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ALPHA-CHLORALOSE IMMOBILIZATION OF ROCK DOVES IN OHIO

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ABSTRACT: To improve capture efficacy of rock doves (*Columba livia*) in nuisance situations, we reevaluated the effectiveness of three dosages (60, 120 and 180 mg/kg) of alpha-chloralose (AC). Responses to immobilization using 180 mg/kg AC also were compared in rock doves deprived of food for 16 hr and not food deprived. Mean (±SE) time to first effects (33 ± 2 min) and mean time to capture (94 ± 5 min) were significantly less for rock doves receiving 180 mg/kg than for rock doves receiving lower dosages (≥53 ± 3 min and ≥153 ± 17 min, respectively). Ten, 10, and eight rock doves immobilized with 60, 120, and 180 mg/kg AC recovered within 24 hr, respectively; all rock doves recovered within 29 hr. Although food-deprived rock doves showed effects of AC immobilization earlier than did rock doves with food, time to capture was similar between these two groups. For capturing rock doves, we recommend treating corn with 3 mg AC/kernel and using 180 mg/kg as the effective dose. This modified formulation and dosage should improve capture success of rock doves substantially and improve the ability to resolve nuisance rock dove problems.

Key words: Alpha-chloralose, capture efficacy, *Columba livia*, formulation, immobilization, rock dove.

INTRODUCTION

Alpha-chloralose is a chloral derivative of glucose which depresses the cortical centers of the brain but does not effect the medula (Borg, 1955; Crider and McDaniel, 1967). AC has been used as an anesthetic in laboratory animals since 1897 (Balis and Monroe, 1964). AC also has been used to capture numerous avian species including wild turkeys (*Meleagris gallopavo*) (Williams, 1966), marabou storks (*Leptotilos crumeniferus*) (Pomeroy and Woodford, 1976), American crows (*Corvus brachyrhynchos*) (Stouffer and Caccamise, 1991), waterfowl, American coots (*Fulica americana*), and rock doves (*Columba livia*) (Woronecki et al., 1992; Woronecki and Dolbeer, 1994).

Although AC has been used extensively as an avian capture agent, it was not registered for use to live-capture animals in the United States. However, after conducting laboratory and field trials, the U.S. Department of Agriculture's Wildlife Services (WS) program received approval from the U.S. Food and Drug Administration in 1992 to use AC to capture nuisance waterfowl, rock doves, and coots (Woronecki et al., 1990, 1992; Woronecki and Dolbeer, 1994). Presently, AC is available for use in the United States only by trained WS personnel or their designees. During 1994 and 1995, WS personnel used AC to capture 3,800 waterfowl, coots, and rock doves in nuisance situations in the United States (Belant et al., 1998).

Corn baits are prepared by adhering AC to whole-kernel corn with corn oil such that each kernel receives 1 mg AC (Woronecki et al., 1992). The technique generally used to capture nuisance rock doves is to place treated corn baits in an area where rock doves have been prebaited, such that each rock dove will receive the most effective dose of 60 mg/kg (Woronecki et al., 1992). However, overall capture success in rock dove removal projects conducted by WS personnel has been low (about 6%; Belant et al., 1998). We have received requests from WS personnel to develop a new formulation and/or dosage of AC for field use that will improve capture success of rock doves. Thus, our objective was to reevaluate the formulation

and dosage of AC recommended previously for rock doves.

MATERIALS AND METHODS

This study was conducted from May to June 1997. Rock doves were captured in northern Ohio and transported to the National Aeronautic and Space Administration's (NASA) Plum Brook Station (Erie County, Ohio; 41°20′N, 82°40′W). Rock doves were placed in group housing in 2.3 × 2.3 × 1.8-m cages with shade and provided water and food.

We obtained vials containing 2.04 g AC from the Pocatello Supply Depot (Pocatello, Idaho, USA). The AC contained 86.9% of the alpha isomer (S. Blom, Pocatello Supply Depot, unpubl. data).

On 28 May 1997, 30 rock doves were dosed using orally-administered AC-treated corn. Treated corn was prepared by initially mixing 3.06 g AC with 1,040 kernels of corn, then adding and mixing 5 ml of corn oil to adhere AC to the kernels. This mixture resulted in 3 mg of AC/kernel, three times the rate recommended by Woronecki et al. (1992).

Each of three groups of 10 rock doves was treated with a different AC dosage (about 60, 120, and 180 mg/kg) beginning at 0800 hr. The body mass (±5 g) of each rock dove was determined immediately before dosing. Based on mass and pre-determined dosages, we orally administered AC-treated corn to each rock dove to the nearest kernel. Corn was administered by holding each rock dove and placing each kernel in the posterior of the oral cavity. After dosing, rock doves were individually marked on a leg using surveying flagging and placed in groups of five in 2.3 × 2.3 × 1.8-m cages for observation.

Characterization of rock dove responses to AC immobilization followed Belant and Seamans (1997). Time to first effects was recorded as the interval (min) from bait administration to observations of AC-induced behavior (e.g., unnatural posture, slowly blinking eyes, relaxed wings, and poor motor abilities). Time to capture was recorded as the interval from bait administration to when rock doves appeared susceptible to capture by hand or with hand-held net (see Woronecki et al., 1992). Time to recovery was the interval from time to capture to when rock doves appeared able to escape capture by hand (see Martin, 1967; Woronecki et al., 1992). Rock doves were observed continuously until all were considered capturable. Rock doves then were monitored at 1 hr intervals until 1700 hr and periodically the following day beginning at 0800 hr until all birds had recovered. Thus, time to recovery was not known for many of the rock doves as they were not observed during a 15 hr period.

We used single-factor analysis of variance (Zar, 1984) to compare mean body mass, mean time to first effects, and mean time to capture among groups of rock doves receiving each of the three dosages. If significant differences ($P \leq 0.05$) were detected, we used Tukey tests to determine which means differed.

We conducted a second experiment to simulate field conditions and determine if rock doves baited with treated corn prior to feeding would be more susceptible to AC than would rock doves that had already fed. On 2 June 1997, we selected two groups of 10 rock doves from the previous experiment to determine if food deprivation affected their response to AC immobilization. One group of rock doves was deprived of food (but not water) for 16 hr immediately preceding the experiment; the remaining group had food available continuously until the experiment.

Each rock dove received AC-treated corn (about 180 mg/kg AC) on 3 June beginning at 0900 hr as described previously. All other procedures followed those described in the previous experiment. We used student t-tests (Zar, 1984) to compare mean body mass, mean time to first effects and mean time to capture between food-deprived rock doves and rock doves not food deprived.

RESULTS

Mean body mass of rock doves in the three dose groups was similar ($P = 0.52$, Table 1). Differences ($P < 0.01$) in time to first effect were observed. Rock doves receiving the high dose treatment of AC exhibited effects 20 min ($P < 0.05$) and 37 min ($P < 0.05$) before the medium and low dose treatments, respectively. Mean time to capture rock doves with the high dose was less ($P < 0.01$) than mean time to capture rock doves with low and medium doses. Mean time to capture rock doves receiving low and medium doses was similar ($P > 0.05$). One rock dove each in low and medium dose groups was not capturable. All rock doves recovered within 24 hr from the low and medium AC doses whereas 8 rock doves recovered within 24 hr from the high dose. All rock doves recovered within 29 hr.

Mean (±SE) body mass of food-deprived rock doves (306 ± 9 g) was less (t

TABLE 1. Dosages, body mass, and responses of rock doves (*Columba livia*) immobilized with orally-administered alpha-chloralose (AC)-treated corn (10 rock doves/treatment), May 1997, Erie County, Ohio (USA).

	AC Dose[a]								
	Low			Medium			High		
Parameter	Mean[b]	SE	Range	Mean[b]	SE	Range	Mean[b]	SE	Range
AC (mg/kg)	61.3	1.0	56.6–64.6	118.8	1.0	115.8–124.1	179.0	0.8	176.5–184.6
Body mass (g)[c]	328A	12	265–380	316A	11	280–385	334A	9	305–405
Time to first effects (min)[d]	70A	2	59–85	53B	3	43–64	33C	2	22–41
Time to capture (min)[e]	171A	12	124–232	153A	17	101–241	94B	5	69–124
Number recovered in 24 hr[f]	10			10			8		

[a] Low = 60 mg/kg, Medium = 120 mg/kg, High = 180 mg/kg.
[b] Means in a row with the same letter are not different (ANOVA or Tukey test, $P > 0.05$).
[c] $F = 0.67$; 2,27 df; $P = 0.52$.
[d] $F = 66.72$; 2,27 df; $P < 0.01$.
[e] $F = 11.25$; 2,25 df; $P < 0.01$. One rock dove each in low and medium dose groups was not capturable.
[f] All rock doves recovered within 29 hr.

= 2.09, 18 df, $P = 0.05$) than mean body mass of rock doves that were not food deprived (331 ± 7 g). Mean dosages for food-deprived (180.4 ± 1.0) and not food deprived (180.5 ± 1.0) rock doves were similar ($t = 0.02$, 18 df, $P = 0.98$). Time to first effects was also less ($t = 3.88$, 18 df, $P < 0.01$) for food-deprived rock doves (37 ± 4 min) than for rock doves not food-deprived (58 ± 3 min). There was no difference ($t = 1.20$, 18 df, $P = 0.24$) in time to capture for food-deprived (96 ± 5 min) and not food-deprived (105 ± 5 min) rock doves. Nine rock doves from each group recovered within 24 hr; all rock doves recovered within 28 hr.

DISCUSSION

Use of 3 mg AC per kernel and a 180 mg/kg dose (3 times the previously reported recommended formulation and dose) resulted in satisfactory immobilization and capture rates for rock doves, without resulting in mortality. The disparity between the most effective doses as determined in this study (180 mg/kg) versus in the study by Woronecki et al. (1992) (60 mg/kg) was likely a consequence of using different techniques to establish optimal doses. We used orally-administered AC-treated corn to determine the optimal dosage, similar to what is used by WS biologists in field capture operations, whereas Woronecki et al. (1992) used oil gavage. The crop of rock doves is used primarily for storage of food and allows for relatively constant amounts of food to be digested over time (Zeigler, 1976). Thus, AC-treated corn consumed would be stored initially in the crop and assimilated over a longer period of time in contrast to administration of AC via oil gavage, which would pass through the crop and be assimilated more rapidly. The low capture rate reported by WS biologists during field operations (6%, see Belant et al., 1998) was probably due to rock doves receiving sub-immobilizing doses of AC.

Although there was no difference in mean times to capture rock doves that were food deprived, whenever possible, we recommend conducting field operations in the morning before rock doves initially feed. Operations conducted at this time should increase bait consumption and increase the potential for rock doves to remain in the area until capturable.

The WS program may conduct additional research to expand the use of AC to other avian species such as blackbirds (Icter-

idae), house sparrows (*Passer domesticus*), and European starlings (*Sturnus vulgaris*). We recommend that future research to determine the most effective AC dosages for other species include experiments evaluating dosages with the bait that will be used in eventual field operations.

The ability of WS personnel to resolve nuisance rock dove problems has been low, primarily a consequence of low capture success (Belant et al., 1998). This improved formulation (3 mg AC/kernel) and dosage (180 mg/kg) should increase capture success of rock doves and improve the ability of WS biologists to resolve nuisance rock dove problems.

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