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Immobilization of Wild Ocelots with Tiletamine and Zolazepam in Southern Texas

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ABSTRACT: Telazol® was used to immobilize nine wild ocelots (*Leopardus pardalis*) captured in box-traps in southern Texas (USA) between May 1997 and April 1998. Mean (±SD) intramuscular dosage rate of 5.05 (±0.76) mg/kg produced an induction time of 3.7 ± 1.8 min. Duration of cataleptic anesthesia was 67.4 ± 19.8 min and ocelots stood 50.0 ± 30.7 min after emergence from cataleptic anesthesia. Ocelots recovered to their preinjection condition 129.7 ± 28.8 min after first standing and 250.8 ± 55.1 min after initial injection. We observed no adverse reactions to Telazol® aside from minor loss of thermoregulatory control. Telazol® administered at 5 mg/kg was an effective and safe immobilizing agent for wild ocelots.

Key words: Immobilization, *Leopardus pardalis*, ocelot, Telazol®, tiletamine, zolazepam.

It is important to establish safe chemical immobilization procedures that minimize the stress, pain, and restraint time of captured animals. Kreeger (1996) extensively reviewed characteristics of immobilizing agents and provided dosage recommendations for 26 felid species. The most widely used immobilizing agents for felids were dissociative anesthetics, a group of cyclohexamines that includes ketamine hydrochloride (KH), tiletamine hydrochloride (TH), and phencyclidine hydrochloride. The advantages of cyclohexamines include their effectiveness on a wide range of species, high therapeutic index, minimal respiratory effects, and good cardiovascular support (Kreeger, 1996). Disadvantages of cyclohexamines include poor muscle relaxation, convulsions, excess salivation, and rough inductions and recoveries (Kreeger, 1996). To minimize these negative side-effects, cyclohexamines are commonly combined with tranquilizers such as xylazine hydrochloride (XH), acepromazine maleate (AM), or zolazepam hydrochloride (ZH).

Wild ocelots (*Leopardus pardalis*) have been successfully immobilized with KH alone (Navarro, 1985; Ludlow, 1986; Konecny, 1989), KH combined with chlorpromazine (Emmons, 1988), KH combined with AM (Tewes, 1986; Laack, 1991), and KH combined with XH (KH-XH) (Crawshaw and Quigley, 1989; Caso, 1994; Beltrán and Tewes, 1995). Telazol®, a mixture of TH and ZH (TH-ZH), has been used on captive ocelots in limited clinical trials (Boever et al., 1977; Schobert, 1987). Poole et al. (1993) found that although KH-XH was acceptable for immobilizing wild Canadian lynx (*Lynx canadensis*), TH-ZH was preferred. The advantages of Telazol® over other immobilization agents include one-step preparation, high potency, wide safety margin, and rapid induction (Schobert, 1987; Poole, et al., 1993). TH-ZH has been used successfully on large wild felids including tigers (*Panthera tigris*) (Smith et al., 1983), lions (*P. leo*), and leopards (*P. pardus*) (King et al., 1977). However, with the exception of lynx (Poole et al., 1993), the dosages and effects of Telazol® in immobilizing medium-sized wild felids are not well documented. Our objectives were to document dosages and effects of Telazol® for field immobilization of wild ocelots.

We conducted our study from May 1997 to April 1998 on sites located on privately owned land in Willacy (26°35′N, 97°22′E) and Cameron (25°57′N, 97°21′) counties (Texas, USA). Ocelots were captured in single-door, 108 × 55 × 40-cm wire box-traps (Tomahawk Trap Co., Tomahawk, Wisconsin, USA). A bait compartment

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containing a live chicken was attached to the rear of the trap (Tewes, 1986). Traps were placed in shaded areas, checked once daily before 0900 hr, and handling was completed before 1100 hr to reduce the risk of hyperthermia for captured ocelots. Telazol® (500 mg powder; Fort Dodge Laboratories, Inc., Fort Dodge, Iowa, USA) was reconstituted with 5 ml of sterile water resulting in a 100 mg/ml solution (50 mg/ml TH and 50 mg/ml ZH). Body weights of captured ocelots were estimated, and ocelots were injected intramuscularly into the hindquarters with a pole syringe at a dose of 5 mg/kg, the recommended dose for wild Canadian lynx (Poole et al., 1993). Following induction, ocelots were placed in a shaded area, weighed, measured, and blood, feces, and ectoparasites were sampled. Ocelots were aged as adult (>18 mo) or subadult (10 to 18 mo) based on body mass, tooth wear, and morphological measurements. All ocelots were fitted with a radiocollar. During immobilization, we recorded rectal temperature at 15 min intervals with a digital thermometer (Becton, Dickinson and Company, Franklin Lakes, New Jersey, USA). Ice packs were placed in the groin area or isopropyl alcohol was rubbed on the pads of the feet to cool the animal if rectal temperature was >38.5 C. Sterile lubricant drops (Lubrifair, VEDCO, Inc., St. Joseph, Missouri, USA) were applied to the eyes to prevent desiccation. The eyes were covered with a cotton cloth to minimize dirt and debris entering the eyes, to protect the eyes from ultraviolet light, and to calm the individuals (Kreeger, 1996). Ocelots were returned to the trap to recover and were continuously monitored to record all stages of anesthesia.

Stages of anesthesia were defined according to Boever et al. (1977). Induction (min) was defined as the time from injection of Telazol® to the onset of cataleptic anesthesia. Cataleptic anesthesia (min) was defined as the time from when the ocelot became recumbent and unresponsive to external stimuli until the time the ocelot first lifted its head. Emergence (min) was defined as the time from when the ocelot lifted its head until it stood. Recovery (min) was defined as the time from when the ocelot stood to when the ocelot returned to its pre-injection condition (showed no signs of drowsiness or lack of coordination). Incapacity time (min) was defined as the sum of induction, cataleptic anesthesia, emergence, and recovery times (King et al., 1977). Spearman's rank correlations were used to examine relationships between body weight and dosage to induction, cataleptic anesthesia, and emergence (Gabor et al., 1977). Recovery time was a more subjective determination than the other categories; therefore, it was not included in statistical analyses. Only ocelots immobilized with the first injection were included in the analyses. Although some ocelots were captured and immobilized more than once, time restraints prevented intensive monitoring on all captures when more than one ocelot was captured and immobilized during a single day. Therefore, only the first Telazol® immobilization event for each animal was included in the analyses.

Eleven ocelots were captured and immobilized 13 times during the study. Nine ocelots (four adult males, three adult females, one sub-adult male, and one subadult female) were immobilized with a single injection of Telazol® and monitored during all stages of anesthesia (Table 1). We found no significant relationship between dosage and induction ($r_s = -0.47$, $z = -1.32$, $P = 0.213$), anesthesia ($r_s = -0.24$, $z = -0.67$, $P = 0.521$), or emergence times ($r_s = 0.16$, $z = 0.46$, $P = 0.678$). However, significant relationships were not expected because of the small sample size and because estimated dosages were held constant. No significant relationship was observed between body weight and anesthesia ($r_s = 0.59$, $z = 1.67$, $P = 0.097$) or emergence times ($r_s = -0.23$, $z = -0.65$, $P = 0.552$). However, a significant relationship was observed between body weight and induction time (r_s

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TABLE 1. Body weights, dosages, induction time, stages of anesthesia, and rectal temperature of wild ocelots (n = 9) immobilized with Telazol® (1:1 combination of tiletamine hydrochloride and zolazepam hydrochloride) in southern Texas from May 1997 through April 1998.

	Mean (SD)	Range
Body weight (kg)	9.2 (1.6)	6.8–11.5
Drug dosage (mg/kg)	5.05 (0.76)	3.85–5.88
Induction time[a] (min)	3.7 (1.8)	1.5–7.0
Stages of anesthesia		
Cataleptic anesthesia[b] (min)	67.4 (19.8)	42–102
Emergence[c] (min)	50.0 (30.7)	22–105
Recovery[d] (min)	129.7 (28.8)	71–171
Incapacity[e] (min)	250.8 (55.1)	167–327
Rectal temperature		
Minimum (C)	38.4 (1.7)	35.9–40.9
Maximum (C)	38.9 (1.4)	37.1–41.5

[a] Induction time = time from injection to the onset of cataleptic anesthesia.
[b] Cataleptic anesthesia = time from when the ocelot became recumbent and unresponsive to external stimuli until the time the ocelot first lifted its head.
[c] Emergence = time from when the ocelot first lifted its head to when the ocelot stood.
[d] Recovery = time from when the ocelot stood to when the ocelot returned to its preinjection condition.
[e] Incapacity = induction + cataleptic anesthesia + emergence + recovery.

= 0.76, z = 2.14, P = 0.021). All ocelots exhibited an agitated disposition when approached prior to immobilization. This behavior was characterized by vocalization, urination, defecation, and attempts to escape from trap. However, the intensity and length of excitability prior to injection varied among individuals. Behavioral characteristics during the induction stage were similar to those described by King et al. (1977) and Poole et al. (1993). After drug injection, signs of drug action included licking the nose and lips, apparent impairment of vision, loss of head and neck control, and limb paralysis proceeding from rear limbs to forelimbs. A common occurrence during the end of the induction stage was ocelots coming to rest in a position that prevented lateral recumbence. When this occurred, induction time (6 and 7 min) was longer than average. However, if we physically moved the cat from this position to a position of lateral recumbence, it would quickly progress to the stage of cataleptic anesthesia.

Effective dosages (Table 1) in this study were less than the dosage recommended by Kreeger (1996) (8 mg/kg). Rabinowitz (1990) used a larger dose (10 mg/kg) of Telazol® for leopard cats (*Prionailurus bengalensis*); however, effects of anesthesia were not reported. Mean induction time of ocelots immobilized with Telazol® (3.7 ± 1.8 min) was less than observed in ocelots immobilized with KH and XH (11.2 min) (Beltrán and Tewes, 1995) and similar to the mean induction time observed in Canadian lynx immobilized with Telazol® (4.4 min) (Poole et al., 1993). A subadult male ocelot that received the lowest dosage (3.85 mg/kg), although recumbent, was the only ocelot that retained muscle rigidity and pedal reflexes. This reaction may be attributed to the lower than average dose; it may also be attributable to individual variation. This individual had a similar reaction when captured 9 mo later, when it again retained muscular rigidity after receiving an initial Telazol® dosage of 5.0–6.25 mg/kg (range based on estimated weight) and a second injection (17 min after the initial injection) of 3.0–3.75 mg/kg. Another noteworthy reaction occurred when an adult female ocelot regained consciousness after being removed from the trap 7 min into cataleptic anesthesia (10

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min after injection). This individual was immediately returned to the trap where it quickly (approximately 1–2 min) lapsed back into anesthesia. The individual was removed again after 10 min and handled with no further complications.

Ocelots immobilized with Telazol® had longer anesthesia time (67.4 ± 19.8 min) compared to ocelots immobilized with KH-XH (40.3 ± 2.8 min) (Beltrán and Tewes, 1995). However, only one ocelot in this study required a second injection to become immobilized, whereas six of 10 ocelots immobilized with KH-XH required a second injection (Beltrán and Tewes, 1995). Poole et al. (1993) also observed this advantage of Telazol® over KH-XH combinations.

The first signs of emergence from anesthesia were usually ear twitching and excessive licking followed by attempts to lift the head. Motor paralysis diminished first in the forelimbs, followed by the rear limbs. Emergence and recovery stages progressed smoothly unless disturbed by visual or auditory stimulation. Incapacity times were longer (Table 1) than those observed in Canadian lynx (Poole et al., 1993), lion, and leopard (King et al., 1977), but less than observed in tiger (Smith et al., 1983). We did observe moderate loss of thermoregulatory control in the immobilized ocelots (Table 1) including one case of hyperthermia (>41 C). This cat was cooled with ice packs and rectal temperature decreased slightly to 40.8 C before the cat became conscious. This cat was recaptured and anesthetized 8 mo later and appeared healthy.

Telazol® (5.0 mg/kg) was a safe and effective immobilizing agent for wild ocelots and should be considered as an alternative to KH-XH (Beltrán and Tewes, 1995). Injections of Telazol® at the recommended dosage require less drug volume than recommended dosages for KH-XH unless KH and XH are lyophilized and reconstituted to a more concentrated solution. Although Telazol® and KH-XH have wide safety margins and low cost, the longer shelf life of KH-XH (Poole et al., 1993) is the only advantage over Telazol® observed in this study. However, because physiological measurements (e.g., temperature, heart rate, respiratory rate, and serum chemistry) were not measured throughout all stages of anesthesia, we cannot conclude that the longer shelf life of KH-XH is the only advantage over Telazol®. Results of this study and the findings of Poole et al. (1993) support the use of Telazol® (5 mg/kg) as a safe immobilizing agent for medium-sized wild felids. However, given the long down times we observed using a 5 mg/kg dosage rate, we recommend further studies investigating smaller dosage rates. Smaller dosage rates may decrease the total time an animal is incapacitated, which is particularly important for capture situations where handling will be minimal and when animals are released before recovering to their pre-injection condition. Although ocelots in this study were monitored by radio telemetry after release and some animals were recaptured, it was not possible to record any negative side effects that may have occurred after release. Seal (1990) reported that Telazol® has caused several adverse reactions in large felines, particularly tiger. These reactions included symptoms of central nervous system disease, spontaneous reimmobilization, and aversion to food or water. Therefore, we recommend further investigations on the dosages and effects of Telazol® on all felid species.

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