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Source: Journal of Wildlife Diseases, 27(2) : 328-330

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-27.2.328

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*Journal of Wildlife Diseases*, 27(2), 1991, pp. 328–330
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# Immobilization of Fishers (*Martes pennanti*) with Ketamine Hydrochloride and Xylazine Hydrochloride

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ABSTRACT: A combination of 100 mg ketamine hydrochloride (KH) and 20 mg xylazine hydrochloride (XH) was used to immobilize fishers (*Martes pennanti*). Four adult males were intramuscularly injected a total of five times at dosages between 22.4 to 29.0 mg/kg KH and 4.1 to 6.6 mg/kg XH. Mean (±SE) induction time and arousal time were 3.3 ± 0.5 min and 76.8 ± 12.1 min, respectively. Respiration, heart rate, and body temperature in response to sedation appeared normal. A 5:1 mixture of KH-XH appears to be a safe immobilizing agent for fishers.

*Key words:* Fishers, *Martes pennanti*, ketamine hydrochloride, xylazine hydrochloride, chemical immobilization, field study.

Fishers (*Martes pennanti*) have been immobilized with ketamine hydrochloride (KH) (Johnson, 1984; Arthur, 1988), KH with acepromazine (Kelly, 1977; Jessup, 1982), and phencyclidine and promazine (Seal and Erickson, 1969; Seal et al., 1970). Seal and Kreeger (1987) suggested that fishers could be immobilized using KH in combination with promazine, diazepam, or xylazine hydrochloride (XH).

KH is a cyclohexane-based drug that creates dissociative anesthesia (Aronson, 1984; Seal and Kreeger, 1987). XH is an alpha$_2$-adrenergic agonist that induces transitory hypertension prior to prolonged hypotension (Kreeger et al., 1986; Seal and Kreeger, 1987). The combined use of these drugs generally results in smooth induction and recovery (Harthoorn, 1976). KH and XH have been used in combination to immobilize a variety of carnivores; however, KH-XH use has not been reported for fishers. I report on the use of KH-XH for immobilizing fishers in the field for research purposes.

Fishers were captured in 25.4 × 37.5 × 81.3-cm wire cage traps (Model 207, Tomahawk Live Trap Co., Tomahawk, Wisconsin 54487, USA) or incidentally in culvert traps designed to capture black bears (LeCount, 1986). Meat scraps were used for bait. Fishers captured in culvert traps were driven into wire cage traps before immobilization. All fishers were immobilized via hand-syringe in the wire cage traps at the capture site. Each fisher was intramuscularly injected with a 5:1 combination of 100 mg KH (Ketaset®, Bristol Laboratories, Syracuse, New York 13201, USA) and 20 mg XH (Rompun®, Mobay Corporation, Shawnee, Kansas 66201, USA). If required, an additional injection of 5 to 10 mg/kg KH as recommended by Seal and Kreeger (1987) was used to maintain anesthesia.

Induction time was recorded as the time from injection until sternal or lateral recumbancy was attained. Arousal time was defined as the interval between recumbancy and head mobility. Standing time was the interval between recumbancy and upright posturing. Recovery time was the interval between recumbancy and the animal's ability to maintain an upright posture while I moved the trap to different positions. Respiration rate, resting heart rate, and rectal temperature were taken as soon as practical after immobilization. Additional rectal temperatures were taken at 10 min intervals until handling procedures were completed. Weight and morphological measurements were recorded. Each fisher received ear tags (Model 1005-3, National Band and Tag Co., Newport, Kentucky 41072, USA) and a radio collar (Advanced Telemetry Systems, Inc., Isanti, Minnesota 55040, USA). All fishers were released at the capture site after recovery.

Four adult male fishers were captured six times between 9 May and 16 June 1990.



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TABLE 1. Physiological responses of adult male fishers immobilized with ketamine hydrochloride and xylazine hydrochloride.

| | n | Mean | Median | SE[a] | Range |
|---|---|---|---|---|---|
| Ketamine hydrochloride (mg/kg) | 5 | 24.7 | 22.6 | 3.1[b] | 22.4–29.0 |
| Xylazine hydrochloride (mg/kg) | 5 | 4.9 | 4.5 | 1.1[b] | 4.1–6.6 |
| Induction time (min) | 5 | 3.3 | 3.0 | 0.5 | 2.0–5.5 |
| Arousal time (min) | 5 | 76.8 | 90.0 | 12.1 | 37.0–96.0 |
| Standing time (min) | 5 | 99.6 | 98.0 | 17.5 | 50.0–148.0 |
| Recovery time (min) | 5 | 119.4 | 110.0 | 18.5 | 68.0–164.0 |
| Heart rate (bpm) | 5 | 139.6 | 138.0 | 4.3 | 128.0–148.0 |
| Respiration (bpm) | 5 | 73.8 | 66.0 | 21.1 | 42.0–146.0 |
| Temperature at 0 min (C)[c] | 5 | 39.8 | 40.0 | 0.5 | 38.5–41.0 |
| Temperature at 10 min (C) | 5 | 38.4 | 39.0 | 0.7 | 37.0–40.0 |
| Temperature at 20 min (C) | 4 | 38.6 | 38.5 | 0.4 | 37.0–39.5 |

[a] Standard error.
[b] Standard deviation for ketamine hydrochloride and xylazine hydrochloride, SE for all other values.
[c] Rectal temperatures taken at 0, 10, and 20 min post-recumbancy.

Each fisher was immobilized once during the study with the exception of one fisher that was recaptured and immobilized 19 days later to replace the radio transmitter. Mean (±SE) induction time ($n$ = 5) was 3.3 ± 0.5 min (Table 1). Heart rate was relatively constant among fishers (mean = 139.6 ± 4.3 bpm). Respiration rates appeared normal with the exception of one fisher that hyperventilated (146 bpm). This fisher also had the highest recorded rectal temperature (41.0 C). Placing the fisher in shade and pouring water over its body aided in reducing body temperature (39.5 C at 20 min post-recumbancy) and eliminated hyperventilation. Hyperventilation and elevated body temperature in this animal was probably a result of capture in a steel culvert trap exposed to full sunlight with high (>28 C) ambient temperature. Additionally, this fisher was observed panting before KH-XH administration. With the exception of this fisher, mean rectal temperature decreased and then stabilized within 10 min post-recumbancy.

Induction and recovery times of fishers immobilized with KH-XH were similar to times reported using KH alone (Arthur, 1988) or in combination with acepromazine (Kelly, 1977). Although these recovery times are not unusually long, a more expedient recovery is often desired during field studies. Future field studies using KH-XH for immobilization could incorporate the use of an antagonist, such as yohimbine hydrochloride (YH). YH reverses the sedation effects of XH (Hsu and Lu, 1984) and may partially antagonize the effects of KH (Kreeger and Seal, 1986; Deresienski and Rupprecht, 1989). Although its use has not been reported for fishers, Seal and Kreeger (1987) recommended its use for several mustelid species.

This study demonstrates the effectiveness of KH-XH to immobilize fishers. No adverse responses were noted after administration with the exception of one fisher that hyperventilated for several minutes, probably as a result of confinement and exposure to high ambient temperatures. Future studies should experiment with different ratios and dosages of KH-XH as well as the effects of antagonists, to maximize time efficiency in the field without sacrificing the health of the animals.

Material and logistical support was provided through the State University of New York College of Environmental Science and Forestry's Adirondack Ecological Center. I thank Cecily M. Costello for assisting in all aspects of field work. Mary-Kay W. Belant and three anonymous reviewers provided valuable suggestions for manuscript improvement.

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*Received for publication 2 August 1990.*

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