

Effects of Carbaryl on Body Weight and Fat Reserves of Dietetically-stressed Bobwhites

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Results from laboratory studies of pesticides are often used to predict impacts on wild animals. Few pesticidal studies involve stressed animals, yet under wild conditions, animals normally are exposed to continuous but variable environmental stresses. Wild bobwhites (*Colinus virginianus*) experience dietary stress in Kansas during spring (ROBEL, 1974), coincidental with extensive use of various pesticides on agricultural lands. If pesticidal contamination induces additional stress on wild bobwhites, such stress may significantly increase bobwhite mortality during the reproductive season. This study was conducted to measure effects of sublethal levels of carbaryl (a typical agricultural carbamate) on body weights and fat reserves of dietetically-stressed bobwhites. This report is contribution No. 1269-J, Division of Biology, Kansas State University, Manhattan, Kansas 66506. Financial support of the Kansas Agricultural Experiment Station and the National Science Foundation (Grant GB-16010) is acknowledged.

METHODS

Forty-five adult male bobwhites from a commercial game farm were confined individually in 38- x 22- x 13-cm cages with wire tops and bottoms and maintained under constant temperature (25°C), relative humidity (65%), and photoperiod (15L:9D). All birds received food and water ad libitum during a 21-day weight stabilization period and were weighed daily. After bird weights stabilized (less than 1% weight variation during 3 days), the birds were randomly assigned to five 9-bird groups and starved for five days to a mean group weight of 85% of their pre-starved, stabilized weight. One randomly selected 9-bird group was sacrificed at the end of the five days and analyzed for fat; the four remaining groups were placed on reduced rations (one uncontaminated, three carbaryl contaminated) for 15 days then sacrificed. Technical grade carbaryl was milled into the feed to provide dietary intakes of

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TABLE 1

Food consumption, actual carbaryl intake, body weights, and ether-extractable fat in carcasses of bobwhites fed indicated diets.

		Experimental Groups					
	Starved only ^a	Control		5 mg/kg diet		20 mg/kg diet	
		diet		diet		diet	35 mg/kg diet
Food Consumption (g)							
Days 1-5	--	8.97±0.49 ^b		8.96±0.68		9.14±0.14	9.11±0.15
Days 6-15	--	8.21±0.07		8.19±0.12		8.22±0.04	8.17±0.13
Actual Dosage (mg/kg)							
Days 1-5	--	0.00±0.00		4.67±0.49		19.39±1.44	33.01±2.07
Days 6-15	--	0.00±0.00		4.20±0.26		16.92±1.01	29.01±1.72
Body Weights (g)							
Stabilized	210.1±8.6	210.2±9.8		210.1±11.5		208.8±10.3	209.4±10.8
Starved	177.0±9.9	178.0±14.5		177.6±13.2		174.7±11.7	179.9±11.0
Terminal	--	190.4±11.5		188.2±11.2		190.4±10.1	191.9±10.9
Fat Content (% dry wgt.)	6.32±2.66	6.21±2.99		7.05±3.90		5.80±2.88	6.16±3.10

^a Starved group was sacrificed at the end of the 5-day starvation period.

^b Mean ± standard deviation.

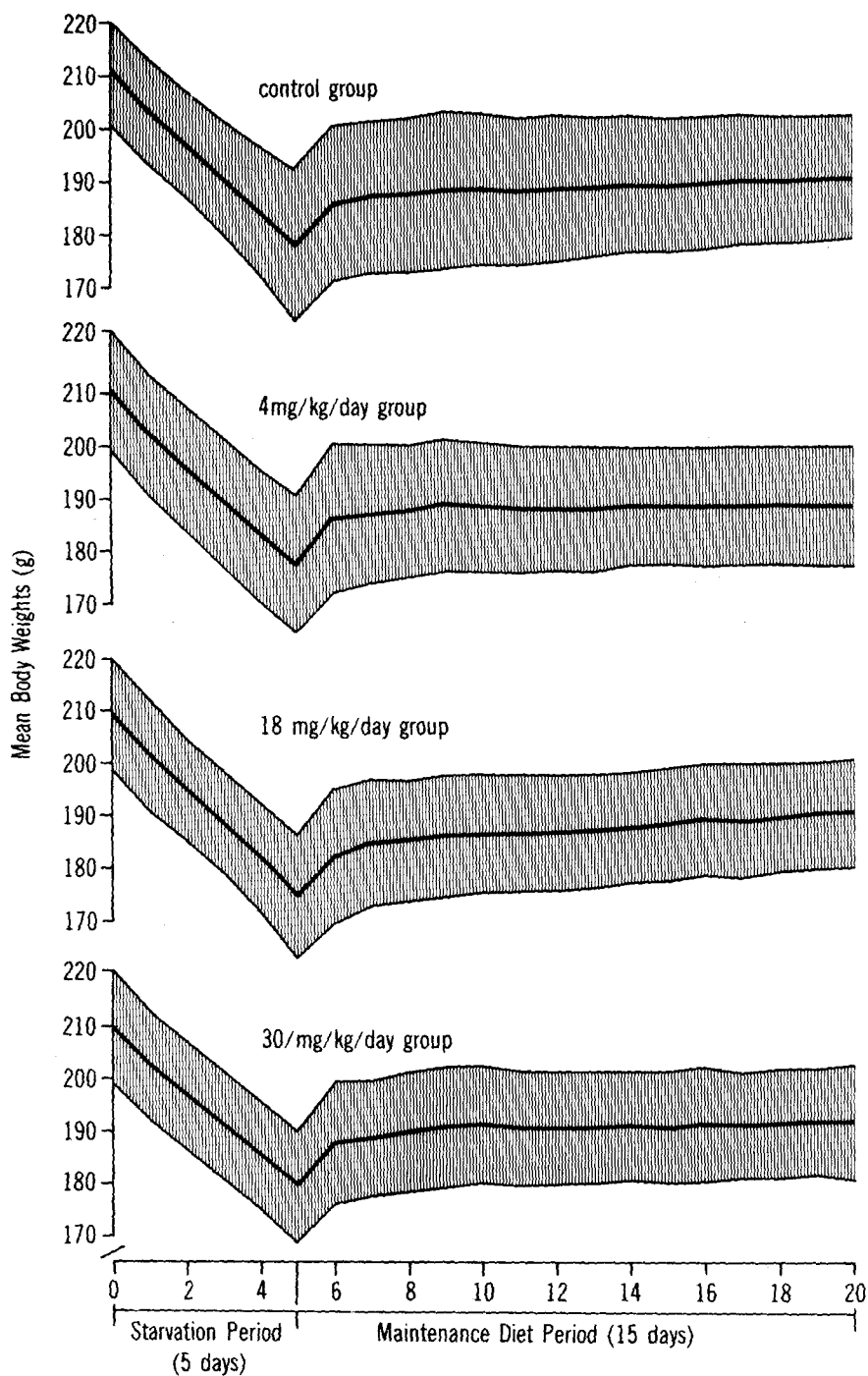


FIGURE 1. Weight changes of four 9-bird groups of bobwhites, from pre-starvation stabilized levels through starvation and 15 days on a maintenance diet. Solid lines represent means; shaded areas extend one standard deviation.

approximately 5, 20, and 35 mg/kg/day, potential levels of exposure under natural conditions in Kansas (SOLOMON, 1975).

Based on energetic studies of CASE and ROBEL (1974), a 9.3 g daily ration of P-18 (a balanced poultry mash) was chosen to maintain each experimental bird at its reduced weight. However, birds gained weight on that intake level so the daily ration was reduced to 8.3 g on day 5 of the experiment and continued at that level for the remaining 10 days.

Body fat reserves were determined in a Goldfisch extraction apparatus with anhydrous diethyl ether as a solvent. Duplicate samples of homogenized body tissue were analyzed as described by BEARDMORE and ROBEL (1976).

Fat data are presented as percentages of dry tissue weight. A one-way analysis of variance was used to analyze fat reserve data; a two-way analysis of variance to analyze body weight data.

RESULTS

After five days of starvation, experimental birds averaged 84.6% of their pre-starved weight (177.4 g vs 209.7 g). Their body fat content averaged 6.31%, approximately 42.2% of the 14.95% body fat content of wild bobwhites in Kansas (ROBEL, et al., 1972) and 52.1% of the 12.10% fat content of full weight hatchery bobwhites used previously in our studies (BEARDMORE and ROBEL, 1976). Carbaryl intake by dietetically-stressed bobwhites averaged 0, 4.4, 17.7, and 30.3 mg/kg/day (Table 1).

Data from bobwhites after 15 days on reduced rations showed that body fat reserves in those fed carbaryl contaminated feed did not differ significantly from fat reserves in bobwhites fed a noncontaminated maintenance diet. Likewise, fat reserves of the four groups of bobwhites fed maintenance diets for 15 days did not differ significantly from fat reserves in bobwhites immediately after five days of starvation.

Weight data from the four bobwhite groups on maintenance diets were almost identical (Figure 1). No significant differences were detected in rate of weight gain or in ending weights between bobwhites fed uncontaminated feed, or feed contaminated with one of three concentrations of carbaryl.

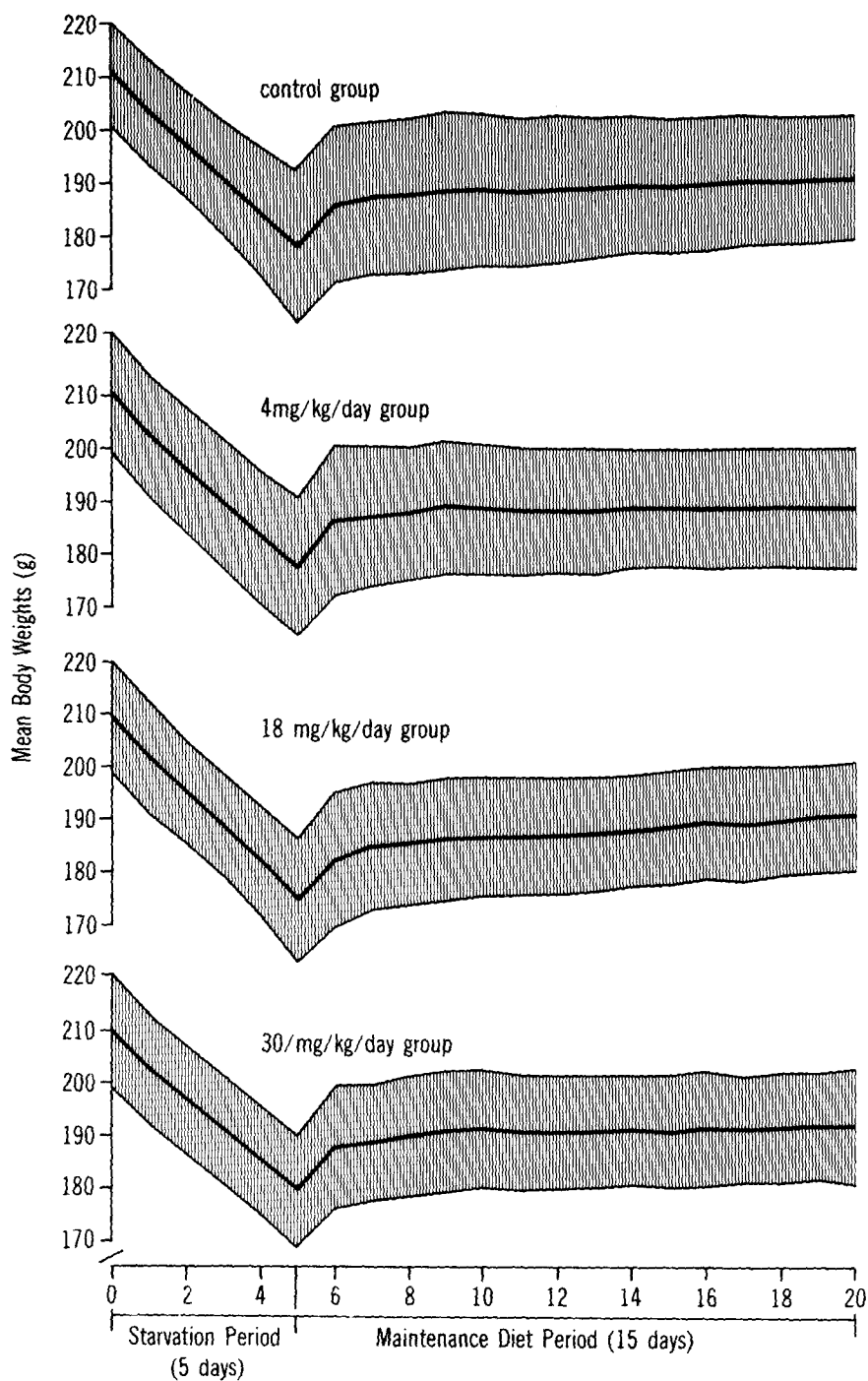


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CONCLUSIONS

Intake of 4, 18, and 30 mg/kg/day of carbaryl in a balanced maintenance ration over a 15-day period did not alter fat reserves or body weights of underweight adult male bobwhites.

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