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# EFFECTIVENESS OF VICHOS NON-LETHAL COLLARS IN DETERRING COYOTE ATTACKS ON SHEEP

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**ABSTRACT:** Vichos non-lethal collars containing 45 to 105 ml of 3% capsicum oleo resin were evaluated as deterrents to coyote attacks on sheep. Each of five coyotes tested made neck/throat attacks on one collared lamb; four punctured collars and one pulled the collar from a lamb without puncturing it. One coyote did not resume biting the lamb for 60 min; it was retested two and four days later. At two days, the coyote punctured a second collar and briefly halted its attack. At four days, the coyote attacked a third collared lamb but made no attempt to grasp the neck/throat area. In tests resulting in collar punctures (n=5), coyotes immediately stopped their attacks and showed obvious signs of oral irritation; however, attack behavior resumed shortly thereafter (mean=17.6 min). Coyotes resuming attacks directed them toward the sides and rears of lambs. The Vichos collar is unlikely to prove effective in controlling coyote predation on sheep.

**KEY WORDS:** animal damage control, aversives, coyote, pen trial, predation, trigeminal

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## INTRODUCTION

When attacking livestock, coyotes (*Canis latrans*) typically bite the throat. For this reason, various collars have been designed (McBride 1974, 1982) and tested (Connolly 1980; Burns et al. 1988; Burns et al. 1996) as coyote control tools. One, the Livestock Protection Collar (LPC), is registered with the U.S. Environmental Protection Agency (Moore 1985) and used in several states (Connolly 1993). While the LPC is designed to kill coyotes by delivering a lethal oral dose of sodium monofluoroacetate (Compound 1080, Connolly and Burns 1990), it could also be used to deliver aversive or repellent substances (McBride 1974).

During development of the LPC, tests with repellents failed to identify promising aversive agents (Burns et al. 1984). This failure was consistent with the more general observation that aversive sensory stimuli do not curtail predation (Linhart 1984; Lehner 1987). Nevertheless, several studies have reported contrary results; there are data to suggest that some bitter chemicals (e.g., denatonium benzoate), irritants (e.g., capsaicin, cinnamaldehyde, creosol), and odorants (e.g., mercaptan) can deter predators (Botkin 1977; Faller 1975; Jankovsky et al. 1974; Lehner 1987; Lehner et al. 1976; Olsen and Lehner 1978; Shelton and Thompson unpublished, as cited in Lehner 1987; Swanson et al. 1975, 1976; Teranishi et al. 1981).

The Vichos anti-predator collar was developed in 1993. When punctured, the collar dispenses a formulation of 3% capsaicin oleo resin. Capsaicin is an effective irritant for most mammals, including all canids tested to date. Here, the results of an evaluation to determine whether Vichos collars deter attacks by captive coyotes on sheep are described.

## METHODS

Tests were conducted between January 9-14, 1995 at the Predator Research Site of the Denver Wildlife Research Center (DWRC), 12 km south of Logan, Utah.

During each test, one collared lamb was introduced into a 9,750 m<sup>2</sup> pen containing an adult coyote that had recently killed sheep and/or goats. Tests continued until five coyotes each made a neck/throat attack on a collared lamb and either killed the lamb without puncturing the collar or punctured a collar and showed some obvious reaction to the capsicum oleo resin that it contained. Coyotes that refrained from renewed attacks for 60 min after the initial collar puncture were tested twice more at two-day intervals. Coyote-lamb interactions were observed from a building overlooking the pens and salient information was recorded on prepared forms.

All animals were identified by uniquely numbered ear tags and kept in individually numbered kennels and pens. Animal care and handling were conducted under procedures approved by the Institutional Animal Care and Use Committee of the DWRC. Lambs severely wounded but not killed during coyote attacks were euthanized immediately, irrespective of test time constraints.

Before testing, sheep were collared, and coyotes and sheep were weighed on an electronic platform scale (Table 1). Vichos collars of various lengths were provided by Livestock Protection Products, Inc., Detroit, Michigan. Each collar contained a quantity of 3% capsicum oleo resin (Table 1). Collars were filled through valve stems, and a small bell was attached to the stems. The manufacturer wanted to explore whether the bell might act as a supplemental deterrent.

## RESULTS

All five coyotes attacked the neck/throat area of collared lambs. Four collars containing 45 to 105 ml of 3% capsicum oleo resin were penetrated during the attacks (Table 2). Coyotes that bit through collars reacted immediately by head shaking, mouth gaping, muzzle pawing and licking, muzzle rubbing in snow and grass, and snow eating. One coyote pulled the collar from a test lamb without puncturing the collar and then made a throat kill.

Table 1. Characteristics of coyotes, lambs, and Vichos non-lethal collars tested in January 1995.

Coyotes			Lambs			Collars		
Animal Number	Sex (M, F)	Weight (kg)	Animal Number	Sex (M, F)	Weight (kg)	Collar Number	Length (cm)	Amount, (ml)
5293	F	11.5	1	M	22.2	L-4	22.8	44
5345	M	13.1	5	F	22.9	L-6	22.8	44
5282	F	10.8	10	F	21.9	L-19	22.8	44
5150	M	13.2	12	F	22.7	L-23	22.8	44
5284 <sup>a</sup>	F	9.5	9	M	23.7	L-11	25.4	75
5284	(first retest)		7	M	32.5	E-1-A	30.5	85
5284	(second retest)		4	F	21.6	E-1	30.5	105
Mean Weight		11.6			23.9			

<sup>a</sup>Coyote was tested with two more collared lambs after being deterred from attack for 60 minutes in her first test.

<sup>b</sup>Amount of 3% oleo capsaisin formulation in each collar.

Table 2. Coyotes, test dates, and results of tests with Vichos non-lethal collars in January 1995.

Coyote Number	Test Date	Collar Punctured	Times (hr:min)		
			Collar Punctured <sup>a</sup>	Attack Resumed	Coyote Was Deterred
5293	9	yes	10:35	10:52	0:17
5345	9	no	---	---	---
5282	9	yes	15:23	15:29	0:06
5150	10	yes	10:06	10:07	0:01
5284 <sup>b</sup>	10	yes	13:37	14:37	1:00
5284	12	yes	10:22	10:26	0:04
5284	14	no	---	---	---

<sup>a</sup>Coyotes stopped attacks on collared sheep at time of collar punctures.

<sup>b</sup>Coyote was tested two more times after initial collar puncture deterred renewed biting attack for 60 minutes.

Coyotes that reacted to collar contents immediately stopped their attacks on lambs for a mean of 21.0 min (n=4, range=1-60 min) and then resumed their attacks (Table 2), usually at the sides and rear of the lamb. The single coyote that did not resume attack for 60 min was subsequently retested twice, at two day intervals. During the second test, the test lamb was immediately attacked at various locations and the collar was punctured. Attack was interrupted for 4 min. Including this result with the times of the other coyotes provided a mean latency of 17.6 min (n=5, range=1-60 min) for all tests with collar

punctures and deterred attacks. Two days later, after collar punctures, the coyote attacked a third collared lamb at the sides and rear, but made no attempt to grasp the neck/throat area. In this instance, and at three other times during the study, intervention in tests was necessary to euthanize lambs wounded by coyotes attacking from the sides and rear (presumably to avoid the capsicum-containing collar). It was evident that coyotes would have killed these sheep, but not with efficient throat-hold patterns.

## DISCUSSION AND MANAGEMENT IMPLICATIONS

Vichos collars briefly interrupted attacks on lambs, but coyote predation was not substantially deterred. This result is consistent with the general finding that sensory repellents do not stop predation by coyotes (Lehner 1987; Linhart 1984). It is worth noting that collars appeared to redirect attacks by coyotes away from the throat, resulting in less efficient killing than would have otherwise occurred.

It was concluded that the Vichos collar is not an effective tool for the control of coyote predation on sheep. More importantly, the Vichos collar appears to elicit predation that is more prolonged, and quite likely, more painful to prey than predation that would have occurred in the absence of the collar.

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