

## CONTRIBUTED ARTICLES.

## THE HOUSE FLY. \*

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*(Continued from page 103.)*

## PART II.

THE house-fly is absolutely useless to man. It is a greater disease-carrier than any other insect known. It may and does carry disease germs on its person by resting on infected matter, *e.g.*, fæces and pus, and then visiting human food or some wound or raw surface; it may also convey disease by vomiting upon substances like sugar; but its chief mode of carrying infection is by means of its constant evacuations while feeding for the disease germs and ova are not destroyed by its digestion. The germs and ova proved to be conveyed in this way are the germs of bacillary dysentery, the resting stage (cysts) of *entamoeba histolytica* (amoetic dysentery) and of *Lambia intestinalis* (supposed to be a cause of diarrhoea) the ova of *Ankylostoma duodenale*, of *Tacnia saginata*, *Trichuris trichiura*, *Heterophyes*, and *Schistosoma mansoni*. It is also known to be the carrier of typhoid, cholera, trachoma, and infantile diarrhoea and has been proved to convey leprosy from a leper to a healthy person through the medium of a wound or raw surface.

General sanitary measures for (1) preventing the access of flies to material upon which they feed and in which they deposit their ova, *e.g.*, covered ash-bins, water closets, street cleaning, drain flushing, etc.; and (2) for frequent removal and incineration of refuse have been chiefly instrumental in producing the very great freedom from the pest in Great Britain. The following epitome of various means of destruction of eggs, maggots, pupæ, and fully developed insects ought to be of some use in India:—

Chloride of lime is utterly useless for preventing the laying of eggs or for destroying the house-fly in any stage of its existence, in any material whatsoever. Burial of horse-manure or fæces once eggs have been laid in it will not prevent breeding.

Barn-door fowls will feed on maggots but their effect in diminishing flies is inappreciable.

The great destroyer of maggots are sunlight, heat (they are speedily killed at 114·8° F.) and the absence of the necessary moisture. Lt.-Col. Copeman has shown that the temperature four inches below the surface of a close-packed heap of fresh stall manure will rapidly rise to 169° F. owing to fermentation.

\* Major E. E. Austin, D.S.O., Assistant in the Department of Entomology in the British Museum, is the Authority for most of the facts recorded in this article.

*I. Prevention of breeding in horse-manure.*

1. Incineration within 24 hours—thoroughly efficient but destroys manureal value.

2. Close packing (Lt.-Col. Copeman's method), the maggots are killed by the high temperature generated by fermentation. It does not interfere with the value as a manure.

Select a patch of hard level ground 3 or 4 feet larger all round than the intended dump. Press and pat the manure down with a shovel into a compact rectangular block with sloping sides adding a little water during the process in dry weather. Each day's load is dumped on the top of the heap and similarly treated. In England this has been tested and found efficient. Lest it fail in the tropics it is advised that any portion of a dump in which maggots are seen should be covered with sacking soaked in paraffin oil. This soaking should be left on for a week when it may be used on another dump.

3. Turning over the surface.—Laborious but effective agricultural value unaffected.

The dump is prepared as above and on the day after deposition and two following days the surface is turned over with a spade to a depth of about six inches so as to expose any maggots that may be present to the heat and gases of fermentation deeper down which kills them instantly.

4. 'Spreading' only suitable for hot dry climates—agricultural value destroyed.

The ground selected should be hard or raked over to avoid holes and hollows and the spreading should be done by horizontal semi-circular sweeps from a spade. The layer of manure should be uniform, not more than an inch deep, and should be raked over thoroughly the same afternoon and on the two following days.

5. Collect and burn egg masses. Not suitable for extensive use in civil life in India.

6. Trapping adult maggots with Major Marett's trap—not suitable for extensive use in civil life in India.

7. Most substances fatal to maggots or eggs are expensive or poisonous except borax and hellebore.

(a) Borax. Destroys the eggs but not the larvæ which go on to full development. The resulting pupæ are, however, malformed and a very large percentage never hatch out into flies. The manure can be used on land in the proportion of fifteen tons to an acre if the quantities given below are used, but larger quantities of borax are injurious to crops.

A watery solution of half a pound to three gallons for every nine cubic feet of manure is sprayed on with a sprayer or watering-can, the stuff being turned over with a fork during the process.

(b) Powdered hellebore (*Viratrum allum* and *v. riride*) root when used as directed below kills 95·5 per cent. of the maggots and is not harmful to fowls or crops but its effect on eggs and pupæ is unknown.

Half a pound of powder is mixed with ten gallons of water, allowed to stand for several hours and sprayed as described for borax through every ten cubic feet of manure.

## II. *Prevention of breeding in kitchen refuse.*

1. Use thoroughly fly-proof bins and incinerate the refuse which should be collected every day.

2. Where dumping is unavoidable the dumping ground should not be less than a mile and a half from the nearest dwelling and borax should be used in the manner indicated.

3. Where burying is unavoidable each day's deposit in the pit should be immediately covered completely with soil or sand to such an extent as to prevent soakage to the surface and when finally filled in it should be sealed with hessian or close-meshed sacking, or stout paper free from holes, or both, the paper being beneath the canvass. It should extend  $2\frac{1}{2}$  to 3 feet beyond the pit, should be covered in by 4 inches of sand or soil and its outer six inches should be tucked vertically downwards into the ground. This acts as an effectual trap for both maggots and any flies that may hatch out from pupæ beneath the covering.

## III. *Prevention of breeding in human fæces.*

This is a question of extreme importance in India where, as used to be and probably still is the case, in places like Poona, human fæces form the chief source of an annual plague of flies, the breeding grounds being pudrette dépôts, filthy private conveniences, and night soil trenches.

The only remedy is a radical change in the methods of sewage disposal. The abolition of the abominations referred to and the use of latrines of the "fly-proof bucket" type or of water closets and disposal by incineration of septic tanks.

## IV. *Methods of destroying house-flies.*

1. Traps of various kinds.

2. Tanglefoot (five parts castor oil and eight parts resin heated together till the latter dissolves) used to coat paper, wires, woodwork, etc.

3. Poisons.

(a) Formalin—Two tea-spoonsful of commercial formalin (40 per cent.), two heaped up table-spoonsful of sugar, and a pint of lime-water. Place the fluid in plates or trays with cubes of bread or pads of lint or cotton wool to act as alighting places.

Formalin is a poison to human beings.

(b) Sodium Arsenite—1 gramme sodium arsenite, and two heaped up tea-spoonsful of sugar, to  $3\frac{1}{2}$  ounces of boiling water—may be used in the same way as formalin, the pads when dry being moistened with water and used again. Sodium arsenite is a deadly poison to human beings.

(c) Pyrethrum powder distributed through the air by means of a special pair of bellows or by placing some of it in a square of muslin, picking up the

corners, twisting them up tight, and shaking the bag thus formed vigorously. This is only suitable for *closed* rooms or shelters. It is non-poisonous but irritating to the nose and throat and messy. A cleaner method is to place a little heap on a tin plate and heat it with a candle flame. The fumes stupefy the flies which fall to the ground and may be swept up and burnt.

#### 4. Sprays.

(a) Sodium Arsenite made up according to the following formula may be sprayed on to manure heaps or on to leafy branches or bundles of straw hung up in any convenient position :

|                                 |    |    |    |    |          |
|---------------------------------|----|----|----|----|----------|
| Arsenite of Soda (80 per cent.) | .. | .. | .. | .. | 1 lb.    |
| Crude Sugar or Treacle          | .. | .. | .. | .. | 12 lbs.  |
| Water                           | .. | .. | .. | .. | 20 gals. |

The sodium arsenite should first be dissolved in a little boiling water.

(b) Various patent sprays which nearly all contain an alcoholic extract of pyrethrum—one contains pyrethrum safrol and soap— $\frac{1}{2}$  to 2 per cent. castor oil improves its efficiency. For use the fluid is diluted with water and atomised by a Mackenzie's or other atomiser. These sprays are only of use in houses and are useless in the open.

(c) Paraffin oil spray (soap  $\frac{1}{4}$  lb., water  $\frac{1}{2}$  gal., paraffin 1 gal.) is instantly fatal to any fly it touches.

5. Flame. The flame of a brown paper torch, or cotton wool soaked in methylated spirits may be used to destroy them while roosting on wires, etc., at night.

6. Petrol fumes will stupefy them so that they fall off their perch and are killed in the fluid.

7. Fly-flappers of various kinds, of which those made of wire gauze are the best.

#### V. Protection against flies.

Fly-proof doors are not much good unless they guard the only entrance to the kitchen or other chamber and unless such entrance is by way of a porch not less than ten feet long guarded at each end by a fly-proof door.

Mosquito curtains will keep out flies.

Flies may be kept out of marquees and other structures by providing each door or other opening with a net (ordinary fishing net with a  $\frac{3}{4}$  inch mesh will do) which should reach well down to the ground.

Larders and pantries should be fly-proof.

Plates, tumblers, cups, etc., should invariably be placed on the table upside down till required for use. Dishes containing food should be provided with wire gauze covers or covers made of muslin or mosquito netting stretched on frames. All vessels containing fluids such as milk should be provided with muslin covers weighted at the edges. A little bacon fat smeared on the edge of a tea-cup will prevent flies settling upon it.