

Since then Mr. Hesse has gone further by poisoning manure with the artificial cultivation and attempting to develop the fly larvae therein. The result was encouraging. The larvae assumed the pupal form but did not hatch out. A further experiment by Mr. Hesse tends to show that the zygospores if swallowed by the fly when disseminated in syrup, are thrown off as conidia by the fly, thus completing the life-cycle of the fungus. The interest of these observations lies in the fact that hitherto the spores have been supposed to work their way into the fly through the surface of its abdomen, whereas it would now appear from Mr. Hesse's experiments that they are swallowed and probably germinate in the crop.

MARTIN (C. J.). **Horace Dobell Lectures on Insect Porters of Bacterial Infections, delivered before the R. Coll. of Physicians.**—*Brit. Med. Jl.* 4th Jan. 1913. pp. 1-8; and 11th Jan. 1913. pp. 59-68.

In the first of these lectures the author deals with the house-fly, and discusses the evidence which exists as to the carriage by this insect of various epidemic disorders, especially typhoid and infantile diarrhoea. In the second lecture the rat flea, as the carrier of plague, and the human flea are discussed. The reason why the human flea is ineffective in the transmission of plague, is because in human cases the average degree of septicaemia before death is so much less than in rats that the chance of a flea imbibing even a single bacillus is small. Possibly in the middle ages when the intensity of the septicaemia in man may have been greater the human flea may have played its part in carrying infection.

Typhus, relapsing fever and poliomyelitis may be transmitted by insects. Typhus fever has been shown to be capable of transmission by the agency of body lice by Nicolle, Compte and Conseil (1909) and by Ricketts and Wilder (1911). The last insect dealt with in the lectures is the bed-bug, of which the author says, there is no real evidence to incriminate this insect in the case of either typhus or relapsing fever. Plague has been transmitted experimentally by bugs but there is no epidemiological reason for supposing that this takes place to any extent in nature.

The report of these lectures is very fully illustrated with drawings of the mouth and other parts of the insects named and a very full bibliography is given.

MITZMAIN (M. B.). **Collected Notes on the Insect Transmission of Surra in Carabaos.** *Philippine Agric. Rev. (Vety.)*. V. No. 12. Dec. 1912. pp. 670-681.

*Experimental Transmission of Surra by Lice.*

The Carabao is a variety of the Indian buffalo (*Bubalus bubalis*) and is commonly regarded as being indigenous to

the Philippines. The author's first enquiry was into the dispersal of the lice of this buffalo and their rôle in the transmission of *Trypanosoma evansi*. The transmission of *T. lewisi* by the agency of lice has been effected by many workers, but it does not appear that *T. evansi* has been experimentally transmitted. Observations were made on four beasts, two had been kept for 3 months in screened stalls and two others in a separate shed, but not screened. The blood was regularly examined, the temperature taken and guinea-pigs inoculated with the blood. At the end of 6 weeks, neither buffalos nor guinea-pigs showing any trace of trypanosomes, the former were regarded as suitable for observation. On 12th Dec. 1910, a thousand lice (*Haematopinus bituberculatus*, Nitzsch) were collected from a carabao heavily infected with trypanosomes. These were divided into five lots of 200 each; one lot was set aside as a control, but all died within 3 days. Two hours after removal from the infected host one lot was placed on the hair of carabao No. 8 (screened stall) and 10 hours later another lot on carabao No. 7 (screened stall). Twenty-four hours after removal from their infected host a lot was placed on carabao No. 16 (unscreened stall) and the next day carabao No. 17 (unscreened stall) received the last lot of lice. The beasts were then all segregated in fly-screened stalls. All remained normal till 3rd Jan. 1911, 22 days after introduction of the lice, when No. 8 became feverish and the blood showed trypanosomes (1 per 50 fields, 1-12th obj.). A guinea-pig (A1) was inoculated with 3 cc. blood from the ear of this carabao and daily blood examinations were made. On 9th Jan. No. 8 which had remained normal since the last rise now registered  $40.2^{\circ}\text{C}^{\circ}$  ( $104.3^{\circ}\text{F}^{\circ}$ ). On 10th Jan. a native horse and two guinea-pigs were inoculated with its blood and 8 days later the horse showed trypanosomes in its blood. The blood of guinea-pig A1 though examined daily showed no trypanosomes until 21 days after inoculation. The others inoculated with the horse showed them in 10-12 days. The other three carabaos after a month showed no signs of infection, either by temperature or blood tests.

How far the lice may act as carriers of surra the author is not prepared to state. It would seem that they must find a new host within a few hours of the death of the previous one and begin their attack almost at once. The lice have been observed not to change their position until the body of the dead host has become quite cold. The quantity of hair on the beast is an important factor, old animals shed much of their hair and therefore have few lice. The author thinks that where beasts are confined in considerable numbers, *e.g.*, in quarantine, and contact is probable, exchange of lice may take place to a considerable extent. Beasts that have ample opportunity of bathing and wallowing have fewer lice than others. The author cites cases of Indo-Chinese bullocks dying of surra and infested by lice undistinguishable from those of the carabao. Experiments are being made as to the possible transmission of carabao lice to this variety of bullock.

*Transfer of the Lice by Flies.*

The carabao louse has been found attached to the legs of a species of *Lyperosia*, common in the islands, on an average of one in three, 1,800 flies collected in five days yielding 620 lice. This lasted till the middle of March, when the *Lyperosia* gradually disappeared and the stable-fly, *Stomoxys calcitrans*, predominated in vast numbers. The louse was never found attached to the latter nor indeed to any other species than the *Lyperosia*. The parasite in question was undoubtedly the larval form of the carabao louse. No other species was collected from carabao on which the infested flies were found. None of the lice found on the flies had imbibed mammalian blood. How far the flies may act as distributors of the lice is unknown, but it seems probable that they can and do act as such.

*An Experiment to demonstrate Periods of Non-infectivity in Carabaos affected with Surra.*

An emulsion of 150 *Lyperosia* sp., which had bitten a surra carabao on a day when its blood was negative, when injected into a horse and two guinea-pigs gave no reaction, but an emulsion made from flies collected on the same carabao when positive gave a definite surra reaction. The author argues that if the blood of the animal had been used in place of the fly emulsion the result would have been the same. From the results of a number of experiments in blood inoculation the author concludes that, (1) during the negative stage of the disease the carabao is not a source of danger as an active focus for fly dissemination; (2) it does not become imperative to verify microscopical findings (when carefully performed) by animal inoculation in suspected cases of surra in carabaos, for it is not convincing or significant during negative periods; (3) when the trypanosome is not found during protracted stages upon microscopical examination it should not be assumed that the animal is free from infection.

*Entomological study of a Surra Outbreak among Carabaos in the region of La Carlotta, Occidental Negros.*

Investigations at 7 haciendas:—

(1.) 105 cattle, 115 carabaos, 6 horses; all permitted to pasture together freely; 8 cases carabao surra and 1 bullock, horses free. Over 80 per cent. of the flies found were common to all three kinds of animals and were all *Lyperosia*.

(2.) 90 cattle, 60 carabaos; 1 horse affected with surra, but had come from a farm close by only 4 weeks before. The flies collected were all *Lyperosia*; no *Stomoxys* whatever.

(3.) Indo-Chinese bull badly infected, 50 carabaos, in same pasture, free; few *Stomoxys*, dense swarms of *Lyperosia* around the bull, which also yielded carabao lice.

(4.) 90 carabaos (12 infected), 2 mares with colts, free. Sire of these colts infected and had been removed to a surra-free hacienda a mile away. Did the horse contract surra from the carabao?

(5.) 23 cattle, 53 carabao, all healthy; lice almost absent; good mud wallows. No TABANIDAE; *Lyperosia* present, with about 1 per cent. of *Stomoxys*.

(6.) 103 carabaos—6 surra cases and 12 suspects; no trypanosomes. More lice than at farm No. 5. *Lyperosia* predominated; few *Stomoxys*.

(7.) Herd of carabaos, 8 per cent. infected with surra, 5 positive on day of inspection. Flies collected, *Lyperosia* 341; *Stomoxys* 7; non-biting Muscids 7. *Lyperosia* vastly predominant.

The distribution of *Lyperosia* and *Stomoxys* on cattle, carabaos and horses during two weeks of field observation was cattle (70 per cent. and 10 per cent.), carabaos (95 per cent. and 3 per cent.), horses (25 per cent. and 70 per cent.). Tabanids were found on cattle only, 3 per cent.

The flies, several hundred *Lyperosia* together, travel with their host and serve as carriers. They have been observed to hold on to one animal for several kilometres; when the animal rests they are switched off and seek new hosts.

An experiment was made by shutting up a healthy carabao with two infected ones in a fly-proof cage, the animals not being in contact. About 5,000 *Lyperosia* flies were collected from healthy working carabaos and let loose in the shed containing the three animals. Daily observation of all three gave negative results. Further like experiments are in progress.

CASTELLANI (A.) & HIRST (S.). **Note on Copra Itch with a Report on the Mite causing it.**—*Jl. Trop. Med. & Hyg.* 16th Dec., 1912.

Dr. Castellani has observed for several years that persons employed in copra mills in Ceylon are subject to a peculiar eruption. The skin of the hands, arms and legs, and sometimes the whole body, except the face, is covered with fairly numerous, extremely pruriginous papules; papulo-pustules and pustules are also generally present. The eruption begins as a rule on the hands and thence spreads to the arms, legs and trunk; never to the face. The author found acari-like parasites on a patient's arm and was told by him that these were common in the copra dust. A sample of dust brought by the patient for examination was found to be swarming with similar acari. These have now been identified by Hirst as a new variety of *Tyroglyphus longior*. The mite does not bury itself in the skin, but appears to induce dermatitis in the same manner as *Pediculoides ventricosus* (Newport), which lives in diseased cereals, but further investigation is necessary.

The author has produced the disease experimentally by rubbing copra dust containing the mite on to the skin of healthy persons.