Development of a Strain of Houseflies Resistant to DDT[1]

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Since DDT is being widely used on a great variety of insect pests, and since it is much superior to the older insecticides for the control of houseflies, tests were made at the Orlando, Florida, laboratory of the Bureau of Entomology and Plant Quarantine to determine whether the extensive use of this chemical on several generations of houseflies would eventually produce flies that were resistant or tolerant to DDT. The results of these tests are reported in this paper.

TABLE 1

PER CENT MORTALITY IN 24 HRS OF THE 14TH GENERATION OF SPECIAL AND REGULAR-STOCK HOUSEFLIES EXPOSED TO A DDT FINE-MIST SPRAY

Test No.	4-Day-old flies		5-Day-old flies	
	Regular stock	Special stock	Regular stock	Special stock
1	69	38	75	52
2	77	22	78	41
3	65	41	76	35
4	87	19	51	42
5	49	17	67	52
6	66	37	70	35
7	78	41	68	30
8	55	19	70	26
Average	68	29	69	39

Quayle (*4*) reported on the resistance of California red scale (*Aonidiella aurantii* (Mask.)) in California to fumigation with hydrocyanic acid gas. Hough (*1*) discovered that some strains of codling moth (*Carpocapsa pomonella* (L.)) were resistant to arsenicals and other insecticides. Knipling (*2*) found that larvae of the primary screw-worm (*Cochliomyia*) *Callitroga americana* (C. & P.)) developed a high degree of resistance to phenothiazine when reared repeatedly on media containing this chemical. Smith (*5*) discussed at length the problems of acquired resistance and racial segregation in insect populations.

In the tests at Orlando approximately 300 houseflies from the regular laboratory colony were exposed to a DDT fine-mist spray in a 100-cu ft chamber described by Lindquist and Madden (*3*). One ml of a 1% DDT-kerosene spray was discharged into this chamber, and the flies were exposed for 2 min, the initial exposure being made on January 30, 1946. About 10% of the flies survived, and these were used as the parent stock in establishing a new special colony. Each of 14 generations of flies was similarly exposed to DDT, and the survivors were placed in clean cages and allowed to propagate. The special flies were reared under the same conditions and provided the same type of food as the regular colony.

After the third generation, 4-day-old flies from the regular colony and from the special stock were exposed to the mist spray at the same time. In this test, as well as in comparative tests with succeeding generations, the survival of the special flies was greater than that of the flies from the regular stock. However, the percentage varied somewhat from generation to generation. An increased quantity of DDT was required to kill 90–95% of the special flies.

The results of a series of tests with the 14th generation are shown in Table 1. The average mortality in 16 paired tests with approximately 1,600 4- and 5-day-old flies was 69% for the regular stock and 34% for the special flies. These data show that selective breeding produced a strain of flies that was more resistant to DDT spray than were flies from the regular stock.

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Susceptibility of DDT-resistant Houseflies to Other Insecticidal Sprays[1]

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Lindquist and Wilson (*3*) have described the development of a special strain of houseflies (*Musca domestica* L.) that was comparatively resistant to DDT space sprays. This strain was developed by rearing for a number of generations the progeny of individuals that recovered from the effects of DDT sprays. Since Quayle (*4*) observed that red scales which had developed resistance to hydrocyanic acid were difficult to kill with methyl bromide, ethylene oxide, and oil, and Hough (*1*), during the course of his work with arsenical-resistant codling moths, found that these strains were less susceptible to other insecticides also, the question arose as to the susceptibility of the new strain of houseflies to insecticidal sprays other than DDT.

To determine whether the resistance observed by Lindquist and Wilson was specific for DDT, a large series of paired tests was conducted in which 5 insecticides, in addition to DDT, were tested as space sprays against the 15th, 16th, and 17th generations of this special stock of flies in comparison with flies from the regular colony. Both strains had been reared by the same technique. The 5 insecticides used were technical chlordane, rote-

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