of 60–90° F. At temperatures above 85° many progeny die before reaching the adult stage.

Sex in *O. submetallicus* is dependent on temperature, and 85° is critical for sex determination. At 84° or lower, lines consist almost entirely of females; at 85°, lines cease in 2–5 generations with the sole production of males and gynandromorphs; and at 86° or higher, lines cease in the second generation similarly.

Sex is determined by the temperature to which the parent is subjected prior to deposition of the eggs concerned: it is not affected by the temperatures to which the deposited eggs are subjected. The period of parental life in which exposure to temperature determines sex of progeny includes the developmental period prior to emergence and the oviposition period after emergence. The sex of eggs deposited during the first few days of adult life is determined by the temperature to which the parent was exposed before emergence, and, as many eggs are deposited during these days, pre-emergence temperatures have an important effect on sex ratio.

The sex of the progeny laid after the first few days of adult life may be largely determined by the temperature experienced by the parent after emergence. There is a time-lag between an alteration in the temperature to which a parent is exposed and the consequent change in the sex of the progeny deposited. The rapidity of the change differs according to whether the alteration is from female-producing to male-producing temperatures, or vice versa. It appears that male-producing temperatures in the developmental period of the parent produce more profound or persistent effects on the sex of progeny than do female-producing temperatures.

The gynandromorphs arise when a parent is exposed, evidently at a critical stage of egg development, first to female-producing and then to male-producing temperatures. Variability in the degree of maleness is probably a function of the time in egg development at which this change takes place. Ability to reproduce is retained only by gynandromorphs showing slight signs of maleness.

Though males are normally rare, and gynandromorphs extremely rare, both can be produced in large numbers, or to the exclusion of females, by temperature manipulation.

The experimental data, which will be published elsewhere, appear to constitute the first proof of temperature determination of sex in any uniparental hymenopteran.

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Selection for High-Order Resistance to 'Dieldrin' in *Lucilia cuprina* Wied.

HOMOZYGOUSLY DDT-resistant strains of *Musca domestica*¹ and 'Dieldrin'-resistant strains of *Anopheles gambiae*² have been developed in a single generation by the application of discriminating dosages which are lethal to susceptible and hybrid phenotypes in heterogeneously resistant strains of these insects. Selection experiments with chlordane on *Musca domestica* also imply that pure resistant lines follow

one generation of selection with heterogeneous resistant strains³.

Strains of *Lucilia cuprina*, free from both susceptible and hybrid phenotypes, may also be obtained with one generation of selection from partially resistant strains, providing the parent family lines contain a proportion, no matter how small, of males and females, which tolerate the high male and female discriminating dosages, established in the course of genetical experiments on the inheritance of resistance in this blowfly⁴.

The selection procedure, employed during the past year, is as follows: Flies from heterogeneous strains are allowed to emerge from batches of pupae on the first day into colony cages, after which the larger unhatched pupae are isolated. Female flies mainly hatch from the segregated pupae on the second day and are supplied with sugar, water and sliced liver.

When the male flies of the first day hatching are approximately 12 hr. old, the high male discriminating dose (2 µgm. of 'Dieldrin' per fly) is applied and surviving males at the conclusion of the holding period of 24 hr. are mated to the virgin female flies, which have hatched overnight. The female high discriminating dose (4 µgm. of 'Dieldrin' per fly) is applied to the female flies, 3–5 days from emergence. Male and female progeny from the selection tolerate their respective high discriminating doses, without mortality.

A further observation has been made in regard to this selection procedure with *Lucilia cuprina*. The progeny of parents, found by means of applying the high discriminating doses, tolerate significantly larger amounts of 'Dieldrin' than the parents. Is this merely vigour tolerance? For example, a strain in which considerable reversion towards susceptibility had occurred by the tenth generation contained no male or female flies able to tolerate 10 µgm. of 'Dieldrin' per fly. Five female and three male flies from this reverted strain survived their respective high discriminating doses. The male and female progeny from the parents not only tolerated the high discriminating dosages of 2 and 4 µgm. of 'Dieldrin' per fly, respectively, with complete survival, but, in addition, female flies were able to withstand 10 µgm. of 'Dieldrin' per fly, again with nil mortality. Inconsistent survival occurs with male flies at this dosage-level following a single generation selection, but 50–75 per cent survival often results with male flies.

A full account of both observations in connexion with the development of high-order resistance to 'Dieldrin' in *Lucilia cuprina* will be published elsewhere in conjunction with reversion data on selected strains. In regard to reversion of resistant strains, initial experiments have shown that during the process of reversion towards susceptibility the lower limit of tolerance to 'Dieldrin' of successive generations of a strain, developed by means of one-generation selection, progressively approaches the high discriminating dose-levels. Once hybrid flies appear, usually by the sixth generation, susceptible flies are diagnosable in subsequent generations.

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⁴ Shanahan, G. J., *Nature* (in the press).