SYNERGISM OF CARBON DIOXIDE AND CHICK AS BAIT FOR *CULEX NIGRIPALPUS*[1]

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During the course of routine mosquito collecting at the Encephalitis Research Center, it became important to know which attractant would provide the best bait for trapping large numbers of *Culex nigripalpus* Theobald, the primary vector of St. Louis encephalitis in the Tampa Bay area of Florida in 1962 (Chamberlain *et al.*, 1964; Dow *et al.*, 1964). Dr. W. C. Reeves suggested a comparison of traps baited with live animals and/or carbon dioxide, and an initial test comparing a chicken, carbon dioxide, and both attractants together was made in July and August, 1965.

MATERIALS AND METHODS. The test employed three portable mosquito bait traps (Bellamy and Reeves, 1952), each of which was operated a total of 12 nights in a freshwater swamp adjacent to a small lake in northwest Hillsborough County, Florida. To keep the traps pointing in the same direction each night, they were set on wooden stands in a cradle about 4 feet above the ground. The stands were in a north-south row, 42 feet apart. The traps were operated each night from 4:30 p.m. to 8:30 a.m.

The chicks used as bait were two pairs of white Leghorn cockerels, which were tested in their third and fourth weeks at the ages of 15 to 18 and 22 to 25 days. They were held in screened cages placed on the floor of the trap (Dow *et al.*, 1964) but were not otherwise restrained.

The carbon dioxide was produced by subliming dry ice in a 2-pound coffee can. The cylindrical can (about 16 cm. high and 12.5 cm. in diameter) was insulated inside with a layer of corrugated cardboard and outside with dish toweling. It was charged with 3.5 pounds of crushed dry ice (a mixture of coarse powder and lumps of various sizes). A small hole in the plastic cover permitted the gas to escape. The trap which was baited with carbon dioxide alone was operated with the CO_2 dispenser resting on its side on the floor of the trap. The trap with both attractants had the chick cage inside and the CO_2 dispenser fastened in a horizontal position on the top of the trap. Each chick was used with the same trap for all 6 test nights, and each bait cage and dry ice container was used with the same trap throughout the test.

The traps and their associated attractants were assigned to the stands in the swamp at random. Their position was changed each night according to a 3 x 3 Latin square design so that in the course of the first 3 nights, each trap was operated at each site, and in the next 9 nights of the test, the same design was repeated three times. In order to prevent the accumulation of odor-producing substances, all of the bait traps and chick cages were thoroughly washed with soap and water after each use.

RESULTS. The test was conducted successfully each night. None of the chicks had to be replaced, and some dry ice was always left when the traps were picked up in the morning. *Culex nigripalpus*, represented entirely by females, was the most abundant species in the traps, and the collections are analyzed on the basis of this species (Table 1). The trap operated with a chicken and carbon dioxide has caught (a) the largest total of *C. nigripalpus* (11,161), (b) the largest number of *C. nigripalpus* (1,560) in a single trap-night, and (c) on 11 of the 12 test nights,

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TABLE 1.—*Culex nigripalpus* caught in traps with different baits.

Date (traps set on day preceding)		Chick	Carbon dioxide	Chick and carbon dioxide
July	14	137	26	510
	15	28	126	377
	16	18	168	323
		184	320	1,210
July	21	265	182	1,278
	22	320	176	1,489
	23	147	339	1,476
		732	697	4,243
August	18	144	627	863
	19	32	634	1,163
	20	84	490	1,560
		260	1,751	3,586
August	25	241	349	338
	26	220	458	734
	27	57	237	1,050
		518	1,044	2,122
Totals for each bait		1,694	3,812	11,161

more *C. nigripalpus* than either of the traps with a single bait. The average number of *C. nigripalpus* per trap-night was 930 in the double-baited trap, more than twice the combined averages of the trap baited with a chick (141) and the trap baited with carbon dioxide (318). On 3 of the 12 test nights, the chick-baited trap caught more than the one baited with carbon dioxide.

Two-way analysis of variance performed with the trap catches converted to logarithms showed that baits were a highly significant source of variation. Trap sites, as well as individual trap nights, were of no importance. When trap nights as a source of variation were divided by weeks and nights within weeks, the difference between weeks proved to be significant.

The weekly ratio of *C. nigripalpus* in the chick- and CO_2-baited traps shows an increase in favor of the chick-baited trap in the second week that each pair of chicks was tested. This shift in ratio may be the result of increased attractiveness of the chick in its fourth week, although it was not found statistically significant under the circumstances of this test.

SUMMARY. Mosquito traps baited with a chick, carbon dioxide, or both attractants combined were tested for 12 nights in an area with abundant *Culex nigripalpus*. The average catches showed that the attractants used together were more than twice as effective as each used separately, and therefore synergistic.

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