# EFFECT ON HOUSE FLIES OF EXPOSURE TO RESIDUAL APPLICATIONS OF CHEMOSTERILANTS

D. W. MEIFERT, R. L. FYE, AND G. C. LABRECQUE
Entomology Research Division, Agric. Res. Serv., U. S. D. A.

Sexual sterilization by chemicals as a means for the reduction or eradication of an insect species has been suggested by Knipling (1959, 1960) and Lindquist (1961 a, b). Initial field experiments, conducted in Florida, demonstrated that marked reductions in populations of house flies (*Musca domestica* L.) could be achieved with a bait containing a chemosterilant (LaBrecque *et al.*, 1962). Although the results with baits showed promise for this method of application, additional methods of presenting the chemosterilants to the insects would greatly improve the versatility of the sterilization technique. Investigations were therefore made to determine the effectiveness of residual applications of apholate, tepa, 5-fluoroorotic acid, and metepa in producing sterility in house flies.

The chemosterilants in methanol were applied to the inner surfaces (bottom and sides) of pint mason jars at the rate of 10, 25, 50, 100, and 250 mg./sq. ft. To obtain an even coating, 2.5 ml. of solutions of the desired concentration was placed in the jar, and the jar was rotated so the solution washed over its entire inner surface. Rotation was continued until the solvent evaporated. Jars treated with 2.5 ml. of methanol alone served as checks. Twenty-four hours later five males or females less than two hours old were introduced into each of the jars. The mouths of the jars were then covered with organdy cloth treated with repellent M-2020 to prevent the flies from resting on this surface. The jars were kept in an upright position during exposure periods of 2, 3, or 4 hours. After exposure the flies were allowed to escape into cages containing food and water, and 24 hours later five virgin flies of the opposite sex were introduced. Oviposition medium was made available at regular intervals throughout the next 26 days. Each lot of medium was inspected frequently for eggs and the fertility of any eggs observed was determined by the subsequent presence of larvae. The jars were aged with the organdy cloth covers and retested after 14, 30, and 60 days. The results are given in Table 1.

Sterility of house flies can be acquired through tarsal contact with a chemosterilant. The 250-mg. deposit of tepa was effective in sterilizing both sexes of flies at all exposure periods after aging for 30 days but was not effective after 60 days. The 100-mg. deposit sterilized the males for at least 14 days (30 days in one test) at all exposure periods and was effective after 1, 14, and 30 days in sterilizing most of the females at all exposure periods. The 50-mg. deposit was effective in sterilizing the males after 14 days of aging at exposure periods of three or four hours and after one day at two hours, whereas most of the females were sterilized after three or four hours' exposure to the 50-mg. deposit but were not affected after the two-hour exposure. The deposits of 25 and 10 mg. were not consistently effective with the males but the 25-mg. deposit sterilized the females after one day of aging at all exposure periods but had no effect thereafter. The 10-mg. deposit was not effective. The metepa deposits of 250 and 100 mg. were effective in sterilizing the males at all exposure periods after 30 days

TABLE 1.—EFFECT ON HOUSE FLIES OF EXPOSURE FOR VARIOUS PERIODS OF TIME TO RESIDUES OF TEPA AND METEPA ON GLASS. (V = SOME VIABLE EGGS DEPOSITED; NV = NO VIABLE EGGS DEPOSITED; NO = NO OVIPOSITION; AND M = 100% MORTALITY.

| Chemical | Residue (mg./sq. ft.) | Exposure period (hours) | Age of residue (days) | Egg deposition and viability at indicated age (days) when the sex exposed to the residue was— | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Male | | | Female | | |
| | | | | 7-8 | 10-17 | 21-26 | 7-8 | 10-17 | 21-26 |
| Tepa | 250 | 4 | 1 | NV | NV | NV | NO | NO | NO |
| | | | 14 | NV | M | — | NO | NO | NO |
| | | | 30 | NV | NV | M | NO | NO | NO |
| | | | 60 | V | — | — | V | — | — |
| | | 3 | 1 | NV | NV | NO | NO | NO | NO |
| | | | 14 | NV | NV | M | NO | NO | NO |
| | | | 30 | NV | NV | M | NO | NO | NO |
| | | | 60 | V | — | — | V | — | — |
| | | 2 | 1 | NV | NV | NO | NO | NO | NO |
| | | | 14 | NV | NV | M | NO | NO | NO |
| | | | 30 | NV | M | — | NO | NO | NO |
| | | | 60 | V | — | — | V | — | — |
| | 100 | 4 | 1 | NV | NV | NO | NO | NO | NO |
| | | | 14 | NV | M | — | NV | NO | NO |
| | | | 30 | V | NO | — | NO | NO | NO |
| | | | 60 | V | — | — | V | — | — |

Table 1.—Continued.

| Chemical | Residue (mg./ sq. ft.) | Exposure period (hours) | Age of residue (days) | Egg deposition and viability at indicated age (days) when the sex exposed to the residue was— | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Male | | | Female | | |
| | | | | 7-8 | 10-17 | 21-26 | 7-8 | 10-17 | 21-26 |
| Tepa | 100 | 3 | 1 | NV | NV | NV | NO | NO | NO |
| | | | 14 | NV | NV | M | NV | NO | NO |
| | | | 30 | NV | NV | M | NO | NO | NO |
| | | | 60 | V | — | — | V | — | — |
| | | 2 | 1 | NV | NV | NV | NV | NO | NO |
| | | | 14 | NV | NV | M | V | NO | NO |
| | | | 30 | V | V | — | NO | NO | NO |
| | | | 60 | — | — | — | V | — | — |
| | 50 | 4 | 1 | NV | NV | NV | NO | NO | NO |
| | | | 14 | NV | NV | M | V | NO | NO |
| | | | 30 | V | V | — | NO | NO | NO |
| | | | 60 | — | — | — | V | — | — |
| | | 3 | 1 | NV | NV | NV | NO | NO | NO |
| | | | 14 | NV | NV | M | NO | NO | NO |
| | | | 30 | V | V | — | NO | NO | NO |
| | | | 60 | — | — | — | V | — | — |
| | | 2 | 1 | NV | NV | NV | V | V | NO |
| | | | 14 | V | V | — | V | NO | NO |
| | | | 30 | V | V | — | V | NO | NO |

Table 1.—Continued.

| Chemical | Residue (mg./ sq. ft.) | Exposure period (hours) | Age of residue (days) | Egg deposition and viability at indicated age (days) when the sex exposed to the residue was— | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Male | | | Female | | |
| | | | | 7-8 | 10-17 | 21-26 | 7-8 | 10-17 | 21-26 |
| Tepa | 25 | 4 | 1 | NV | V | — | NO | NO | NO |
| | | | 14 | V | V | — | V | NO | NO |
| | | | 30 | — | — | — | V | V | V |
| | | 3 | 1 | V | V | V | NO | NO | NO |
| | | | 14 | V | NO | — | V | V | NO |
| | | 2 | 1 | V | V | — | NO | NO | NO |
| | | | 14 | V | V | — | V | NO | NO |
| | | | 30 | — | — | — | V | NO | V |
| | 10 | 4 | 1 | NV | NV | M | V | V | NO |
| | | | 14 | V | V | — | V | V | NO |
| | | 3 | 1 | NV | V | V | V | V | V |
| | | 2 | 1 | V | V | — | V | NO | NO |
| Metepa | 250 | 4 | 1 | M | — | — | M | — | — |
| | | | 14 | NO | NV | NV | NO | NO | NO |
| | | | 30 | NV | NV | NV | NO | NO | NO |
| | | | 60 | V | — | — | V | — | — |

Table 1.—Continued.

| Chemical | Residue (mg./ sq. ft.) | Exposure period (hours) | Age of residue (days) | Egg deposition and viability at indicated age (days) when the sex exposed to the residue was— | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Male | | | Female | | |
| | | | | 7-8 | 10-17 | 21-26 | 7-8 | 10-17 | 21-26 |
| Metepa | 250 | 3 | 1 | M | — | — | M | — | — |
| | | | 14 | NV | NV | NV | V | NO | NO |
| | | | 30 | NV | NV | NV | NO | V | NO |
| | | | 60 | NV | NV | NV | V | — | — |
| | | 2 | 1 | M | — | — | M | — | — |
| | | | 14 | NV | NV | NV | NO | NO | NO |
| | | | 30 | NV | NV | NV | NO | NO | NO |
| | | | 60 | NV | V | — | NO | NO | NO |
| | 100 | 4 | 1 | NV | NV | NO | M | — | — |
| | | | 14 | NV | NV | NV | V | NV | NO |
| | | | 30 | NV | NV | NV | NO | NO | V |
| | | | 60 | V | V | — | — | — | — |
| | | 3 | 1 | NV | NV | NV | M | — | — |
| | | | 14 | NO | NV | NV | V | V | NO |
| | | | 30 | NO | NV | NV | V | NO | NO |
| | | | 60 | V | — | — | — | — | — |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | Male | | | Female | | |
| | | | | 7-8 | 10-17 | 21-26 | 7-8 | 10-17 | 21-26 |
| Metepa | 100 | 2 | 1 | NV | NO | M | NO | NO | NO |
| | | | 14 | NV | NV | NV | NO | NO | NO |
| | | | 30 | NV | NV | NV | V | V | NO |
| | | | 60 | V | — | — | — | — | — |
| | 50 | 4 | 1 | M | — | — | NO | NO | NO |
| | | | 14 | NV | M | — | V | NO | NO |
| | | | 30 | NV | NV | NV | V | V | NO |
| | | | 60 | V | — | — | — | — | — |
| | | 3 | 1 | NV | NV | NV | NO | NO | NO |
| | | | 14 | NV | NV | V | V | NO | NO |
| | | | 30 | NV | NV | NV | V | V | NO |
| | | | 60 | V | — | — | — | — | — |
| | | 2 | 1 | NO | NO | M | NO | NO | NO |
| | | | 14 | NV | NV | NV | V | V | V |
| | | | 30 | V | M | — | V | V | NO |
| | 25 | 4 | 1 | NV | NV | NV | NO | NO | NO |
| | | | 14 | NV | NV | NV | V | NO | NO |
| | | | 30 | V | V | NO | V | V | NO |

Table 1.—Continued.

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|---|---|---|---|---|---|---|---|---|---|
| | | | | Male | | | Female | | |
| | | | | 7-8 | 10-17 | 21-26 | 7-8 | 10-17 | 21-26 |
| Metepa | 25 | 3 | 1 | NV | NV | NV | NO | NO | NO |
| | | | 14 | NV | NV | NV | V | V | V |
| | | | 30 | NV | NV | V | NO | V | NO |
| | | 2 | 1 | NV | NV | NV | NO | NO | NO |
| | | | 14 | V | V | V | V | V | V |
| | 10 | 4 | 1 | NV | NV | NV | V | V | V |
| | | | 14 | V | V | NV | V | V | NO |
| | | 3 | 1 | NV | NV | NV | V | V | V |
| | | | 14 | V | V | V | V | V | NO |
| | | 2 | 1 | NV | NV | NV | V | V | V |
| | | | 14 | V | V | V | V | V | V |
| None | — | 4 | 1 | V | V | NO | V | V | V |
| | | | 14 | V | V | V | V | V | NO |
| | | | 30 | V | V | — | NO | V | V |
| | | | 60 | V | — | — | V | — | — |
| | | | 1 | V | V | V | V | V | V |
| | | | 14 | V | V | V | V | V | V |
| | | | 30 | V | V | V | V | V | NO |
| | | | 60 | V | V | V | V | — | — |

and ineffective after 60 days, except the 250-mg. deposit at the three-hour exposure. These deposits were toxic to the females after one day of aging and sterility was not consistent thereafter. The 50-mg. deposit sterilized the males for 30 days at exposure periods of three or four hours and for 14 days at two hours. The 25-mg. deposit was effective for 14 days at exposure periods of three or four hours and for one day at two hours. The deposit of 10 mg. was effective for one day at all exposure periods but not effective thereafter. The 50- and 25-mg. deposits sterilized the females after one day but had no effect after aging. The ten-mg. deposit was not effective. Apholate and 5-fluoroorotic acid, when applied at dosages ranging between 10 and 250 mg./sq. ft. with exposure periods of two, three, or four hours, were not effective.

## Summary

House flies were sterilized by tarsal contact with residues of tepa and metepa but not apholate or 5-fluoroorotic acid on glass surfaces.

## Literature Cited

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