletamine hydrochloride (HCl) and zolazepam HCl (Telazol®) was evaluated in central Massachusetts (USA) during 1991 and 1992. Doses between 9 and 11 mg/kg resulted in a mean (±SD) induction time of 3.2 ± 1.3 min and a mean (±SD) immobilization time of 44.2 ± 19.5 min. Induction time did not differ by dose, sex, capture method, or porcupine weight. Immobilization time differed by dose and porcupine weight but not by sex or capture method. Tiletamine HCl and zolazepam HCl seems to be an effective combination of drugs for immobilizing porcupines as long as sufficient time is allowed for recovery.

Key words: *Erethizon dorsatum*, immobilization, porcupine, tiletamine, zolazepam, Telazol®.

There are few published reports concerning the chemical immobilization of North American porcupines (*Erethizon dorsatum*); Roze (1984, 1987) successfully used ketamine hydrochloride (HCl), and Sweitzer and Berger (1992) used a combination of ketamine HCl and xylazine HCl. Telazol® (Aveco Co., Inc., Fort Dodge, Iowa, USA), a 1:1 combination of tiletamine HCl and zolazepam HCl, has been used successfully to immobilize a variety of mammalian species, though appropriate dose rates vary somewhat by taxon (Gray et al., 1974; Boever et al., 1977). Because of these successes, and because Telazol® can be stored and carried in powdered form and then reconstituted to varying concentrations, we used it to immobilize porcupines for our field studies in central Massachusetts (USA) during 1991 and 1992. Although the manner in which we collected data relevant to immobilization was not intended to be experimental, our results are useful because they were obtained under field conditions using a variety of doses and individuals, and can give guidance to future porcupine researchers intending to use this drug combination.

During June 1991 to August 1992, porcupines in central Massachusetts were captured in single-door (91 × 23 × 23 cm) live traps (Tomahawk Live Trap Company, Tomahawk, Wisconsin, USA), and by hand with the aid of heavy gloves. A powdered mixture of Telazol® was reconstituted with sterile water to make a solution of 100 mg/ml. This solution was kept refrigerated, and unused portions were discarded after 4 wk (Kreeger et al., 1990). Initially, we weighed each porcupine in the trap prior to injection. An intramuscular injection of Telazol® then was administered by hand to the thigh at a dose of 10 mg/kg body weight. Later in the study we lowered the dose to 7 mg/kg to shorten the immobilization time, and only estimated body weights because porcupines were less agitated and tolerated injection attempts more calmly if not disturbed by weighing.

Induction time was defined as the time from injection to the time a porcupine lowered its head to the ground and could be handled without resistance. Immobilization time was the time from induction to the time the porcupine first lifted its head off the ground.

While each porcupine was immobilized, we carried out a variety of procedures pertinent to animal care and to our ecologic studies such as applying opthalmic ointment and recording pulse, respiration, rectal temperature; weighing, measuring, eartagging, tattooing, and radio-collaring; identifying sex and examining teeth to estimate age (Dodge, 1967). After the procedures were completed, or when the animal was moving too much to handle any longer, it was placed in a portable insu-

lated cooler (60 × 34 × 37 cm) with the lid propped open 2 cm to allow air circulation but prevent escape. The cooler provided a safe place for the animal to recover fully before being released. Porcupines were released about 2 to 3 hr after injection.

Stepwise multiple regression analyses were used to assess factors which might affect induction and immobilization times, temperature, heart rate, and pulse after induction (STATISTIX, Analytical Software, St. Paul, Minnesota, USA).

Forty-two porcupines were immobilized 50 times with a single dose of Telazol®. The 50 animals were composed of 13 adult males, 30 adult females, five juvenile (<1 yr) males, and two juvenile females. Twelve other porcupines handled 15 times required a second dose (after 10 min with no drug effect) or third dose (after an additional 10 min) to achieve induction; these individuals were not included in analyses because a complete first injection was not achieved and thus the exact drug dose was unknown. These animals received a minimum of 1.6 to 10.6 mg/kg (last dose given) but could have received a maximum of 5.6 to 25.0 mg/kg (total of all doses). Immobilization time was 11 to 56 min. One other juvenile male which received 10 mg/kg did not recover following immobilization and died 7 hr after induction; it was also excluded from the analysis.

Three animals received doses <3.0 mg/kg, seven received 3.1 to 5.0 mg/kg, 10 received 5.1 to 7.0 mg/kg, four received 7.1 to 9.0 mg/kg, and 26 received 9.1 to 11.0 mg/kg. Induction time for these animals ranged from 1 to 8 min and immobilization time ranged from 1 to 81 min. For individuals receiving doses of 9.1 to 11.0 mg/kg, mean (±SD) induction time was 3.2 ± 1.3 min (range 1 to 6 min), and mean (±SD) immobilization time was 44.2 ± 19.5 min (range 1 to 81 min).

Induction time was independent of dose ($P = 0.63$), capture method ($P = 0.39$), body weight ($P = 0.35$), and sex ($P = 0.34$). It was, however, inversely related ($P = 0.04$) with heart rate during the first 15 min of induction, but heart rate explained little of the variation observed in induction times (adj. $r^2 = 0.06$).

Immobilization time varied by dose and body weight (adj. $r^2 = 0.39$, $P = 0.0001$, $P = 0.0037$, respectively), but not by capture method ($P = 0.99$) or sex ($P = 0.29$). Based on these analyses, immobilization time (IT) could be predicted by the following equation: IT = $-6.97 + 3.36 \cdot$dose $+ 3.95 \cdot$weight, where dose is measured in mg of Telazol® per kg of body weight.

Neither rectal temperature ($\bar{x} = 37.2$ C, SD = 0.8, range = 33.5 to 38.8, $n = 46$) nor respiration rate ($\bar{x} = 69$, SD = 31, range = 26 to 156, $n = 39$) measured 1 to 15 min after induction varied by dose, capture method, sex, body weight, or air temperature ($P \geq 0.08$). Heart rate measured 1 to 15 min after induction ($\bar{x} = 129$, SD = 24, range = 72 to 174, $n = 47$) varied inversely with body weight (adj. $r^2 = 0.14$, $P = 0.008$), but did not vary with dose, capture method, or sex ($P > 0.08$).

In 13 of the monitored porcupines at least one of the following behavioral responses were observed during immobilization: muscle rigidity, limb or mouth movement, excessive salivation, vocalizations, and muscle tremors at the outset or during immobilization. Because these responses were not consistently documented, we did not test whether they were related to dose or capture method.

Three of the 18 porcupines receiving 10 mg/kg Telazol® climbed and fell from trees when released at 76, 150, and 174 min respectively after injection. Thirteen others were stumbling and unsteady between 54 and 250 min after induction. Two of the porcupines receiving 10 mg/kg Telazol® and released at 156 and 230 min, respectively, appeared to be fully recovered and were able to walk without stumbling, or climb a tree without slipping. Of nine porcupines receiving between 5 and 8 mg/kg, none fell from trees, two released at 104 and 120 min, respectively, still were unsteady; seven others released between

107 and 228 min appeared to be fully recovered.

The variation in induction and immobilization times not related to dose or body weight could have resulted from several factors. Faster heart rates were related to shorter induction times, but only explain a small amount of the variation observed. Other potential factors include the amount of time spent in the trap before immobilization, the exact location of drug administration, the possibility that less than a full dose was properly received, behavior immediately prior to injection, and physiological and metabolic differences between individuals (Pigozzi, 1987). We did not test these hypotheses in this study.

After release, porcupines frequently sought refuge in nearby trees. If released too soon (<3 hr) after immobilization with Telazol® they could fall and become injured. We recommend holding porcupines immobilized with Telazol® 3 to 4 hr from time of induction before release to reduce potential injury.

Telazol® appears to be a reasonably effective drug for immobilizing porcupines. A dose of approximately 10 mg/kg gives an average induction time of 3 min and immobilization time of 44 min. The principal disadvantage is the relatively long recovery time; advantages are lack of adverse side effects during immobilization and recovery. Convulsions did not occur in any cases, and the muscle tremors and other side effects we observed did not interfere with handling and did not appear to cause harm.

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