

THE HOUSE FLY. *

BY COLONEL C. S. EVANS, I.M.S.

Most trained nurses are well aware of the important part played by the common house fly in the dissemination of many diseases and particularly in relation to infantile diarrhoea, which accounts for many thousands of deaths among children.

Therefore the description of the habits of the house fly and some practical instructions as to dealing with this pest, which we reprint, by kind permission of Colonel C. S. Evans, I.M.S. (Rtd.), will be read with greatest interest by all :—

"The House Fly, *Musca Domestica* (Lin.), is found throughout Europe and is widely distributed in both hemispheres. It is found in Northern India and certainly exists in Ceylon, but it is said not to occur in Southern India, where it is largely replaced by a closely related and equally dangerous species, the *Musca Nebulo* (Fabr.), which has identical breeding habits and is particularly fond of ovipositing in night soil—a fact of very considerable importance, especially in the East where opportunities are abundant.

The house fly is about $\frac{1}{4}$ inch long and mouse grey in colour. The thorax is marked on its dorsal aspect by four longitudinally placed narrow black stripes. In the male and frequently in the female the sides of the abdomen are buff. In the male the space between the eyes, as looked at from above, is $\frac{1}{5}$ th (British) to $\frac{1}{13}$ th (warmer climes) the total width of the head. In the female the space is much broader, occupying $\frac{1}{3}$ rd the diameter of the head, and the central back stripe is relatively broad and separated from the eyes on each side by a much narrower interval. The proboscis is curled up in a cavity under the head and terminates in a couple of fleshy lobes. The fourth longitudinal vein in each wing is sharply bent near the tip of the wing in such a manner that its end nearly meets that of the one in front of it.

The adult female fly lays a number of eggs, each egg hatches out a maggot or larva, and each maggot wanders about, feeds, grows, and then passes into a resting stage known as the pupa or chrysalis. The fly, when fully developed, forces its way out of the end of the chrysalis case or puparium.

Female house flies prefer to do their ovipositing in groups and under suitable circumstances they may be seen clustered together in a hollow, on the surface of a fresh manure heap or mass of faeces depositing their eggs. Each house fly lays from 120 to 150 eggs at a time and does this five or six times in her life. The eggs are tiny ($\frac{1}{25}$ th to $\frac{1}{20}$ th of an inch long) oat-shaped bodies which look through a lens like minute grains of polished rice. They are piled one on top of the other to form little masses concealed in crevices in the material selected by the mother so as to afford protection from the direct rays of the sun which are rapidly fatal to them.

* 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.

The eggs are laid in material on which the maggots feed—fermenting horse manure, exposed human fæces, and fermenting organic matter of various kinds such as exists in ash-pits and deposits of house refuse. In the East pudrette dépôts and filthy apologies for private conveniences are sources of a periodical plague of flies. Moisture and warmth are essential conditions. The house fly cannot breed in absolutely dry material, and should the food stuff dry up before the maggots have attained their full size, the resultant flies will be undersized. Hence it is that while house flies cannot breed in camel droppings scattered, naturally they will readily do so when it is piled up so as to be permanently moist underneath. In Cairo in the hot weather (June to August) the intense heat causes flies to disappear and breeding in the municipal refuse dumps to cease owing to the surface being dried up. The continuance of the species, however, is insured by the fondness of the people for the water melon, the moist rind of which is cast in large quantities upon the refuse dumps affording moisture and shade beneath which maggots hatch out and live freely. As regards horse manure, the material is attractive to egg-laying house flies only so long as it is perfectly fresh, say 24 hours. Eggs are laid in such heaps within the first eight hours, after that the drying of the surface and heat generated by fermentation deeper down soon renders it unattractive to flies. A manure heap to which no fresh additions are made can therefore only produce one batch of flies and old heaps are perfectly innocuous.

In from 8 to 24 hours in warm weather under favourable conditions in the British Isles, longer (up to three days) if the temperature is lower, the eggs hatch out tiny white footless maggots. These burrow into and feed vigorously upon the food material in which they have been hatched. They may come out and move about on the surface at night but in the daytime they keep out of sight occupying a zone of not more than 4 to 5 inches thick at the periphery of a manure heap, being prevented from going deeper by the heat generated by fermentation in the centre of the dump. If exposed by disturbance of the surface, they rapidly burrow out of sight. A "trituration or comminuted" appearance of patches of the surface, like finely chopped straw, is a sure indication of the presence or recent presence of larvæ.

The fully developed maggot is just under half an inch long and has an ivory-yellow waxy appearance. It takes 42 hours to 4 or 5 days in hot weather, longer, it may be six or eight weeks, at lower temperatures, to reach this stage of development. It then ceases to feed, wanders away out of the food material and may be found around the base of the dung heap where it is drier, and cooler, owing to the absence of fermentation and shady from overhanging straws. Here it remains for three or four days before pupating (passing into the chrysalis stage) or it may wander away to a distance of an inch or two to three or four feet from the heap and burrow to a depth of not more than a couple of feet in the soil before pupating—occasionally their burrowing takes them under the manure heap. In whatever position they may be discovered they are nearly always found in groups or nests. Where the food material is forced in a trench latrine the maggots when fully

developed burrow in the walls of the trench, it may be as much as several feet till at a distance of from an inch to a foot from the surface they settle down and undergo the change to the chrysalis condition. The process of growth of the maggot and subsequent burrowing is not prevented by filling up the trench with earth.

In the chrysalis or resting stage the skin of the mature larva becomes contracted and hard to form a case or puparium within which is the developing fly known as the pupa or chrysalis. The puparium is barrel-shaped and about a $\frac{1}{4}$ of an inch long. It is at first yellow, gradually becoming red, brown, and finally black. This stage lasts from four days to four weeks, according to the temperature.

The fully developed fly (a wizened shrunken creature with shrivelled wings and a dilatable sac or bladder known as a ptilinum on the front of its head) forces off the upper and lower surfaces of the anterior end of the puparium with the help of its ptilinum and escapes. It then, if buried, works its way to the surface by the aid of the expansion and contraction of the same organ. The sac is then withdrawn into the head and appears no more. The outer covering of the body and legs hardens and assumes its normal colour, the wings spread out, and the mature insect capable of flight goes forth and the cycle begins again.

A little reflection over the details given above will show the absolutely colossal figures that may be obtained by calculating the possible progress of a single pair of flies in a single season.

The exact duration of the life of a fly is not known. In the British Isles, in the warmest time of the year, it probably does not live more than three or four weeks, while in autumn and winter, in warm indoor retreats, it may live as many months. Still, it is by no means certain that the autumn or winter flies live long enough to become the parents of the succeeding year's swarm. How the species is preserved from one season to the next is not known. Towards the end of 1919 much stir was caused by the announcement of the discovery, by a French Naturalist, of house fly larvæ in live snails during the winter months.

The physical torment of house flies ceases at sunset when they go to rest. Under conditions of abnormal heat and drought, however, they may continue to move about and disturb would-be sleepers till as late as 11 p.m. Provided there is abundance of suitable food and shelter the house fly does not travel far from its place of birth. They do, however, constantly travel over long distances, less so in towns where their flight is intercepted by houses than in the country. Their flight is certainly aided by wind, especially over water where they may travel as much as five or six miles. Usually house flies travel against or across the wind, and there is not the least doubt that they may move against a gentle current of air which conveys odours that attract them.

Human feces has an irresistible attraction for flies, which feed freely upon them and human food, especially sugar, jam, milk, bread, cheese and dried fruit, *e.g.*, dates (all consumed uncooked by man) comes next, so that they often pass directly from one to the other. During feeding they vomit

forth their stomach contents to liquify their food, *e.g.*, sugar, and are constantly emptying their intestine, the evacuations containing disease germs and ova unaltered by any digestive process, it may be as long as four days after ingestion.

In Europe great numbers of flies are destroyed every autumn by a parasitic fungus (*Empusa Muscoe-Cohn*). Flies dead of this disease have swollen, whitish, dark-banded abdomens and may be seen adhering to window panes, etc., by means of fungoid outgrowths called rhizoids surrounded by a halo of spores."

(*To be continued.*)

EXPERIENCES IN THE BALKANS.

(*February 1915 to December 1920.*)

BY MISS ROUND.

I was accepted by Lady Paget for the Serbian Relief in October, but owing to a letter being mislaid, did not get away until February 1915. We crossed the Channel at night in absolute darkness and were all glad when Dieppe was safely reached. After careful examination of passports we were allowed to land. In Paris all was bustle and excitement, but we soon resumed the journey. At the Swiss French Frontier, the Doctor who was travelling with us, myself, and another Nursing Sister, was arrested as a spy. He had failed to get the latest passport, wore no Brassard and began to speak German. We two were sent on, and on arrival at Lausanne were met by the head of the Swiss Police and told to await orders. We were given an excellent lunch, and while enjoying it a telegram arrived saying that the Doctor was released and would follow by the next train. This caused us to lose our connection at Milan and delayed us some hours. On arrival at Brindisi we managed to get a boat for Salonica, but with the utmost difficulty got our stores on board, even then, when we arrived a big cheese had gone astray. This bit of the journey was most interesting as we went through the Corinth Canal. It was started in the time of the Emperor Nero and many attempts have been made to find a better position, but finally they decided to finish the original scheme, and it was completed three years before the war. It is four miles long and a small steam tug pilots the vessel through, the bottom of the boat being protected from the rocky sides by means of rafts, which expand and supplement the water. It takes about four hours to go through but saves at least three days' journey. On reaching Salonica a telegram was sent to Skoplje—Serbia, to say we should be arriving in 24 hours. We arrived on Tuesday—the telegram the following Saturday. At the hotel in Salonica we ordered a lunch basket for the train which was to include a chicken, some hard boiled eggs, butter, bread, etc. When it was opened at midday we found two eggs, about half a pound of butter and two very small loaves. So if you ever should travel that way, inspect your lunch basket.

At Skoplje no one could speak English; but after much difficulty we found out the Hospital and soon found ourselves in the midst of much work. No one knew of our coming, but we were soon fixed up. Next morning we were asked if we all three, Doctor and our two selves, would go at once to the second Reserve Hospital about 500 beds—we gladly went, but I shall